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Ecological Problems and Peculiarities of the Environmental and Economic Development of the Nenets Autonomous Okrug

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Abstract. The current stage of economic development of the Russian Arctic combines two contradicting tendencies — the intensification of economic development in line with the adopted special preferential measures and the aggravation of technical and technological contradictions under the tightening of sanctions and technological blockade, increasing wear of equipment, the loss of markets for extracted products. Under these conditions, anthropogenic and, particularly, technogenic environmental threats to nature and human habitat become the most important risk factor. The purpose of the work is to identify current ecological threats, problems and features of the environmental and economic development of the Nenets Autonomous Okrug. The study applies a comprehensive economic and sociological toolkit, including general theoretical approaches — dialectical, spatial economics and sustainable development, and private methods — statistical analysis, a number of sociological methods of collecting and processing data. The information basis of the study is the data of official authorities, statistics, the work of domestic and foreign scientists, as well as the results of a sociological survey of residents of the Nenets Autonomous Okrug (May 2022; n=539). Key features of environmental and economic processes in the region were identified. Low degree of waste processing, high risks of technogenic accidents at oil and gas production enterprises and transport infrastructure remain. The main environmental threats perceived by the population include oil and gas production facilities, household waste and illegal dumps. In a number of territories, threats from defense activities, catching and processing of fish and illegal fishing are also relevant. The population is least satisfied with the quality of water resources, the cleanness of the environment and the state of forests and parks. Based on the results obtained, recommendations aimed at optimizing the environmental component of the social well-being of the population are given. The scientific significance of the study is determined by the actualization of knowledge about environmental and economic processes in the Arctic region of the Nenets Autonomous Okrug, based on a comprehensive economic and sociological toolkit. The practical importance lies in the formation of the analytical framework for managing the environmental and economic development of the regions during the period of exacerbated contradictions in the development of the Russian Arctic.

Keywords: *environmental problem, Nenets Autonomous Okrug, industrial pollutant, environmental threat, population survey, environmental and economic development, Arctic zone*

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Introduction

The historically established extractive profile of the economies of the Arctic regions causes an increased load on the environment. The most pronounced ecological risks are in the places of localization of industrial enterprises and their production wastes, as well as in areas affected by the natural transfer of pollutants [1, Makosko A.A., Matesheva A.V., pp. 62–65; 2, Slukovskii Z.I., Guzeva A.V., Dauvalter V.A., pp. 2–5]. Certain results of the programs to reduce accumulated environmental damage in the Arctic should be noted [3, Shevchuk A.V., Shumikhin O.V., pp. 99–101], as well as the gradual modernization of treatment facilities and the overall ecologization of processes at operating enterprises [4, Skufyina T.P., Samarina V.P., Samarin A.V., pp. 55–57]. State measures to enhance the economic development of the Arctic zone of Russia (AZRF) [1], increase in the number of investment projects and opening of new industries [5, Volkov A.D., Tishkov S.V., Nikitina A.S., pp. 190–193] form the prerequisites for increasing anthropogenic load on the natural ecosystems of the Arctic macro-region. More pronounced prerequisites are caused by the risks of technogenic accidents, inevitable under the depleting nature of equipment operation under the conditions of sharply tightened sanctions and technological dependence. This determines the relevance of a comprehensive study of existing ecological problems and the dynamics of environmental and economic processes in the Russian Arctic for the timely accounting and prevention of long-term environmental consequences of economic activity. The most complete overview in this sphere can be obtained on the basis of synthesis of ecological-economic and sociological research methods within the approach, already tested on the materials of other Arctic regions [6, Volkov A.D., Tishkov S.V., Karginova-Gubinova V.V., Shcherbak A.P., pp. 102–108].

The object of consideration in this paper is the Nenets Autonomous Okrug (Nenets AO), where environmental risks are quite strong [7, Vasiltsov V.S., Yashalova N.N., Novikov A.V., p. 344], and scientific data on ecological and economic processes require updating. The purpose of the study is to identify key ecological problems and features of the environmental and economic development of the Nenets Autonomous Okrug. In order to achieve the goal, a complex economic

[1] Federal'nyy zakon ot 13.07.2020 № 193-FZ «O gosudarstvennoy podderzhke predprinimatel'skoy deyatel'nosti v Arkticheskoy zone Rossiyskoy Federatsii» [Federal Law No. 193-FZ dated July 13, 2020 "On state support for entrepreneurial activities in the Arctic Zone of the Russian Federation"]. URL: http://publication.pravo.gov.ru/Document/View/0001202007130047 (accessed 15 November 2022).

and sociological methodology was applied, which included a specialized survey of the population and comparison of its results with official statistics.

The study aims to update the scientific basis for managing the development of the Arctic macro-region in the current economic, environmental and geopolitical conditions.

The consequences of the impact of economic activity on the Arctic ecosystems are multi-faceted. In addition to direct pollution of the atmosphere, soils and waters of the Arctic as a result of mining and transportation, noted in numerous works of Russian [8, Sedova N.B., Kochemasova E.Iu., pp. 817–818; 9, Karnaeva A., Kulikova O., Mazlova E., Buryak A., pp. 2–5] and foreign researchers [10, Walker T.R., Crittenden P.D., Dauvalter V.A. et al., pp. 769–773; 11, Tolvanen A., Eilu P., Juutinen A. et al., pp. 835–836 and references in this paper], the natural transfer of pollutants and the systemic impact of increased CO2 emissions on biological processes and circulation of substances in Arctic ecosystems are of paramount importance [12, Stern G.A., Macdonald R.W., Outridge P.M. et al., pp. 24–28; 13, Rani A., Gupta K., Saini K.C. et al., pp. 225–231]. Changes in concentrations of pollutants are noted as both in the main components of the Arctic natural environment [14, Schartup A.T., Soerensen A.L., Angot H., pp. 4–7; 15, Ershova A., Makeeva I., Malgina E. et al., pp. 3–5; 16, Ji X., Abakumov E., Polyako V. et al., pp. 4–8] and directly in living organisms [17, Sobolev N., Aksenov A., Sorokina T. et al., pp. 971–972], including in the organisms of people living in the macro-region [18, Varakina Y., Aksenov A., Lakhmanov D. et al., pp. 8–9]. General multidirectional dynamics of the current environmental pollution by certain substances [19, Evans L.K., Nishioka J., pp. 53–56; 20, Zhang W., Paatero J., Leppänen A.P. et al., pp. 4-7], differentiated also in the spatial section [21, Makosko A.A., Matesheva A.V., pp. 41; 22, Zaikov K.S., Sobolev N.A., pp. 247–250], should be noted. With regard to the AZRF and the regions of the North, researchers note a strong correlation between the types of environmental pollution and the spatial specifics of operating enterprises [23, Glazyrina I.P., Zabelina I.A., pp. 1052–1056; 24, Druzhinin P.V., Shkiperova G.T., Potasheva O.V., Zimin D.A., pp. 136–138; 25, Zabelina I.A., Delyuga A.V., Zabelina N.I., pp. 138–141].

