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Issue Article

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THE CHOICE OF ROCK CUTTING TOOLS, THE MODE OF WORKING OUT AND THEIR DRIVE WHEN DRILLING WELLS WITH AN ELECTRIC DRILL AT THE GOTURDEPE FIELD

Abstract: *The article discusses the analysis and recommendations on the choice of rock cutting tools, the mode of working and their drive, as well as the technology of drilling vertical and directional wells with an electric drill in the Western part of the oil and gas fields of Turkmenistan in order to increase the mechanical drilling speed and to successfully achieve the design depth. Materials of previously drilled wells, mining and geological characteristics of deposits, as well as operating instructions and rules for the operation of electric drills were used to analyze the selection of rock cutting tools, the working mode and their drive, as well as the technology of drilling vertical and directional wells with an electric drill. This paper provides a detailed analysis of the selection of rock cutting tools, the working mode and their drive, as well as the technology of drilling vertical and directional wells with an electric drill and provides recommendations on not allowing cable section breakdowns during drilling, as well as recommendations on choosing types of drill bits and operating instructions for different types of electric drills. This work can be used to perform the assigned tasks when drilling oil and gas wells with the aim of increasing the mechanical speed.*

Key words: *electric drilling, flushing units, central hole, bit, drilling mode, rotation speed, axial load, mechanical speed, axial backlash.*

Language: *English*

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Introduction

The correct choice of bits of the appropriate rock strength is the main necessary indicator in the drilling process to improve the mechanical and commercial drilling speeds of wells.

Based on the analysis of the drill bits for successful drilling by electric drilling at the Goturdepe field, we offer the following recommendations for choosing the optimal rock cutting tool and the mode of working and their drive:

a) The recommended standard sizes of electric drill bits are equipped with both central and lateral (hydraulic) flushing units. The central flushing holes are equipped with bits with diameters of 490; 393.7; 320 mm, and the side flushing holes are equipped with bits with diameters of 295.3; 269.9; 215.9 and 190.5 mm [1, 2]. In the table № 1, 2, 2.1, 2.2, 2.3, 2.4 and 3 are given the recommended sizes of bits for use in different sections of the Goturdepe field with an electric drill.

Table 1

Drilling interval, m	Standard sizes and types of bits	Note
0 – 1000 Baku Tier	III 490 S-CV III 393.7 M-CV (M-GN) III 320 S-CV (S-GV)	Bits with diameters of 269.9 mm and 190.5 mm are used for drilling wells up to 1800 m deep in the western section of the Goturdepe square, in the eastern section of the area can be used for drilling exploration wells.
1000 – 2400 Baku tier, Acheron tier to the soles of "black clays"	III393,7 M-GW (M-CV) III295,3 M-GW (MS-GW) III269,9 M-GW (S-GNU) III215,9 M-GW-1 (M-GW-4) III190,5 S-GW-1 (S-GNU)	
2400 – 4000 Akchagylsky tier, red-colored thickness	III393,7 S-GV (S-CV) III295,3 MS-GV (S-GV) III215,9 M-GV-1 (MS-GV) ISM295,3 R-4	
4000 – 4600 The lower section of the red - colored thickness	III 295.3 S-GW (MS-GW) III 215.9 MS-GW (S-GW) ISM295,3 RG-4	
4600 – 5200 The lower section of the red - colored thickness	III215,9 S-GN (S-GV) III215,9 S-GNU III 190.5 S- GNU III 190.5 S-ZN	

In the technology of drilling with an electric drill, it is also provided for the use of M types with a sealed support;

b) drilling of wells with the above-mentioned bits is carried out using electric drills with gear inserts of type [3, 4]:

3290-12r (=3.15) - when drilling with Ø 490 and Ø 393.7 mm bits;

E240-8r (=3.0) - when drilling with bits Ø 320 and Ø 295.8 mm; .

E215-8r (=3.0) - when drilling with bits about Ø 269.9 mm;

E190-8r (=3.0) - when drilling with bits Ø 244.5 and Ø 215.9 mm;

E185-8r (=2.92) - when drilling with bits about Ø 215.9 mm;

E164-8r (=3.13) - when drilling with bits about Ø 190.5 mm.

c) the drilling regime parameters are established based on the analysis of field materials for working off bits and drilling modes for the Goturdepe area [5, 6];

d) the program of the drill bits for the well with the indication of the operating parameters of the drilling process is given in the table 2. The installed axial loads on the bit during the voyage must be maintained constant. The constancy of the rotational speeds is ensured by the technical characteristics of the electric drills used;

e) when working with the deflector, the axial load on the bit does not decrease against the values set in Tables 2.1.-2.4, because the STE telemetry system provides continuous and accurate monitoring of the effect of the angle of twisting of the drill string on the position of the deflector at any technically permissible axial loads;

f) during the drilling process, the driller is obliged to maintain the established drilling modes and the operation of the electric drill, guided by the readings of control measuring devices, including kilowatmeters, power indicators on the bit, ammeters, voltmeters. The main devices that should be used to monitor the operation of the bit are the hydraulic weight indicator of the drill string and the wattmeter. According to the ammeter, only the maximum permissible (by heating the engine) value of the total current consumed by the electric drill is controlled [7, 8];

g) if there is no increase in power during drilling, consumed by an electric drill, in accordance with an increase in the axial load, or there is a zero indication of the power indicator in the presence of a load on the bit according to the weight indicator, this indicates the "hanging" of the drill string due to its "sticking" to the wall of the well or the expansion of the lower compressed part [9,10, 11].

In directional wells, in particular at large zenith angles, the phenomenon of "hanging" is very common. In these conditions, it is especially important to monitor the operation of the bits according to the power indicator;

h) to prevent the drill string from "hanging", it is recommended to rotate it during drilling with a rotor at a speed of 5-30 rpm. Turns and detachments of the column from the bottom-hole can also be used as a measure to eliminate the resulting "hanging";

i) in order to avoid jamming of the bit, the electric drill must be turned on before reaching the bottom-hole. The bottom-hole should be approached smoothly with washing and elaboration;

k) drilling should begin with the bit running in at an axial load of 2-5 tc, for 3-5 minutes, with its gradual bringing to the optimum value within 5-10 minutes;

l) the moment of lifting the bit is determined by two signs: a decrease in the mechanical drilling speed and an increase in power on the electric drill, recorded by the readings of the power indicator and meters with frequent peaks. The first sign indicates the wear of the bit armament, and the second one indicates the wear of the support. The presence of these signs is a signal of the need for an immediate cessation of the longest drilling of the well and the lifting of the bit. A 2-3-fold decrease in mechanical speed can be used to make a decision about lifting the bit, if it is observed relative to the lowest value of the mechanical speed of penetration at the beginning of chiseling. It should be taken into account that the drilling speed of clay layers is a multiple of times less than permeable layers (reservoirs) [12, 13, 14];

m) as an additional feature, according to which it is possible to control and set the operating time at the face, is the axial backlash of the support. The value of the latter should not exceed 4-5 mm for bits about 215.9 mm and 5-6 mm for bits about 295.3 mm.;

n) the sudden termination of the penetration with a simultaneous reduction to zero of the power on the bit while the electric drill is running indicates the termination of the kinematic connection between the electric drill motor and the bit due to the breakdown of the splined coupling couplings, shafts or the destruction of the gear transmission of the gearbox insert [15 ,16];

o) when drilling wells with bits of the ISM-FT type, it must be taken into account that they contribute to a more intensive set of curvature than three-roller bits;

p) core sampling should be carried out in accordance with the "Instructions on the technology of drilling oil and gas wells with electric drills".

Table 2. Standard sizes of the bits used and drilling modes on the Goturdepe area (Eastern section, exploration wells, design depth of 5200 m).

Interval	Stratigraphy	Type bit	Type electric drill	Axial load, kN
1. 0-700	Baku Tier	Sh490 M-CV (Sh490 S-CV)	3290-12=3,15	100-120
2. 700-2800	Baku tier + Absheron-akchagyl + red-colored thickness	Sh393,7 M-CV Sh393,7 S-CV ISM 392 RG	E290-12r = 3,15150-180	150 - 280
3. 2000-2300	“Black clays”	Sh393,7 M-CV	E290-12r = 3,15150-180	160-180
4. 2800-4600	Red - colored thickness	Sh295,3 MS-GV	E240-12r	180-240
5. 4600-5200	Red - colored thickness	Sh215.9 S-GW Sh 215.9 S-GN	3185-8r=9 3185-8r=2,92	200-220 180-200

continuation of table 2

Interval	Stratigraphy	Type bit	Power consumed by the bit, kW	Rotation speed, rpm	Note
1. 0-700	Baku Tier	Sh490 M-CV (Sh490 S-CV)	250-310	455 (145)	When using bits of the ISM-RG type, it is necessary to strengthen control over the deepening of wells in order to prevent the curvature of the hole
2. 700-2800	Baku tier + Absheron-akchagyl+ red-colored thickness	Sh393,7 M-CV Sh393,7 S-CV ISM 392 RG	200 – 270	145 (445)	
3. 2000-2300	“Black clays”	Sh393,7 M-CV	200-270	145	
4. 2800-4600	Red - colored thickness	Sh295,3 MS-GV	190-220	230	
5. 4600-5200	Red - colored thickness	Sh215.9 S-GW Sh215.9 S-GN	120-140 120-140	75 (75)240	

Table №2.1. Standard sizes of the bits used and drilling modes on the Goturdepe area (Eastern section, production wells, design depth of 4250 m).

Interval	Stratigraphy	Type bit	Type electric drill	Axial load, kN
1. 0-100	Baku Tier	Sh490 S-CV	3290-12	100
2. 100-1500	Baku tier + Absheron	Sh393,7 M-CV	3290-12	150 - 200
3. 1500-3500	Absheron-akchagyl+ red-colored thickness	Sh295,3 MS-GV Sh295,3 S-GV	E240-8r= 3	200-240
4. 2000-2300	“Black clays”	Sh295,3 MSGV Sh295,3 S-GV	E240-8r= 3	200-240
5. 3500-4250	Red - colored thickness	Sh215.9 M-GW Sh215.9 S-GN	E240-8r=2,92	180-220 180-200

continuation of table 2.1

Interval	Stratigraphy	Type bit	Power consumed by the bit, kW	Rotation speed, rpm	Note
1. 0-100	Baku Tier	Sh490 S-CV	250-310	455	Drilling modes for directional wells are the same as for vertical wells.
2. 100-1500	Baku tier + Absheron	Sh393,7 M-CV	200 – 270	455 (145)	
3. 1500-3500	Absheron-akchagyl+ red-colored thickness	Sh295,3 MSGV Sh295,3 S-GV	190-220	230	
4. 2000-2300	“Black clays”	Sh295,3 MSGV Sh295,3 S-GV	200-220	230	
5. 3500-4250	Red - colored thickness	Sh215.9 M-GW Sh215.9 S-GN	120-140 120-140	240	

Table 2.2. Standard sizes of the bits used and drilling modes on the Goturdepe area (Eastern section, production wells, design depth of 2700 m).

Interval	Stratigraphy	Type bit	Type electric drill	Axial load, kN
1. 0-30	Baku Tier	Sh393,7 M-CV	3290-12	120
2. 30-800	Baku tier + Absheron	Sh295,3 M-GN	E240-8r	100-120
3. 800-2700	Absheron-akchagyl+ red-colored thickness	Sh215,9 M-GV-1	3185-8r =3	120 - 200

Continuation of table 2.2

Interval	Stratigraphy	Type bit	Power consumed by the bit, kW	Rotation speed, rpm	Note
1. 0-30	Baku Tier	Sh393,7 M-CV	270	455	

2. 30-800	Baku tier + Absheron	Sh295,3 M-GN	220	230	Drilling modes for directional wells are the same as for vertical wells.
3. 800-2700	Absheron-akchagyl+ red-colored thickness	Sh215,9 M-GV-1	110	240	

Table 2.3. Standard sizes of the bits used and drilling modes on the Goturdepe area (Western section, production wells, design depth of 3800 m).

Interval	Stratigraphy	Type bit	Type electric drill	Axial load, kN
1. 0-800	Baku tier + Absheron	Sh393,7 M-CV	3290-12	120
2. 800-3200	Absheron-akchagyl+ red-colored thickness	Sh295,3 M-GW	3240-8r=3	150 - 240
3. 1300-1500	“Black clays”	Sh295,3 MS-GV	3240-8r=3	160-180
4. 3200-3800	Red - colored thickness	Sh215,9 S-GW	3185-8r	180-220

Continuation of table 2.3

Interval	Stratigraphy	Type bit	Power consumed by the bit, kW	Rotation speed, rpm	Note
1. 0-800	Baku tier + Absheron	Sh393,7 M-CV	270	455	Drilling modes for directional wells are the same as for vertical wells.
2. 800-3200	Absheron-akchagyl+ red-colored thickness	Sh295,3 M-GW	220	230	
3. 1300-1500	“Black clays”	Sh295,3 MS-GV	220	230	
4. 3200-3800	Red - colored thickness	Sh215,9 S-GW	110	240	

Table 2.4. Standard sizes of the bits used and drilling modes on the Goturdepe square (Western section, operational directional wells, design depth of 1700 m).

Interval	Stratigraphy	Type bit	Type electric drill	Axial load, kN
1. 0-30	Baku Tier	Sh393,7 M-CV	3290-12	80-120
2. 600-1500	Absheron + 2 packs of "black clays" + akchagil	Sh295,3 M-GN	E240-8r=3	120-180
3. 1500-1700	Upper red - colored thickness	Sh215,9 M-GV-1	3185-8r=3	120 - 220

Continuation of table 2.4

Interval	Stratigraphy	Type bit	Power consumed by the bit, kW	Rotation speed, rpm	Note

1. 0-30	Baku Tier	Sh393,7 M-CV	250-310	455	Drilling modes for directional wells are the same as for vertical wells.
2. 30-800	Absheron + 2 packs of "black clays" + akchagil	Sh295,3 M-GN	270	230	
3. 800-2700	Upper red - colored thickness	Sh215,9 M-GV-1	110	220	

Table 3. Lithological and stratigraphic characteristics of the geological section of the Goturdepe deposit

Stratigraphy					Lithology
group	system	department	tier		
			The western section of the square	The eastern section of the square	
Kainazoi–Neogene-Pliocene			Baku 0-600m Absheron 600-1600m Akchagyl 1600-1635m Red-colored thickness 16350-4000m	Baku 0-900m Absheron 900-2400m Akchagyl 240-2600m Red - colored thickness 2600-5200m	Baku tier: alternation of slightly compacted sands and clays. Absheron tier: alternation of weakly compacted sands and clays and siltstones. Akchagyl tier: sandstone, dense clays, siltstones. Red–colored stratum: alternation of sandstones with dense clays "black clays" occur in the western section in the range of 1300 – 1500 m, in the eastern section in the range of 1900 - 2200 m.

Drilling muds and well flushing

a) The type of drilling mud, its parameters and chemical treatment must comply with the approved regulations for drilling muds [17,18];

b) To prevent the swelling of the rubber of the current supply cable sections used and the premature loss of its mechanical properties, the oil content in the drilling mud should not exceed 105 ºC (by weight of the volume of the solution) [19, 20, 21];

c) well flushing is designed from the provision condition:

- the velocity of the upward flow of drilling mud in the annular space in the range of 0.4 - 1.00 m /s;
- specific flow rate of the washing liquid - 0.035 - 0.062 p/sec per 1 cm^2 [22];
- the hydromonitor effect of flushing the bottom of the well with pressure drops in the bit of no more than 6.0 MPa;

d) the specific hydraulic power on the bit must be kept at least 0.3 kv [23,24].

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Issue Article

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PROCESS CONTROL FOR DRILLING WITH A HORIZONTAL END OF THE BARREL BY ELECTRIC DRILLING

Abstract: *The article discusses studies on the management of the drilling process of horizontal wells, as well as instructions on choosing the type of profiles for directional wells in the Western part of the oil and gas fields of Turkmenistan in order to successfully complete the projected well. When developing a profile for drilling, it is necessary to provide for the angle of meeting of the projected productive formations with the projected trajectory and the intervals of possible natural curvature at intervals. The use of these data determines the type and shape of the hole trajectory by sections, as well as the curved part of the hole, zenith angle, azimuth angle, displacement of the hole from the vertical, etc.*

For research on the management of the drilling process of horizontal wells, materials of previously drilled wells, geological characteristics were used. This paper provides a detailed analysis of the complexity of the study on the management of the process of drilling horizontal wells and their specific causes, as well as recommendations on the choice of methods for managing the process of drilling horizontal wells. This work can be used to perform the assigned tasks when drilling directional wells and for the development of deposits with complex mining and geological characteristics.

Key words: *permeability, porosity, phase, water saturation, meeting angle, deflection angle, typical profile, additional hole, apsidal horizontal, projection.*

Language: *English*

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Introduction

Proper management of the process of drilling wells with a directional end of the hole depends on the permeability of rocks, on natural curvature, on the angle of meeting of the productive horizon, on the displacement of the trajectory from the vertical and other indicators.

In this scientific article, we will consider in detail the influence of these parameters in the process of deepening directional wells.

Permeability of rocks. The relative permeability of a porous medium is the ratio of effective (or phase) permeability to absolute permeability.

Figure 1 shows experimental dependences of the relative permeability of sand to water (k_w) and oil (k_o) on the water saturation of the porous space [1, 2].

As can be seen from the figure, with a water saturation of more than 20%, the phase permeability of the rock for oil decreases sharply, although we still get anhydrous oil within the reservoir pressure gradients. This is explained by the fact that due to molecular surface forces, water is retained in small pores and on the surface of sand grains in the form of thin films, thereby reducing the cross-sectional area of filtration channels [3, 4]. When the water saturation reaches 80%, oil filtration stops, although there is still oil in the reservoir. Therefore, premature flooding of

wells should not be allowed, it is necessary to warn (about water entering the bottom-hole zone) when opening the formation by drilling and during various repair work on the well.

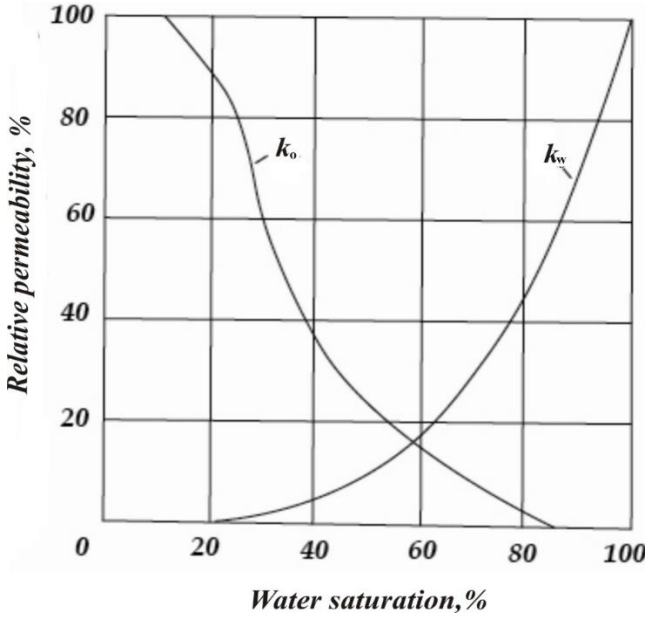

Figure 1. Graph of the dependence of the relative permeability of sand for water and oil on water saturation

Deflection of the barrel and its measurement. When designing drilling operations, the possible natural azimuthal position should be taken into account. Otherwise, the well will not cross the thickness at the intended points and the geological task may not be completed. To construct geological sections, it is necessary to know the actual spatial position of the borehole, which is shown in Figure 2.

This position is characterized at each point of the borehole by the zenith angle of the borehole **θ** and azimuth **α**.

Zenith angle - this is the angle between the vertical and the axis of the well at the measurement point. The zenith angle is located in a vertical plane passing through the axis of the well. This plane is called the apsidial plane.

The azimuth of the well is the angle between the direction to the north and the projection of the axis of the well on the horizontal plane, i.e. the line of intersection of the apsidal and horizontal planes.

Instead of the zenith angle, the angle of inclination of the well $\eta = 90^0 - \theta$ is sometimes used, which are the angle between the axis of the well and its projection on the horizontal plane [5, 6, 7].

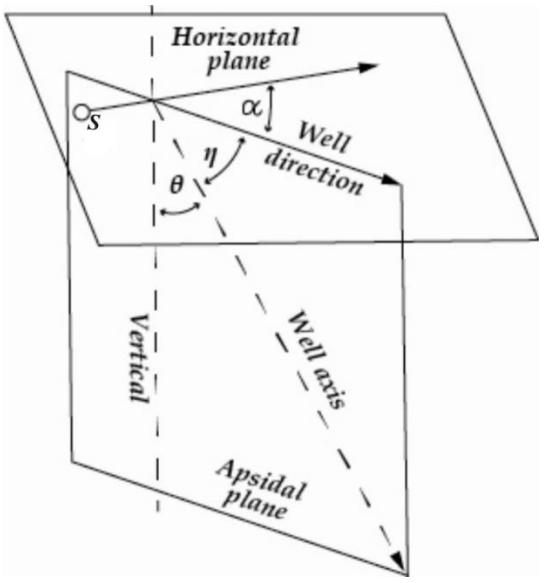

Figure 2. Elements of the spatial position of wells.

According to the values of the zenith angle and azimuth at the measurement points, the increment of coordinates is determined and the profile of the well is built on the section.

The zenith angle and azimuth of the well are measured using instruments -inclinometers.

Currently, IK-2, UMI-25 and MI-30 inclinometers are used for measurements in non-magnetic media.

When constructing design profiles, the necessary angle of meeting of the mineral by the well, the patterns of natural curvature for individual intervals of the well should be taken into account. In some cases, the position of the wellhead may be preset. If there is an azimuthal curvature, it should be taken into account in the constructions [8, 9, 10].

Using these data, the value of rectilinear and curvilinear intervals of the hole, the norms of curvature of the well at intervals, the position of the wellhead, the initial zenith angle and azimuth of the well, the length of the well along its axis are determined.

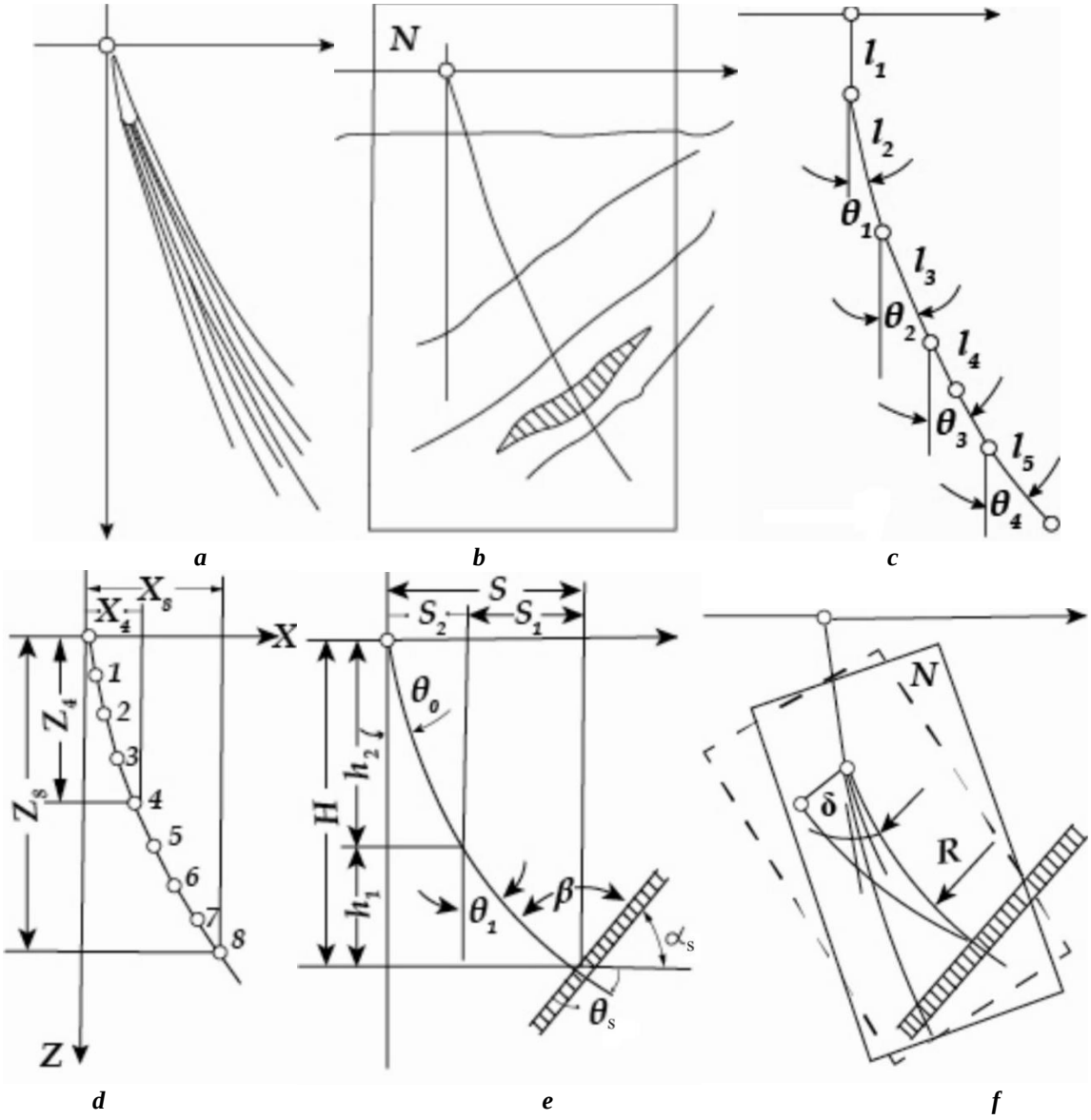

Figure 3. Schemes of construction of project profiles.

