Marine environmental protection in mineral resource development in the arctic zone of Russia

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Abstract. International and environmental law in Russia does not provide a preventive and precautionary approach to forestall degradation of the marine environment and the "polluter pays" principle at the present stage. The author proposes supplementing international environmental law in the investigated area with an approach based on the principle that the polluter not only pays but also restores. Improvement of approaches and principles of international law will be the basis for changing Russian legislation and legislation of other countries in order to prevent degradation of the marine environment. After an oil spill, the coastal waters of the seas and their ecosystems are the most vulnerable; therefore, the national legislation of states is primarily interested in legal regulation of marine environmental protection in case of oil and petroleum product spills. The legal obligation on oil and gas producing companies to carry out measures to remediate the marine environment will require them to finance scientific research, search and develop new technologies for the safe development of subsoil resources and restoration of the marine environment. This study is a comprehensive analysis of the scientific research results in the field of biology, environmental protection, protection of water bodies, marine environment, as well as international and Russian environmental law governing relations in the field of marine environment protection during the development of mineral deposits on the continental shelf, internal sea waters, in the territorial sea and the adjacent zone of the Russian Federation. Key words: marine environment, international environmental law, environmental protection, protection of the marine environment, subsoil use, subsoil development, Russian Arctic zone, water body reclamation.

1 Introduction

The Arctic is an important strategic element in the domestic and foreign policies of the coastal states - Russia, the United States, Canada, Denmark, Finland, Iceland, Norway, and Sweden. According to the UN Convention on the Law of the Sea of 1982, the marine environment encompasses the entire sea area, the seabed and ocean floor and the subsoil thereof, i.e., it constitutes a unified marine geoecosystem. The northern borders of Russia are washed by the

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Barents, White, Kara, Laptev, East Siberian, and Chukchi Seas. Scientists estimate that gas and oil reserves on the continental shelf will suffice for many decades of the 21st century [1, 2]. Along with economic interests, environmental risks are also growing - the negative impact on the Arctic environment.

As scientists note, oil and gas operations on the shelf, despite the increased attention of the state authorities, operating companies, public to the observance of safety, control and supervision over all stages of field development and constant improvement of technological processes, remain a rather unpredictable type of economic activity [3]. Among the most significant threats to the Arctic marine environment conservation scientists name oil and oil product spills [3, 4, 5], pollution of water and bottom sediments with heavy metals (6), plastic (7, 8), biological pollution with invasive (alien) species imported by ships with ballast water [9, 10], the negative impact of noise generated by ships and drilling operations, burial of waste and other materials, including radioactive objects [11, 12].

Explosions and leaks from oil and gas pipelines, ship collisions with ice, removal and movement of soil during construction of platforms and oil terminals, pipeline laying, emissions from ships and platforms during mining and transportation of mineral resources, drilling works, discharges of drilling and other industrial waste [3], oil spills occurring as a result of a well or during tanker traffic [4, 5], etc. are considered the main sources of pollution. Exploration and development of subsoil areas, dumping production and consumption wastes, shelf construction result in acoustic pollution of water masses and air, activation of dangerous geological processes and technogenic accidents and disasters [3, 5, 13]. Of all of these, the exploration and development of oil and gas fields should be ranked among the most hazardous for the Arctic marine environment. Oil and petroleum products spilled into the sea and industrial waste from the oil and gas industry are eventually swept up to the coastal areas, and it is in this part that the most severe environmental consequences of accidents are observed [14].

The remarks of V.N. Ekzaryan and A.K. Akhmadiev are justified, the oil and gas industry is facing the problems related to finding new technologies for production in deep water areas, new approaches in managing environmental risks, and creating a legal basis for regulating subsoil use in new conditions and areas [5].

In legal science, scientists pay attention to the problems of regulation in the field of environmental protection and ensuring environmental safety when using subsoil [15, 16], in the sphere of granting the right to use subsoil areas and environmental protection of the Arctic zone of the Russian Federation [17], the issue of the need for a special legislative act establishing the features of legal regime of the Arctic ecosystems' protection [18, 19] is discussed. In a number of works, both Russian and foreign [20, 21], it is noted that today the legal problems of organizing mining in the World Ocean are still unresolved [5]. It should be noted that until now, the issues of legal regulation in the field of marine environment protection during the exploration and development of oil and gas fields in the Arctic zone of Russia have not become an independent subject of research.

1.1 Objective

Based on a review of scientific achievements in the field of biology, ecology, environmental protection and analysis of international and Russian environmental law, the effectiveness of legal regulation was assessed and the directions for improving its mechanism for the protection of the marine environment during the exploration and development of oil and gas fields on the continental shelf, territorial sea and coastal zone of the Russian Federation were identified.

2 Materials and Methods

The methodological basis of this study is general scientific (analysis, synthesis, generalization, induction, deduction) and special legal methods (formal-logical). The study is based on the review and analysis of publications of scientific research results in the field of biology, ecology, geology, environmental protection, protection of water bodies, including the Arctic marine environment, as well as legislation of the Russian Federation regulating relations in the field of marine environment protection during the development of mineral deposits on the continental shelf, internal sea waters, in the territorial sea, and the contiguous zone of the Russian Federation. Comparative and comparative analysis of the federal laws regulating subsoil use and environmental protection, their interpretation, and interpretation in a logical sequence with the use of special techniques of legal technique were carried out. General rules of law in the sphere of subsoil use and environmental protection, their application to private relations - protection of the marine environment during exploration and production of hydrocarbon raw materials in the subsoil of the Arctic seas were investigated.

