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On the development of the main research areas of the Arctic zone of the Russian Federation¹



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Abstract. The article is focused on the current research trends in the field of environmental protection and security in the Arctic. This means the development of Arctic environmental safety strategies for the period until 2030, pollution and the environmental situation in the Russian Arctic, use of strategic environmental assessment (SEA) for the major infrastructure projects in terms of their impact on the Arctic environment and the possible damage, an environmental atlas of the Arctic zone of the Russian Federation within the project of the National Atlas of the Arctic. An assessment of the dumping impact (waste disposal in the sea) on the environment of the Arctic and indigenous peoples, taking into account the transboundary transfer of pollutants. All the tasks of the environmental damage elimination could be solved by special programs. The authors also formulated the possible outcomes of the proposed research in the Arctic.

Keywords: *Arctic zone of the Russian Federation, environment, ecological safety, strategy, strategic environmental assessment, environmental atlas, dumping, accumulated environmental damage*

Arctic Environmental Security Strategy until 2030

Assessment of anthropogenic pollution and analysis of the environmental situation within the Russian Arctic reveals the most significant problems, solution of which determines the strategic directions for the Arctic environmental protection. These include:

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a) The unsatisfactory condition of a number of areas outside the industrial zones on the Kola Peninsula and Taimyr, water objects, including sources of drinking water and poor quality of drinking water.

b) Threatened species diversity of flora and fauna, and especially the preservation of rare and endangered species, hunted species of animals, socially significant flora areas and berries.

c) Land degradation, including natural grasslands.

d) Cross-border pollution of the atmosphere and ocean.

e) Radioactive pollution of the environment.

Production and transportation of hydrocarbons in the Arctic regions of Russia and the basins of the major Siberian rivers create powerful anthropo-technological impact not only on terrestrial ecosystems, but also begin to exert significant pressure on the Arctic marine ecosystems through a system of river flow. Some inland areas of the Russian Arctic are characterized by strong transformation of the natural geochemical background, atmospheric pollution, degradation of vegetation cover, soil and ground, inclusion of pollutants in the food chains, increased morbidity of population.

There are four major areas of the environmental stress: Murmansk region (10% of the total emission of pollutants), Norilsk agglomeration (more than 30% of the total emission of pollutants), oil and gas fields in Western Siberia (30%) and the Arkhangelsk region (a high degree of pollution with so-called specific substances). Cities in Arctic zone are always present in the list of cities with significant air pollution. Among the industries related to pollution, the first place is occupied by steel and mining in Norilsk, Monchegorsk, Pechenga, Zapolyarny, Olenegorsk, Kandalaksha, Talnakh, Kovdor, Deputatskoe, and others [1]. Despite the economic downturn of the 1990s, the area of pollution is growing slowly due to the disproportionate reduce of production and inertness of natural processes. Centers of mining and metallurgical industry are characterized by elevated levels of toxic accumulation in ecosystems, increased morbidity, cancer and skin diseases. Mining and primary processing of raw materials in the Arctic leads to mechanical disturbance of soils mainly in the permafrost areas, as well as the pollution of underground and surface-waters with the air strontium compounds, heavy metals (especially mercury) and oil.

A particularly high load is observed in the tundra landscapes, forest tundra and northern taiga in Western Siberia and Bolshezemelskaya tundra. The number of accidents at the individual fields is not the same, but it is directly related to the size of deposits and consequently the overall of industrial facilities in its territory, duration of operation, the technical density loads on the territory. Each of them is a potential source of negative effects on the environment.

Annual number of leaks of oil carbohydrate is extremely high. Consequently, in the oil-producing regions accumulate a significant amount of petroleum hydrocarbons and their contents in soil during the extraction and operation of pipeline systems. The volume of possible concentrations of the bituminous substances in soils of the northern Russia ranges from several g/kg to several hundred g/kg. The total load on the environment of the oil-producing companies, concentrated in the Arctic regions, determines the seriously threatening chronic pollution of the Arctic Ocean, which over time, with a high degree of probability, can lead to destabilization of the ice cover of the Arctic and the severe global consequences.