γ - meeting angle;

δ - the angle of deviation of the well from the initial direction;

a - graphical finding of a typical profile;

b- transferring a typical profile to a section;

c - point-to-point graphical profile construction;

d - building a profile based on analytically defined coordinates of points;

e - analytical method for calculating the profile;

f - building the profile of an additional hole.

To build the design profiles of wells, graphical and analytical methods are used, which is shown in Figure 3. Various variants of these methods are known. The simplest variant of the graphical method of construction is the use of a typical curve [11, 12]. Profiles of a group of wells drilled in the same geological and technical conditions are combined by the wellheads and transferred to tracing paper. The position of the middle profile in the scattering cone is determined.

This profile is accepted as a typical one (Similarly, a horizontal projection of a typical well is obtained. A typical design profile is transferred to a tracing paper sheet, the tracing paper plane is indicated by the index N) and superimposed on the section so that the mouth coincides with the surface line, the profile position relative to the vertical is preserved, and the profile itself intersects the mineral at a given point. The plan of the project well is also being built, taking into account the laws of the azimuthal direction [13, 14, 15].

Another way is that for a group of wells, the average values of angles are determined by depth intervals, and then a typical profile is constructed in the form of a polyline consisting of segments drawn at these angles.

Individual profiles for specific wells can be plotted graphically from the point of intersection of the mineral well upwards using segments, the first of which is deposited at a given meeting angle and the subsequent ones at an angle to the previous one equal to the increment of the zenith angle at this interval [16, 17, 18]. In this case, you should pay special attention to setting the meeting angle. With a meeting angle that does not correspond to those that take place on the site, the actual route may not coincide with the design one, since the angles of the meeting of the well with the rock layers located above the mineral also change [19, 20]. In addition, if the wells are drilled vertically, the resulting initial zenith angle may not be equal to zero.

The most accurate are the constructions using the analytical method. It consists in determining the coordinates of the points of the project route and constructing its profile and plan in the form of points, then connected by a smooth curve. The initial data for determining the coordinates are the average (preferably RMS) values of zenith angles and azimuths for a group of wells, taken as the basis for finding a typical curve. The calculation of coordinates is carried out similarly to calculations when constructing the actual position of wells [21, 22].

Calculations are easier and give more accurate results if an electronic computer is used to obtain coordinates. The program for calculating the coordinates of the average trajectory on a computer was developed at the Tomsk Polytechnic Institute.

If the well has a constant curvature throughout or at several intervals, and there is no azimuthal departure, you can use another version of the analytical calculation of the basic data for the construction. For the calculation, the intensity of the curvature i_θ must be known from the depth intervals h. The vertical depth of the intersection of the mineral H, the angle of the meeting of the formation β are set. The angle of incidence of rocks is known α_r. Zenith angle at the meeting point of the formation

$$\theta_{S.} = \alpha_{S.} + [\beta] - 90^{\circ}$$

The zenith angles at the beginning of any interval of the well, the departure of the well-laying point from the projection of the reservoir meeting point to the surface and the length of the well are determined by simple calculations.

The design of multi-barrel wells differs in some features.

The angle of inclination of the well. Figure 4 shows the relationship between the angle of inclination and the deviation of the well bottom from the vertical. With an increase in the angle of inclination, the deviation of the bottom hole from the vertical also increases. The analysis shows that when drilling inclined wells, the actual angle of inclination was scored higher than the design one, and as the deviation of the well bottom from the vertical increased, the difference between these angles increased [23]. However, these results are not an immutable regularity, as they turned out due to the fact that: 1) the profile was calculated without taking into account the specific drilling conditions; 2) drilling of an inclined well was carried out in an azimuth different from the design one; 3) work on correcting the azimuth was not carried out accurately enough; 4) when drilling a rectilinear inclined section, the angle of inclination decreased and the greater this angle was, the more intense the decrease occurred. All these shortcomings identified by the analysis can be avoided, and the difference between the design and actual tilt angles will be minimal.

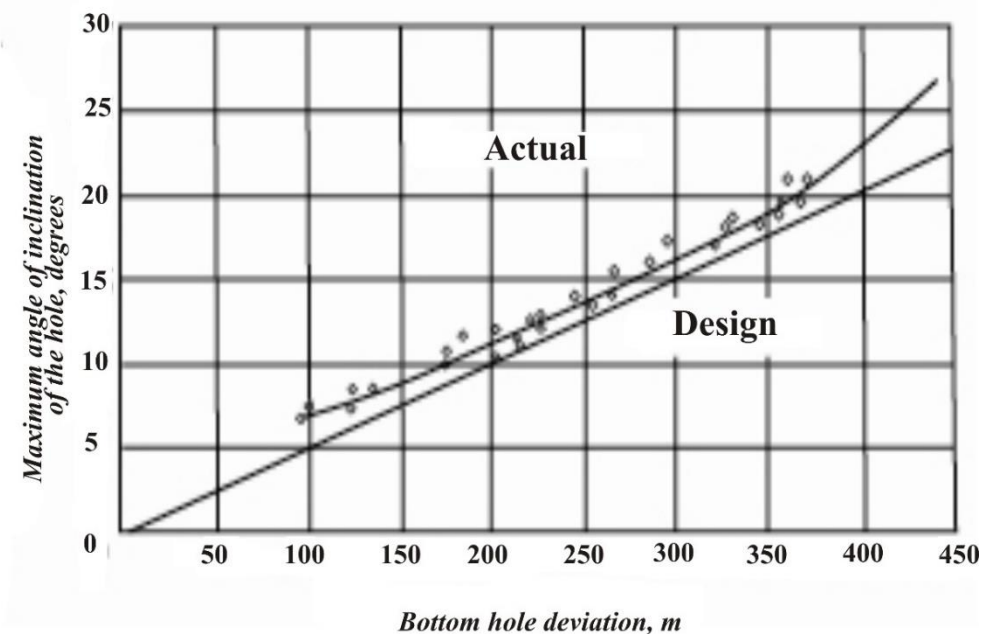

Figure 4. The relationship between the slope of the borehole and the deviation of the well bottom from the vertical

An increase in the depth of the directional well compared to the design one. Figure 5 shows the dependence of the lengthening of the borehole on the deviation of the bottom of the inclined well from the vertical.

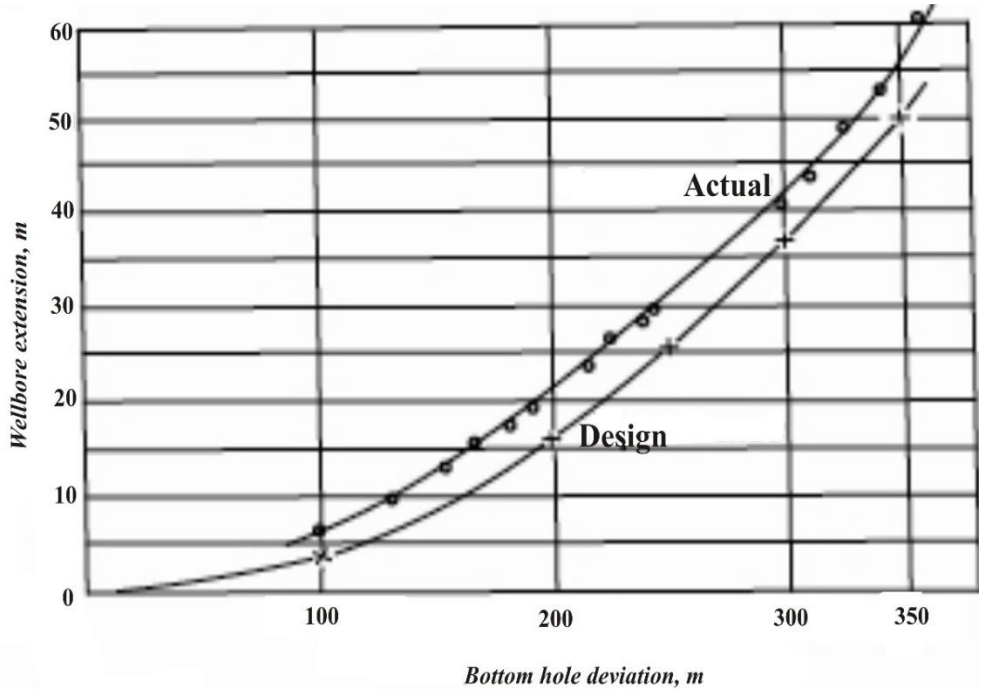

Figure 5. Dependence of the elongation of the borehole of inclined wells on the deviation of the bottom.

The above graph clearly confirms that the design elongation of the inclined borehole is 1.1-3.5%, and the actual elongation is 1.4-4% of the total depth of the well. Although this discrepancy between the design and actual elongation is not so large (4-5 m), it should be kept in mind when designing inclined wells [24]. The elongation value is of particular importance when designing a large number of directional wells. Even a minor error with a large number of wells can lead to an increase in additional penetration, and consequently to a decrease in the efficiency of directional drilling.

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Issue Article

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AN INTEGRATED APPROACH TO THE STUDY OF THEOLINGUISTICS

Abstract: *After Uzbekistan gained independence, interest in theolinguistics increases significantly. Philosophers and representatives of theology can be seen addressing sacred and religious texts in the hope of finding answers to theological questions in sacred books, including the Holy Quran and the Hadith Sharif. Indeed, religious texts are an invaluable source of knowledge about humanity's future, people's lifestyles and lifestyles, traditions and culture. In short, religious and sacred books have always acted as objects of scientific research in various fields of human knowledge, including theologians, philosophers, historians, linguists, psychologists, culturologists.*

Key words: *language, integrated approach, theolinguistics, scientific research, religious picture of the world.*

Language: *English*

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Introduction

Although theolinguistics is a new science, its roots are very ancient. In this regard, the development of this paradigm is promoted by the theories of Plato, Proclus, Porphyry, religious philosophers Nikolai Kuzalik, Locke, Schelling, Hegel, V. Humboldt, who have reached the highest theoretical level of science in the world. The "supporters of the philosophy of water" include M. Heidegger, N. Hartman, E. Kassirer, O. Rosenstock-Gassy, Bertrand Russell, etc., Russian scientists Aksakov and A. Potebnya, P.A. Florensky, S.N. Bulgakov, A.F. Losev expressed their relationship in the works of the series. After all, the basis of the author's works was language teaching. The problems of theolinguistics began to be actively developed in the works of Michael Thiele, Albrecht Greule, Elzbieta KuharskaDreis, A. K. Gadomsky, V. I. Postovalova, I. V. Bugaeva, V. A. Stepanenko, K. Koncharevich, A. A. Buevich, etc. Currently, within the framework of theolinguistics, research is being conducted in various areas: characteristics of the language of religious texts, features of the translation of theological texts, problems of lexicography, religious discourse, etc. Gadomsky A.K. Religious language – theolinguistics - linguistics. "theolinguistics (from Greek. theos – God and Latin lingua – language), is, firstly, a science that arose as a result of the interaction of language and religion, is the first stage in the formation of linguistics as a science of language designed to serve the interests of religion; secondly, a branch of linguistics that studies religious language in a narrow and broad sense of this the term and the study of the manifestations of religion, which are fixed and reflected in the language; Thirdly, theolinguistics is a branch of secular science, supranational science, supra-religious (supra-confessional) science, linguistic science. The lecturer described the main sections, subject, object, purpose and objectives of theolinguistics; the main approaches and methods of theolinguistic research. In his works, A.K. Gadomsky, following the traditions of Polish theolinguistics, uses the terms "religious language" and "religious style". In Polish linguistics, the authors of the encyclopedic definition of the term are I. Baerova. They believe that "in a narrower sense, religious language is the language of moral and dogmatic theology, as well as a ritual language (the liturgical language in Christianity), the language of personal prayers, sacred texts (the Bible), sermons, works of religious fiction. And in a broader sense, it

is a colloquial language containing statements about God and about the attitude of people to God, as well as the language of texts on a religious topic, for example, texts on the history, sociology and psychology of religion" "theolinguistics is a discipline that studies the language of Biblical scholars, theologians and other persons involved in theory religion and practicing believers". He also wrote that "it is a term denoting a science that explores the relationship "language: religious theory and practice", an attitude explicated in the texts of church rituals, in the language of Holy Scripture, in the texts of sermons, in prayers, in the epistles of the hierarchs of the church and in the individual statements of believers" Heather N. Religiuos language and critical discourse analysis: ideology and identity Christian discourse today. Theolinguistics tries to describe how a human word can be used in relation to God, as well as how language functions in religious situations that do not meet the strict standards of direct one-way communication, and which, on the other hand, despite this, coincide with the logic of its description in known forms, such as metaphor or speech act. In Uzbekistan, there are bright works dedicated to theolinguistics. M.R.Galieva in her article, she scientifically explained the growing need for a religious language, in particular, in the creation and meaning of religious theolinguistic lexemes; b) the ability of religious theolinguistic lexemes in the expressed thinking, culture, worldview of people, etc.; c) the specifics of the theolinguistic lexeme of religious language and religious text; d) recognition and development of the theolinguistic lexeme of religious style as a functional method. Narzullayeva D.B. the correct interpretation of theological lexemes presupposes the existence of a holistic view of "God, man and being". In modern culture, the growth of the processes of its secularization - the study of the soul outside the religious attitude requires an analysis of the spiritual world of a person and a harmonious combination of aphoristic expressions. The words of blessing in comparative linguistics are not fully understood.

A.K. Gadomsky in his writings paid special attention to the history of theolinguistics in the West and in Russia and, in our opinion, he is the founder of the Russian theolinguistic school, so his interpretations of “theolinguistics”, “religious language”, “religious style” are correct and vividly reflect the interrelationship of the close interrelationship of the linguistic worldview and the religious worldview. According to A.K.Gadomsky, theolinguistics is divided into general and private (Christian linguistics, Chinese studies, etc.). General theolinguistics, taking into account the diversity of religions and the versatility of the linguistic material under consideration, studies general issues such as the definition of theolinguistics, the definition and universalization of basic concepts, the formation of conceptual apparatus (religious language, religious discourse, religious style, religious genre, etc.) the development of the main directions of theolinguistic research and a number of other general issues.

Private theolinguistics focuses on the manifestations of specific religions (Christianity, Islam, Buddhism, etc.) and their reflection in specific languages. Our work involves the study of theolinguistics from general to private. According to I.V.Bugaeva, the study of the topic "language and religion" is fraught with one danger: an incorrect description of certain aspects from the point of view of theology. Therefore, a philologist-theolinguist, in addition to philological education, must have basic knowledge in the field of theology. This is the first and main condition for reliable research on topics of such an integrated discipline, which is theolinguistics. Otherwise, naive descriptions are obtained, for example, of the concepts "faith", "god", "soul", etc., which have no scientific value. Agreeing with the opinion of I.V.Bugaeva, we believe that the purpose of studying theolinguistics is not only to recognize the functionality of religious lexemes, but also to study the etymology of lexemes, which reveals the full picture of the functioning and semantics of the theolinguistics.

Dante Alighieri points out that people cannot understand each other only through gestures or body movements, in order to convey their thoughts to each other, it is necessary to have a reasonable and sensitive sign. The language became such a sign. Dante believed that language has a two-sided nature: sensuous, which is found in its sound, and rational, which is manifested in its ability to denote and mean something. Diderot believes that the needs of society contributed to the development of language, but man owes his appearance to God.

L. Jacob tries to explain the concept of language through the concept of a sign in general and the definition of its role in a person's mental life. He calls language “every system of such signs that can be arbitrarily used to communicate thoughts.” After all, the main task of linguistics is the study of each known language in its internal relations, in its relations, for the components. Belinsky argues that modern to the birth of thought, a person began to speak at the same time as he began to think. Steinthal believes that in the middle of human development, thought can be connected with the word, but at the beginning it apparently has not yet grown up to it, and at a high degree of abstraction leaves it as not satisfying its requirements and as if because it cannot completely abandon sensuality, looking for external support only at any stage. De Saussure compares with chess… Language is a system that obeys its own order. To clarify this, a comparison with a chess player will help, in relation to which it is relatively easy to distinguish what is external and what is internal: the fact that this game came from Persia to Europe is of

an external order: on the contrary, everything that concerns the system and rules of the game is internal. Humboldt emphasizes that language is not a product of activity, but an activity. Its true definition can therefore only be genetic. Each generation receives a ready-made language from the previous one, but these ready-made forms contain everything for the renewal of the language and its eternal movement as a result of human creativity. According to Rizhsky, words are the signs of our thoughts. The properties of the thing being denoted must be in its image, if it can express them. Consequently, everything that is essential and always belongs to our thoughts must be essential and necessarily in our words. Linguistics is one of the oldest sciences of our time. Language is a complex phenomenon in which there is a communicative code, in which there are its own rules of communication and use. L.V. Shcherba distinguished three aspects of language: speech, by which he understood the process of speaking and understanding; language, i.e. grammatical and lexical rules; language material, i.e. the sum of individual acts of speaking and understanding lasting in memory. At the end of his life L. Bloomfield wrote Let me express my confidence that a peculiar factor peculiar to man, which does not allow us to explain his actions in terms of ordinary biology, is a highly specialized and flexible biological complex and that this factor is nothing but language ...” E. Sapir believes that language is a huge generalizing force, maybe the largest of all existing ones. This means not only the obvious fact that meaningful social communication is hardly possible without language, but also the fact that common speech acts as a kind of potential symbol of social solidarity of all speakers of a given language.

According to A.K. Gadomsky, who shares this understanding, "linguistics emerged as a theolinguistics (theolinguistics) and only acquired a secular character over the centuries". Theolinguistics is a type of scientific discipline that includes scientific and religious-theology branches of the perception of reality. Language and speech have an indisputable relationship and are closely intertwined in all spheres of human life. If, according to V. Von Humbolt, language contributes to the formation of the human spirit, then in our opinion religion is the second category. Since it is she who is an important category of development and formation of a full-fledged worldview. In modern linguistics, there are a lot of new directions of theology, religious anthropology and theolinguistics. To understand the general cultural and historical context of the emergence of theolinguistics as a synthetic discipline in modern humanitarian cognition, in addition to the noted tendency to return to the Humboldt anthropological program of language learning, another significant trend is important. Namely, the trend of "integrating theological knowledge into the worldview and culture", which is increasingly manifesting itself in the modern world. In the field of language within the framework of theolinguistics, A. Wagner offers solutions to the following problems: the problem of religious language; religious linguistic behavior – religious forms of communication; spheres of use of religious language.

The term theolinguistics was first coined by linguist Jean Pierre van Noppen in 1981. In some sources he is cited as the “father” of theolinguistics. In 1995, David Crystal introduced the term theolinguistics into his Cambridge Encyclopedic Dictionary. "The language of Biblical scholars, theologians and other specialists involved in the theory of religion, and practicing believers".

Religion is an integral part of the culture and social consciousness of an ethnic group. This is due to the fact that religion, being one of the earliest forms of social consciousness, largely influenced and continues to influence the culture and social way of life of any people, determining their national picture of the world, a special way of perceiving the world, moral consciousness, their spiritual and national view of the surrounding reality. A characteristic feature of the religious picture of the world is that it is formed not only under the influence of purely religious views, but also national worldview. Verbalized by means of language, the religious picture of the world becomes the cultural heritage of the people and an integral part of the conceptual and linguistic picture of the world. The origin in the depths of the anthropocentric approach of the linguistic direction – theolinguistics, a science that arose at the junction of language and religion and explores the features of linguistic units that verbalize the religious picture of the world, is due to the relevance and necessity of studying the problem of interaction between language and religion and the fact that the study of language without religion, which is one of the types of public consciousness and an inseparable part of any culture is incomplete, and in some cases impossible."... the definition of the subject of science is not a simple statement of the obvious; it should indicate the range of possible objects of its research, the totality of which qualitatively distinguishes the subject of this science from the subjects of all other sciences. Such a definition of the subject of science can only be of a theoretical nature; it is designed to reveal the unity of all the objects studied by it. That is why the definition of the subject of any science can only be the result of a special study, the need for which is not always and not obvious to everyone.

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Issue Article

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RESORT TOURISM IN GEORGIA

Abstract: *Georgia is an important resort-tourist country. Its enchanting nature, diverse landscape, the Caucasus range covered with permanent snow and glaciers, the velvety subtropical zone of the Black Sea coast, abundant rivers and exotic waterfalls, original karst caves, mountain zone and seaside resorts, unique mineral springs, monuments of ancient culture, in general, rich recreational resources. It creates very favorable conditions for the development of resort farming, tourism and alpinism. The territory of Georgia is a classic country of vertical zonation of geographical landscapes.*

Due to the wealth and variety of natural factors, 340 resort places are allocated in Georgia, which are used for strengthening health, treatment and prevention of diseases. Resort places are characterized by favorable weather, presence of mineral waters or mountain mud. Some resorts are well-equipped: cottages, small bathhouses, natural springs of mineral springs have been built. [2]

The use of mineral waters is of great importance in the resort relaxation and treatment package. Almost all types of mineral water can be found in Georgia and there are more than 2000 mineral springs. The wealth and diversity of mineral waters allows treatment, prevention and reabilitation of diseases of the cardiovascular, nervous, digestive systems, gynecological, musculoskeletal system at the resorts of Georgia.

Key words: *Resort, mineral waters, treatment, healing mud, resort place, balneological resorts, medical tourism.*

Language: *English*

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Introduction

Discussion: The creation of resorts in Georgia began in the first half of the 19th century, although Georgian people have been using mineral waters for the treatment of various diseases and mountain air for the purpose of improving people's health since ancient times. The main part of the resorts is located in coastal and mountainous areas. The mountainous area of Georgia is distinguished by beautiful landscapes, healthy air and numerous springs. The positive beneficial healing properties of mountain air - fresh air, intensity of solar (including ultraviolet) radiation, due to which it becomes more active, moderate temperature in summer (compared to lowland area) - also contribute to relaxation. [2]

Pic. 1.

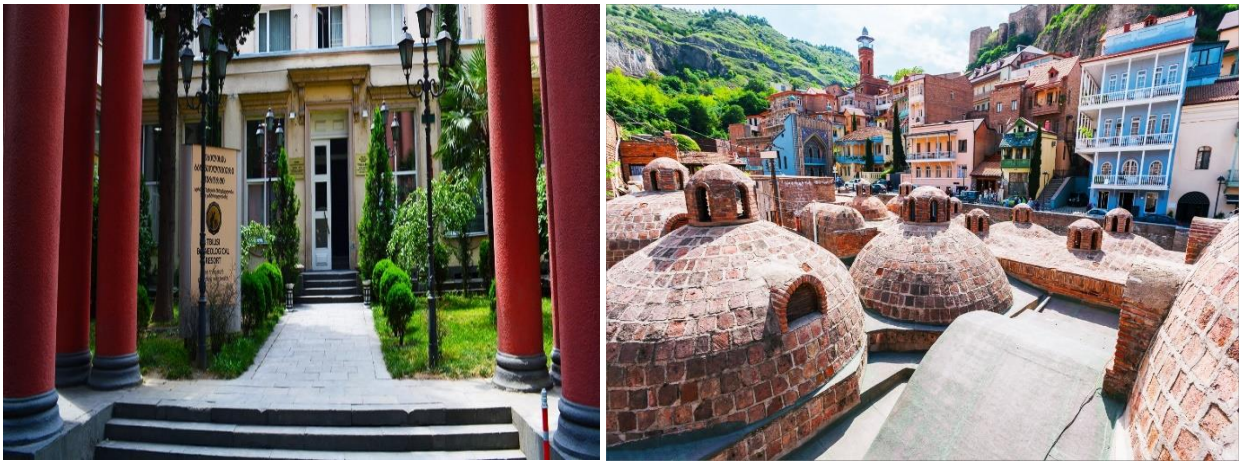
Using the natural and resort factors of Georgia in the field of tourism is the best way of sustainable economic development. The funds received from the field of tourism will make it possible to rehabilitate the resorts, modernize the existing infrastructure and create a new one, train the local population to international standards for the field of tourist services, including medical personnel and their employment in the relevant infrastructure.