In addition to direct physiological effects on human health [26, Plusquellec P., Muckle G., Dewailly E. et al., pp. 21–24; 27, Lamoureux-Tremblay V., Muckle G., Maheu F. et al., p. 7], socio-psychological consequences of environmental pollution are dangerous and closely related [28, Saraeva N.M., Galiakberova I.L., Sukhanov A.A.; 29, Saraeva N.M., Sukhanov A.A., pp. 86–88]. The level of susceptibility of the population to environmental threats, in particular, the subjective feeling of insecurity, is one of the key parameters of the social well-being of the residents of the Arctic regions [30, Romashkina G.F., Vylegzhanina A.O., pp. 126–127]. This study points out the discrepancy between the threats perceived by the population and the objective growth of environmental hazards on the example of the Yamalo-Nenets Autonomous Okrug. In earlier studies, we noted similar phenomena, but only for a number of environmental components, and first of all for pollutions, which due to their nature practically exclude identification with the help of the senses — “with the naked eye” [6, Volkov A.D., Tishkov S.V., Karginova -Gubinova V.V., Shcherbak A.P.]. At

the same time, for some types of pollution, the respondents' assessment allows to qualitatively supplement the available official, statistical and scientific data not only on environmental problems in the Arctic regions, but also on the sources of their occurrence [6, Volkov A.D., Tishkov S.V., Karginova-Gubinova V.V., Shcherbak A.P.].

Despite the fact that a number of studies note the relative ecological well-being of the territories of the Nenets Autonomous Okrug [31, Rozhnov V.V., Lavrinenko I.A., Razzhivin V.Yu. et al.; 32, Yakovlev E., Puchkov A., Malkov A., Bedrina D., p. 8], a number of local problems affect the health of the local population and the content of pollutants in human organisms [18, Varakina Y., Aksenov A., Lakhmanov D. et al., pp. 8–9]. The consequences of accidents at the largest enterprises in the region and transport infrastructure, due to their geographical location, are dangerous both for the territories of the Nenets Autonomous Okrug and for the neighboring Arctic territories of the Komi Republic. Examples are the emergencies of October 2020 (oil spill at the Kharyaginskoe field oil pipeline) and of May 2021 (oil spill at the Oshskoe field infrastructure), resulted in significant environmental damage in the mentioned territories.

Within the framework of this work, the existing studies of the environmental and economic problems of the Arctic territories will be supplemented by a comprehensive analysis of the current situation in the Nenets Autonomous Okrug.

Materials and methods

The object of the study is the Nenets Autonomous Okrug included in the AZRF in accordance with the provisions of the Decree of the President of Russia "On land territories of the Arctic zone of the Russian Federation" [2]. The main objectives of the study are:

1. Summarize and update data on environmental and economic processes and development problems of the Nenets Autonomous Okrug. The information basis for solving this task was the data of official authorities and departments, statistical information, as well as the data received in response to official requests to these structures.

2. Supplement the information obtained at the first stage with the results of a specialized sociological study on the territory of the Nenets Autonomous Okrug. A mass questionnaire survey of the population was conducted from May to June 2022.

3. Based on the results of a comprehensive economic and sociological study, draw conclusions about the dynamics of environmental and economic processes and urgent ecological problems in the development of the Nenets Autonomous Okrug.

In connection with the previously noted extreme differentiation of the spatial development of the region and the uneven location of the population, the sociological part of the study was conducted in a number of settlements, including remote ones (Fig. 1). A combined survey method

[2] Ukaz Prezidenta Rossiyskoy Federatsii ot 02.05.2014 g. № 296 «O sukhoputnykh territoriyakh Arkticheskoy zony Rossiyskoy Federatsii» [Decree of the President of the Russian Federation of 02.05.2014 No. 296 "On land territories of the Arctic zone of the Russian Federation"]. URL: http://www.kremlin.ru/acts/bank/38377 (accessed 15 November 2022).

was used: the main part of the sample, formed in the most populated and transport accessible towns and villages (Naryan-Mar, Iskateley village, Krasnoe village and Telviska village), was covered by direct personal formalized interviewing; remote and sparsely populated areas (Nes, Nelmin-Nos, Karatayka and Ust-Kara villages) were surveyed using an Internet questionnaire. The total sample size was 539 people [3]. All respondents were informed about the purpose of the study and expressed their willingness to cooperate.