In order to resolve issues of environmental security in the Arctic, we need the efforts of not only of the Russian organizations but also countries interested in the development of the Arctic. Cooperation of the eight Arctic states officially began in 1989 when in Finland in Rovaniemi the Environmental Protection Conference took place and it was attended by ministers from Canada, Norway, the Soviet Union, the US, Denmark, Sweden and Iceland. The conference adopted environmental strategy for the Arctic and the founded an integrated approach to ecological cooperation in the region for the eight Arctic states².

Currently in the Arctic zone of the Russian Federation it is planned to perform a large-scale infrastructure projects, as well as raising the level of hydrocarbon and bio-resource use, strengthening the national security. In this regard, it is relevant to unite the efforts of the authorities in the environmental protection of the Arctic. But the analysis of strategic documents issued by a number of Russian ministries and departments shows that the issues of environmental protection, ecological safety in the Arctic are poor reflected or do not visible at all [2].

Development of "Environmental Security Strategy of the work on the development of the Arctic for the period till 2030" will coordinate the activities of federal and regional authorities, sectoral ministries and organizations on the basis of the relevant program (subprogramm), modern trends aimed at stabilization and rehabilitation of the Arctic environment, including the possibility of "green" economy, adaptation of people and industries to climate changes and attraction of business to address the elimination of accumulated environmental damage. At the same time it should be noted that in the northern regions we already have similar types of documents³.

Strategic ecological assessment, making the National Atlas of the Arctic

The world practice aimed at ensuring the environmental safety of infrastructure projects and programs is related to the Strategic Environmental Assessment Tool (SEAT). SEAT application

² Strategy of environmental protection in the Arctic. Rovaniemi, Finland, June 1991

³ O koncepcii ekologicheskoy bezopasnosti HMAO na period do 2020 goda. Khanty-Mansijsk, rasporyazhenie Pravitelstva HMAO № 110-rp ot 10.04.2007.

is regulated by a number of EU Directives. In Russia the use of SEAT is very modest. JSC “Gazprom” and a number of other corporations have used it for some projects. Overall, however, the effective tool to prevent the possible negative consequences for the environment is still not used at the earliest stages of projects.

In accordance with the request of the Government of the Russian Federation issued on 23.10.2013, № AD-P9-7566, Russian Ministry of Natural Resources prepared, agreed with the federal executive bodies and approved by order 28.04.2014 №10-p, the “Work plan for the preparation of regulatory legal acts providing realization of the Protocol on strategic environmental assessment to the Convention on the Assessment of the Environmental Impact in transboundary context at the national level”. The plan means amendments to the legislative acts of the Russian Federation on environment, environmental assessment, the continental shelf of the Russian Federation, the exclusive economic zone of the Russian Federation, internal sea waters and the adjacent Russian area, as well as adoption of a number of other act⁴. In this regard, the introduction of the SEAT is very relevant for considering the infrastructure projects and programs planned for implementation in the Arctic.

National Atlas of the Arctic (the Atlas) is the official publication, made in accordance with the list of the orders of the President V.V. Putin № Pr-1530, 29.06.2014 and the order of the Government of the Russian Federation № AX-P9-5271, 07.15.2014. The Atlas is a fundamental integrated cartographic printed product of information, scientific and applied nature, containing a set of mutually agreed information about the geographic, environmental, economic, historical, ethnographic, cultural and social specialty of the Russian Arctic designed for a wide range of academic, administrative, economic, defense, scientific, educational, cultural and social activities. Environmental atlas section should reflect the current state of the environment, to give an idea of the dynamic characteristics of objects and phenomena in the Arctic region. The main problems lie in the environmental section and they are of interdisciplinary and cross-border nature. The complexity of systematisation of information, that is diverse and often difficult to spot and compare. This section should give a comprehensive description of natural resources, environmental conditions, factors and results of human impact on the local environment.

Complex solution for Environmental section will help to overcome the disconnect between the main areas of environmental challenges, to provide initial information for decision-making, to

⁴ О проекте структуры Стратегии экологической безопасности Российской Федерации на период до 2025 года // Записка Департамента международного сотрудничества Минприроды России № 10/0341 от 16.06.2014.

create an information and analytical framework for addressing environmental challenges of the Arctic region.