According to foreign experts and according to the experience of advanced tourism countries, in such a rich country with natural and resort factors as Georgia, the development of resort-recreational (health) tourism is advisable and prioritized. If we take into account that the largest segment of the tourism sector in the whole world is wellness tourism, it is really desirable for Georgia to develop this direction, based on its resort-tourist potential and economic-geographical location (Eurasia Corridor, the heart of the Caucasus, the Great Silk Road).

Taking into account the resort-recreational and health factors, the most promising resorts for investment include: Tbilisi, Tskaltubo, Borjomi, Nunisi, Tsai, Akhtala, Abastumani, Bakhmaro and others.

Recently, the establishment of health, healing and rehabilitation centers based on natural mineral waters has become relevant all over the world, which at the same time contributes to the development of spa tourism. From this point of view, Georgia is not an exception and has the greatest perspective for the development of this type of tourism (more than 2000 mineral springs, of which approximately 50% are used for drinking, and 50% for procedures).

A striking example of this is the modernist reforms carried out at the Tbilisi balneological resort, as a result of which Tbilisi became the capital of the international level - SPA CITY, where it is already possible to receive foreign tourists. [1] There are only two such cities in Europe – Tbilisi and Budapest, unique high-flow thermal sulphide water also rises in the area. Within the borders of the city are distinguished by physical-geographical characteristics and healing properties A number of important climatic resorts and vacation spots. In the heart of old Tbilisi, on the border of Abanotubni and Ortachali, there are several on the surface of the groun. Hot sulphurous water rises in the place. The history of the foundation of Tbilisi is also related to these sources. [5]



Pic. 2. Tbilisi balneological resort and historical bath

Almost all foreign travelers or famous people who visited Tbilisi in the 17th-18th centuries remember and write about the baths held at the natural hot springs, including French travelers - Jean Chardin and Dubois de Monterey, botanist Joseph Tournefort, Italian missionary Joseph Delaporte and others.

In the second half of the 19th century, the first thorough investigation of the thermal waters of the capital of Georgia was conducted by the German geologist, the famous researcher of the Caucasus, Wilhelm Abikh. It was he who left us the geological description of this place and noted the expediency of using Tbilisi's mineral springs for healing purposes.

Tbilisi balneological resort is with natural factors - healing - mineral-sulfur A modern well-equipped medical diagnostic and rehabilitation facility equipped with water and healing mud. Here, under the supervision of qualified specialists and using modern diagnostic equipment, a course of treatment and rehabilitation is conducted based on the combination of natural factors and medicines. There is also a health resort, physiotherapy, Rehabilitation and medical tourism scientific Practice center. [5]

There are 11 resort-recreational regions on the territory of Georgia: Abkhazia; Adjara of Samtskhe-Javakheti; Borjom-Bakuriani; of Kolkheti; Svaneti; Racha-Lechkhumi; South Ossetia; East-Caucasus; Tbilisi; of Kakheti. Resorts in the country belong to different types, which we have presented in the form of a table.

The development of health resorts in general is a very important area for our country. The development of which will lead to the employment of a significant part of the local population and the improvement of the social background in the country. For this, it is necessary to prepare and retrain the population in accordance with the modern requirements in the following directions: medical staff, hotel staff, restaurant staff, banking staff.

Teaching foreign languages (especially English) to the local population should be intensive. Foreign investors who decide to invest in the resort areas of Georgia must meet certain requirements, the most important of which is the creation of jobs for residents of Georgia, in particular, the local population. The state will retrain locals and offer qualified personnel to the investor. The investor, on the other hand, will employ already trained staff at this or that facility where ðthe investment is made, 80-90% of the total staff should be locals or other citizens of Georgia.

Conclusion: An active role in the development of medical tourism should be played by tour operators, who should use their connections and actively advertise Georgian resorts. Social networks, which are used by the largest part of the world's population, are a good way to advertise health resorts. It would be interesting to invite internationally recognized experts who, after researching Georgian resorts, would make a competent conclusion and confirm the advantages of our medical resorts. Such professional evaluations will be a great incentive for foreigners to decide to come to Georgia for treatment. It is important that all resort areas have wireless internet. The life of a modern person without the Internet is unimaginable, so foreign vacationers need constant access to it. Finally, the coordinated action of the state, investors and tour operators ensures the rapid development of medical tourism in the country.[2]

The development of medical resorts has a direct impact on the development of the entire district. As a rule, tourists who come for treatment in one or another country, who are fascinated by the resort, try to make their visits regular, buy or rent country houses in the same area. Tourists who come for treatment in one or another country are often accompanied by family members, which further increases the number of tourists. As a result, the real estate business will develop in the district. The increase of affluent tourists in the region creates new opportunities for the locals, in particular, they will be able to grow part of the agricultural products on the spot, new squares and

recreation parks will be built, where the locals will be employed. Greening will contribute to the health of the environment. Also, the increase of foreign tourists in the region creates the need to expand banking and hotel services, which ensures the creation of additional jobs.[2]

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Issue Article

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FEATURES OF TERRITORIAL DEVELOPMENT THAT ENSURE THE IMPLEMENTATION OF BOTH SUPPORT ZONES IN THE ARCTIC AND THE INNOVATIVE NORTHERN SEA ROUTE

Abstract: *In the article, the authors traced the emergence of support zones for the development of the Arctic zone of the Russian Federation using state documents and carried out an examination of the definitions of their content. The main features of support zones are indicated: general and social functions, organizational form, economic model, spatial structure, type. For the first time, a comparative description and rating assessment of support zones was carried out using the Rosstat database of municipal indicators and with an emphasis on population dynamics, volume and structure of production, and the nature of local budget revenues. The assessment results made it possible to identify factors of strong differentiation of zones that adversely affect the socio-economic development of the Arctic regions. An overview is presented and an assessment is made of the regions' proposals for the design filling of support zones.*

Key words: *formation of support zones, Arctic zone of the Russian Federation, criteria for selecting investment projects, support zone, monocities of the Arctic, investment project, socio-economic development, spatial development, Arctic, rating assessment, natural resources, energy resources, oil and gas projects, Northern Sea Route, personnel.*

Language: *English*

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Introduction

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The relevance of the study is expressed in the development and deepening of the theoretical provisions of the Russian scientific school of spatial economics in terms of substantiating the regulatory mechanisms for ensuring the functioning of the regional economy based on the management of spatially differentiated micro-, macroeconomic and institutional parameters of the multi-level economic system of the Arctic zone of the Russian Federation (AZRF) in order to overcome the rarefaction and ensuring the coherence of its space. The growing complexity of multi-dimensional economic systems and the increase in the number of spatially determined economic connections between their levels in conditions of increasing instability of the global environment determine the need to deepen the conceptual foundations of the theory of spatial economics, and additional elaboration of particular theoretical issues that directly address the solution of specific practical problems of spatial organization of the economy.

However, the use of these critical software tools faces some serious challenges. Today we are observing not only a pronounced downward trend in the volume of budget funds allocated for the implementation of the Development Support Zones Program, but also a deviation in the implementation of initial plans. On the other hand, a different approach to the implementation of Russia's strategic goals in the Arctic has been developed - through a "special economic regime". There is an obvious need for a combination and flexible use of the capabilities of each of these mechanisms of spatial development, depending on current external and internal challenges and regional characteristics. The most pressing issue of developing these mechanisms for spatial development is in relation to the regions recently included in the Russian Arctic.

Which in the future could be enshrined in regulatory legal documents regarding the implementation of the state program of the Russian Federation for the socio-economic development of the Arctic zone of the Russian Federation and the subprogram "Formation of support zones for development and ensuring their functioning, creating conditions for accelerated socio-economic development of the Arctic zone of the Russian Federation ". The main approaches to selecting and assessing the effectiveness of investment projects in the Arctic zone of the Russian Federation are considered, the main results of the VII International Forum "Arctic: Present and Future", held in December 2022, are presented. Prospects for the development of various areas of the Arctic zone of the Russian Federation are presented and analyzed. The following areas aroused the greatest interest among forum participants: such as the socio-economic development of the polar territories and support zones, the retention of personnel in the Arctic zone of Russia, the development of the Northern Sea Route. The most significant conclusions and recommendations on the issues considered are presented (Figures 1-3).

Figure 1 - Support zones - an economic development tool that provides for the creation of a favorable regime for management in the territories of the Arctic zone.

Figure 2 – Scheme of macro regions of Russia

The new edition of the state program of the Russian Federation for the socio-economic development of the Arctic zone of the Russian Federation was approved by Decree of the Government of the Russian Federation of 2021 No. 1064. The state program includes three subprograms, the main one of which, with the nearest deadlines for implementation and the amount of funding from the federal budget, is the subprogram "Formation of support zones for development and ensuring their functioning, creating conditions for accelerated socio-economic development of the Arctic zone of the Russian Federation."

At the same time, the wording “support zone” has not yet received a normative definition. Just as the criteria for selecting investment projects in the “support zones” of the Arctic have not been defined.

In this publication, we will focus on methodological approaches to the selection of investment projects in the “support zones” of the Arctic, which could later be enshrined in regulatory legal documents. Today, when developing methodological approaches to both the formation and functioning of support zones for development in the Arctic, and the Arctic zone of the Russian Federation as a whole, meeting the goals and objectives of the socio-economic development of the Arctic zone of the Russian Federation and ensuring the national security of Russia in the Arctic, the question increasingly arises on the criteria and requirements for projects implemented with government support. The methodology for assessing the costs and benefits of investment projects to provide support from budget resources is closely related to the methodology for assessing the effectiveness of investments. At the same time, The harsh conditions of the Arctic impose their own requirements on the selection of priority projects. The tasks of geopolitics, national security, intensification of economic activity in the Arctic zone, and social effects from the implementation of projects come to the fore.

Figure 3 – Characteristics of budgetary provision of Russian regions

To date, a significant number of methods and approaches to the assessment and investment projects have been developed and approved. Here are some of them: Decree of the Government of the Russian Federation of December 30, 2018 No. 1516 "On approval of the Rules for the selection of investment projects for inclusion in the register of investment projects and maintaining a register of such investment projects"; Order of the Ministry of Economic Development of Russia and the Ministry of Finance of Russia 2020 N 139/82n "On approval of the Methodology for calculating indicators and applying criteria for the effectiveness of investment projects applying for state support from the Investment Fund of the Russian Federation"; Order of the Ministry of Regional Development of the Russian Federation 2018 N 117 "On approval of the Methodology for calculating indicators and applying criteria for the effectiveness of regional investment projects"; Order of the Ministry of Regional Development of the Russian Federation of 2019.

At the same time, today the main principles for selecting priority projects in the Arctic include the following. Projects must be coordinated and interconnected at the stages of goal setting and planning, which will significantly reduce the costs of their implementation. The implementation of support zone projects should have a multiplier effect and help improve the efficiency and diversification of the economy of the Arctic zone, stimulate the development of nearby territories and the development of plume industries. The functioning of support zones should help improve the quality of life in the region, level out imbalances in the territorial structure of the region, primarily in bridging the gap between the location of production and the population, and create new jobs. Requirements for projects are caused by the priorities of investment projects, promoting import substitution, increasing exports and technological development. At the same time, it is important that when selecting projects the mistakes of forming a mono-profile structure of territories and cities (mono-cities) are not repeated. The criteria for selecting project proposals from the constituent entities of the Russian Federation that are part of the Arctic zone of the Russian Federation for their subsequent implementation within the framework of projects to create support zones for development in the Arctic are, namely:

- location on the territory of the Russian Federation of the production site of the investment project;
- implementation of an investment project in a sector of the economy that is a priority for the development of the economy of the Russian Federation in accordance with the Main Directions of Activities of the Government of the Russian Federation for the period until 2035;
- availability of a construction permit (in the case of construction work being carried out as part of an investment project);
- presence of the status of a legal entity registered on the territory of the Russian Federation.

Investment projects, when selected, must comply with the long-term priorities of the socio-economic development of the Russian Federation and

act on the basis of the following principles: intensification of investment activity in key sectors of the regional economy; support for investment projects introducing technologies for the production of products with high added value; support for investment projects that introduce modern technologies for the production of competitive goods on the market; support for investment projects that have a positive economic, budgetary and social effect.

Additional criteria for assessing industry efficiency and feasibility of project support may include the following indicators, namely:

 an increase in the share of the region's provision with products produced under the project by at least 1 percent compared to the current situation in providing the region with products of its own production in the total volume of consumption of similar products as of the last reporting year preceding the year of filing documents for the investment project for participation in selection;

 reduction in the cost of sales of products planned for production under the project by no less than 5 percent compared to the average cost of similar types of goods sold in the region;

 production within the project of export-oriented products, as well as products for which there is no own production in the region as of the last reporting year preceding the year of submission of documents for the investment project for participation in the selection;

 creating conditions for retaining the population in rural areas by co-financing the costs of construction (purchase) of housing for newly hired workers within the framework of the project in the amount of at least 30% of the total cost of construction (purchase) of housing;

 the presence within the framework of the project of expenses for training (retraining) of personnel in higher and secondary educational institutions, including for improving the skills of employees.

The economic requirements for the selection of investment projects for the development of support zones in the Arctic are obvious, namely:

 net present value (NPV) for the investment project for the billing period, but not more than 8 years from the start of production commissioning, has a positive value;

 the budget effect of the investment project in the form of tax revenues to the regional and local budgets has a positive value to the total amount of government support planned to be received for the project;

 the forecast level of wages for workers under the investment project is not lower than the forecast average level of wages in similar types of economic activity of the constituent entities of the Russian Federation in the Arctic zone.

It is advisable that each investment project meets the following criteria, namely:

 aimed at producing products with high added value and reducing the export of raw materials outside the Russian Federation;

 introduces modern technologies that make it possible to produce goods (services) with better consumer properties, or having a lower cost in comparison with similar goods (services) produced in the Russian Federation;

 creates on the territory of the constituent entities of the Russian Federation and support zones of the Russian Arctic objects of fixed assets that were not part of the tax base of the subject of investment activity before the start of the project;

 creates at least 30 new jobs (including at least 5 highly productive ones) in the case of creating a new production facility or ensures the preservation and modernization of jobs in the case of expansion of existing production.

Thus, it is obvious that project selection based solely on values is not applicable to the Arctic.net present value (net present value, NPV) of the project, internal rate of return, weighted average cost of raising capital. Any project in the Arctic must be comprehensive in nature, ensure the interconnection of measures to create an Arctic transport system, the development of energy infrastructure, industrial facilities, the synchronous, interconnected application of existing territorial development instruments and mechanisms to support the implementation of investment projects. Each project is a contribution to both the development of the “support zone” for the development of the Arctic and the Northern Sea Route.

Effective management of the territories of the Arctic zone of the Russian Federation (AZ RF) is an urgent scientific and practical task. Support zones of development are recognized as a key mechanism for achieving strategic interests and ensuring national security in the region. However, this tool does not yet have sufficient methodological, regulatory and organizational development.

The evolution of the normative economic and spatial image of the support zones of the Russian Arctic allows us to track the evolution of special documents on the development of the Arctic Zone of the Russian Federation (Table 1). Their study helps to identify the most significant features for the methodology of development and implementation of concepts for the formation of support zones: general and social functions, organizational form, economic model, spatial structure and the main features of the potential type of zone.

Table 1. Evolution of the content of support zones for the development of the Russian Arctic

Document	Information related to support zones (SZ)
Strategy for the development of the Russian Arctic and ensuring national security for the period until 2035. Section "Spatial development of the Arctic: zones of advanced development...". Approved 2020	The possibilities for ensuring the global competitiveness of the Russian Arctic include the formation of priority development zones (shelf development of the Pechora-Barents Sea province, Polar-Ural pioneer development; Belkomur industrial; Kola innovative, etc.). Has no spatial aspect.
State program "Socio-economic development of the Arctic zone of the Russian Federation for the period until 2035." 2020	Key implementation mechanisms: frame-cluster approach; formation of support zones for development; selective state policy for the development of Arctic territories.
"On the development of the Arctic zone of the Russian Federation." Federal Law, April 2018 Ch. 1, clause 5, art. 3 "Basic concepts used in this Federal Law."	OZ is "a part of a subject of the Russian Federation, in which, in order to ensure the socio-economic development of this subject and the Arctic zone as a whole, as well as ensuring national security issues in the Arctic, it is planned to provide measures of state support for economic and other activities in order to create favorable conditions for the provision of investments, ensuring accelerated comprehensive development and creating comfortable conditions to ensure the livelihoods of the population."
"On the development of the Arctic zone of the Russian Federation." Federal Law, September 2018 Art. 3 "Basic concepts used in this Federal Law."	OZ is "a comprehensive project for planning and ensuring the socio-economic development of the Arctic zone, aimed at achieving strategic interests and ensuring national security in the Arctic, providing for the synchronous interconnected application of existing instruments of territorial and sectoral development and mechanisms for the implementation of investment projects, including on the principles of state- private partnership".
State program "Socio-economic development of the Arctic zone of the Russian Federation". Implementation until 2035, 2020	OZs are "comprehensive projects for the socio-economic development of the Arctic zone, aimed at achieving... (hereinafter, see above)...on the principles of public-private and municipal-private partnership."
"On the development of the Arctic zone of the Russian Federation." Federal Law, September 2018 Art. 3 "Basic concepts used in this Federal Law."	OZ is "the territory of the Arctic zone, where interrelated projects are being implemented aimed at the comprehensive socio-economic development of the Arctic zone, achieving... (hereinafter, see above)...PPP, as well as special regimes for carrying out economic activities and territories with preferential conditions for conducting business activities."

Support zones realize and develop the communication and resource potential of the Russian Arctic. They will activate the transport capabilities of the Northern Sea Route (NSR), meridional river and road corridors, air and railway communications, information communication to involve fuel and energy, minerals, raw materials and biological resources of the Arctic into economic circulation, taking into account interregional interaction.

Support zones work for the development of their region and the Russian Arctic as a whole, ensuring an improvement in the quality of life of the population living and working here. The regional vector of development of each specific support zone is determined by the level and nature of the problems of the municipality on the basis of which it is formed. Directions and projects for the formation of the zone should solve these problems. In organizational form, support zones represent a "project of projects", consisting of a set of transport, industrial, social projects that must be linked to each other in time and space. The "struggle" of spatial and organizational forms manifested itself in changing definitions of the support zone. Sharing the point of view of one of the authors of the bill "On the development of the Arctic Zone of the Russian Federation", member of the Council for the Arctic and Antarctic under the Federation Council M. A. Zhukov, The authors consider the support zone to be the territory in which projects are implemented. The economic model for the formation and functioning of support zones involves the use of public-private partnerships (PPP) and other state support mechanisms operating in an interconnected and synchronized manner in the implementation of investment projects on their territory.

The spatial structure of support zones is materialized by a transport-industrial framework, the planning and creation of which ensures their formation and development. The main elements of such a frame are:

1) highways providing access to the Northern Sea Route, communication with neighboring regions and their support zones and transport accessibility of new sources of raw materials;

2) transport (ports, stations), mineral resources (extraction and primary processing of raw materials) and multifunctional nodes and centers (resource processing, cargo transshipment, socio-cultural sphere, energy, construction, etc.).

The ideology of the transport-industrial framework grew out of the concept of the supporting framework - "the combination of the main focuses of the economic, social and cultural life of the territory and the socio-economic lines connecting them" - a classic analytical and constructive tool of economic geography. It also works in the formation of settlement and infrastructure frameworks (through the concentration of necessary resources) and the supporting framework for the re-industrialization of the Arctic.

Typical features of support zones are determined, namely:

*level and nature of natural resource development;

*related maturity of industrial specialization;

*relationship between center and periphery;

*features determined by the specifics of the financial and economic mechanisms used for their formation and implementation.

The beginnings of typification can be traced in the classification of priority development zones in the Development Strategy of the Russian Arctic for 2020. until 2035 and in the type of Arctic territories (promising, active development, industrial development) identified in the State Program for the Development of the Arctic Zone of the Russian Federation. An analysis of the Arctic strategies of foreign countries did not reveal direct analogues to Russian support zones. Territories of special attention in the Arctic policy of European countries and Canada are areas inhabited by indigenous peoples, which are allocated administratively in Denmark and Canada. Norway's Arctic strategy affects only the High North, which includes the provinces of Nurlan, Troms and Finnmark. A special approach within the framework of a special program (Northern Periphery and Arctic Program 2018–2035) is being implemented by the European Union,

The text of the updated State Program for the Development of the AZ of the Russian Federation (2020) outlines the goals and objectives of the support zones, the mineral and raw material nature of their projects and their close connection with the development of transport. The large section "Participation of government bodies of the constituent entities of the Russian Federation in the implementation of Program activities" presents material that requires updating on the formation and functioning of eight support zones of the Russian Arctic regions. With the inclusion of three municipal districts of Karelia into the Arctic zone of Russia in 2020, the Karelian support zone was added to this eight.

In the last two years, the formation of a statistical base for the macro-territory has been underway: section 2.5 has been introduced into the Federal Statistical Work Plan. "Indicators of socio-economic development of the Arctic zone of the Russian Federation and ensuring national security", the State Statistics Committee website presents the Publication Calendar of official statistics. However, for now the information is provided in general for the Arctic Zone of the Russian Federation, or for regions that include Arctic territories. In this article, using available statistical materials, a socio-economic characterization of the support zones is carried out, they are compared using a rating assessment, and the factors influencing interzonal differentiation are revealed. We chose the municipality as the operational unit of comparative analysis, which is due to the different status composition of the support zones. The main information source was the passports of municipalities; additional data (for example, on the execution of municipal budgets) were collected on the websites of the respective districts. The general indicators of the support zones were determined by summing up similar indicators of municipalities, which provides a unified methodological and information basis for the assessment and representativeness of the characteristics of the Arctic zone itself, and not the totality of the subjects of the Federation, of which only four are included in it entirely, and five are separate municipalities. The calculation of zone ratings for each indicator and the summary average as its place in a series of nine reference zones was carried out according to the author's methodology. To assess the socio-economic situation of support zones, data for 2017 was used, allowing us to get an idea of the starting situation of their development (Tables 2 and 3). The paucity of indicators is due to the focus on assessing production development and the lack of information on individual indicators and municipalities.

Table 2. Characteristics of support zones for the development of the Russian Arctic

Support zone for the development of the Russian Arctic	General characteristics of support zones				
	Area, km^2	Population per 01/01/2021, people	Share of urban population,%	Social nal density population, people/km^2	Home-produced goods shipped, completed services in-house (TSPiUSS), thousand rubles.
Arkhangelskaya	185 617	650 755	92.8	771,533	351 868 546
Kola	139 523	634 282	92.8	838.516	401 431 288
Nenets	176 810	43,937	72.4	307,604	324 557 313
Taimyr-Turukhanskaya	1,095,095	227 220	90.4	31,164	1 036 785 268
Karelian	43 377	43 930	67.2	1.315	8 714 223
Yamalo-Nenets	769 667	536 049	83.7	272,914	2 524 084 683
Vorkutinskaya	24180	80 061	99.4	-	41 580 714
Chukotka	723 489	49,822	70.0	84,733	83 144 623
North Yakutskaya	593875	26 190	50.5	0.048	25 844 772

The analysis revealed contrasting differences in support zones in composition, area, size and social density of the population, the cost of goods produced and services provided, and the share of manufacturing industries in it. Common to the support zones is the predominance of the urban population (with the exception of North Yakutia), low and very low population density and the road network. The general trend of "northern outflow" of the population is intensified by the production decline (Vorkuta and Karelian zones), but the trend reverses in those zones where production is developing (Nenets and Yamalo-Nenets zones). The "earned" revenues of local budgets are directly dependent on the nature and power of the municipal economic basis. The identified differences are largely explained by the accumulated transport and industrial potential of mineral resource development, which makes it possible to distinguish old and new industrial Arctic territories. The first include Arkhangelsk, Kola, Vorkuta, Taimyr-Turukhansk, Karelian, the second - Nenets, Yamalo-Nenets, Chukotka, North Yakutsk.