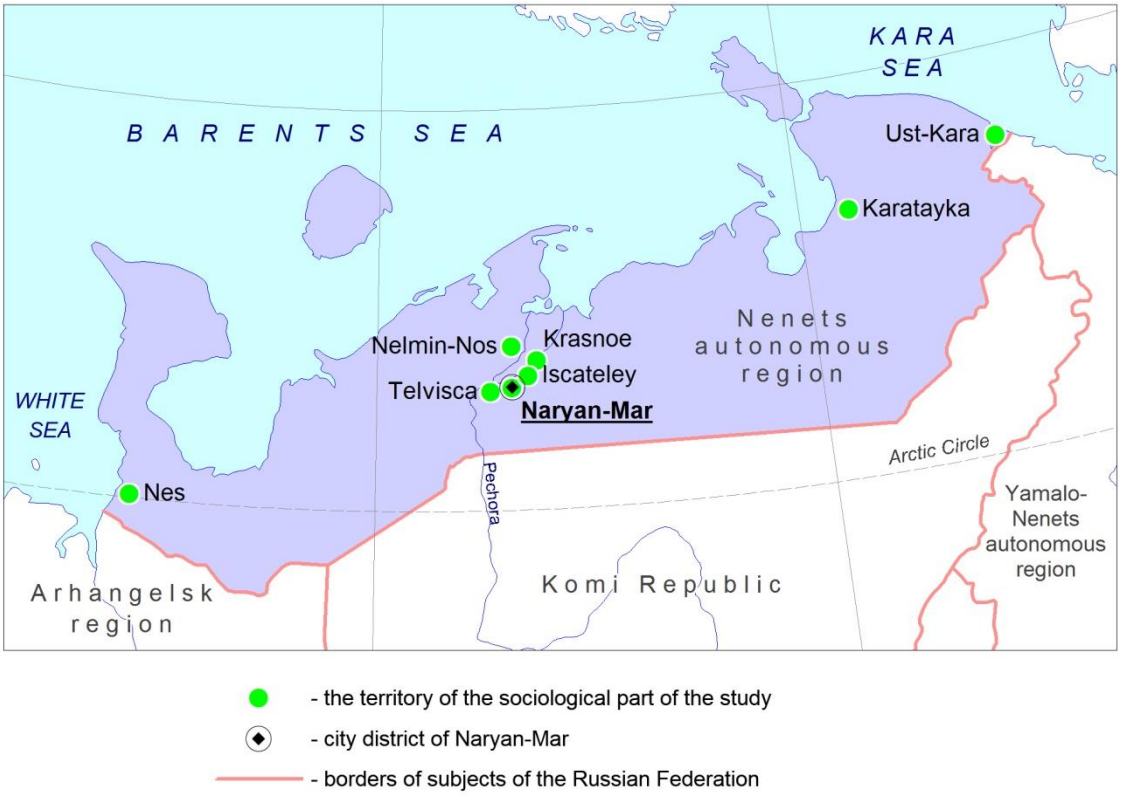

Fig. 1. Territories of the study — Nenets Autonomous Okrug.

The technical processing of the obtained data was carried out in the SPSS system. Data analysis was conducted using the methods of spatial economics, ecological economics, statistical analysis, sociological analysis and dialectical approach.

Results and discussion

Ecological situation in the Nenets Autonomous Okrug in official data

In 2021, the total volume of emissions of pollutants into the atmosphere in the Nenets Autonomous Okrug amounted to 56.1 thousand tons [4], the dynamics of emissions for 2018–2021 presented in table 1.

[3] The sample is distributed as follows: Naryan-Mar – 291 people, Iskateley – 98 people, Krasnoe – 56 people, Telviska – 37 people, Nes – 20 people, Nelmin-Nos – 15 people, Ust-Kara – 15 people, Karatayka – 7 people.
[4] Calculated by the authors based on Rosprirodnadzor data.

Table 1

Air pollutant emissions within the boundaries of the Nenets Autonomous Okrug, tons [5, 6].

Territory	2018	2019	2020	2021	including in 2021 without cleaning
Total volume: Nenets Autonomous Okrug	73 140	66 883	59 366	56 083	56 077
Including: Naryan-Mar urban district	515	739	1 237	1 282	1 282
Zapolyarnyy municipal district	72 625	66 144	58 129	54 802	54 795
Per square kilometer: Nenets Autonomous Okrug	0.41	0.38	0.34	0.32	0.32
Including: Naryan-Mar urban district	11.41	16.39	27.41	28.40	28.40
Zapolyarnyy municipal district	0.41	0.37	0.33	0.31	0.31
For reference: Russian Federation	1.00	1.01	0.99	1.00	0.91

For 2018–2020, all air emissions were not cleaned.

The main cause of air pollution in the Okrug is the activities of oil and gas extraction companies, as well as fuel combustion in the heat and power supply and vehicle traffic [7] (in 2021, about 26% of pollutant emissions were associated with fuel combustion [8]). It should be noted that all large and hazardous enterprises, in particular, oil and gas producers, are located several hundred kilometers away from settlements [9], and the level of pollutant emissions per square kilometer in 2021 in the Nenets Autonomous Okrug (0.3 tons) was more than three times lower than the same indicator for the Russian Federation as a whole (1.0 tons) [10]. Taking it into account, it is impossible to speak about the general high risk of air pollution in the Okrug, these risks are rather of a local nature.

The volume of wastewater discharge is presented in Table 2. It should be noted that in recent years this indicator has decreased by almost a third (due to the reduction in discharges of

[5] Data on facilities with emissions of more than 10 tons of air pollutants per year (and 5–10 tons for substances of I–II hazard classes).
[6] Calculated by the authors based on data from Rosprirodnadzor and FSSS.
[7] Doklad «O sostoyanii i ob okhrane okruzhayushchey sredy Nenetskogo avtonomnogo okruga v 2021 godu» [Report "On the state and protection of the environment of the Nenets Autonomous Okrug in 2021"]. Department of Natural Resources, Ecology and Agro-Industrial Complex of the Nenets Autonomous Okrug. Naryan-Mar, 2022, 141 p.
[8] Calculated by the authors based on Rosprirodnadzor data.
[9] Doklad «O sostoyanii i ob okhrane okruzhayushchey sredy Nenetskogo avtonomnogo okruga v 2021 godu» [Report "On the state and protection of the environment of the Nenets Autonomous Okrug in 2021"]. Department of Natural Resources, Ecology and Agro-Industrial Complex of the Nenets Autonomous Okrug. Naryan-Mar, 2022, 141 p.
[10] Calculated by the authors based on data from Rosprirodnadzor and FSSS.

Naryan-Mar enterprises). However, almost the entire volume of wastewater is treated to standard values, while this rate across Russia is much lower.

Table 2

Wastewater discharge within the boundaries of the Nenets Autonomous Okrug, mln m³ [11]

Area	2018	2019	2020	2021
Wastewater discharge volume, million m³: Nenets Autonomous Okrug	3.00	2.40	2.50	2.00
Including: Naryan-Mar urban district	2.03	1.40	1.20	1.04
Zapolyarny municipal district	0.97	1.00	1.30	0.96
Share of wastewater treated to standard values in the total volume of wastewater discharged through treatment facilities, %: Nenets Autonomous Okrug	100.0	100.0	99.98	n/d
For reference: Russian Federation	46.50	45.73	44.33	n/d

It should be noted that the quality of water from the distribution network has remained at approximately the same, but rather low, level in recent years. In 2021, 14.0% of water samples did not comply with established standards. In general, a significant problem for the Okrug is the increased iron content in the used waters. This problem is especially relevant for the village of Iskateley, where four out of five water samples had an increased content of it. In Naryan-Mar, water supply problems are exacerbated by the high degree of deterioration of the water supply network. In the villages of Karatayka, Nelmin-Nos and Ust-Kara, water supply is arranged from block-modular water treatment plants, there are no distribution networks, and no sanitary protection zone has been created. There is a decentralized water supply (wells and boreholes) in the villages of Krasnoe, Nes and Telviska. The share of non-centralized water supply sources that do not meet sanitary requirements in the Okrug as a whole in 2021 was 24.3%, which is slightly higher than the average for the Nenets Autonomous Okrug.