It is advisable to ensure the preparation of maps on the following topics:

1. Environmental problems.
2. The accumulated environmental damage. "Hot" points of AED.
3. Problems and forecasts of climate change.
4. Dumping (dumping of waste at sea).
5. Wrecks.
6. Flooded solid radioactive waste.
7. Flooded nuclear submarines and other radioactive objects.
8. Disposal of explosives and ammunition.
9. Cross-border transfers of radioactive waste in oceans and rivers.
10. Disposal of waste in the sea.
11. Waste water discharges.
12. Dumping of soils.
13. Peaceful underground nuclear explosions.
14. The role of demilitarization in the pollution of the Russian Arctic.
15. The central polygon of the Russian Federation.
16. Impact of transport and energy on the environment in the Arctic.
17. Areas of natural and man-made environmental problems (Arkhangelsk, Iultin, Norilsk, Talnakh, Murmansk, Kola Bay, Monchegorsk, Pechenga, Nickel, Varandey, Deputatsky, Kuzomenie, Shoyna and etc.)
18. The sources of pollution affecting the Arctic outside of the Russian Arctic.
19. Environmental problems of defense potential recovery.
20. Economic problems of environmental management.
21. Specially protected areas.
22. Effect of abandoned industrial sites and settlements in the Arctic
23. The sustainability of the territory and waters in case of oil spills.
24. The problem of gas hydrates, forecasts for the impact of climate change.
25. The role of environmental NGOs in the Arctic zone of the Russian Federation.

According to the results of own work in the Russian Arctic during the expeditions in 2011—2013, SOPS offered analytical and photographic materials that could be used for the National Atlas of the Arctic.

Assessing the impact of dumping on the Arctic environment

All countries that have access to the sea, did or still do the dumping of various materials, in particular soil, excavated during enforcement work; industrial waste; solid waste; construction waste; sleep-sled ships; explosives and chemical substances; radioactive waste in the waters of their internal seas. [3] Marine environment enables dumping, being able to process large quantities of organic and inorganic substances without great damage to water. However, it should be noted that this ability is not unlimited and therefore dumping is seen as a necessary measure.

In varying degrees, the effects of dumped materials are visible for all organisms that live in the ocean, and are including in the trophic chain. Organizing the waste control at sea makes it crucial to choose the areas of dumping, to define the dynamics of pollution of water and sediments. In order to identify possible volume of pollution at sea, calculations of all polluting substances in dumped materials should be made. The main international act to regulate and limit the dumping is the Convention on Marine Pollution by Dumping of Wastes and Other Materials 1972 with its 3 annexes (the London Convention). The London Convention has been ratified by the Soviet Union on the 15th of December 1975, and in accordance with paragraph 2 of the Article XIX the Convention was entered into force in the USSR on the 29th of January 1976.

In 1996, the Protocol to the London Convention was agreed upon (The Protocol 1996) to give a modern character to the Convention and eventually replace it. Within the framework of the London Convention and the Protocol 1996, the Contracting Parties should provide following activities:

- a) improve the compliance of the London Convention, with the emphasis on collaboration and cooperation and following the sanction regime for non-compliance;
- b) further improvement of scientific assessment of the environmental acceptability of wastes proposed for dumping, including monitoring, evaluation options and removal;
- c) development of a guide for the construction of artificial reefs and use of best available technologies for the implementation of this Protocol;
- d) activities in the field of technical cooperation and assistance are a priority issue on the agenda and if possible it should be carried out in cooperation with similar programs under other agreements;
- e) regular review of the long-term program of work and strategies in the field of technical cooperation and assistance;
- f) assistance in the removal of the threat of ocean acidification and permanent storage of carbon dioxide in geological formations under the seabed are expressed in caution against broad--

scale pollution of oceans as well as the idea of storages for carbon dioxide, since the current level of knowledge in the field of efficiency and potential of the environmental impact of such a process is not sufficient⁵.