Table 3. Rating assessment of support zones for the development of the Russian Arctic

Support zone development AZ RF	Indicators used to calculate ratings						
	Decline in numbers population 2021 by 2002, %	Physical population density, people/km^2	Processed share of production in TSPi-USS,%	Shipped by TSPiUSS for one resident, thousand rubles/person	Tax share and no tax income in own local budget revenues,%	Road density, km/100 km^2	Consolidated rating
Arkhangelskaya	-6.3	3,506	59.3	541	78.5	1.159	3.9
Kola	-15.0	4,546	28.8	649	73.0	0.566	4.8
Nenets	5.8	0.248	6.3	7387	78.4	0.067	4.8
Taimyr-Turukhanskaya	-20.1	0.207	46.0	4563	56.6	0.050	5.8
Karelian	-26.1	1.013	14.3	198	55.3	3,731	6.0
I have little-Nenets	5.7	0.696	13.9	4709	37.2	0.162	6.1
Vorkutinskaya	-40.3	3.311	1.5	519	46.9	0.496	7.3
Chukotka	-7.4	0.069	0.9	1669	32.0	0.043	7.7
North Yakutskaya	-21.0	0.044	0.2	987	35.4	0.031	8.2

The Arkhangelsk and Kola support zones are especially distinguished by the balance of the economy and the maturity of the industrial complex (diversification of the sectoral structure of industry, the ratio of production and processing, etc.). In them, as well as in the Karelian zone, the main elements of the transport and industrial framework of the AZ of the Russian Federation were formed - the Arctic port and the railway connecting it with the federal railway network (Arkhangelsk, Murmansk, Belomorsk). In other zones, even those with great resource potential, the industrial and transport components are poorly and disharmoniously developed; rare centers cannot overcome the influence of the vast periphery. Spatial and economic imbalances are caused by single-profile specialization and, in fact, the dependence of the economy of a particular territory on the state and development plans of one company.

Closely interconnected integrated resource and (especially) infrastructure areas are the main frontiers (frontiers) for the development of Arctic territories. Their prospects depend primarily on the availability of access to the Northern Sea Route, the formation of the main transport axis, the level of network trunking, and the stage of frame formation. A preliminary assessment of the frames of support zones with an emphasis on the primary transport component, carried out using open sources, revealed the following, namely:

– the framework is developing in the Arkhangelsk, Kola, Karelian zones, which is manifested in the reconstruction of Arctic ports and the ongoing plans for the construction of the Belkomur railway (Arkhangelsk - Syktyvkar - Solikamsk);

– the framework is being formed: actively with powerful corporate participation in the Yamalo-Nenets zone (Sabetta port on the NSR, Northern Latitudinal Railway); moderately, but with real funding under the State Program for the Development of the Arctic Zone of the Russian Federation in North Yakutia (reconstruction of ports on the Lena River, the port of Tiksi, construction of a shipyard on the basis of the Zhatai shipyard);

– the frame is being designed: the Syktyvkar - Naryan-Mar highway is being built in the Nenets zone, a pre-design feasibility study for the port of Indiga has been completed, the construction of the Barentskomur railway line (Indiga - Sosnogorsk - Solikamsk) is proposed; in the Vorkuta zone, the Northern Railway is being modernized, possible railway exits to the NSR through Arkhangelsk "Belkomur", Indiga "Barentskomur", Ust-Kara (or Amderma) "Karskomur" are being considered;

– the framework requires reconstruction in the Taimyr-Turukhansk (port of Dikson, new coal ports "Chaika" and "Sever") and Chukotka zones (port of Pevek) and formation in the Chukotka zone (construction of the Kolyma – Omsukchan – Omolon – Anadyr highway).

Thus, for the Nenets and Vorkuta zones the main task is the railway access to the NSR port. For the Kola, Arkhangelsk, Karelian regions, the development of the transport network through all types of transport (poly-mainline) is essential; for the remaining zones, it is the strengthening of the main transport axis "river-sea" or "road-sea" with the reconstruction of ports on the NSR.

The formed or completed frames are the transport basis for anchor projects that create the production base of support zones and determine their industrial profile.

According to the implementation plan for the State Program for the Development of the AZ of the Russian Federation, in December 2020, a Decree of the Government of the Russian Federation on the procedure and criteria for selecting projects for inclusion in the list of priority ones within the framework of support zones was adopted. This issue is considered in the scientific literature, as a rule, in the aspect of describing the largest investment projects. We were unable to find a comparative analysis of project initiatives for all support zones from the point of view of complementarity. Below, based on materials from various sources, proposals from the Arctic regions for potential anchor projects are summarized.

Kola support zone. The region is positioning itself as a successful investment site, combining traditional and new types of economic activity in the Arctic. The strategic function of the zone can be designated as an outpost of the Northern Sea Route. The basis of the production potential is made up of enterprises in the mineral resources, mining, metallurgical and chemical sectors, which are part of the largest national financial and industrial groups. The necessary transport and energy infrastructure is being formed to meet their current needs and potential capabilities. An indisputable advantage is the presence of an ice-free Murmansk seaport and a base for the Russian icebreaker fleet. The traditional core, which includes the fishery complex, is complemented by a new cluster for the construction of offshore hydrocarbon production and processing facilities, as well as the tourism sector.

Arkhangelsk support zone. The main emphasis in its development is on the creation of an Arctic transport system. The strategic function associated with supporting the NSR is close to the Murmansk region, but with some restrictions that may be of a fundamental nature.

On the territory of the Arkhangelsk region there are strategic enterprises with developed competencies in the field of shipbuilding and ship repair, united in the Severodvinsk cluster. Their specialization is mainly military in nature, while civil shipbuilding is considered as a promising direction. Work has begun

on the creation of the Arkhangelsk production and logistics complex, which will work both in the interests of the Russian Ministry of Defense and for commercial orders. The production potential of the region is represented by the woodworking and pulp and paper industries, which in the long term are unlikely to be able to provide sufficient cargo flow along the NSR, unlike the mining, metallurgical and chemical enterprises of the Murmansk region. Projects for the development of the region's mineral resources are so far limited to the Pavlovskoye silver-bearing lead-zinc deposit.

The economic model of the Arkhangelsk zone is associated with the realization of the advantages of the priority development territory and the widespread use of the cluster approach.

Karelian support zone. The region declared its specialization to be the introduction and use of environmentally friendly technologies for environmental management and production in the Arctic.

The project content is expected to be achieved through the creation of a multimodal transport hub with a deep-water seaport in Belomorsk, which should become a key element of the transport corridor facilitating the development of the natural resource potential of the republic. The existing industrial potential is represented by a mineral resource complex for the development of deposits of common and strategic minerals, and it is proposed to develop it through a biotechnological cluster, combining projects in the field of advanced processing of timber, biological resources of the White Sea, and wild plants. The specialization of the Karelian zone in renewable and alternative energy turned out to be unique for the European sector of the Russian Arctic. In the future, the region can provide itself with the most environmentally safe energy, becoming a leader in the pace of low-carbon development. The direction of economic diversification, as in other Arctic territories, is the promotion of ethnocultural, environmental, fishing and rural tourism. There is no definite vision yet regarding the economic model for the functioning of the Karelian zone.

Nenets support zone. Since the Nenets Autonomous Okrug is the least populated and poorly diversified region of the Russian Arctic, the ideology of development of its support zone is determined by the development of transport infrastructure for more efficient development of hydrocarbon resources on the sea shelf and onshore part of the Timan-Pechora oil and gas province. Most of the hydrocarbon production projects in the western sector of the Arctic, including the shelf zone (Varandey terminal and Prirazlomnaya platform), are already being implemented in the region. This allows the district, in planning its prospects, to rely on the experience of implementing commercially successful projects in the Arctic without special tax and administrative regimes. With regard to the economic model, it is especially emphasized that the development of oil and gas fields already makes it possible to accumulate the necessary financial and technological resources for the formation of a modern system of settlements with high standards of quality of life. The development of transport infrastructure will make it possible to use the economic potential of the territory even more effectively, as well as strengthen ties with the central part of Russia and strengthen the country's position in the Arctic basin.

Vorkuta support zone. The Komi Republic is the only Arctic region of Russia that does not have direct access to the Arctic Ocean and, accordingly, to the infrastructure of the Northern Sea Route. The specialization of its support zone in the context of fulfilling strategic tasks at the national level is a production and logistics complex that provides transcontinental connections between the ports of the Kara, Barents and White Seas with the ports of the Pacific Ocean, which will allow mining and processing enterprises in the regions of the European North, the Urals and Siberia to reach promising global markets in the West and East. The second component of the specialization is national security. Its development is based on the infrastructure of the Arctic group of troops and the Ministry of Emergency Situations.

In the future, it is planned that the support zone will reach the sea by extending the branch of the Northern Railway "Karskomur" from Vorkuta to the potential seaport of Arcturus [Litovsky, 2020] on the shore of the Kara Sea in the village of Ust-Kara, or the village of Amderma, Nenets Autonomous Okrug. An important factor in the development of the transport and logistics hub is the construction of the Northern Latitudinal Railway. The connection of transport corridors, in the zone of influence of which new mineral resources and processing centers may arise, will ensure the filling of cargo flows of the NSR and optimization of the load of Arctic ports. For the development of the Vorkuta zone, it is proposed to use mechanisms to support depressed areas by granting the single-profile municipality "Vorkuta" the status of a PSEDA.

Yamalo-Nenets support zone. One of the most actively developing territories of the Russian Arctic. Positions itself as a transit corridor providing connections between the industrial centers of the Urals and the oil and gas centers of Yamal with the European part of Russia. Essentially, it consists of three elements - operating anchor projects for the extraction and production of liquefied natural gas (LNG) in Yamal, the new seaport of Sabetta and the Northern Latitudinal Railway, which is under construction, which has a chance of being faster than other options (Belkomura and Barentskomur) to materialize the transport link "Ural – Komi – North-West" that is strategically important for interregional

development. The transport-industrial framework is complemented by a strong humanitarian block in the form of numerous environmental, educational and scientific projects for the comprehensive study and natural rehabilitation of this sector of the Russian Arctic. The zone uses a wide range of economic mechanisms in the implementation of projects: private investments are attracted (Yamal LNG), government funding (the port of Sabetta), a PPP mechanism is used along the Northern Latitudinal Railway in the form of a concession, supplemented by regional investments in the construction of the road part of the bridge across the river Ob.

Taimyr-Turukhansk support zone. Its specialization is formed on the basis of mining. At the moment, there are two active cores - the Vankor oil and gas cluster and the Taimyr coal mining center. In the future, two more oil and gas fields may be added to them - Ust-Yenisei and Khatanga. At the same time, only the coal industry and metallurgy, which is being developed in the Norilsk industrial region, are focused on the transport capabilities of the Northern Sea Route (interestingly, the current port of Dikson, according to plans, will be focused only on receiving cargo, and two new ones - "Chaika" and "Sever" - on exporting coal to export). Existing oil and gas flows are tied to a system of trunk pipelines in a southwestern direction outside the zone of influence of the Northern Sea Route and other Arctic territories.

A feature of the economic model of the Taimyr-Turukhansk zone is the high degree of involvement of raw material corporations in the construction and operation of transport infrastructure for their own projects. This, on the one hand, increases their feasibility and independence from government investment (but only during favorable market conditions). On the other hand, it consolidates the export and raw materials specialization of the territory with all the accompanying socio-economic risks.

North Yakut support zone. The fundamental feature of the development of the territory can be considered the basin approach, due to the alternative nature of inland water transport, complete dependence on northern supplies and the connection of all Arctic and northern territories of Yakutia with the Northern Sea Route (via inland waterways). It is noteworthy that the republican authorities classify as territories of integrated development not only five uluses classified as AZ RF by Presidential Decree of 2018, but another eight that are rightfully proposed for expansion of AZ RF and the North Yakutsk support zone.

The river-sea transport infrastructure is the framework of both the support zone and the republic as a whole. At the same time, two vectors of Arctic specialization are clearly distinguished. External (latitudinal) is aimed at ensuring the activities of the Northern Sea Route along the entire coast of Yakutia, including servicing ships and vessels with nuclear power plants in the port of Tiksi. The internal (meridional) vector reflects the realization of the region's own interests in the Lena basin. The key project here is the construction of the high-tech Zhatai shipyard.

The design content of the industrial core of the support zone is supposed to be linked with potential mineral resource centers for the development of acutely scarce and strategically important resources. However, the degree of preparation of projects varies greatly, which casts doubt on their feasibility in the near future. The most relevant in this regard remain the anchor projects of the Anabar territory (diamond, rare earth and oil and gas), as well as the Zyryansky coal center of the Kolyma territory. Among the government support measures that could intensify the formation of the North Yakut support zone are TASED and PPP. In addition, it is proposed to extend to this territory some procedures of a free customs zone and other measures to simplify business activities.

Chukotka support zone. The specialization of the easternmost support zone of the Arctic is fully formed and cannot be changed. Based on the use of the geographical advantages of direct access to the Pacific Ocean and the proximity of the markets of the Asia-Pacific region, two practically isolated territories will be developed here - the Chaun-Bilibino and Anadyr industrial zones. The first specializes in the extraction of polymetallic raw materials, the second - in the development of traditional fuel and energy resources. A special feature of the territory is that its infrastructure framework needs serious modernization of all three subsystems: energy, transport and telecommunications, and so far, unlike other Arctic regions, it is considered not as a competitive advantage, but as a deterrent.

The development concept of the North Yakutsk support zone presents passports of anchor investment projects with an assessment of costs and efficiency, as well as information on mineral resource centers, which distinguishes it favorably in terms of the degree of development from other support zones of the Russian Arctic.

Let us note that the description of project initiatives touches on the proposed mechanisms for the creation and functioning of public health organizations. Several publications by the authors of the article and other researchers are devoted to this issue, including on the basis of comparison with foreign experience.

After some surge in information and discussion activity around the transition from the sectoral to the territorial principle of development of the Russian Arctic (in the format of support zones), there has been a lull in the public space since 2020.

Meanwhile, according to the implementation plan for Subprogram 1 "Formation of support zones for development and ensuring their functioning..." in 2020, the Ministry of Economic Development of

Russia was supposed to present "the concept of a project for the formation of support zones for development", "develop and carry out research work", "adopt regulations". In 2020, a Decree of the Government of the Russian Federation was to be issued on the procedure and criteria for selecting projects for support zones. Planned activities were not completed within the specified time frame. The Ministry of Economic Development is considering 30 regulations aimed at creating conditions for the effective implementation of investment projects in the Russian Arctic, as well as acts on amendments to the Tax Code, the Law "On Subsoil" and other laws. The long approval process in the government of the draft Federal Law "On the development of the Arctic zone of the Russian Federation", entirely dedicated to support zones, postponed until 2024 the financing of research work, the result of which should be economic calculations for projects of support zones in terms of the necessary transport, energy, telecommunications and other infrastructure, the volume of natural resource extraction, and future cargo flows. An important methodological position for developing concepts of support zones and selecting projects, according to the authors of the article, as well as the developers of the Concept for the formation of the North Yakutsk support zone, is the assessment of the multiplicative effects of their implementation, consistently carried out by colleagues from the Institute of Economics and Economics of the SB RAS.

On December 4-6, 2017, the VII International Forum "Arctic:

present and future", which brought together 1,600 participants from 37 regions of Russia and 17 foreign countries. The forum is organized by the Interregional Public Organization "Association of Polar Explorers" (ASPOL), headed by Artur Chilingarov, Special Representative of the President of the Russian Federation for international cooperation in the Arctic and Antarctic. The forum was held with the support of the State Commission for the Development of the Arctic. More than 20 heads of key ministries and departments for the development of the Arctic, governors and heads of all Arctic regions of the Russian Federation took part in the discussion and decision-making process. Members of Parliament took part in the discussions, including Chairman of the Committee on Constitutional Legislation and State Building Andrei Klishas, Chairman of the Council for the Arctic and Antarctic under the Federation Council Vyacheslava Shtyrov, Chairman of the Committee on Regional Policy and Problems of the North and Far East Nikolai Kharitonov, Chairman of the Committee on Ecology and Environmental Protection Vladimir Burmatov and others, as well as representatives of business, science, non-profit and public organizations. The plenary session was devoted to one of the main topics in the forum program - the development of support zones, their regional models and the role of the state. During the plenary session, delegates discussed the readiness of the Arctic regions to launch and operate support zones, as well as the coordination of the activities of federal and regional authorities in this process. The discussion was attended by the special president of ASPOL A. N. Chilingarov, governors and heads of all Arctic regions of the Russian Federation. According to the new edition of the state program "Socio-economic development of the Arctic zone of the Russian Federation" and the draft federal law "On support zones for development in the Arctic zone of the Russian Federation", which is being developed, it is assumed that the main mechanism for the development of the Arctic region will be support zones, which provide for the development of the territory as an integral project on the principle of ensuring the interconnection of all industry activities at the stages of planning, goal setting, financing and implementation. The implementation of pilot projects for the direct creation of support zones is planned for 2018-2020, and their operation for 2021-2025. The creation of support zones was actively discussed at the VI Forum in 2018, where eight support zones were discussed: Kola, Arkhangelsk, Nenets, Yamalo-Nenets, Vorkuta, Taimyr-Turukhansk, North Yakutsk, Chukotka. At the 2020 forum, a decision was made to create a ninth zone - Karelian.

At the plenary session, reports from representatives of all regions in whose territory support zones are being created were heard and discussed. In order not to list all the speakers, we can state that all the governors and heads of the Arctic regions of the Russian Federation made their proposals. The interest of the heads of the constituent entities of the Russian Federation in this problem is enormous, since this is an opportunity for serious development of the northernmost regions of our country, and with the support of the state. But this is also a great responsibility, since many problems have accumulated in the Arctic regions and we must be able to organize everything in such a way that the regions can fulfill the mission that is entrusted to them by the state.

Of particular interest to those present was the report of one of the ideologists of the creation of support zones and... O. Governor of the Nenets Autonomous Okrug (NAO) A.V. Tsybulsky, who dwelled in detail on the prospects for the development of the Nenets support zone and noted the feasibility of interregional interaction. The administration of the Nenets Autonomous Okrug carried out work to form the Nenets support zone, which included projects related to the production of hydrocarbons and the development of the Northern Sea Route (NSR). The NAO is rich in various resources. The subsoil of the district contains 52% of the total oil and gas resources of the Timan-Pechora oil and gas province. In terms of hydrocarbon reserves, the district ranks first in the

European North of Russia and fourth in Russia and, in addition, has a rich resource - access to the coast of the Arctic Ocean, the Northern Sea Route. Thus, the Nenets support zone includes the implementation of investment projects and the creation of infrastructure directly related to the extraction of hydrocarbon resources and the development of the Northern Sea Route. The district envisions the creation of three main centers for the development of the Nenets support zone. The first and main one is the village of Indiga in the ice-free bay of the same name in the Barents Sea. It is planned to build a deep-water port of Indiga in Indiga Bay - the only ice-free bay on the entire coast of the Arctic zone from Murmansk to the port of Sabetta with the ability to receive large ships year-round without icebreaker support. The second direction of development of this territory is the Sosnogorsk - Indiga railway line, the construction of which will give Russia a new sea access to world markets, will allow connecting the port of Indiga with the main cargo-generating and resource-producing regions of the country - the Komi Republic, the Urals, Kuzbass, as well as Kazakhstan. The new multi-functional seaport of Indiga, in combination with the new Sosnogorsk - Indiga line, will become the basis for sustainable socio-economic development not only of the Nenets Okrug, but also of the entire Arctic zone of the Russian Federation, since it will make a significant contribution to the formation of an integral transport network of the European part of the North of Russia.

The second largest center for the development of the Nenets support zone may be Naryan-Mar, the administrative center of the Nenets Autonomous Okrug. Here it is necessary to reconstruct the Naryan-Mar airport and create a checkpoint across the state border on its territory. One of the priority projects of the Nenets support zone is the development of a network of highways. The new edition of the state program "Socio-economic development of the Arctic zone of the Russian Federation" already includes projects for the construction of three transport corridors Naryan-Mar - Usinsk, Naryan-Mar - Toshviska, Naryan-Mar - Mezen. The implementation of these projects will improve the transport accessibility of the region, since this is one of the main problems hindering the development of the Nenets Autonomous Okrug. Until now, the district is isolated from the main centers of the European part; the only connection is air.

The third development center of the Nenets support zone is the village of Amderma. It is proposed to implement projects for the reconstruction of the Amderma airport and the creation of an aircraft refueling point, and the construction of the Vorkuta - Amderma railway for transporting mined coal from the Pechora coal basin.

A.V. Tsybulsky put forward a proposal on the feasibility of interregional interaction. The Vorkuta support zone has rich natural resource potential, has railway connections with the regions of Russia, but does not have access to the Northern Sea Route. Therefore, it is advisable to unite the neighboring Nenets and Vorkuta support development zones. The purpose of the association is to create a transport corridor from the Urals through Vorkuta along the Sosnogorsk - Indiga railway line to Indiga Bay to open a direct route to the port of the same name. The unification of two support zones will not only be an interregional project of the Nenets Autonomous Okrug and the Komi Republic, but will also make a significant contribution to the formation of an integral transport network of the European part of the North of Russia and the realization of the industrial potential of the territories through access to promising sales markets along the NSR.

One of the most controversial was the report of the Governor of the Murmansk Region M.V. Kovtun, who stated the need to amend the bill on the development of the Arctic zone of the Russian Federation. The governor criticized the principle of providing state support to anchor investment projects in support zones worth more than 100 billion rubles. The fact is that often the creation of infrastructure to ensure the operation of a project is too expensive and unaffordable for the region. According to the governor, the criterion for granting the status of an "anchor project" should not be the cost of this project, as stated in the draft law, but its significance for the development of the support zone. In addition, the head of the region noted, the legislation does not provide for sufficient measures to ensure the socio-economic development of support zones and improve the quality of life of the population, Also, the draft law does not contain a list of measures to ensure environmental safety and scientific research. To resolve these problems, it is necessary to develop a separate federal law that would regulate these issues or make appropriate changes to other legislative acts regulating these problems. The problem of raw materials resources in the Arctic has always attracted great interest. The main panel session was "Oil and gas of the Russian Arctic: prospects and problems of development," which attracted the largest number of participants. And this is understandable, since the resources of the Arctic are the future of Russia. The Ministry of Economic Development has compiled a list of 145 projects that are already being implemented or planned for implementation in the Arctic. Most of them (38.9%) are related to the extraction and processing of minerals, primarily hydrocarbons. They are also the most capital-intensive and large-scale. The unfavorable price environment for hydrocarbons on the world market has slowed down the implementation of some projects in the Russian Arctic. Under the conditions of sanctions, the problem of the lack of domestic technologies and equipment for the development of oil and gas fields in the polar

region is still relevant. The situation was also complicated by new US restrictive measures introduced in August 2018 regarding oil production in the Arctic.

At the panel session, a number of issues of interest and concern to many were discussed, among which the following can be highlighted, namely:

- resource potential of oil and gas fields on land and the Arctic shelf;
- implementation of oil and gas production projects in the regions of the Arctic zone;
- ways to reduce the cost of oil and gas production in the Arctic;
- promising markets for Arctic hydrocarbons.

Indeed, the resource potential of the Arctic is rich. The Yamal Peninsula is a strategic oil and gas region of Russia. Explored and preliminary estimated gas reserves here exceed 16.7 trillion. m^3. In the future, Yamal will become one of the three main centers of Russian gas production with a potential annual productivity of up to 310-360 billion m^3 of gas.

The Bovanenkovskoye field is the main center of gas production in Yamal. With initial reserves of 4.9 trillion. m^3 deposit is one of the three largest in Russia and one of the five in the world. In total, three gas fields will operate with a total capacity of up to 115 billion m^3 of gas per year. In the future, the design productivity of the Bovanenkovskoye field will increase to 140 billion m^3 of gas per year.

The second promising area for shelf gas production with a focus on the same Asia-Pacific region could be the Laptev Sea, taking into account its natural conditions (primarily shallow water) and location in the middle of the Northern Sea Route.

However, the main role of the Russian Arctic shelf, taking into account the current situation in the oil production sector, should play in maintaining the achieved levels of oil production.

The pipeline system of the Arctic zone of the Russian Federation is developing. The Transneft company implemented the largest project for the construction of the Zapolyarye – Purpe – Samotlor oil pipeline. The total length of the pipeline system passing through the territory of the Yamal-Nenets and Khanty-Mansi Autonomous Okrug is almost 1 thousand km. This is the shortest route that connected the north of the Krasnoyarsk Territory and the Yamal-Nenets Autonomous Okrug with Russian oil refineries, world markets and the Eastern Siberia - Pacific Ocean directions. The launch of the oil pipeline made it possible to double oil production in the region by 2020.