The provision of quality water is complicated by the natural and climatic features of the territory, in particular, its high swampiness and the presence of permafrost. The importance of water resources in the life of the local population and, in particular, the prevalence of fisheries is noteworthy; commercial fishing is carried out. At the same time, since the 1990s, there has been a fifty-fold decrease in the volume of catch in different areas of the NAO. On the one hand, it was caused by the pollution of water bodies by enterprises producing electricity, extracting and processing oil, gas, and coal. On the other hand, unauthorized fishing and irrational use of water bodies have also played an important role.

The level of solid municipal waste generation for 2021 per inhabitant of the Nenets Autonomous Okrug (according to the average annual population) amounted to 0.3 tons, which is 1.2 times less than the Russian average [12]. In Naryan-Mar, there was 0.4 tons of waste per person, which is higher than the average for the Okrug and for Russia as a whole. However, from 2017 to

[11] Calculated by the authors based on FSSS data.
[12] Calculated by the authors based on the FSSS and UISIS data.

2021, there has been a 2.1 times reduction in solid municipal waste formation by weight in the Okrug, while the volume has increased by 1.1 times [13].

The share of production and consumption waste per unit of produced gross regional domestic product in the Nenets Autonomous Okrug is also lower than in the Russian Federation as a whole, but this is primarily due to the economic specialization of the territory [14].

The share of utilized production and consumption waste in Nenets Autonomous Okrug as a whole was 87.7% in 2021, which is 1.9 times higher than the national average, however, the share of recycled waste in the Okrug is lower (30.0% compared with 40.7% in the Russian Federation as a whole). The low share of solid municipal waste sent for recycling (sorting) in their total mass is also noteworthy: in 2021, this indicator for the Nenets Autonomous Okrug was 14.4%, for Russia as a whole — 46.5% [15]. Thus, we can conclude that the re-use (efficient use) of waste is not developed in the region.

The number of unauthorized dumps in the Nenets Autonomous Okrug as of October 2022 is 58, the number of waste disposal sites is 18, including 17 temporary ones, for up to 11 months (see Table 3). Formation of unauthorized dumps and difficulties with their liquidation are primarily associated with the underdevelopment of the transport infrastructure (lack of year-round roads) in the territories of rural settlements.

Table 3

Number of authorized and unauthorized waste disposal sites [16]

Area	Number of authorized MSW disposal sites		Number of unauthorized MSW disposal sites	Population density, people per square kilometer
	active	planned in 2022–2023		
Nenets Autonomous Okrug	18	20	58	0.25
Including: Naryan-Mar urban district	1	n/d	22	571.60
Zapolyarnyy municipal district	17	20	36	0.11
Including: Karskiy village council (Ust-Kara)	0 (0)	1 (1)	1 (1)	586.96[17]
Kaninskiy village council (Nes)	1 (1)	2 (0)	3 (1)	131.16
Malozemelskiy village council (Nelmin Nos)	1 (1)	0 (0)	1 (1)	786.81

[13] Calculated by the author according to the FSSS data.
[14] Calculated by the authors based on UISIS and Rosprirodnadzor data.
[15] Calculated by the authors based on Rosprirodnadzor data.
[16] Pis'mo v administratsiyu munitsipal'nogo obrazovaniya «Gorodskoy okrug «Gorod Nar'yan-Mar» ot 18 oktyabrya 2022 g. № 6204/01-26. Istochnik: Ofitsial'nyy zapros KarNTs RAN; Pis'mo v administratsiyu munitsipal'nogo rayona «Zapolyarnyy rayon» Nenetskogo avtonomnogo okruga» ot 3 noyabrya 2022 g. № 01-30-2743/22-0-1. Istochnik: Ofitsial'nyy zapros KarNTs RAN [Letter No. 6204/01-26 dated October 18, 2022 to the administration of the municipal formation "City District" City of Naryan-Mar. Source: Official request of KarRC RAS; Letter to the administration of the municipal district "Zapolyarnyy district" of the Nenets Autonomous Okrug dated November 3, 2022 No. 01-30-2743 / 22-0-1. Source: Official request of KarRC RAS].
FSSS data.
[17] The high values of population density indicators in the village councils of the Nenets Autonomous Okrug are primarily due to their small administrative boundaries.

Yusharskiy village council (Karatayka)	1 (0)	1 (1)	2 (1)	105.20
Telvisochniy village council (Telviska)	2 (1)	1 (0)	1 (0)	222.61
Primorsko-Kuiskiy village council (Krasnoe)	0 (0)	3 (1)	3 (3)	377.41
Work settlement Iskateley	0	0	1	824.19
Others	12	12	24	0.03

Noise pollution is associated with industrial and economic activities. The transport sector also makes a significant contribution. It should be noted that one of the most environmentally friendly types of transport — railway (taking into account its electrification) — is absent in the Okrug. However, unlike some other northern territories, water transport is developed, which has a relatively low negative impact on the environment, especially in the field of passenger and household transportation (but a number of works note the need for further research on the impact of maritime transport on the ecology of the Arctic [33, Svavarsson J., Guls H.D., Sham R.C., Leung K.M.Y., Halldórsson H.P., p. 6]). At the same time, non-ecological types of transport are also developing: road and air. Taking into account economic specialization, pipelines are functioning. In general, we can talk about a rather low transport development of the territory.

Summing up, we can conclude that the relatively favorable values of some environmental indicators, in particular, the level of emissions of pollutants into the atmosphere, the volume of waste generation (but not disposal), the noise level are associated with underdevelopment, low population density and relatively low anthropogenic load. At the same time, the same circumstances are an obstacle in providing the population with quality water and organizing waste recycling. The region's leading industry — oil and gas — has the greatest negative impact on the quality of the environment. Geological exploration and field development disturb the land; associated gas flaring generates significant emissions of pollutants into the atmosphere, etc.