An important aspect of the implementation of Convention obligations is: the account of the burial places; check-in; dumping operations at sea; submission of annual reports on all permits issued for disposal of waste and other materials at sea, along with their type and quantity; providing an annual report on the monitoring and its major results. All dumping with the aim of disposal can be divided by the following:

- a) soils — a result of dredging or other mining engineering;
- b) petroleum hydrocarbons — a result of the activities of oil production and transportation, fleet activities;
- c) organochlorine compounds;
- d) heavy metals — a result of human activities;
- e) explosives — a result of direct disposal of ammunition, flood combat and transport vehicles, mining of the Arctic seas during the Great Patriotic War from Pechenga to the mouth of the Yenisei River by the German fleet;
- f) radioactive substances, the disposal of liquid and solid radioactive wastes, flooding emergency reactors and submarines, large-sized elements, construction of nuclear facilities, nuclear weapons, etc.;
- g) for the coastal zones of heavy traffic: a separate group of wastes is wrecks and vessels written-off from the Register as emergency wrecks are disposed in the area from the Kola Peninsula to Chukotka, including the Pacific Coast [3, 4].

An important role in the pollution of sea water is played by rivers. Russian Arctic seas — receivers of the runoff waters from the major rivers of Eurasia and they contain the mass suspensions and water pollutants. Some of them are radioactive and they are collected in the vast water catchment areas.

For the purposes of the safe use of resources in the Arctic zone of the Russian Federation, it is necessary to fully explore and keep up to date the information on resources and pollution dynamics for all elements of the ocean environment — water, sediment, aquatic vegetation, marine life and beaches.

⁵ Konvenciya po predotvrashheniyu zagryazneniya morya sbrosami othodov i drugih materialov 1972 g. s popravkami 1993 g. Moskva, Vashington, London, Mexiko, 29 dekabrya 1972.

It is necessary to assess the ways and reasons of pollution of the Arctic seas of Russia and the complex sources of pollution, the concentration of pollutants, their distribution, the mass of pollutants, seasonal changes and the dynamics, the composition of materials' flows. The overall assessment of the factors affecting the state of the Arctic seas should note that the territory of Russia is the main but not the only source of pollutants. Transfer of pollutants is not only a result of the river water flows or underground flows, but also it is a result of transboundary air and water transfer, including the one from the Atlantic Ocean [5]. In the past 25 years, this issue has not been given sufficient attention. The main source of information on the pollution of the Arctic, results of the dumping were made by the foreign organizations "Bellona" and "Greenpeace", but their report are rather doubtful due to the objectivity and representativeness of the information.

According to the Development Strategy of the Russian Arctic and needs to ensure national security for the period up to 2020, the priority direction of development of the Arctic is to ensure the environmental safety. The past years of works on inventory and elimination of environmental damage in the Russian Arctic had shown the need to organize the coordination of activities of Rosprirodnadzor, Rosatom, Roshydromet, the Russian Defense Ministry, the Northern Fleet of the Russian Navy, EMERCOM, the Russian Space Agency and non-governmental environmental organizations to create an integrated database of objects and dumping areas and their effect on environmental safety in the Russian Arctic and the Arctic ocean.

***The Arctic development program for the elimination of
accumulated environmental damage***

Regarding AED it is important to have an assessment of human impact on the environment in the Russian Arctic, based on an inventory of sources and facilities of such an impact; to collect information about the pollution of environmental components and violation of the ecosystems. In 2013, the Council for the Study of Productive Forces, under the Russian Ministry of Natural Resources carried out a project "Assessment of accumulated environmental damage in the Arctic zone of Russian and threats to the environment caused by the expansion of economic activities in the Arctic, including the continental shelf and the regions of the Russian presence on the archipelago of Svalbard" [5]. Because of the tight deadlines the research had a largely cameral character with a travel of specialist to the particular regions (Murmansk and Arkhangelsk Region, Yamalo-Nenets Autonomous Okrug, Nenets Autonomous Okrug, Chukotka Autonomous District). A part of the research was a study of the priority environmental projects and investments in effectiveness done by both Russian and foreign investors (including preliminary technical, economic and environmental ones); a study of reasonable measures, technical and eco-

conomic assessment of rehabilitation of the areas in order to minimize human impact on the environment during the Russian presence on the archipelago of Svalbard.