At the session, serious concerns were expressed regarding the profitability of the extraction of gas resources on the Arctic shelf. Deputy General Director for Scientific Work of the Federal State Budgetary Institution VNII Okeangeology A. A. Chernykh noted that by now it has become completely obvious: the development of gas resources in most areas of the Arctic shelf is unprofitable not only today, as the Shtokman project showed, but even in a fairly distant future. The exception is the NOVATEK Yamal LNG project on the Kara Sea coast. The problem is undoubtedly serious and needs to be worked on. As for the NOVATEK Yamal LNG project, it is unique and we will consider it in more detail. The Yamal-LNG liquefied natural gas plant in Yamal was recently put into operation. It is the world's largest and northernmost liquefied natural gas plant with a capacity of 16.5 million tons per year. Investors: OJSC Yamal LNG as part of PJSC NOVATEK (50.1%), Total (20%), CNPC (20%), Silk Road Fund (9.9%).

Under the conditions of sanctions, the problem of the lack of domestic technologies and equipment for the development of oil and gas fields in the polar region is especially pressing. The situation was also complicated by new US restrictive measures introduced in August 2018 regarding oil production in the Arctic. Therefore, the session “Creation of equipment and technologies for the development of the Arctic shelf” aroused undoubted interest.

The discussions on the creation of domestic equipment and technologies were attended by Deputy General Director of the Federal State Unitary Enterprise VNIIOkeangeology named after. I. S. Gramberg" A. A. Chernykh, head of the project group of the Foundation for Advanced Research (Laboratory of Advanced Underwater Robotics) V. V. Litvinenko, chief designer of the project of JSC "Lazurit" S. Kh. Umyarov and others. Development of the Arctic shelf and its coast is strategically important for the development of Russia and involves the development and implementation of modern means and technologies for the extraction of mineral resources. Considering that, according to various estimates, the share of imports in geological exploration reaches 85%, and in the implementation of offshore projects up to 90%, this is a serious challenge for the domestic industrial and oil and gas engineering industry. During the session, the needs of companies with large-scale projects for Russian equipment, services in the field of geological exploration, geophysical work and production on the Arctic shelf, as well as the possibility of reducing dependence on the import of foreign technologies were discussed. In addition, the discussion participants discussed the creation of favorable conditions for the development of innovative technologies necessary for the development of the continental shelf in the Arctic (for example, the admission of private companies to the shelf). Undoubtedly, projects for the development of Arctic hydrocarbons are grandiose. However, there are problems associated with the supply of foreign technologies and equipment for work on the shelf. The sanctions affected the most vulnerable point of the oil and gas industry - its technical equipment: the provision of technology and the supply of equipment,

As always, much attention was paid to the development of the Northern Sea Route, which, as a result of the development of the Arctic shelf, provides an incentive for economic growth in the northern regions.

In 2017, the Northern Sea Route turned 85 years old. In 1932, for the first time in the history of navigation in northern latitudes, the expedition of the Russian explorer Otto Schmidt managed to navigate the Arctic Ocean in one navigation - from the Barents Sea to the Bering Sea. In the same year, the state administration of the NSR was created. This organization was responsible for a wide range of economic issues in the Arctic, as well as for ensuring navigation along the Northern Sea Route. In essence, a single governing body was created in the country, in whose hands significant resources were concentrated. Without the development of the Northern Sea Route, the development of the Arctic region of Russia is impossible, since it is the basis of the Arctic transport system. It should be noted that there is great interest in the NSR all over the world. Tu Deming, General Director of the shipping company COSCO (China), which transports goods around the world, expressed great interest in the development and use of NSR. The so-called project to create the "Ice Silk Road of the 21st Century" within the framework of the "One Belt - One Road" program is already being actively developed by the joint efforts of China and Russia. The difficult political situation in the world today contributes to the creation of such a global competitive transport artery that will serve both the political and economic interests of both countries.

The main advantage of SMP is its commercial potential. According to some estimates, unlocking the full potential of this Arctic route could reduce the annual costs of international maritime trade by $53.3-127.4 billion by 2024. These are very attractive prospects. The NSR is the shortest sea route connecting Europe and Asia. Sea transportation today is the most cost-effective and this business is only growing and developing. The Russian government is allocating money for the development of the infrastructure of the North, nuclear icebreakers are being created based on the latest technologies, and China plans to build new cargo ships with an increased ice class. And this is the second time at such representative forums that much attention has been paid to people in the Arctic. Without humans, the development of the country's natural resources, the fulfillment of that mission, which is assigned to the North and the Arctic is impossible. The supply of young personnel in the Arctic regions depends on the migration of graduates. The picture is not rosy. Graduates mostly leave for non-Arctic regions of the country. Thus, from the Arkhangelsk region in 2018, 25% left for other regions of the country and only 4% for the Arctic regions. Respectively, 21% and 1% of graduates left the Murmansk region. The volume and quality of personnel training in universities do not always meet the needs of companies operating in the Arctic. At the same time, specialists who received education in other regions are not always ready to move to the Arctic regions for permanent residence. It is necessary to systematically create conditions for improving the quality of education and the demand for graduates, expanding targeted training, introduction of practical training mechanisms with the involvement of specialists from specialized Arctic enterprises. At the forum, it was noted that the problem is not simple; its solution requires serious efforts and, first of all, the state, namely: the creation of a socio-cultural environment, opportunities for professional growth, etc. For the purposes of state development, the Arctic must turn into a territory attractive to life and work. It seems advisable to restore the previously existing northern benefits. This requires a joint solution to the problem by the state, regions, and business. Currently, personnel training for the Arctic zone is carried out through various forms of training, but the main suppliers of personnel are state universities. The state order for personnel training is constantly increasing. The number of budget places in universities in the Arctic zone has increased fourfold over the past four years. In 2023, 5 thousand more budget places were allocated than in 2022. The greatest demand is for engineering and technical specialties, so in the structure of budget places they make up 44%, which is higher than similar indicators in other regions of the Russian Federation. However, it is necessary to increase the number of budget places in engineering and technical specialties, since these are the specialties that are most in demand in the Arctic. One of the most effective forms of implementing educational programs with an Arctic focus is network learning, which consolidates the resources of a number of educational programs of universities and industrial enterprises, and not only universities in the Arctic regions. More than 30 universities in other regions of the Russian Federation use the same programs and modules for training specialists to work in the Arctic. In addition, network learning is also used within the framework of international cooperation, in which Russian and foreign universities take part. Such a consortium is called Barents Transborder University. Studying at the university contributes to the development of student mobility in the Barents region and, ultimately, cooperation in future professional activities. However, there are many problems in its development. The development of the university is hampered by the lack of funding for the creation and implementation of joint master's programs by Russian partner universities, as well as funding for student mobility, since students must undergo training for a semester at a foreign university in accordance with the curriculum. While the number of Russian students studying at Finnish universities is gradually growing, there are practically no Finnish

students in Russian universities. The situation will change when the number of universities in Russia that conduct their master's programs in English increases. Another possibility for the development of the project is the expansion of scientific cooperation within the framework of joint master's programs (research-based master programs), which will allow obtaining additional financial resources and ensuring the mobility of teachers participating in the project. At the forum it was emphasized that in order to motivate young specialists it is necessary to promote them to management positions and create conditions for career growth. Regional authorities and employers should more effectively use the potential of educational organizations in the region, develop a system for attracting and retaining young specialists in production and in the social sphere, increase the attractiveness of working and living conditions, opportunities for professional growth, implementing government support measures. It is necessary to maintain branches of educational institutions in the North, as this is a tool for retaining young people. At the final plenary meeting of the State Duma, it was noted that in order to implement the task of preserving the human presence in the Arctic, colossal funds are allocated from the federal budget - more than 190 billion rubles. Funding will be provided in three key areas: the development of support territories, the Northern Sea Route and shipping in the Arctic, as well as the creation of new equipment and technologies.

Conclusion

The enormous importance of the Arctic region is no longer in doubt, as well as the realization that this region cannot be developed using the methods of the Soviet five-year plans, and as we move to high latitudes (to the Arctic shelf, to the coastal zone and coastal territories), the volumes increase required investments and financial risks.

The main difficulty in introducing new approaches and methods in the formation of space, cells of the territory's framework is that the inertia of already established structures and management methods is still great, and new proposals, developed and even enshrined as mandatory in government documents, have difficulty making their way. This situation can be explained by the difficulties of the transition from the usual strictly centralized management to the need to establish equal rights for different participants in the process of Arctic development. Even with the understanding that they all have a common goal - the modernization of outdated industries and the creation of new ones based on progressive technologies that correspond to the principles of sustainable development of territories and meeting the social needs of the population, uniform rules have not yet emerged.

The Arctic zone of Russia, consisting of the northern parts of eight constituent entities of the Federation, due to completely unique circumstances, has practically approached the position of a special and independent object of state regulation and management. These circumstances include: the huge and diverse resource potential of the territory; the determining role of extracted raw materials in the country's export earnings; the high vulnerability of the Arctic ecological system, on which the state of many regions of the world depends; urbanization of developed territories (80% of the population lives in cities and towns). Exorbitant costs in industrial production and maintenance of public utilities inevitably stimulate the search for methods and solutions to reduce costs, hence the objective need to build an innovative economy here. It depends only on the success of this direction whether the Arctic will develop in the modern format of the 21st century, or whether it will get stuck in the 20th century with its worn-out funds and the continuing outflow of population to more prosperous regions.

Only the state can be a guarantor and necessary participant in the movement of the Russian Arctic along the innovative path of development. Hopes for private capital and the market did not justify themselves. Private companies, which have taken possession of what was developed in Soviet times, are not engaged in the development of the territory, but in the exploitation of rich deposits, more in their own interests than in the Arctic or the country and its population. This is evidenced by the insufficient level of investment in R&D and low spending on corporate social responsibility, despite the fact that almost all owners of Russian mining companies appear on the Forbes list.

However, even under such unfavorable circumstances and despite all the contradictions of state policy, a new space is gradually being built in the Russian Arctic with modernized enterprises serving large government orders and the needs of large companies, thereby forming regional clusters, which will play a major role in the formation her new look. New avant-garde areas of development, as a rule, are tied to the localization of the largest deposits of strategic types of raw materials, cities and towns serving these deposits or producing the necessary equipment and materials for them, as well as seaports and port points associated with sea and river transport routes with access to to the Arctic, Pacific and Atlantic oceans.

In recent decades, the polar territories, regardless of their national protectorate, have increasingly become an area for the implementation of pilot projects to introduce innovative development methods, the latest eco-friendly production technologies, information technologies and communications, monitoring of natural and social processes. Such approaches to the development of resources and space in the Arctic in the modern world order are dictated, on the one hand, by plans to create

a powerful raw material and production base of the polar countries in extreme natural and climatic conditions, and on the other hand, by high investment risks and market requirements to meet international standards. Products created in the Arctic must not only be in demand in the domestic and world markets, but also competitive. Wherein, Today, the task is also not to destroy those unique resources of this region, which are still less involved in economic development or are classified as resources of deferred demand, but in the future may be of even higher importance than the reserves of energy and mineral raw materials that are so in demand today. There are still obstacles to the implementation of such large-scale plans in Russia, which, unfortunately, cannot be overcome tomorrow or in the near future. These include: insufficient, and often meager, funding due to budget deficits and the choice of other priorities for government injections (expenditures on the military-industrial complex and military operations, on new Crimean facilities, etc.); an acute shortage of professional personnel in the absence of effective incentives to attract specialists to work in a difficult climate and in conditions of primitive infrastructure; lack of own technologies and the depressing state of science designed to develop these technologies (during the period of reduction in funding for "northern projects", many scientists and engineers working in this field went abroad); the lack of an effective system for managing complex resource-territorial objects and, finally, a corrupt corps of managers of all ranks, slowing down useful initiatives and transferring state support funds into inappropriate expenses. All these negative factors are well known, and there is no doubt that they were taken into account when developing numerous program documents on the Arctic: this is the "Concept of sustainable development of the Arctic zone of the Russian Federation" (2018), and "Fundamentals of state policy in the Arctic until 2035." (2020), and "Strategy for the Development of the Arctic Zone" (2020), and the State Program for the Social and Economic Development of the Arctic Zone until 2035). However, if we take a realistic approach to the situation on the ground and take into account people's sentiments, it becomes obvious that social policy will play almost the leading role in achieving Russia's ambitious goals in the Arctic. Today it is quite difficult to achieve the voluntary resettlement of people to areas with unfavorable natural and climatic conditions, especially in the absence of modern production and social infrastructure. In addition, the older generation, who spent decades working in Arctic fields or at weather stations on the polar coast and lost their savings during the "shock therapy" of the 1990s, has already popularly explained to her children the dubious advantages of working in the North. "Suitcase" sentiments prevail among both older and younger residents of the northern regions. This is evidenced by a steady downward trend in the population of the latter (except for the Nenets, Yamalo-Nenets districts and the Republic of Sakha (Yakutia)) and special sociological studies. Let us present the results of surveys in the Arkhangelsk region, which are very typical for most northern regions. The main problems pushing young people out of rural areas, respondents consider the impossibility of decent employment (79%), lack of modern leisure facilities (52%), lack of comfortable housing (45%), uncertainty in the future of the settlement (32%), low incomes and inaccessibility of education (14% each).

The next stage of lawmaking for the formation of new spatial structures in the Arctic was the draft of the new Federal Law "On the development of the Arctic zone of the Russian Federation" (2020). In it, this zone of the Russian Federation is considered as a single management object, with the formation of a federal executive body and a new integrated approach to territorial and socio-economic development - the creation of support zones. The support zone is defined as "a comprehensive project for planning and ensuring the socio-economic development of the Arctic zone, aimed at achieving strategic interests and ensuring national security in the Arctic, providing for the synchronous interconnected application of existing instruments of territorial and sectoral development, as well as mechanisms for investment projects, including on the basis of public-private and municipal-private partnerships." In total, it is proposed to create eight support zones in the Arctic (Kola, Arkhangelsk, Nenets, Yamalo-Nenets, Vorkuta, Taimyr-Turukhansk, North Yakutsk and Chukotka). Each zone in terms of infrastructure will be based on ports, and, accordingly, they will all be connected by the main transport route - the Northern Sea Route. At the present stage, the new seaport of Sabetta (the eastern coast of the Yamal Peninsula) has occupied an important place in the Yamalo-Nenets support zone, which has already sent the extracted oil from the Novoportovskoye field by tankers to the west. It is unlikely that anyone will deny that an integrated territorial approach is more effective than a sectoral one, especially in a region such as the Russian Arctic, with its vast expanses, large differences in natural, resource, ethnographic and environmental plans, not to mention the different levels of development of certain territories. This was well understood back in the years of the USSR, when the strategy of creating territorial production complexes (TPC) was adopted as the main concept for the development of new territories. The social and economic effect during the formation of the industrial complex was achieved through the comprehensive and rational development of the entire production infrastructure, the use of local natural (land, water, raw materials) and labor resources. The creation of the TPK was recognized as the most effective spatial form of organization of productive forces, in which the advantages of specialization, cooperation, and combination of

various elements of the economic system are realized. Large TPKs created in the Soviet years in the northern regions of Russia are still operating. Murmansk, Timan-Pechora, North Ob, North Yenisei TPK represent the industrial framework of the entire Arctic. There has never been and could not be a complete territorial development in the Arctic, due to extremely unfavorable natural and climatic conditions, and too high costs for all types of production work, social infrastructure and personnel maintenance. In addition, continuous territorial development in Arctic latitudes is also unacceptable for environmental reasons, since highly vulnerable natural systems are able to withstand anthropogenic loads that are extremely limited in space.

In a word, the focal type of development based on large deposits of strategic types of minerals, both today and in the future, remains the only acceptable one in the Arctic. But now we are faced with the urgent task of modernizing the existing heritage and especially the introduction of more energy-efficient and environmentally friendly production technologies.

It is clear that Soviet approaches to the formation and development of the TPK (by the way, very effectively and creatively used in many foreign countries) today require rethinking and modernization. In the new Russia, the development of production entirely at the expense of the state budget is unacceptable, as is the use of a certain contingent in northern enterprises that does not require high wages for hard work. The ideology of TPK in spatial economics has been replaced by a cluster approach, which has been successfully working for a long time in all Western countries and has enormous potential in the Russian Federation. Clusters, as zones of high concentration of economic activity of business entities, make it possible to introduce new forms of innovative processes that increase labor productivity and the level of specialization of all participants. The purpose of the cluster approach is to intensify activities for the implementation of production projects in a certain territory, which should ensure an increase in production efficiency, diversification and improvement of the structure of the economy, increasing its competitiveness, when not an individual enterprise, but a large industrial complex will compete in the relevant market. For example, the model of the oil and gas cluster in the Arctic represents a balanced interaction of a group of production, service, scientific and educational organizations (oil refining enterprises, petrochemical, geological exploration and oil production companies, icebreaker and tanker fleet services, port infrastructure, universities and scientific organizations).

However, as international experience shows, the most successful clusters are formed where a "breakthrough" is made or expected in the field of technology and production technology with subsequent entry into new market niches. "Collecting" clusters from "debris and waste" of industries and market sectors that are in a state of decline, as a rule, does not lead to success.

An analysis of the clusters that are currently forming in the Arctic zone allows us to identify several leading sectors that, it seems, will receive the most intensive development in the near future: fuel and energy, timber industry, logistics, ecology and tourism, biotechnology, agro-industrial complex. The most industrially developed Murmansk and Arkhangelsk regions have significant potential for the formation of clusters. Each of these regions has its own specifics, both are historically focused on servicing the oil and gas sector and participating in activities that ensure the operation of the Northern Sea Route. The competition that has arisen between Murmansk and Arkhangelsk for the status of the main logistics operator, in our opinion, is temporary and makes little sense, because each region, performing certain functions, contributes to the "Arctic piggy bank". In the field of oil and gas production, both regions are associated with the development of fields in the Barents and Kara Seas, which entails the need to develop coastal infrastructure, the condition of which will determine success in the development of mineral resources, year-round use of the Northern Sea Route, and the interest of foreign investors in participating in Arctic projects. However, it must be taken into account that the process of innovative restructuring with the formation of interaction between many players, from firms to regional authorities, requires a lot of time. In addition, since a difficult economic situation has developed in the Arctic zone, due to an almost twenty-year period of neglect and stagnation, it is obvious that the cluster approach cannot be implemented here without special preparation, government subsidies, intensive cooperation of efforts of both business at all levels and municipal and regional authorities. In 2006, the Federation Council, together with the Higher School of Economics Research University, with the assistance of the Russian-Canadian NORDEP program, prepared "Methodological recommendations for the implementation of cluster policy in the northern regions." The recommendations identified a wide range of issues regarding the participation of all levels of government in supporting and promoting regional clusters, carried out an analysis of existing cluster initiatives in the northern regions, and considered the tasks and instruments of cluster policy.

As already mentioned, the idea of support zones in the Arctic is set out in the new Federal Law "On the Development of the Arctic Zone of the Russian Federation," presented in the summer of 2020 for discussion by interested departments and the scientific community as the main form of spatial development of the regions.

To date, there is no final decision: whether the new bill will be adopted as the main federal act or will turn into "targeted" by-laws. While it is under consideration by the Government of the Russian Federation, the analysis of proposals from the regions, as well as the financial possibilities for its implementation, continues. The prospects for the latter are not very bright: the Russian Ministry of Economic Development, taking into account the comments of the Ministry of Finance, proposed reducing expenses for the state program for the development of the Arctic from 2018 to 2035 by four times (from 209.7 billion to 50.9 billion rubles). However, regardless of the amount of future funding, the bill raised many questions among the expert community.

For example, doubts arise about the appropriateness of the proposed mechanism for managing the development of the Arctic zone. For these purposes, it is proposed to create a new authorized executive body, and for each support zone (there are eight of them, according to the number of subjects of the Federation in the zone) - a "Project Office of the Support Development Zone." Judging by the list of rights and responsibilities of the new formations, two more heavy bureaucratic structures are being created, intermediate between federal bodies and enterprises operating in the region. All powers to develop scientific programs and select topics for inclusion in the state scientific research plan will be transferred to a new executive body, which will, together with the leadership of the Arctic subjects of the Federation, local authorities will coordinate this plan and monitor its implementation. Is there a need to create a new body when there are a large number of highly professional scientific centers that have accumulated a large amount of analytical and information material on the Arctic and the North, and present scientifically developed plans for long-term research based on many years of work to study the entire range of problems? Are we, in the person of the new body, building another Skolkovo, where billions of budget funds have been invested, but scientific results corresponding to such investments have not yet been obtained?

Moreover, in the new law, the northerners did not see answers to the questions that concern them: will the Arctic be developed on a rotational basis or are full-fledged settlements with a full range of services needed; when will the problem of traditional land use for the indigenous peoples of the North be resolved; Is the regional practice of setting lease payments for reindeer pastures at the level of 300 thousand rubles legal? per year (in the Vorkuta district, despite the fact that in the Nenets district similar payments amount to 18 thousand per year); when will the law on free and indefinite use of lands for the indigenous population be adopted; When will they finally introduce rent payments for the development of mineral resources in the Arctic, or, for example, a tax on progressive capital, so that this region can begin to fully develop? Unfortunately, This is not the first time we have encountered quasi-novel approaches in regional politics, which obscure the real picture on the ground, create bureaucratic barriers to free development, introduce additional reporting and inspections, and hamper healthy initiative from the localities with their regulations.

The Kola, Arkhangelsk and North Yakutsk zones are considered to be the most prepared today for the formation of a supporting framework for the re-industrialization of the Arctic. All of them have strong economic prerequisites for accelerated development and in recent years have focused on the formation of clusters of a certain specialization on the basis of existing industrial enterprises and companies associated in their activities with a specialized center.

The implementation of the Kola Support Zone project on a full scale requires certain decisions at the federal level, in particular on granting the Murmansk seaport the status of a special port zone, as well as on the mechanisms for the formation of the so-called Pomeranian zone in the Barents region (the latter project also affects the Arkhangelsk region). Based on the industries that currently determine the specialization of the region, marine, mining and chemical and fishing clusters can be formed. They are represented by a number of large companies that are competitive not only on the national market, but also on the world market. The region has port facilities (operating and projected), vessels of various profiles and an icebreaker fleet, a repair base, highly qualified workers and management personnel.

Arkhangelsk support zone. In recent years, most enterprises in the Arkhangelsk region have been focused on supplying products for large-scale oil and gas projects (development of the Prirazlomnoye oil field, construction of the Varandey terminal, as well as development of the Bovanenkovo gas field on the western coast of Yamal). Eight years ago, the Constellation association was created in the region, which included, in addition to such large enterprises as Sevmash and Zvyozdochka, hundreds of medium and small enterprises - suppliers and contractors of the oil and gas industry. High-tech engineering companies are attracted, connections are established with regional and foreign industry operators. The Yamal LNG project alone became the core for attracting 70 local companies. That is, an oil and gas cluster is practically already being created. In general, there are three more clusters operating in the region - shipbuilding, timber and social, and two more are in the process of creation - biotechnological and fishing. This is the real picture in the area where clustering processes have developed at the regional level, a clear understanding of the need for cooperation and interaction in order to achieve greater benefits for each

level of enterprises and sustainability in the labor market.

Great prospects are associated with the Yamalo-Nenets and Nenets support zones, where the main centers of hydrocarbon production in the Arctic are located. These two subjects of the Federation have not only achieved success themselves thanks to the development of extractive industries and transport infrastructure, but are also major customers of various products outside their regions, attracting many enterprises, firms, research centers, forming modern-type oil and gas clusters.

The proposal to create a North Yakut support zone was perceived by local authorities in the Republic of Sakha (Yakutia) as a very promising project with a large backlog. First of all, a rationale has emerged for the revival of the seaports of Tiksi and Zelenomyssky, where both concrete piers and hydraulic bases have been preserved; the river-sea class fleet will undergo renovation, which will be provided by the modernized Zhatai shipyard. In the future, it is planned to launch the shortest meridional transport corridor from northwest China to Western Europe through Skovorodino, Yakutia and the Northern Sea Route.

Norilsk support zone in the Arctic part of the Krasnoyarsk Territory already has two powerful clusters, occupying one of the leading places in the Eastern Arctic. The core of the first of them is the Norilsk mining and chemical complex (one of the main users of the Northern Sea Route). The second is being formed on the basis of oil and gas fields of the Vankor group, located in the Taimyr and Turukhansk regions.