State and dynamics of the ecological situation in the Nenets Autonomous Okrug in the assessments of the residents. Environmental well-being

Satisfaction of the population with the state of the environment was studied in the context of both individual objects of assessment of various scales (from the place of residence to the world), and by various components of the environment. The results of answers to the question "How satisfied are you with the state of the environment?" were also differentiated by the territory of residence (Fig. 2) [18].

[18] A 5-point scale was used (from 1 — "absolutely not satisfied" to 5 — "completely satisfied").

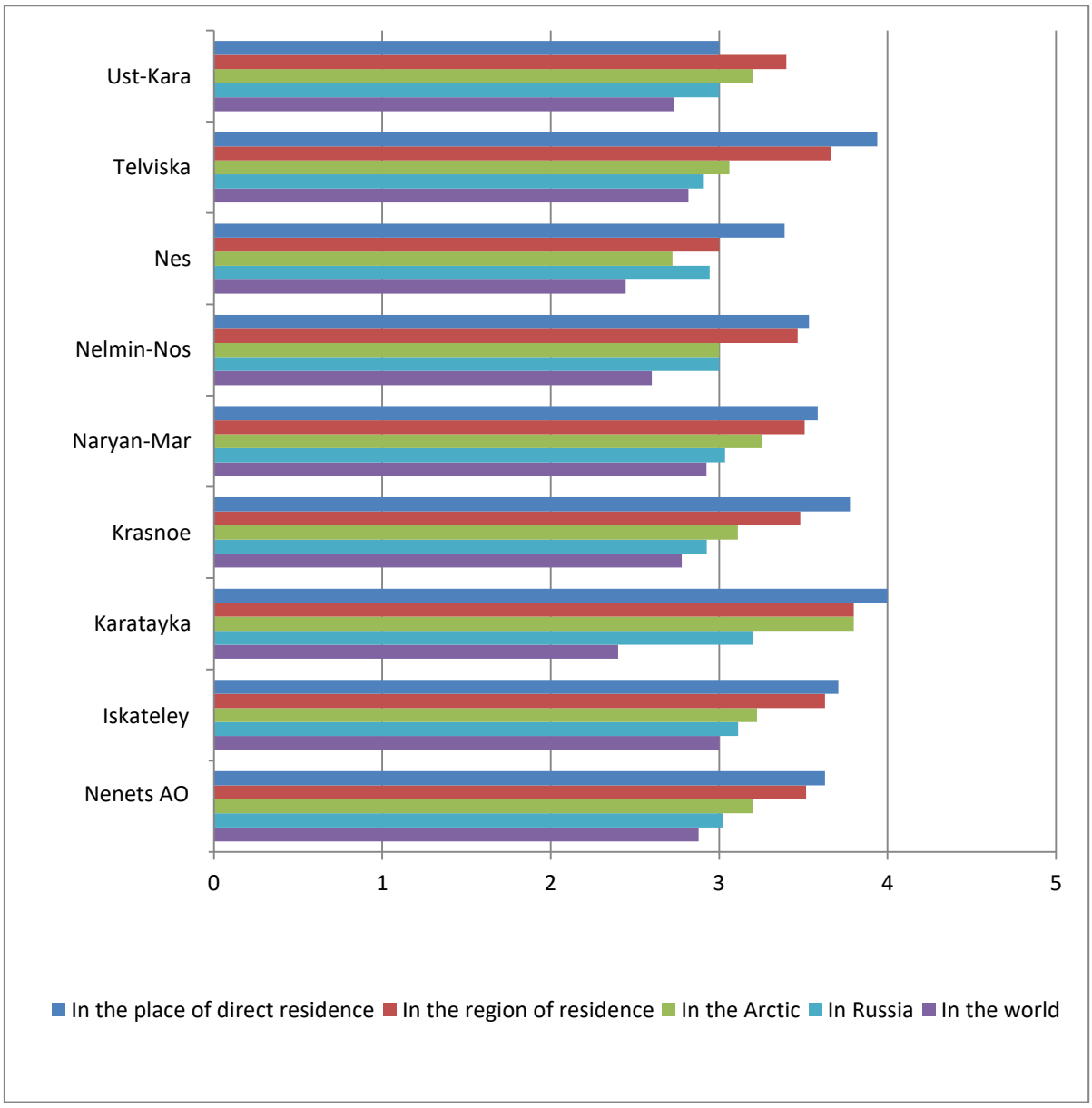

Fig. 2. Assessment by the residents of the Nenets Autonomous Okrug of satisfaction with the state of the environment, % of the number of respondents.

Consideration of the ratios of assessments of the environmental situation by settlements reveals a tendency of more critical perception of the state of the environment in objects of assessment on a larger scale. Obviously, this is due to the generally negative information agenda in the media coverage of the problems of ecological well-being at the national and global levels.

The dynamics of the state of the environment over the past 10 years was assessed by respondents on the scale of their place of residence, region of residence, the Arctic, Russia and the world (in particular, in Fig. 3, 4).