The solution of these tasks could be performed on the basis of an analysis of previously accumulated knowledge of the anthropogenic impact on the environment in the Russian Arctic and extending this knowledge by linking the quality of the characteristics of the environment with the sources of pollution, and polluted areas (“hot spots”) with the past and current activities. The most complete information base of “hot spots” in the AZRF and objects of accumulated environmental damage has been done and now it is the basis for strategic planning of environmental activities in the Russian Arctic.

Tasks to eliminate AED could be solved within the framework of a special task-term program. Relevant work in this area was conducted by the Ministry of Natural Resources, which allowed to start the formation of the Federal Target Program (FTP) “Elimination of the accumulated environmental damage 2014—2025”. The purpose of the program is to improve the quality of life of citizens, to reduce the amount of accumulated waste, to eliminate the objects of the past environmental damage, as well as to engage and reclaim tens of thousands of hectares of contaminated land in the economic turnover. The federal target program included more than 100 regional projects, the total cost of the program is 218 billion rubles. Co-financing of the projects comes from the budgets of regions and it is provided with regard to their budgetary security⁶. Due to various reasons the work on the harmonization of the federal target program has stopped at the stage of agreement and no practical measures for the elimination of AED had been taken in the whole country, including in the Arctic regions. Ministry of Natural Resources of Russia continues to work in this direction through the implementation of the approved set of priority issues incorporated to eliminate negative impacts on the environment as a result of the past economic and other activities which included activities on the territory of the Russian Arctic, Far North and the locations of a number of protected areas⁷.

It should be noted that in the period 2011—2015 there was a work carried out to assess the AED and to clean some areas in the Arctic: archipelago of Franz Josef Land, Vrangeli Island, settlement of Amderma and Svalbard. This important mission was carried out by various organizations under the Russian Ministry of Natural Resources. Of interest is an initiative of the Govern-

⁶ Proekt Federalnoj tselevoj programmy «Likvidaciya nakoplennoego ekologicheskogo ushherba» na 2014—2025 gody. M.: Minprirody Rossii, 2013.

⁷ Kompleks pervoocherednyh meropriyatij, napravlennyh na likvidaciju negativnyh vozdeystvij na okruzhayushchuyu sredu v rezultate proshloy ekonomicheskoy i inoj deyatel'nosti (utverzhdyon rasporyazheniem Pravitel'stva Rossijskoj Federacii ot 4 dekabrya 2014 g. № 2462-r).

ment of the Yamalo-Nenets Autonomous District: in 2012 it organized a geo-environmental survey Belyi Island and in 2013 it began to clean up the island. At the same time, the experts, who were responsible for the organization of the survey, used methodological approaches and materials of COPS for geoecological survey on pollution of the Franz Josef Land and for working out the appropriate program for their cleaning [6].

Conclusion

Summarizing all said above, it is relevant to underline the following directions for research and environmental security measures in the Arctic:

1. Development of Environmental Security Strategy for the development of the Arctic until 2030.
2. Carrying out a strategic environmental assessment of policies and programs, large infrastructure projects in terms of their impact on the Arctic environment and possible damage.
3. Creating environmental unit within the National Atlas of the Arctic taking into account the areas of environmental sensitivity to oil spills and other negative impacts on the environment.
4. Evaluation of the impact of dumping on the Arctic environment, social and living conditions of indigenous peoples, taking into account the transboundary transport of pollutants.
5. Development of a program (subprogram) for elimination of accumulated environmental damage in the Arctic.

Implementation of the proposed research will contribute to:

- a) improvement of the ecological status of the Russian Arctic and North;
- b) the conservation of biological diversity;
- c) the implementation of international commitments, improvement of the country's environmental image;
- d) the creation of conditions for replication of experience on cleaning the Arctic territories in other regions;
- e) the effectiveness of the state property use (functioning of the Northern Sea Route, fisheries and eco-tourism).

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