Vorkutinskaya and Chukotka support zones are still seen as a contour image on the map of the socio-economic space of the Arctic, since their exceptional raw material potential, which was already tapped to a certain extent in Soviet times, has been poorly used in recent years: a significant part of the local mining centers have been experiencing a serious decline since the beginning of market reforms or have been withdrawn from industrial use. In the near future, obviously, one should not expect a rapid change in the situation: the state does not consider the industrial development of mineral deposits in these territories as a priority task, and private investors are not ready to take risks alone.

Consideration of the prospects for the development of support zones presented in the Federal Law "On the Development of the Arctic Zone of the Russian Federation" shows that the industrial scheme for the development of the Arctic based on resource-exploiting industries is preserved. Harmonization of the development process, which takes into account the importance of all types of natural resources on land and sea, renewable and non-renewable, is not prioritized in the document, and this is alarming. Meanwhile, the initial stage of development, typical for a significant part of the Arctic territories, especially for coastal zones, which are the most dynamic in nature and environmentally vulnerable, makes it possible to use the experience of already developed similar habitats in other countries, avoid historically accumulated mistakes, and apply new world methods and technologies of the last 20 years. The new bill provides for financial support for activities and priority projects from the budget system of the Russian Federation and extra-budgetary sources, in a ratio of 1:4. But with such a distribution of financial investments, it is difficult to expect much enthusiasm from business. It is well known that in regions with difficult natural and climatic conditions, the state must lead the way and create infrastructure, which subsequently attracts business.

As in previous years, the Arctic faces a relatively low level of funding for investment programs. At the same time, it is obvious that for greater efficiency in the use of limited funds in the development of strategic documents and basic laws that will determine the conditions and directions of the Arctic zone, it would be necessary to more actively involve the already developed arsenal of scientific proposals from leading scientific centers that have been associated with the Arctic and its problems for decades. In fact, the main expected goal of the new law was to create a working algorithm for solving strategic problems for the future development of Russia in the Arctic region. After almost 20 years of neglect of the Arctic by the state, the present period can be considered as a return to high latitudes, but with the understanding that in the 21st century. this must happen on a fundamentally new motivational and technological basis. The previous period with the most active activity in the 1950–1980s was not only characterized by high financial and labor costs with the determining role of the state, but was also marked by the acquisition of vast experience in solving complex technical and technological problems, which brought the country to the forefront of Arctic exploration in the world. However, at the present stage, when developing new development concepts and approaches, it is necessary to take into account the main conclusions from the difficult experience of past decades, namely:

1) The Arctic does not forgive mistakes; its development is not a sprint, but a long marathon;

2) you cannot "fight" the Arctic, you need to understand its specifics and patterns of development and competently integrate into natural processes, without destroying the ecological balance through technogenic impact, so as not to complicate life and work here for future generations;

3) the use of high technologies, knowledge-intensive products, and innovative approaches is a distinctive feature of the Arctic development process; their main goals are the efficient and safe development of resources, minimizing human participation in production processes, creating materials and technical

means that help reduce costs for all types of work while maintaining high reliability of their operation;

4) When developing new concepts for the development of the Arctic and preparing new legislative initiatives, it is necessary to take into account existing and proven effective scientific methods for organizing the socio-economic space.

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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.*

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Introduction

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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

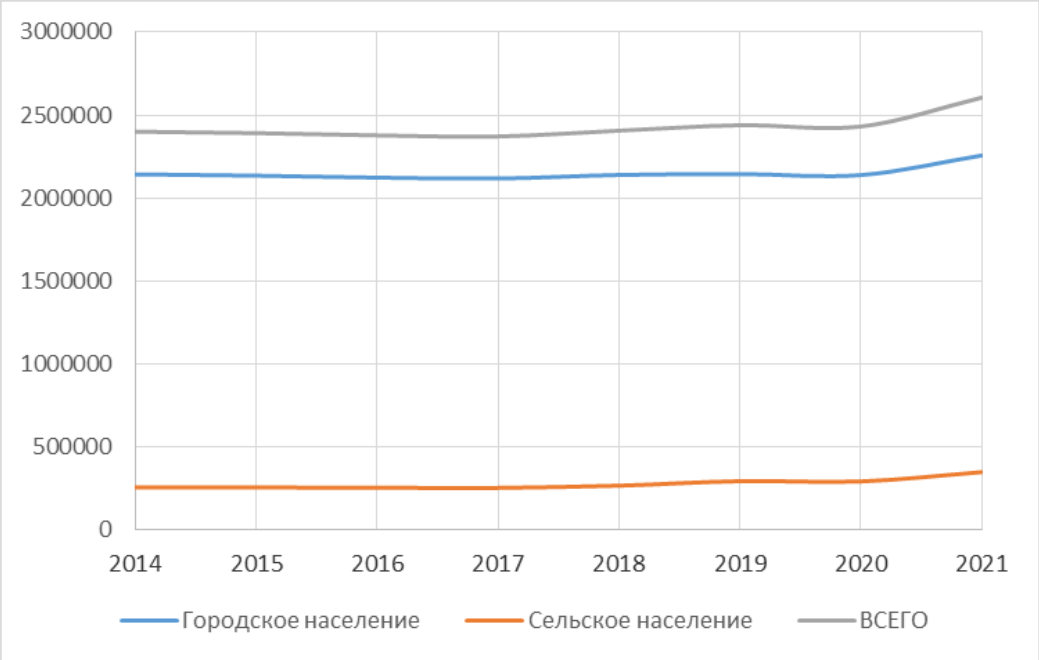
programs and development strategies in the Russian Arctic as of 2022, namely:

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.

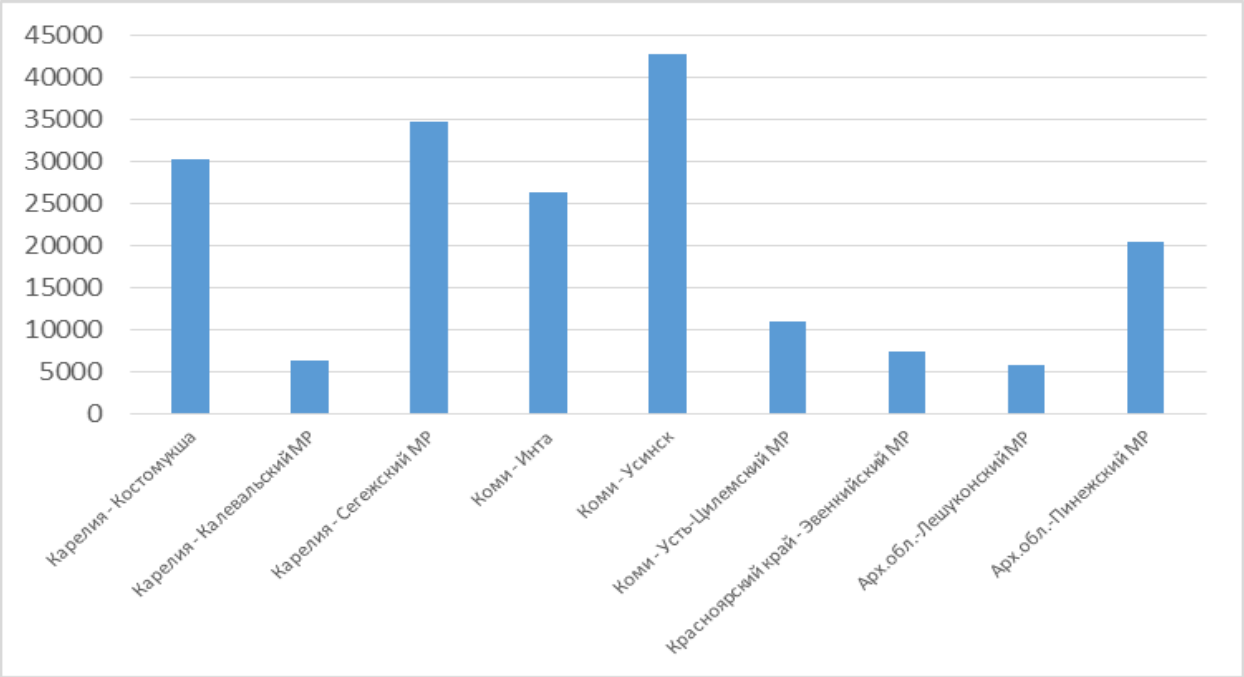


Figure 2. Population growth in the Russian Arctic in 2022.

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%).

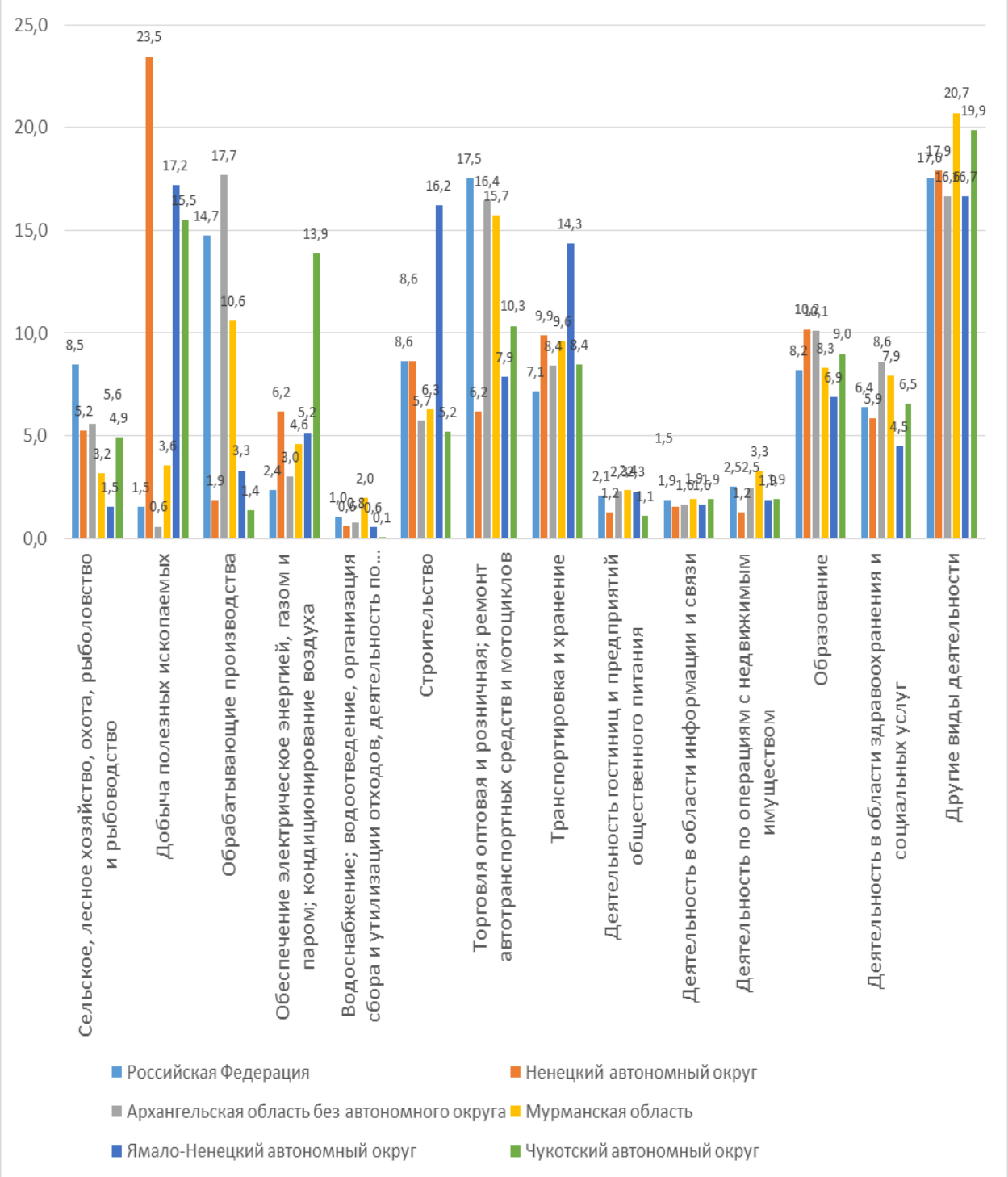


Figure 3.Employment structure of the population of some constituent entities of the Russian Federation included in the AZ of the Russian Federation, by economic sector, 2020, %

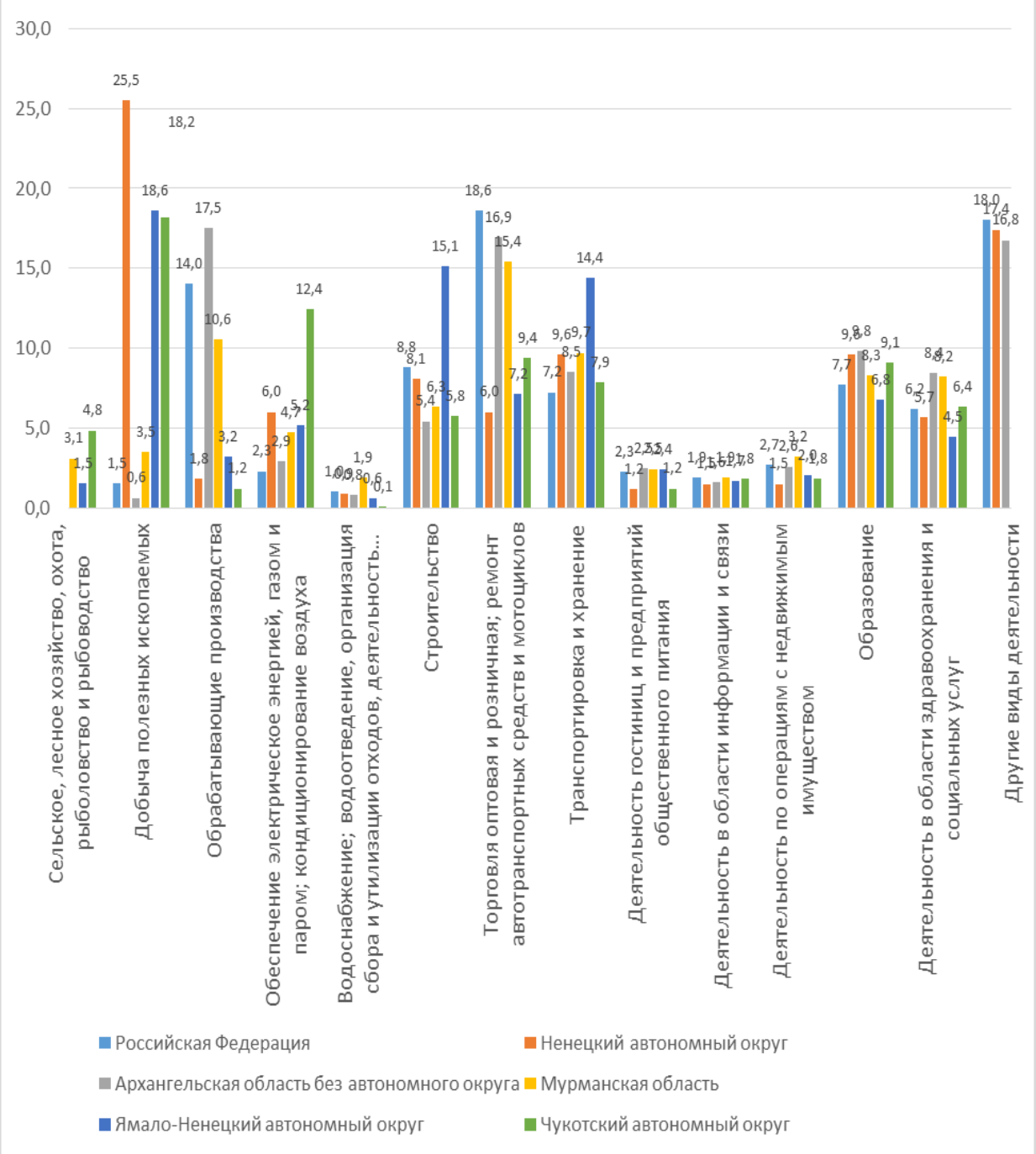


Figure 4.Employment structure of the population of some constituent entities of the Russian Federation included in the AZ of the Russian Federation, by economic sector, 2020, %

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

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CRITERIA FOR ASSESSING THE SUPPORT SETTLEMENTS OF THE RUSSIAN ARCTIC TO ENSURE BOTH EXTERNAL AND INTERNAL SECURITY OF THE POPULATION OF THE ARCTIC ZONES AND THE SOCIO-ECONOMIC DEVELOPMENT OF THE REGIONS OF THE RUSSIAN ARCTIC

Abstract: *The article reflects the result of a detailed analysis of all Arctic settlements in Russia with a population of more than 500 people. taking into account not only standard statistical parameters, but also specially collected data on the location of medical and educational organizations, logistics infrastructure (including the largest civilian warehouses of fuels and lubricants), proximity to licensed areas for mining, etc. The research work carried out is a basis for identifying the supporting settlements of the Russian Arctic. The detail of the analysis allows us to form a flexible system of criteria for support settlements in the field of external and internal security, as centers of socio-cultural support for the population of the Arctic, centers of service and administrative support for the implementation of resource projects.*

Key words: *competitiveness, demand, quality, accessibility, innovation, digital technology, economic policy, industrial policy, union of federal, regional and municipal branches of government; profitability, profit, financial stability, stability, purchasing power.*

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Introduction

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In modern conditions, the general global trend of spatial development is to concentrate the population and economy in the largest cities. Cities are the drivers of innovative development.The spatial development strategy of the Russian Federation is based on the fact that the largest cities and urban agglomerations are the main centers of economic growth.

However, the situation in the Arctic has a number of specific features that require a special approach. These specific conditions do not allow general trends in the spatial development of Russia and the world as a whole to be extended to the territory of the Russian Arctic. In particular, the thesis about the exclusive role of large cities as the main drivers of the economy does not work in the Arctic, and it is not surprising: both in the Russian and global Arctic, the population of the largest cities does not exceed 300–350 thousand inhabitants (Murmansk and Arkhangelsk in Russia, Anchorage and Reykjavik in the foreign Arctic), and more often 100–150 thousand people. The focus of the economy primarily on the extraction of natural resources, the low population density and undeveloped network of settlements, the weak level of development of the land transport network - all this determines the special role of which relatively small settlements (small and medium-sized cities, and in some cases also permanent or temporary settlements) play in socio-economic development and ensuring national security in the Arctic. They serve as centers for the location of bodies and organizations performing functions of ensuring national security (state, information, environmental, etc.), including those related to the functioning of the Northern Sea Route, and are also bases for geological exploration and/or mineral resource centers. Improving the system of government policy measures aimed at ensuring national security in the Russian Arctic and the socio-economic development of the Russian Arctic regions requires an objective understanding of the role of the Russian Arctic settlements in these processes. For this, it is necessary to adapt general methodological approaches to the spatial development of Russia and the formation of public policy measures to the specific conditions of the Arctic. First of all, this is the task of determining the role and specific functions of settlements in the socio-economic development of the Arctic, which is the subject of a significant part of the presented research work, namely:

the first section reflects theoretical approaches to scientific understanding of the features of the development of settlements in the Arctic, as well as their interactionwith each other in the settlement system;

the second section presents characteristics of the characteristics of Arctic cities (in Russia and, for comparison, abroad), and formulates a hypothesis regarding possible options for their role in the settlement system in the context of the formation of a system of support settlements in the Arctic zone of the Russian Federation;

The third and fourth sections reflect the applied part of the study - the methodology for identifying support settlements and proposals for the formation of criteria and a list of support centers.settlements of the Russian Arctic.

Conceptual approaches to carrying out research work are based primarilytaking into account the specifics of the Arctic zone of Russia, defined in the Strategy for the development of the Arctic zone of the Russian Federation and ensuring national security for the period until 2035, including: extremely low population density and a weak level of development of transport and social infrastructure (due to harsh natural and climatic conditions); stable geographical, historical and economic connections with the Northern Sea Route; uneven industrial and economic development of individual territories of the Arctic zone of the Russian Federation (hereinafter referred to as the Russian Arctic); the economy is focused on the extraction of natural resources, their export to industrialized regions of the Russian Federation and export; high resource intensity of economic activity and livelihoods of the population, their dependence on fuel supplies, food and other vital goods from various constituent entities of the Russian Federation; growth of conflict potential in the field of international relations in the Arctic.

During the work, primary data were analyzed, many of which were introduced into scientific analysis for the first time. A total of 256 populations were included in the analysis.localities of the Russian Arctic with a population of at least 500 people (at the beginning of 2023), for which a total of 57 indicators were collected (including indicators of the development of the mining industry within a radius of 150 km from the settlement - for licensed areas; characteristics of transport infrastructure, location of government organizations, the presence of medical organizations, warehouses for fuels and lubricants (hereinafter referred to as fuels and lubricants) and food depots, etc.). Additionally - only in connection with the analysis of transport development - permanent settlements with a smaller population were considered, in which large fuel warehouses and/or large transport enterprises, hospitals and clinics are located, as well as a number of rotational camps with large cargo or passenger turnover of airports. The uniqueness of the collected primary data forces us to present them in an appendix containing a large amount of information on certain areas of development of settlements in the Russian Arctic; a significant part of

the data is presented in cartographic display (both primary data and proposals for the formation of a list of reference settlements of the Russian Arctic). The final list of settlements proposed for inclusion in the list of support centers included 180 settlements in the Russian Arctic (including 12 key ones, with the maximum range of impact on the development of the Russian Arctic).

Main part

When moving from a specific cityAt the level of the city network, the problem of zones of influence arises. In the space around each city, the population and enterprises receive innovative development impulses, but also, as a rule, a variety of goods and services from their center city, for which the recipients of innovation are the periphery. At the same time, a complex system of supporting the city's innovative activities is actually being formed between the center and the periphery. Cities do not generate innovation "on their own"; in fact, they are regional economic centers, serving as focal points of economic and social life of the entire region, customers for the production of raw materials and producers of services for the entire region. Citizens - generators of innovation - are in close contact with all participants in the process, and especially with consumers, serving, as it were, as controllers of the quality of innovation (a number of scientific schemes have been proposed to explain this phenomenon - this is the concept of regional innovation systems, and cluster theory, and the "triple helix", which explains the interaction of science, government and business in the innovation process, etc.). Thus, we have the second sign of a "normally functioning city" - a regional "support system".

At the same time, cities - the centers of regions - interact not only with their periphery, but also with each other. Here, on the one hand, they literally divide zones of influence, and on the other, they exchange the products of their regions. Depending on the zone of influence, different hierarchical systems of cities develop (the spatial pattern formed by centers of different orders is classically explained by Walter Christaller's theory ("Christaller's grid"), which in turn has various modifications). The highest level of the urban network in the second half of the 20th century increasingly began to be viewed as a network of global (another term used is world) cities. Each global city has (according to Friedman) its own zone of influence, on the one hand, and on the other hand, close ties with other global cities.

The simplest system of urban development, which forms the theoretical basis for managing spatial development, includes three main elements, namely:

— hub cities as a place of concentration of significant volumes of various types of activities (places of generation of innovations as an engine of economic developmentthat);

— regional economies How systems supporting the economy of hub cities (suppliers, consumers,14 not only ensuring the proper market volume, but also performing the functions of "consumer control" of innovation);

— global networks of hub cities through which regional economies interactinteraction with each other.

There are, however, several atypical cases, especially important for understanding the situation in the Arctic.

The first exception is network regions. Economic history has repeatedly described the phenomenon of the European "city belt" - a network of cities involved in close economic exchange processes (in the modern situation it is inherited by the main economic axis of Europe, figuratively called the "blue banana" - from Northern Italy, through Switzerland to the mouth of the Rhine and Benelux countries). It is this relationship that is believed to have formed the basis of the modern urban system. Unlike the system described above, cities - the main elements of this system - did not have full-fledged support regions. Often these were city-states (Genoa, Venice); Fernand Braudel emphasized that the cities of the "city belt" were almost deprived of "sponsored" agricultural territory and purchased food from outside. However, The lack of regional support networks was compensated by the closest (especially by historical standards) transport connections, which provided local producers (and innovators) with both the proper market volume and diversity. Relatively small cities have become the main drivers of economic development, but what is important here is that they did not develop on their own, but rather in a system of dense interactions that apparently replaced the regional support system, and even provided advantages to the cities of the "city belt" over classic regional capitals (such like Paris, Madrid, Berlin, which historically were the clear focal points of respectively France, Spain, Prussia, etc.).

In a sense, analogues of the European "urban belt" are systems of cities connected through waterways.ty - the Mediterranean and the Hanseatic League of Cities. In modern history, an analogue of this kind of dynamically developing areas, consisting of many interacting small centers (often they do not have city status) instead of a centralized system "nodal city - periphery", are the so-called Becattini areas (a classic example is Northern Italy), as well as, apparently the famous Silicon Valley in California. In all cases, high connectivity and total permeability of the network region compensate for the lack of size (or even simply the absence) of a large hub city: in fact, the hub city appears to be dispersed in the space of the regional support network, the boundaries between the hub city and the region are blurred.