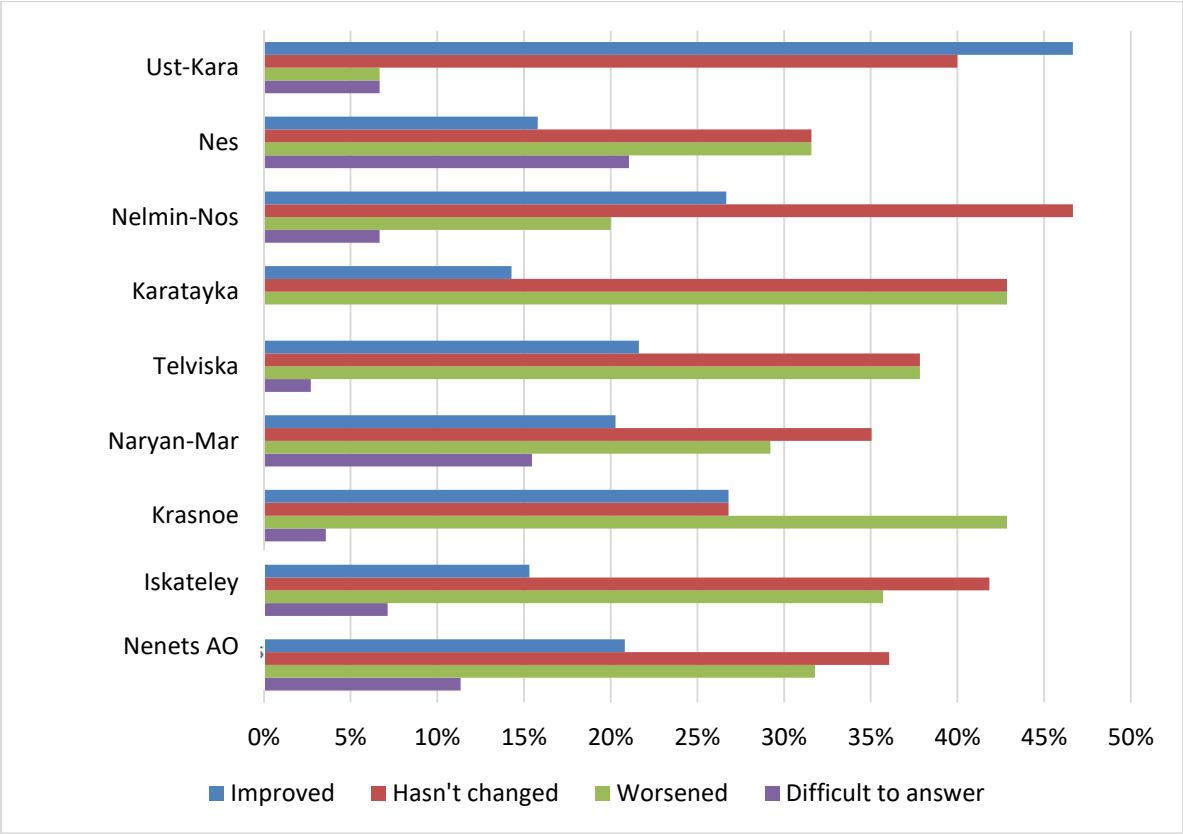

Fig. 3. Assessment by residents of the Nenets Autonomous Okrug of changes in the state of the environment over the past 10 years in the place of their residence, % of the number of respondents.

It should be noted that respondents are most critical of changes that have taken place on the scale of Russia and the world, most positive — on the scale of the place and the region of residence. Moreover, the share of negative assessments grew in direct proportion to the increase in the scale of the object of assessment. Besides, as the transition to objects of greater spatial coverage, an increasing proportion of respondents found it difficult to answer the question (Fig. 3, 4). In general, the noted features are consistent with the data obtained in other regions of the Russian Arctic [6, Volkov A.D., Tishkov S.V., Karginova-Gubinova V.V., Shcherbak A.P.].

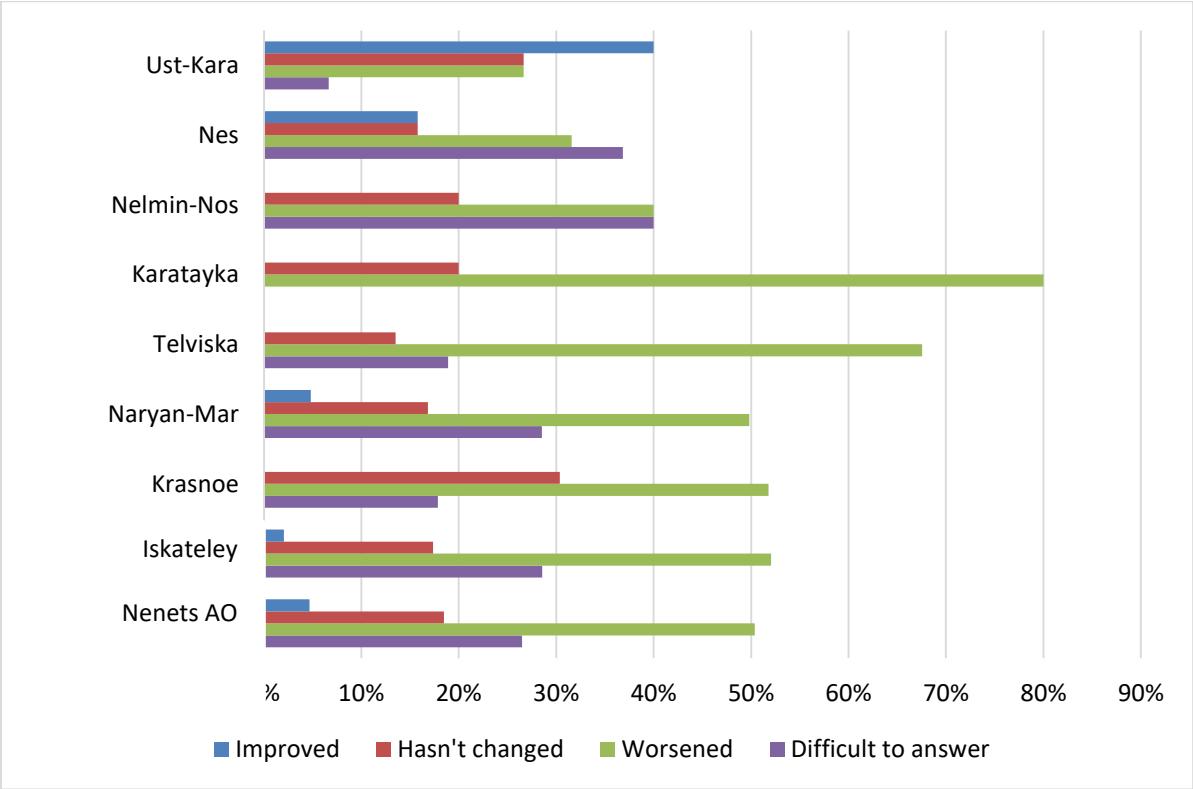

Fig. 4. Assessment by residents of the Nenets Autonomous Okrug of the dynamics of the state of the environment over the past 10 years across Russia, % of the number of respondents.

At the local level, in most settlements, with the exception of Ust-Kara and Krasnoe, the predominant assessment of the dynamics of the situation is “has not changed”, combined with an approximately equal proportion of respondents in Telviska, Karatayka and Nes who noted the deterioration of the situation.

Satisfaction of the population with the state of the environment in the place of residence differs significantly in its main components. The residents of the Nenets Autonomous Okrug are most satisfied with air quality and noise level (Fig. 5), which can be explained by the remoteness of the main enterprises from the settlement centers, as well as the overall small population of the region. The population is the least satisfied with water quality — 46% of respondents expressed a negative assessment (“completely unsatisfied” and “not satisfied”). The state of forests and parks, as well as the cleanliness of the environment, are also assessed quite critically — 37% and 33% of negative assessments, respectively (Fig. 5).

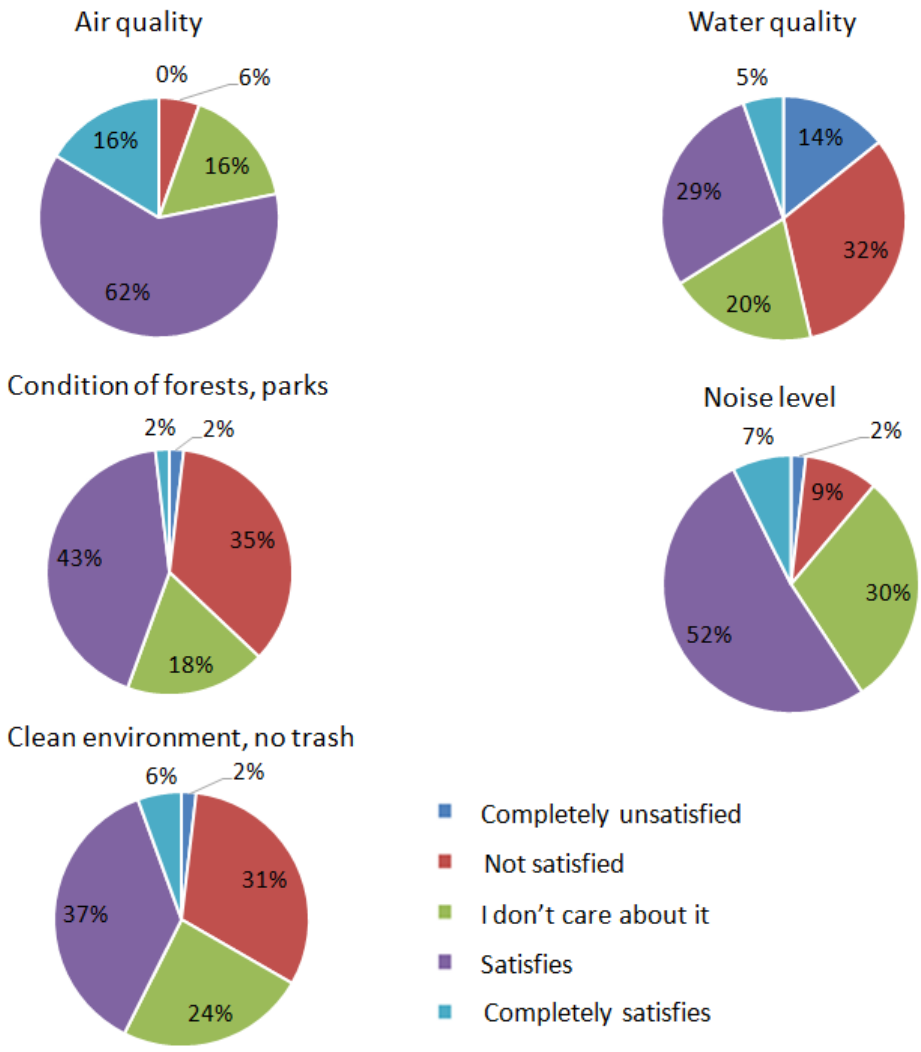

Fig. 5. Satisfaction of the population of the Nenets Autonomous Okrug with the main components of the natural environment, % of the number of respondents.

The population's perception of sources of pollution and threats to the environment [19] in the place of residence reflects the spatial distribution and nature of the main production and infrastructure facilities in the region. Thus, the most critically perceived source of environmental threats in Nenets AO is the activity of oil and gas enterprises (harmful emissions into the atmosphere, oil spills): 49% of respondents noted it as a moderate threat (answer options "weakly threatens" or "threatens"), 35.5% — as a pronounced threat (answer options "strongly threatening" or "very threatening"). The second and third most significant threats were illegal dumps of the population and household waste and illegal dumps of enterprises — 24.5% and 15% of respondents noted them as highly threatening or very highly threatening. Transportation and related issues (air pollution, oil spills, etc.) were perceived by the population as relatively significant but moderately threatening. It was noted as weakly threatening or threatening by 60.1% of respondents, and as strong or very strong threat — by 9.3%.

[19] The question "How do you assess the threat to the environment in the place of your direct residence from the listed objects?". Response on a 5-digit scale "not threatening – slightly threatening – ... – very threatening".

In terms of perceived threats, the spatial context of the respondents' place of residence was much more pronounced than in other survey questions. For example, in the village of Nes near Arkhangelsk Oblast, military activities (residues of incomplete fuel combustion, radioactive contamination, etc.) were mentioned by 65% and 25% of respondents as moderate or pronounced threats, respectively. Estimates of the following locality-specific threats were also considerably higher than the average (Table 4):

Table 4

Local features of perceived threats to the environment [20]

Settlement	Source of threat to the environment
Krasnoe village	1. Activities of oil and gas enterprises
Nes village	1. Unauthorized fishing, logging by entrepreneurs 2. Military activities (residues of incomplete fuel combustion, radioactive contamination, etc.)
Nelmin Nos village	1. Unauthorized fishing, logging by entrepreneurs 2. Illegal dumps of the population, household waste 3. Transport and related issues (air pollution, oil spills, etc.)
Naryan-Mar	1. Illegal dumps of the population, household waste
Ust-Kara village	1. Fish farming, trout farming

Another important aspect of social well-being is the perceived ability of citizens to influence the environmental sustainability of the place of residence within the framework of existing social institutions. This aspect has been developed quite fully in modern theories of economic and pro-environmental behavior of individuals [34, Stern P.C.; 35, Zhang J., Gong X., Zhu Zh., Zhang Zh.]. In terms of the previously identified importance of the problem of household waste in the study areas as a sphere that depends to some extent on the behavioral attitudes of people, it is interesting to consider the answers of the respondents to the question "Does the existing legislation help citizens to take care of nature, the state of the environment and the living environment?" (Fig. 6).

[20] Compiled by the authors based on the research materials.