The network region model has a parallelin the system of global cities, which thus have a double advantage: on the one hand, most of them have "their"

region, their own zone of influence, on the other hand, they take advantage of close connections with each other (in particular, provided by the network of the largest international airports connected by direct flights).

The second exception is supplier cities.The phenomenon is described by J. Jacobs and consists of a manufacturer entering the global market without its own regional support system that would ensure diversity and innovation (although she described this process for regions without large cities). As a rule, the share of such manufacturers in their industry is small, which ensures the "banana republic" effect: the manufacturer depends on the global market, but due to its small weight, it cannot influence it. In a number of cities, this is a type of classic single-profile cities that supply a limited range of products to the world market and are strictly dependent on its market conditions. Please note that the type of city here is not related to its size: often a small city, serving as a "node" for its district and having in the suburbs and surrounding countryside a stable circle of consumers of services and goods of its producers (post office, hospital, bakery, tax office, college, etc.), is more resilient than a larger population a mono-profile manufacturer of, say, paper or ore.

Supplier citiesoften minimally connected with the surrounding area: even the simplest services for its population (district hospital, administration) may be located not in the supplier city, but, for example, in the nearest regional center. This usually happens when a regional center is historically the hub of a territory and a new industrial center is being built nearby. This, it should be noted, is the worst option for a single-profile city, when its narrow industrial specialization is not "diluted" by at least providing the simplest services for residents of the surrounding area, or even for the townspeople themselves.

Let us note one exception, a special type of supplier cities. At the present stage, development benefits are gained not only by large regional centers, but also by small cities specializing exclusively in scientific developments - science cities, technopolises. In fact, these are also mono-profile suppliers. However, they "supply" innovations directly and this sets them apart from the general range of suppliers that do not influence the market as a whole: such cities are quite capable of setting the fashion for new directions of technological development. Are the basic patterns of innovative development, the high level of exchange of ideas and the large volume of the market, violated here? Upon closer examination, it turns out that it is not. In Soviet times, in remote cities - science cities, despite the secrecy regime, a very high level of access to specialized information was purposefully maintained: the best databases were created, the best scientists were gathered (and the exchange of knowledge was supported between employees of different science cities); Even global information flows were often connected to the powerful exchange of information between science cities (relevant intelligence data flowed into them). Thus, the effect of ease of knowledge exchange, which is formed by itself in large cities, was artificially supported in science cities. And since such cities were created within the framework of priority areas of the economy (primarily the military-industrial complex), the introduction of innovations was largely guaranteed by the customer of the research: they went (contrary to the theory of cluster advantages) not to the local consumer, but directly to the national level.

Paradoxically, the phenomenon of remote science cities is relevant to modern problems in the Arctic: it proves that it is possible to maintain "normal" urban tasks by artificially strengthening the main urban functions - an active exchange of ideas and a capacious market.

In general, if we take a simplified approach, the roles of cities in the world system can be reduced to the following types, namely:

A. The largest hub cities (for brevity let's call them "alpha cities") are the "engines" of large regional innovation systems, generators of innovationinnovation on a global scale. They are included simultaneously in two systems of mutual exchange of innovations, goods and services, namely:

— a global network of world cities;

— an exchange system within the macroregion, which concentrates the main consumers of financial, managerial, information and other services of the alpha city, and also supplies it with personnel,raw materials, etc.

An essential condition for the functioning of alpha cities is their highest transport accessity (physical and economic):at their service are the world's most important airports, the best highways in the world, etc. Let us note: in such cities certain industrial enterprises can be located, but for the development of cities this is not the main thing, the main thing is management functions, it is the "control levers" that are concentrated here » - company headquarters.

B.Secondary hub cities are hub cities on a regional and local scale, with a smaller area of influence. They are included in the following systems and have:

— connection with the nearest alpha city (or a nodal city of a higher order) according to the center-peri typeholiday;

— regional exchange system.

An important condition for their development is good transport and information connectivity with their region, as well as with a "higher" city in the hierarchy (an alpha city or a hub city of a higher order than this one). Interaction with cities of equal size is somewhat reduced.

B. Partner cities are cities included in

closenetwork exchanges within network regions. This type of urban network is not common and could be considered an exception if the network regions were not associated with the most powerful breakthroughs in economic development (the European central "urban belt", Silicon Valley, etc.). Here, populated areas are included in networks of more or less equivalent exchange with nearby cities.

The condition for the existence of such exchange networks is excellent transport connectivity, which allows, in general, the efficient functioning of transport flows on the principle of "everyone with everyone", which is possibleonly in densely developed areas of the planet.

D. Supplier cities: cities that are "alone" drawn into networks of global exchanges, but do not have the resources to influence the global market (unlike global cities that are strong players, legislatorsly fashion in the global market). The connections are narrow, one-sided and vulnerable (with the collapse of the industry).

All of the above reflects, in the most simplified form, the functioning of urban systems in "normal""under the conditions" - more precisely, in those conditions in whichThe basic postulates of urbanism were developed. However, in relation to the Arctic, these conditions turn out to be inapplicable - mainly due to the lack of more or less stable transport connectivity between cities in the Arctic, their small numbers, large distances between settlements, which prevent the formation of exchange networks usual for cities (the specific conditions of the Arctic are well known and enshrined in documents of Russian state policy in the Arctic).

However, the functions of cities in the Arctic (as opposed to the functions of cities in general) have not been adequately studied - what is clear is that they do not work (or arethey work wrong) general principles of urban development, which often gives rise to talk about the general futility of Arctic urbanization. In foreign works, on the contrary, Arctic urbanization is considered as a specific phenomenon that requires special attention. The last decade has seen a virtual explosion of research interest in this topic.

In general, the situation is so ambiguous that the formation of state policy regarding Arctic cities must, of course, be preceded bystudy of the features of their development.

City dwellers make up about 3.3 million people in the global Arctic, or slightly more than half of the total population (if we conventionally count as city dwellers residents of settlements with a population of more than 5 thousand inhabitants), but cities in the Russian Arctic are especially important - they are inhabited by, according to official data, 89% of the population of the Arctic zone of the Russian Federation. It is noteworthy that there is no such level of urbanization anywhere else in Russia: in the Central Federal District the share of city residents is 82.3%, in the Northwestern Federal District - 84.5%, in the industrial Sverdlovsk region 84.9% live in cities, in the Moscow region - 81 ,5%.

The differences between the settlements of the Arctic in general and the Russian one in particular from the settlement network of the temperate zone can be characterized by five main features:benefits, namely:

*the first feature of the Arctic is that there are no big cities in itchildbirth: the population of the largest cities in the region does not exceed 350 thousand people - this circumstance does not allow the application of national principles of spatial policy in the Arctic, aimed at supporting primarily large urban agglomerations. The cities of the foreign Arctic are generally smaller: the largest cities of the Canadian Arctic, Yellowknife and Whitehorse, are smaller than the "out of the ordinary" Yamal city of Muravlenko. In other words, against the backdrop of the foreign Arctic, the Russian Arctic is a zone of large and even "very large" cities, although against the backdrop of the main settlement zone there are 50–100 thousand cities that form the main backbone of the urban network of the Russian Arctic (Norilsk, Novy Urengoy, Noyabrsk, Salekhard, Nadym , Monchegorsk, Vorkuta), are comparable, perhaps, with the suburbs. This is perhaps the main paradox of Arctic urbanization;

*second feature— the urban population of the Arctic is very concentrated. In essence, Arctic urbanization is a piecemeal number of local urban systems. As researchers have already noted, only five urban systems that have developed around the largest urban centers of the Arctic make up more than half of the official urban population of the Arctic: these are Arkhangelsk, Murmansk, Anchorage, Norilsk and Reykjavik with their suburbs. Almost a third of the world's Arctic citizens and approximately half of the Russian Arctic live in Arkhangelsk and Murmansk and their surrounding areas alone.

Due to the high concentration of urban populationIt seems that most of the Arctic territory is devoid of not just large cities, but generally any significant urban centers. Conversely, cities located in sparsely populated areas have a virtual monopoly on city services: they are often the only points of receiving medical care, access to cultural institutions, banks, and sometimes even to the Internet for hundreds of kilometers around;

*the third feature, which further enhances the effect of the second, is that the largest Arctic cities are located along the southern border of the Arctic (and taking into account the fact that the Arctic border is a rather arbitrary concept, most of them will be Arctic with some degree of convention) . So, Reykjavik is located on the 64th parallel - like Arkhangelsk. Alaskan Anchorage unexpectedly turns out to be the southernmost of the large Arctic cities: located at 61 degrees latitude (61.159591), it is only slightly north

of St. Petersburg (to be completely precise, its geographical latitude corresponds to the northern tip of the Vyborg district of the Leningrad region) and practically at the latitude of Siberian Surgut (by the way, similar to Anchorage in both size and a period of rapid growth due to the discovery of oil fields). And only Murmansk and Norilsk can be considered "truly Arctic" large cities (more than 150 thousand inhabitants).

*the fourth feature of the Arctic is instabilitypopulationcities and a large scale of migration (increased proportion of both incoming and outgoing). Arctic cities of different countries are characterized by multidirectional population dynamics.

While the population of Arctic cities is growing in the world as a whole, in Russia over the past three decades,is declining, and in some places very significantly, while the population of both large and small settlements is declining. For example, during the period since the last census of the USSR in 1989, dozens of cities in the Russian Arctic have lost from 20 to 50% of their population, and some (Igarka, Pevek, Bilibino) - more than 50%. At the same time, 5 Arctic cities of Russia have grown by more than 20%, and the population of one city founded in 1986 (Gubkinsky in the Yamal-Nenets Autonomous Okrug) has increased by more than 50% and now reaches 28 thousand people. The population decline in settlements was especially intense in the Arctic part of the Republic of Sakha (Yakutia) and in Chukotka outside the year-round land transport network - where the decline was especially dramatic, as well as in the cities and towns of the Murmansk region. So, for the period from the 2002 census to January 1, 2023.

The reduction and/or loss of an Arctic village in most cases is due to the following circumstances, namely:

— objective depletion of a deposit, the development of which was associated in the past with the growth of a city or town;

— changes in shipping conditions, technologies, etc., leading to a loss of economic efficiencyactivity in the same place (for example,the disappearance of the need for coal for ships traveling along the Northern Sea Route, as well as changes in the shipping conditions themselves);

— relocation of enterprises and organizations related to ensuring external security (military units), concentration of activities (geology, wherethere was an almost complete removal of expedition bases from remote villages), the liquidation of some administrative-territorial units (districts);

— unprofitability of continuing production during the transition from conditions socialist managementto market ones.

The latter circumstance deserves special attention: in some cases, the resumption of work can be (hypothetically) restored if there is a changeexternal economicconditions (for example, an increase in the cost of extracted raw materials) and/or with the development of infrastructure (which will lead to a reduction in transport costs). It is the inaccessibility of transport in a significant number of cases that determines the ineffectiveness of continuing work. For example, the conditions for the development of tin-bearing rocks in the north of Yakutia are as follows: "The inaccessibility of the Deputatskoye deposits and their remoteness from tin producing enterprises lead to a low turnover rate of invested funds - from the start of lending to the receipt of finished products, it takes 1.5 years. With high interest rates for loans and transport tariffs, the competitiveness of domestic metal is low, and the cost of its production in the 1990s exceeded world prices. Tin from the rich Churpunnya ore deposit (content above 2%, one of the deposits in the Deputatskoye area) was transported by a winter road 250 km to the village. Nizhneyansk, then transported 4,100 km by winter road or by water with two transshipments to the port of Osetrovo on the Lena, and then another 1,800 km by rail to Novosibirsk."

In the case of urban population growth, the following circumstance attracts attention. In the worldIn the Arctic, mainly the largest, multi-functional cities, as well as administrative centers at the regional level, are growing. In light of these trends, the population growth of Salekhard and Naryan-Mar corresponds to global trends. However, the population growth in oil and gas producing cities observed in Russia, on the contrary, runs counter to them. True, the rapidly growing "oil and gas" cities of Novy Urengoy and Gubkinsky can be considered unique: despite the lack of administrative status and general specialization in servicing the oil and gas industry, both cities are distinguished by relative diversification. The key role, apparently, is played by the fact that both cities are bases for the development of relatively young, effective for the development of fields (Novy Urengoy is the development base for, among other promising fields in the north of the Yamal and Gydan peninsulas; Gubkinsky - the Komsomolsk gas field, etc.), both are centers for the location of a number of oil service enterprises. At the same time, Gubkinsky, with a population of just under 30 thousand people, is a unique (for the Arctic) example of maintaining its own branch of a higher education institution (Udmurt State University), has its own television and radio company and the production of dairy products (using imported milk). We can confidently say that in both cases, population growth reflects the city fulfilling its full function as a base for the development of promising deposits; both cities can be considered exemplary/pilot examples of the development of support settlements - bases for the development of mineral resource centers.

For many other cities, recent decades have seen

a decline in diversity economy. In a number of cases, this trend developed back in the 1970s, when specialization was encouraged in the economy (for example, in Igarka, experimental cultivation of vegetables was practically lost, a technical school was transferred to Krasnoyarsk, etc.). The narrowing of specialization was largely facilitated by the development of rich oil and gas reserves in Western Siberia (the mechanism of this process is essentially identical to the "Dutch disease" on a local scale). For example, Salekhard has now in practice lost its function as an experimental base in agriculture (now planned for restoration).

Fifth specificThis feature applies to the Russian Arctic: the Russian specificity of Arctic cities against the backdrop of the global Arctic lies precisely in their narrow specialization - paradoxically narrow for relatively large settlements. Abroad, in the Arctic there are 13 university cities (with a total population of more than 770 thousand people, or 52% of the total urban population of the foreign Arctic) out of 50 (with a population of more than 5 thousand people), in Russia - only 4 out of 55 (including Norilsk , where the Norilsk Industrial Institute was transformed into a university literally in 2021, and the city of Apatity without its own university, but with the Kola Scientific Center of the Russian Academy of Sciences). Russia stands out sharply against the global background due to the proliferation of "cities near oil fields" - this category is easily calculated by the method of exclusion: if you do not count cities with universities, capital cities and ports, then "all that remains" these will be industrial, essentially single-profile cities: Novy Urengoy, Noyabrsk (with the remote suburb of Muravlenko), Vorkuta, Gubkinsky, Zapolyarny... Their number is a total of 17% of the urban population of the Russian Arctic, while abroad such cities are rare: in essence , this is only Labrador City and Sodankylä (industrial Kiruna is also an administrative center - like Nadym, but only more than half its population - about 17 thousand people, although it is located in milder climatic conditions). Both among national capital cities (Reykjavik, Tórshavn) and regional level (Tromsø, Bodø, etc.), and among non-capital cities abroad, port cities stand out: Harstad, Mu i Rana, Alta, Sitka, Kenai, Happy Valley-Goose Bay, Homer and others. Against, in Russia there is a disproportionately high share of intra-continental cities not connected to the sea, which is especially paradoxical in light of Russia's Northern Sea Route. At the same time, there was actual degradation and liquidation of ports on the Northern Sea Route and approaches to it due to the destruction of infrastructure (primarily due to exceeding the standard terms of its operation), the water areas of the ports are polluted by abandoned and sunken ships and other objects (Amderma, Dixon, Igarka, Tiksi).

As the situation develops, there is a contradiction between the strategic objectives of ensuring national security for the long term and the economic interests of individual companies. A striking example is the decommissioning of the Gazprom PJSC railway line to Yamburg, the only one connecting the country's railway network and the Northern Sea Route (shallow depths in the Yamburg area limit the possibilities for port development here, but the same problems are present in other ports, for example in Novy Porto, in the Varandey area, etc.). A similar situation is repeated on a smaller scale in the areas where departmental winter roads operate: for example, a winter road from Igarka to Vankor was laid during the period when it was necessary to transport large cargo to the field, Along the way (as an externality), he provided the opportunity to import relatively cheaper products from Novy Urengoy to Igarka. With the disappearance of the need for the delivery of goods from the Yenisei, the need to maintain the winter road for Rosneft has disappeared, but its value still remains for Igarka, and the municipality is not able to maintain the winter road on its own. The port of Dikson is practically not used at present.

In areas of new development, the construction of cities (which continued in Russia until the 1980s, when the youngest Siberian cities of Muravlenko and Gubkinsky were created) was replaced by rotational camps. Information on rotational camps is fragmentary, but we can confidently say that the socio-economic development of the Arctic is greatly hindered by the narrowness of their functions. De facto, such villages are like centers of civilization for the surrounding area, including for the indigenous peoples of the North: this is a place where you can make purchases in a store or sell your products, charge your mobile phone and other devices (which have long become necessary in life). only city residents, but also reindeer herders), use cellular communications, etc. Sociologists and anthropologists even record changes in the migration routes of reindeer herders, as well as the specialization of their farms - so as to ensure the possibility of close contact with "counterparties" in cities and in the fields. The problem is that such contacts are most often illegal. Resource mining companies cannot officially provide services, for example, supplying local consumers with electricity - as a result, high-tech rotational camps and semi-legal settlements of local residents that do not have the status of settlements and/or municipalities often coexist (for example, the Varandey port area). In some cases, residents of such villages actively fight to receive additional benefits and services from resource companies, which creates social tension.

However, if rotation campsexpansion of functions is closed by their departmental affiliation, then stationary cities sometimes lack additional functions due to weak connections with each other, not only transport, but also institutional, due, for example, to administrative boundaries, routing of hospital patients, etc.

In the future, tourism, including cruise tourism, concentrated in cities, should become one of the sectors of specialization in the Arctic.

Comparing the volume of cruise tourist flowin Alaska with current and plannedthe number of cruise tourists in the Russian regions of the Far East (up to 20–30 thousand people), we have to admit that an economically significant effect from cruise tourism is possible only if the tourist flow increases by at least an order of magnitude. At the same time, you can build on the guidelines calculated using the example of Alaska:

— 1 workplace on the territory per 800–900 tourist visits;

— potential up to 6–8 thousand rubles of revenue per one cruise tourist visiting the location;

— potential up to 25–30 million rubles of added value in one location per 10 thousand cruise shipsrists who visited the location.

In addition to their role in ensuring production itself, cities in the Arctic play a key role in ensuring a decent quality of life and safety.

It is in the cities of the Arctic that the main points of medical care (including emergency care), control centers for regional divisions of all resource-extracting companies,main training centers for the Arctic.

Due to the location of medical infrastructure (including maternity hospitals) in cities, cities play a key role in ensuring the reproduction of the population of the Russian Arctic, and this function of cities is especially pronounced in resource development areas, where the share of births in cities is higher than the share of deaths in cities. Thus, in the Arctic zone of the Krasnoyarsk Territory, cities account for 87% of births and 78% of deaths, in the Nenets Autonomous Okrug - 56% of births and only 44% of deaths, in Chukotka - 47% and 40%, respectively. In other words, in the Arctic, “they are born in cities, die in the tundra,” the role of cities in ensuring safe births and thereby ensuring population reproduction and national conservation in general is unprecedented.

Of all the regions of the Russian Arctic, only in the Murmansk region the share of cities in the number of births is slightly less than the share of cities in the formation of mortality, which is primarily due to the fact that here almost the entire population of the region lives in cities, and the high mortality rate is ensured by the existing age structure population, characteristic not so much of the Arctic as of old-developed areas in general (a high proportion of the elderly population in cities).

In addition to the industries considered, cities provide a contribution to the economy of the Russian Arctic through the implementation of so-called development services: they are insignificant in direct value expression in comparison with the cost of mineral resources mined in the Russian Arctic, but are critical for the functioningdevelopment of the entire economy of the Russian Arctic as a whole (including extractive industries, shipping along the NSR, etc.). For such industries, a conditional name is proposed - “veto industries”: disruption of the work of these industries will cause a shutdown of production in the main industries of the Russian Arctic. Veto industries include:

— securityhydrometeorological monitoring and forecast in the Arctic Ocean, hydrographic and synoptic support for shipping, air navigation;

— geological and related studies;

— information support and communication services;

— specific knowledge-intensive services related to monitoring and preventing the risks of the impact of the natural environment (in particular permafrost degradation) on the construction and operation of buildings and structures;

— veterinary services (for reindeer husbandry) and somery others.

Objective restrictions on the development of many areas of socio-economic development in the Arctic (identified in the Strategy for Socio-Economic Development of the Arctic Zone of the Russian Federation and other documents) also affect the specific role of Arctic settlements in socio-economic development. Many of the functions that most Russian cities perform are ineffective in the Arctic. First of all, these are labor-intensive and material-intensive production in the manufacturing industry, including even many types of raw material processing. For example, in the Arctic (by the way, not only in Russia, but also in the world), despite widespread oil production, there are no large oil refineries due to the inefficiency of transporting refined oil products and the narrowness of the market for their consumption in the Arctic itself. However,

In the context of economicFor the development of the Arctic as a whole, the function of the base for the development of the territory is especially important. The theory of development bases, developed back in Soviet times and updated in the works of Russian scientists, implies that the Arctic economy is essentially a push-pull: the main product is created in the areas where raw materials are extracted (in modern conditions, mainly at a considerable distance from large populated areas), however, the possibility of developing resources in new areas is ensured by the activities of enterprises and organizations in base cities. In general, this support activity is designated as the category of “development services”; we are talking about services in the field of production services, information support for mining activities (geological, geodetic work), ensuring the operation of transport and communications, etc.

Despite the fact that in recent decades, dozens of scientific works have been carried out both in Russia and abroad on the features of the development of

Arctic cities, detailed studies regarding the inventory of the functions of Arctic cities have not yet been carried out.

The reason for this gap is obvious. Function analysistions of settlements in the Russian Arctic is objectively difficult due to the following circumstances, namely:

— existing statistical data do not allow us to see the specifics of how cities perform a number of functionstions of the base due to the fact that some of the functions are distributed in space between the city and fields and other economic objects outside the city limits: city residents are often employed in production outside the city (daily or regular rotational trips);

— For many settlements (in which no municipal formation at the city district level has been formed), statistical data are very poorly presented.

To fill the existing gap, a special study was conducted based on ba data.SPARK text about enterprises and organizations,registered in the largest Arctic cities (33 cities in total, 36,828 operating enterprises and organizations; 140 types of activities according to the OKVED classification (up to the fifth digit inclusive) as of May 2022.

Conducted (for the first time in the practice of social analysisbut-economic development of the Russian Arctic), the analysis made it possible to identify the key functions of Arctic cities, including those that determine their role as bases for the development of the surrounding territory, ensuring the development of mining and other industries outside the territory of the cities themselves.

Often, service provision that affects the development of the surrounding area is not explicitly identified. However, practice shows that the presence of newly developed cities and towns in areas simplifies the organization of supplies to rotational camps and production facilities, and also increases the living comfort of employees of such facilities. An indicative (albeit private) example is the advice of a shift worker-blogger to take a shift near large cities, where, according to him, there is a better supply of food.

In general, the analysis of enterprises in the SPARK database allowedidentify the range of activities that are hypothesizedis technically connected with the development of the surrounding territory - the degree of this influence in each specific case is supposed to be determined in the process of compiling a list of support settlements according to the parameters of specific enterprises.

Data analysis allows us to identify the followingnew areas of activity of enterprises, sizepuppies in cities and towns of the Arctic zone of the Russian Federation, which potentially influence the development of territory outside populated areas, namely:

— transport and logistics services (including delivery, storage and redistribution of food, fuel and lubricants), communications;

— higher and secondary specialized education, includingincluding training of professional personnel;

— scientific activities, including those related to ensuring the process of development of resource areas (geological exploration, geodesy and cartography) and the economy as a whole (meteorological service, study of permafrost processes, etc.);

— medical support for the population of the Russian Arctic and employees of enterprises working on a rotational basis (in emergency cases);

— services for the extractive industry (in particular, oilfield services, industrial and roadnew construction);

— sociocultural services (including for indigenous minorities);

— administrative and managerial activities (including administrative and management activities in relation to extractive industry enterprisespeople engaged in mining and related activities outside populated areas);

— food industry, suburban ruralfarming (production of vegetables, milk, eggs).

To one degree or another, the development of territory outside the populated area may be related (depending on specific enterprises): financial and banking activities, wholesale and retail trade, personal services, hotel business and catering establishments, etc. Among the types of activities, aimed, as a rule, at domestic consumption within cities and towns - housing and communal services, real estate transactions, primary and preschool education, etc., which nevertheless constitute a significant part of those employed in Arctic cities and towns.

In addition to the analysis of the SPARK database, an analysis of the placement of individual key types enterprises, in particular fuel and lubricants warehouses and wholesale foodbases, cargo and passenger turnover of ports, etc. The results of the analysis clearly showed that a number of cities perform functions to support activities in areas of development of mineral resource centers outside the city territory proper: the volume of production activity in the selected areas in such cases significantly exceeds the average volume of activity required to provide for the city's own population. Here are some striking examples of cities performing the function of a base in relation to the adjacent territory:

1. Airports of New Urengoy, Igarka, Pevek (airportKeperveem port) and some otherscities (especially in off-road areas) carry a significantly larger number of passengers than other cities and towns of similar size. In particular, Novy Urengoy has surpassed Murmansk and Arkhangelsk in terms of passenger turnover, whose population is 3 times larger. The reason for this disproportion is the exclusive role of Novy Urengoy in the development of fields in the north of the Yamal-Nenets Autonomous Okrug: the city serves as a transport hub

for rotation crews and cargo transshipment.

2. In a number of cities and townssimilarly, powerful fuel and lubricant warehouses are concentrated, although the needs of their population and the own volume of the urban (village) economy do not require such volumes of fuel. This is especially noticeable in the example of small population settlements in a roadless zone: for example, the villages of Anyuisk and Rytkuchi in the Chukotka Autonomous Okrug. Thus, we have received clear evidence that the economic (as well as sociocultural) significance of settlements in the Arctic is not determined by the size of their population: many even small settlements can be important bases for the development of the surrounding territory (especially in the sparsely populated, roadless part of the Arctic) Therefore, when determining the criteria and list of support settlements, it is advisable to focus on the parameters of the enterprises and organizations located in them.

During the work, 14 interviews were conducted with experts who had work experience or were directly working in the cities of Norilsk, Nadym, Salekhard, Kovdor, Apatity, Kirovsk, as well as in the fields of the Khanty-Mansi Autonomous Okrug-Yugra and Yamal-Nenets Autonomous Okrug, as well as with expert scientists working in the cities of Salekhard and St. Petersburg (with many years of research experience in the Yamal-Nenets Autonomous Okrug). According to the anthropological study, Arctic cities perform (or, in the opinion of respondents, should perform) a number of special functions related to ensuring national security in the difficult conditions of the Arctic. Some of these functions are necessary to ensure national security, but are currently not fully performed by Arctic cities, so government support for these areas is paramount.

The peculiarity of the functions of Arctic cities to ensure national security is due to theirproperties that allow you to soften/levelnegative properties of the Arctic natural and socio-economic environment (absent in the main settlement zone), posing a threat to national security and/or inhibiting socio-economic development, namely:

— low transport connectivity;

— harsh natural conditions requiring physicalsocial and psychological adaptation;

— sparse settlement network and low transport development;

— high economic needand a rational system of environmental management in complex, knowledge-intensive technologies (arising from difficult natural and climatic conditions).

Support settlements have/should have specific properties that ensureanswerto specific challenges of the natural and socio-economic environment, to mitigate or overcome their negative impact, namely:

1 .“Proximity of help”: strongholds as the nearest accessible center for providing medical care (and other measures to counter emergency situations). The Arctic is characterized by a sparse network of settlements and a high probability of interruption of transport communications due to weather conditions, therefore the standard system of distributing medical institutions at different levels and routing patients in the Arctic leads to an increased risk of harm to the health of citizens and/or death and, as a result, an increase in overall mortality in the Arctic and failure to meet the country's national conservation goals.

A typical example is the case on the Yamal Peninsula (tundra, north of Se-Yakhi, second half of the 2010s). The patient needed to be transported to a specialized medical facility in an emergency (childbirth requiring surgical intervention - caesarean section). In accordance with the existing system of hierarchy of medical centers, the required medical care was to be provided at the district hospital in Salekhard, where all medical personnel certified to carry out the relevant operation were available. Yamalo-Nenets Autonomous Okrug is a region with a well-established air ambulance system. However, in this case, even here, despite the almost exemplary organization of the air ambulance service, due to bad weather in the south of the peninsula, transportation to Salekhard was impossible.

In the hospital in the village of Se-Yakhi, where the woman in labor could be taken, there was no doctor who could perform this operation. The only surgeon the helicopter could take the woman to was at a medical facility at a nearby oil and gas field, but he was not certified to perform such operations. The delay in providing medical care endangered the lives of the woman and child. After lengthy negotiations with the chief physician of the Yamal Sanitation Aviation, the doctor at the medical facility at the field agreed to provide assistance, thereby giving the mother and child a chance to survive, although due to the lack of appropriate certification in the event of complications, he could be held criminally liable for the intervention performed. The story ended happily

It is obvious that the network of support settlements in the Arctic (and, more broadly, in sparsely populated areas) should provide the ability to provide emergency medical care of a wide profile (injuries, appendicitis and other life-threatening inflammations, obstetrics, etc.) at the shortest distance from the potential place where the need for medical care arises. medical care. At the same time, the emergency medical care system should include not only medical institutions subordinate to the Ministry of Health of the Russian Federation, but also departmental medical institutions of resource-extracting (and other) companies.

The difference between the Arctic and the main settlement zone is that space is less connected and there is a high risk of interruption of transport communications (snow drifts, bad weather), therefore there is a need to develop a network of support

settlements as centers for providing emergency medical care and, as a result, saving people.

2. "Safe for personnel": support settlements contribute to the preservation of valuable (adapted) assetspopulation.

Both from the work on the adaptation of migrants in the Far North since the 1960s, and from the interviews conducted, it becomes obvious that permanent residents of the Arctic are bearers of additional qualities that distinguish them from the rest of the country's population. This is a high level of adaptation to Arctic conditions, consisting, in particular, in the readiness and ability to cope with the negative psychological impact of the polar night, severe frosts, etc. Strictly speaking, these skills can be equated to a kind of additional education and thus be considered in context of the quality of human capital.

"If you are in the Arctic, you must have some kind of clearance. It's like an additional training that I received from birth. I know how to behave in the north. <…> If you know the north, if you know how to behave with the local population, how to behave in cold weather, how to start a car, what not to do in low temperatures, etc., naturally, you have a better chance of doing everything more efficiently, save your life, prevent accidents at work, make the right decision if you are a commander. It's impossible without this specificity" (Salekhard).

Accordingly, new employees, to those arrivingto work in the Arctic, not only professional training is required, but also "training" to live in the Arctic and adapt to specific Arctic conditions. It is widely known that not everyone undergoes such adaptation: a high proportion of those employed in the Arctic return to more southern regions, which traditionally, both in Soviet times and today, leads to poor survival rates for new settlers in the Arctic, to high staff turnover and, consequently, to additional costs of attracting more and more new personnel and preparing them for life in the Arctic.

Therefore, when attracting labor in the ArcticIn the Russian zone, it is advisable to prioritize people with experience of living in the Arctic, local natives. The preservation of stronghold settlements in the Arctic helps to increase the share of local natives among workers employed in the Russian Arctic, which means an increase in the human capital of Arctic companies and a reduction in company costs for recruitment, additional recruitment and adaptation of personnel.

3 ."Infrastructuredeposit". When developing new territories, the value of existing infrastructure facilities at the time of development increases: the presence of an airport, port infrastructure, fuel warehouses, roads or winter roads significantly reduces the company's costs for field development. Therefore, pre-existing cities are often used as logistics hubs when developing vast territories; this allows to reduce costs, even if the fields being developed are located at a great distance from the hub. A striking example is the city of Novy Urengoy, which plays the role of NOVAT-EK's corporate base for the development of new fields in the north of the Yamal-Nenets Autonomous Okrug. Respondent: Look, Novy Urengoy is a city with 110 thousand people. I was in Perm, we had 1.1 million - 10 times more. With Basargin, Perm has barely reached the city of 1.07 million passengers. But Urengoy, at the expense of shift workers, he already has a million now.

Interviewer: The largest passenger turnover in the Arctic.

Respondent: And they don't attract shift workers from Moscow or St. Petersburg. It takes you by rail to Novy Urengoy, built a base city there and carries it on the "short shoulder" with airplanes. He has planes flying from Moscow, but these are business trips, it's like this: pay the money and fly. And he flies his own watch on the "short shoulder", and there are no questions.

Interviewer: Are they from Novy Urengoy?

Respondent: Of course. <…> Urengoy has everything. There is a road, there is a railway, Vekselberg has now bought the port from them and is rebuilding it, building palaces. In principle, everything is there.

This city was formed from the development of all this infrastructure around. And rightly so. Mikhelson is now building factories there, and what not he does there. Well, there were different factories there. And there are service centers. Urengoy is a growing center.

Property of communication permeability.

Current Researchin the field of regional science convincingly show the important role of the so-called non-codifiable, or implicit, knowledge (tacit knowledge) for the development of innovative industries. If for mass production technology can be transferred through standard instructions and diagrams, then for the development of modern innovative activities (from the production of computer components to creative industries), a necessary (albeit insufficient) condition is the possibility of face-to-face communication between participants in the innovation process.

The development of economic activity in the Arctic often requires innovative approaches due tospecific conditions for its implementation: permafrost, extreme temperatures, etc. Often technologies have to be created from scratch, since standard technical and technological solutions developed in temperate climates are not applicable in the Arctic.

Partially, innovative solutions are in demand due to the complexity of technological processes used at enterprises in the main industries of the Arctic - non-ferrous metallurgy, underground mining, oil services, offshore work and a number of others.

The implementation of complex technological processes in the Arctic (certain types of work in metallurgical production, in mines, in oil services) requires permanent work teams, as well as mentoring practices. To do this, either special programs are needed to retain shift workers in the company, or to attract residents of Arctic cities to work,who, other things being equal, are more likely to have a stable job at their place of residence.

An important result of the study is to obtain an idea of the general disorientation of respondents regarding the desired strategy for the development of the Arctic cities. Meet polar opinions:from “cities are not needed and shouldswitch to a shift method of work" to "we need to return to Soviet mechanisms for the development of the Arctic." Taking into account the fact that the survey involved decision makers (members of the management of large companies), as well as high-class specialists, such disorientation is fraught with the risk of slowing down almost any measures of state support for the development of the Arctic, if they are not provided with clear and consistent information explaining state strategy regarding the development of Arctic settlements. In this regard, one of the general measures should be a well-thought-out information campaign to highlight the program for the creation and development of human settlements in the Russian Arctic zone. In particular, the following ideas should be conveyed, namely:

— stronghold settlements will remain for a long period of time;

— support settlements will be centers of proliving of the permanent population;

— the most important functions of supportsettlements - provision of emergency assistance, retention and training of personnel, infrastructure and logistics base, innovative development of the Arctic.

Next, priority measures to support support systemslocalities can be organized in accordance with the identified specific properties of support settlements, leveling the negative impact of specific Arctic conditions on ensuring national security and socio-economic development.

Support settlements as centers of provisionemergency assistance and emergency response.

Specialized measures: reconfiguration of the network and functions of health care institutions.

Due to the high risks of interrupting transport links, a number of industries that require a quick response (primarily the provision of emergency assistance, etc.) are difficult to spatially optimize; Small towns play roles typically found in larger cities. Therefore, instead of a hierarchical network of distribution of functions in the field of medicine, etc., a network of relatively universal centers for the provision of emergency medical care (surgery and general obstetrics, traumatology, etc.) should be organized, sufficiently densely covering the territory of the Arctic and ensuring safety in the immediate area . The prototype of such a network is a network of relay communication towers that provide coverage of the territory with a communication signal at any point.

To ensure the most complete coverage of the territory, the emergency medical care system should include both general medical institutions located under the Ministry of Health of Russia and specialized medical institutions (dispensaries, etc.), as well as departmental medical institutions of companies, if they are the only medical institution over a sufficiently large area (to be determined separately). The result of this approach will be a reduction in mortality in general and the preservation of Russia’s human potential. Emergency response services should be organized in a similar manner.

Support settlements as centers for training, retraining and retention of adapted personnel.

Traditional measures: support for secondary vocational and higher education organizations as institutions for retaining personnel in the Arctic, initially adaptedbathrooms for living in harsh conditions.

New (promising) measures identified duringresearch:

— launching institutions to attract remigrants (personshaving both experience living in the Arctic and experience working/studying outside it) - by analogy with Chinese practice, as well as the practice of some private companies;

— stimulation development in the Arctic of training bases and training grounds for educational institutions of various profiles that prepare personnel for work in the Arctic. Practicing in the Arctic will allow adaptation and selection of personnel already at the training stage, and, in addition, already at the training stage the process of transferring so-called “tacit knowledge” to students as a component of mastering the most complex professional skills can begin.

Support settlements as infra centersstructural development.

In key settlements in areas of promising resource projects, it is advisable to develop new infrastructure based on PPP or other mechanisms: investments in infrastructure, as well as geological exploration, will simplify the launch of projects that will bring significant tax revenues. However, significant investments in infrastructure and further development of support settlements as centers of permanent residence in the areas of mineral resource centers are advisable if the following conditions are met, namely:

— the resource base in the area of the support settlement will ensure the maintenance of production for a long period (at least 50 years);

— the development of a mineral resource center requires the use of particularly complex technologies

(for which maintaining a permanent workforce is criticaltic meaning);

— the prospects for the development of the core population have been provena new point in the area of the mineral resource center, not only as an infrastructure and logistics base, but also as a base for the integrated development of the area.

In other cases, it is advisable to develop the infrastructure of mineral resource centers on a temporary basis with servicing by labor attracted on the basis of a rotational method of labor organization.

Supporting settlements as centers of innovationnogo development.

Traditional measures, namely:

— promoting the conservation of Arctic cities throughimprovement and comfort of the urban environment, improvement of the transport situation;

— assistance development institutions mentoringin order to simplify the adaptation of new personnel.

New (promising) measures, namely:

— development of a system of measures that promotes greater decentralization of decision-making both within companies (for example, encouraging the allocation of independentdivisions and subsidiaries of large subsoil users - with their subsequent registration in the Russian Arctic).

In addition, anthropological research has shown the need to develop a special system of measures(including through amendments to the law on local self-government) with the allocation of a special category of municipalities of the Russian Arctic (preferably not for the entire Arctic territory, but only for remote territories outside the land transport network or with other special development conditions), for which a special regime is provided municipal management, taking into account transport isolation, low population density and other specific factors.

For populated areasArctic regions that will not receive the status of support centers, it is advisable to develop a special system of measures to support socio-economic development, including through the organization of new channels of interaction with support settlements (for example, in support settlements there may be demonstration facilities and consultation points in the field of use of alternative sources energy adapted for remote areas, etc.).

Key role in Alaska's tertiary sector gameThere are cities, although the concentration of the economy is small: the three largest cities - Anchorage, Fairbanks and Juneau - collectively employ just over 50% of the state's workers, and all cities with a population of more than 3 thousand people employ about 62% of Alaska's workers. The cities' industries are primarily service-based, with Anchorage primarily focused on wholesale trade and professional and scientific services, Fairbanks on retail, and Juneau on government (it is the state capital) (see Table 6).

Thus, to the most pronounced functionsCities in Alaska with a population of more than 3 thousand people function as trade, administrative, educational and information centers, as well as transport hubs and business service centers. In the case of a coastal location, the function of a fishing center with a developed infrastructure for fish processing is added. Mining, which is Alaska's specialty in the US economy, is carried out outside cities by over 3 thousand people, and mainly on a rotational basis in remote temporary settlements. Among the relatively new functions of Arctic cities, such areas as film tourism, maintenance of testing grounds for transport equipment, and others stand out.

One of the specific features of the Arctic economy is the widespread use of rotational and seasonal work, and this is often work in the service sector, in tourism, and not in the resource industries, as is usually the case in Russia. Since seasonal workers in tourism are employed mainly in cities, a rather specific phenomenon arises: Arctic settlements of foreign countries often have population sizes that fluctuate greatly depending on the seasons of the year (in Russia, a similar phenomenon also exists, but mainly in areas of fish processing, alluvial gold mining, etc.d.).

For example, in Alaska, about 21% of those employed are nonresident workers.and they account for about 15% of the salary fund. The high proportion of rotational (temporary) workers among those employed in Alaska is primarily due to the seasonality of such activities as fish processing, hotel business, catering, retail trade, and construction. A large proportion of rotational workers are also concentrated in industries such as mining, transportation and storage, health care and social security.

Thus, despite its post-industrial nature, the economy of Alaska has a pronounced Arctic specificity, and it is also expressed in cities: seasonality manifests itself mainly in urban,post-industrialsectors of the economy (tourism services, trade, health care and social security).

ThisThis feature serves as additional confirmation of the need for a special approach to Arctic cities as management objects.

The importance of cities in various territories, includingcoming to the Arctic zone of the Russian Federation varies. This is due to many factors: history of development, resource base, settlement system and others. As part of the work, an attempt was made to conditionally divide the Arctic zone into “two Arctics” based on the transport accessibility of the territories. The purpose of the division is to consider how pronounced the quantitative differences are in the role of cities in the “transport-accessible” Arctic (“Arctic-1”) and in the “transport-inaccessible” Arctic (“Arctic-2”). For this purpose, Arctic settlements were divided into three categories, namely:

— settlements with high transport accessibility -

the presence of a year-round road;

— settlements with limited transport accessibility – availability seasonal road and/or railway;

— settlements with low transport accessibility - water and/or air transport.

For analysis purposes, two grouping options were carried out, namely:

— group 1: “Arctic-1” includes settlements with high and limited transport accessibility, “Arctic-2” includes settlements with low transport accessibility;

— grouping 2: to "Arctic-1"include settlements with high transport accessibility, “Arctic-2” includes settlements with limited and low transport accessibility.

Indicators reflecting the importance of the cities “Arctic-1” and “Arctic-2” in both grouping options were calculated. For many indicators available statistics at the level of municipal districts and urban districts as a whole. If settlements with different levels of transport accessibility are located on the territory of a municipality, this territory was assigned the level of transport accessibility that characterized the settlements with the majority ofstanding population. In difficult cases (Priuralsky, Tazovsky municipal districts) the “average” category of limited transport accessibility was assigned. Categories of transport accessibility assigned to municipalities of the Russian Arctic for calculation purposes.

Significant differences between the two regions of the Arctic with different degrees of transport accessibility (especially clearly manifested in the second option for grouping municipalities) require a differentiated approach when determining the criteria for supporting settlementspoints of the Russian Arctic.

Conclusion

The conducted research convincingly showsthat the patterns of urban development, as well as their functions, are unique in the Arctic, mainly due to poor connectivity between populated areas due to harsh climatic conditions.

Arctic cities and settlements demonstrate a number of paradoxes or special cases of the development of urban interactions that must be taken into account when forming a specialized system of supporting settlements in the Arctic.

1. In the Arctic, a special type of network interactions between cities and settlements is being formed (“extended network region”), in the absence of high transport connectivity, it is held together according to a problem principle: cities interact within this system in order to solve common, region-specific problems.

Analysis of the functions of Arctic cities allowed yourevealThere are not many activities based on intra-Arctic networking. This is the training of specialized personnel (pilots, doctors, etc.) with specific competencies; this is ensuring security, where the network principle is most clearly manifested (in the entire Russian Arctic, for example, there are only two marine rescue and coordination centers of the Russian Ministry of Emergency Situations - in Murmansk and the village of Dikson). Within the network region, the “division of labor” (mutual complementarity) between Murmansk and Arkhangelsk is clearly visible. This is a phenomenon that can be confusing when the stereotypical approach about the “correct” model of the region’s structure as a centralized one is extended to the Arctic, however, in the practice of urban development, such complementarity of the functions of urban centers (provided they closely interact with each other - commodity, information) is quite a normal phenomenon, Moreover, historically, such forms of urban systems are associated precisely with the most dynamically developing areas with high innovative potential. What is noteworthy is the “underconstruction” of this network in the eastern part of the Russian Arctic, and here it is logical to complete the construction of our own subcenters of the general Arctic urban network. Norilsk has the greatest potential to become the third key center of the Arctic network region, and ideally it could be an urban agglomeration of key population centers in the north of the Krasnoyarsk Territory, each of which would also perform its own function in it. This: and here it is logical to complete the construction of our own subcenters of the overall Arctic urban network. Norilsk has the greatest potential to become the third key center of the Arctic network region, and ideally it could be an urban agglomeration of key population centers in the north of the Krasnoyarsk Territory, each of which would also perform its own function in it. This: and here it is logical to complete the construction of our own subcenters of the overall Arctic urban network. Norilsk has the greatest potential to become the third key center of the Arctic network region, and ideally it could be an urban agglomeration of key population centers in the north of the Krasnoyarsk Territory, each of which would also perform its own function in it. This:

· Dixon (main specialization in the field of securityresearch on the safety of navigation on the Northern Sea Route, a historically powerful meteorological research center, as well as an obvious center of concentration of cultural heritage, including the as yet undocumented);

· Dudinka (port and sociocultural functions);

· Turukhansk (nave activity support centersminingindustry and sociocultural center);

· Igarka (logistics and sociocultural center, location of a unique permafrost museum and potentially an agricultural production centerfor the population of the agglomeration).

Norilsk in this system can play the role of a hub educational, medical, scientific and cultural center, a

logistics platform based on airportsthat and the existing food base, as well as a management and organizational center.

Of course, a condition for the successful development of the Taimyr regionagglomeration as the main core of development of the eastern Arctic of Russia is to ensure internal connectivity between all these centers: only under this condition, the interaction of enterprises of the listed settlements could give a synergistic effect for the development of both the north of the Krasnoyarsk Territory and the eastern Arctic as a whole. It is obvious that the specialization of this "third capital" of the Russian Arctic should be most effectively associated with solving problems that are most specific to the eastern part of the Arctic. These are problems of permafrost and climate change, pioneering geological development of the territory, but first of all, ensuring safe navigation and forecasting ice conditions (which was historically provided from Dikson, where the headquarters of the NSR maritime operations was located). Problems with the delivery of goods in difficult ice conditions, which appeared on the NSR in the fall of 2021 (they were called the "Pevek crisis" in the press), make us think about creating an integrated system for ensuring navigation along the NSR. Taking into account the existing division of the Northern Sea Route into the western and eastern parts, it would be advisable to locate such a center in Taimyr.

2. Instead of the classical hierarchical regional system of cities, specific roles are being formedsettlements in the settlement network, namely:

— base cities,being intermediaries between large cities of the main settlement zone, providing the Arctic with a whole range of services, which in urban studies are usually characterized as "large urban" (research and development, personnel training, etc.),

— island cities that provide the population and economic agents in hard-to-reach areas with the necessary set of vital and socially significant services (medical care, government services, communications, etc.). Although many activities are not competitive from a cost perspective, they have a competitive advantage based on uniqueness. As a rule, it is these cities that are the main bases for providing urban services to mineral resource centers.

3. In the Russian Arctic there are many so-called supplier cities with a narrowed range of types of economic activity (cities near fields that do not have the status of district or regional centers, inter-district social facilities, educational and scientific institutions, etc.). Many of them, however, formally (and often informally) perform the functions of providing social services for residents of the surrounding territory (residents of smaller settlements, including representatives of indigenous peoples, rotation workers who use such cities for recreation, families of military personnel stationed in military camps outside outside cities, etc.). To increase the resilience of such cities, it is advisable to take measures to expand them into multifunctional support centers, especially given the convenient transport location in relation to areas with a relatively dense rural population and active activity of resource extraction companies. An example of such a settlement is Vorkuta: with a reduction in coal mining, the functions of socio-cultural, transport and logistics and information and innovation support for the development of the surrounding territory should come to the fore, and Vorkuta already performs these functions in relation not only to the adjacent regions of the Komi Republic, but and in relation to the eastern, most inaccessible part of the Nenets Autonomous Okrug, as well as to some areas of the Yamalo-Nenets Autonomous Okrug.

An assessment of the potential for mining within a radius of 150 km from all Arctic regions carried out during the workical populatedpoints, as well as in licensed areas, the licenses for which belong to large companies stationed in Arctic settlements, makes it possible to determine the priority of measures to "complete" the functions of support settlements in cities and towns with raw material specialization. This measure is also important from the point of view of relieving social tension.

The work done represents a possible range of applied measures implementation which appropriate in support settlements of different categories and undercategories(according to the proposed list). All measures are aimed at strengthening the functions of support settlements that are already represented in Arctic cities and towns of the corresponding category (these are the majority), or in rare cases, at completing the functions of ONP in highly specialized settlements that have the potential to develop as support centers. In addition, it is advisable to develop a system of economic, informational and sociocultural interaction between support and other settlements of the Arctic for the sake of effectively ensuring national security in the Arctic zone of the Russian Federation.

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