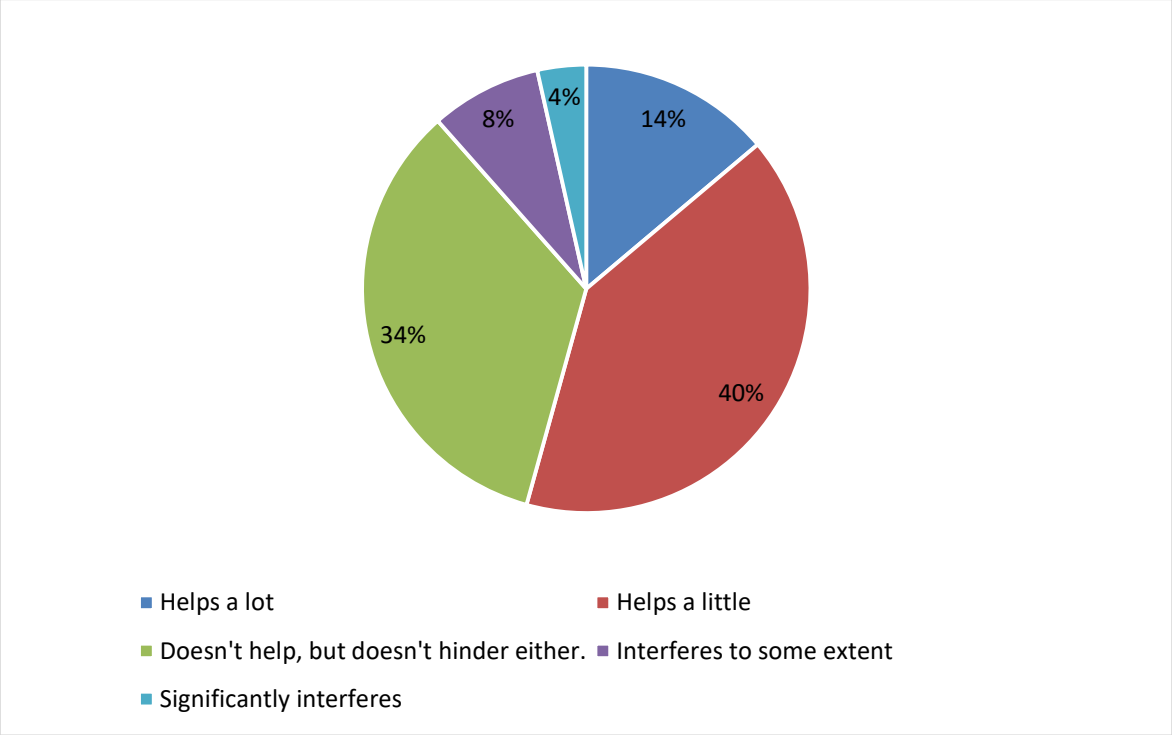

Fig. 6. Distribution of answers to the question “Does the existing legislation help citizens to take care of nature, the state of the environment and the living environment?”.

Although a relatively small proportion of respondents noted the negative impact of legislation on environmental activity, the assessments of respondents who stated that the legislation “does not help, but does not hinder either” in caring for the living environment and the state of ecology (34%) are much more indicative. Thus, according to 46% of respondents, in this area, public institutions do not fulfill their direct function of ensuring effective interaction between actors in the field of environmental well-being.

Summing up the consideration of the results of the sociological part of the study, it should be noted that most of the respondents positively assess the state of the natural environment in the place of their residence. However, as the scale of the object of assessment increases (the region of residence, the Arctic, Russia and the world), we see a decrease in respondents’ satisfaction, which is obviously associated with the negative information background in the media and social networks on these issues. The assessment of the dynamics of the state of the natural environment over the past 10 years has the same feature — while the majority of respondents tend to characterize the dynamics as neutral when considering the place of residence, they are rather negative when assessing large objects.

The population is most critical about the quality of the water resources, as well as the condition of forests and parks and the cleanliness of the environment. At the same time, when assessing local sources of threats to the state of the natural environment, the spatial specificity of populated areas is most clearly seen: for the central regions, the threat from oil and gas enterprises is the most pronounced, in remote villages, engaged mainly in fishing, unauthorized fishing is important, and some respondents noted local collective farms as an independent threat.

Conclusion

Generalization of statistical data, data from official sources and results of the sociological survey of the population of the Nenets Autonomous Okrug allows us to conclude that the ecological sustainability of the region is conditioned by a complex of general and particular factors of anthropogenic influence. The common threats for the majority of territories are:

- impact of extractive industries on the state of the environment both in the place of their localization and in the surrounding territories, determined by the natural transfer of pollutants;
- pollution of territories with household waste. This problem is reflected both in the data on the number of landfills and waste disposal sites, and in the respondents' assessments. The most important cause of the problem is the extremely small number of authorized places for permanent disposal of waste, the low degree of recycling and the underdevelopment of transport infrastructure. The low population density in most areas makes environmentally efficient waste management economically unfeasible and extremely costly;
- transport and related issues.

Among private or local threats to the ecological well-being of the territories, unauthorized fishing (mainly for fishing settlements) and the side effects of defense activities (for the northwestern territories) should be noted first of all. As an independent threat, a number of respondents indicated the activities of local fishing collective farms, polluting the coastal areas with the by-products of primary fish processing.

The assessment of threats correlates with the satisfaction of the population with the main components of the environment: the quality of water resources, the state of forests and parks, and littering of territories are perceived most critically. The reason for adjusting state regulation measures in the field of environmental sustainability of the territories of the Nenets Autonomous Okrug is the relatively low assessment of the effectiveness of existing legislation in the field of environmental protection.

The priority measure to optimize the environmental component of social well-being is the formation of economic incentives for sorting and increasing the degree of processing of household and industrial wastes. For fishing collective farms, the processing of biological waste is relevant in accordance with the technologies developed by scientists from the Karelian Research Center of the Russian Academy of Sciences and the KSC of the Russian Academy of Sciences, as well as practices used in trout breeding enterprises of the Republic of Karelia. In the context of sanctions pressure and technological blockade, the problem of maintenance of oil and gas pipelines and production facilities, and minimization of environmental risks due to equipment depreciation remains the most acute.

A more detailed study of the relationship between the social well-being of the population of the Arctic territories, perceived environmental threats and institutional mechanisms in the environmental and economic sphere should be noted as a promising area of research.

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