3 Results

The sources of international environmental law relevant to the topic of the study include the UN Conventions on the Law of the Sea, 1962 (Part XII), on Environment and Development, Rio de Janeiro, 1992, on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, on Prevention of Pollution from Ships, 1973 (MARPOL 73/78), on Transboundary Effects of Industrial Accidents, Helsinki, 1992, on Biological Diversity, Rio de Janeiro, 1992 and others. This study focused on the approaches and principles outlined at the UN Conference on Environment and Development (Rio de Janeiro, 3-14 June 1992) with regard to the implementation of the provisions of the UN Convention on the Law of the Sea relating to the protection and preservation of the marine environment. The UN Conference, in order to avoid degradation of the marine environment, identified: 1) the need for a preventive, proactive, proactive approach (rather than being based on the principle of response) and 2) the polluter pays principle (paragraphs 17.21-17.22).

In accordance with the above rules of international law Russia adopted laws No. 7-FZ dated 10.01.2002 "On environmental protection", No. 2395-1 dated 21.02.1992 "On subsoil", No. 174-FZ dated 23.11.1995 "On ecological expertise", No. 187-FZ dated 30.11.1995 "On continental shelf of the Russian Federation", No. 155-FZ dated 31.07. 1998 No. 155-FZ "On Inland Sea Waters in the Territorial Sea and the Contiguous Zone of the Russian Federation"; from 17.12.1998 No. 191-FZ "On the Exclusive Economic Zone of the Russian Federation" (Chapter V); the Water Code of the Russian Federation of 20.06.2006 No. 74-FZ (the Air Code of the Russian Federation); from 20.12.2004 No. 166-FZ "On Fishing and Conservation of Water Biological Resources". The above-mentioned laws define state policy in the field of mining in sea waters, including the Arctic zone of Russia, regulate relations in the field of protecting the marine environment from the negative impact of economic activity, ensuring favorable environment, habitat of aquatic biological resources in accordance with the norms of international law.

The Russian legislation understands environmental protection as the activity of legal entities aimed at preservation and restoration of natural environment, rational use and reproduction of natural resources, prevention of negative impact of economic and other activities on the environment and elimination of its consequences (Article 1 of the Federal Law "On Environmental Protection"), in the Air Code of the Russian Federation - the system of measures aimed at preservation and restoration of water bodies (Article 1). However, when referring to the marine environment in Russian legislation in accordance with the norms of international law, the terms "conservation" and "protection" are used. The Russian

explanatory dictionaries reveal their meaning as follows: 1) "to preserve", i.e. to save, to survive, to remain undamaged, unspoiled, and 2) "to protect", i.e. to shield from hostile actions, from attack. The meaning of the lexeme "to restore" is to restore to its former condition something that has been destroyed, disturbed, fallen into decay. The legislation of English-speaking countries uses the term "environmental protection," "protection of the environment," or "nature conservation," which can be translated as "environmental protection," "nature preservation" or "nature conservation" [16]. To understand the essence of the legal regulation in the field of marine environment protection it is necessary to proceed from its content: what meaning is put in these terms, what goals and objectives, legal methods and means are provided by the laws.

In accordance with the conceptual apparatus of the federal law "On environmental protection" the favourable environment is provided by its quality, i.e. the state which is characterised by physical, chemical, biological and other indicators and (or) their totality. Let us combine the listed indicators with the ecological ones. The content of the term "environmental pollution" can be schematically defined as follows (Scheme 1):

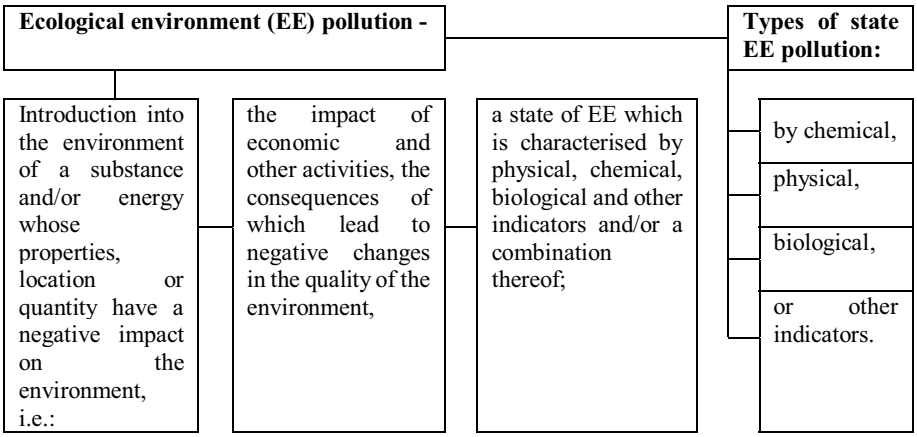

Fig. 1. Legal definition of "environmental pollution" in Russian environmental law.

Biologists have studied mechanisms of the impact of oil and petroleum products on the marine environment, the most dangerous for its inhabitants is the formation of oil and oil films, adverse biological effects on natural fish populations have been identified [22, 23], the impact of marine pollution by hydrocarbons on oxygen uptake by deep-sea benthos and on the composition of the microbial benthos [24], etc. The work by Cherepanova A.E. [25], which presents a classification of forms of marine pollution according to their physical and chemical structure, their persistence in the environment, is of interest.

Based on the analysis of the Russian legislation and review of the scientific literature, a scheme of types (forms) and sources of marine pollution and the negative impact of human economic activities on the Arctic marine environment (Scheme 2) has been created. The classification is developed in accordance with the legal definition of environmental pollution, the content of which is presented in scheme 1.

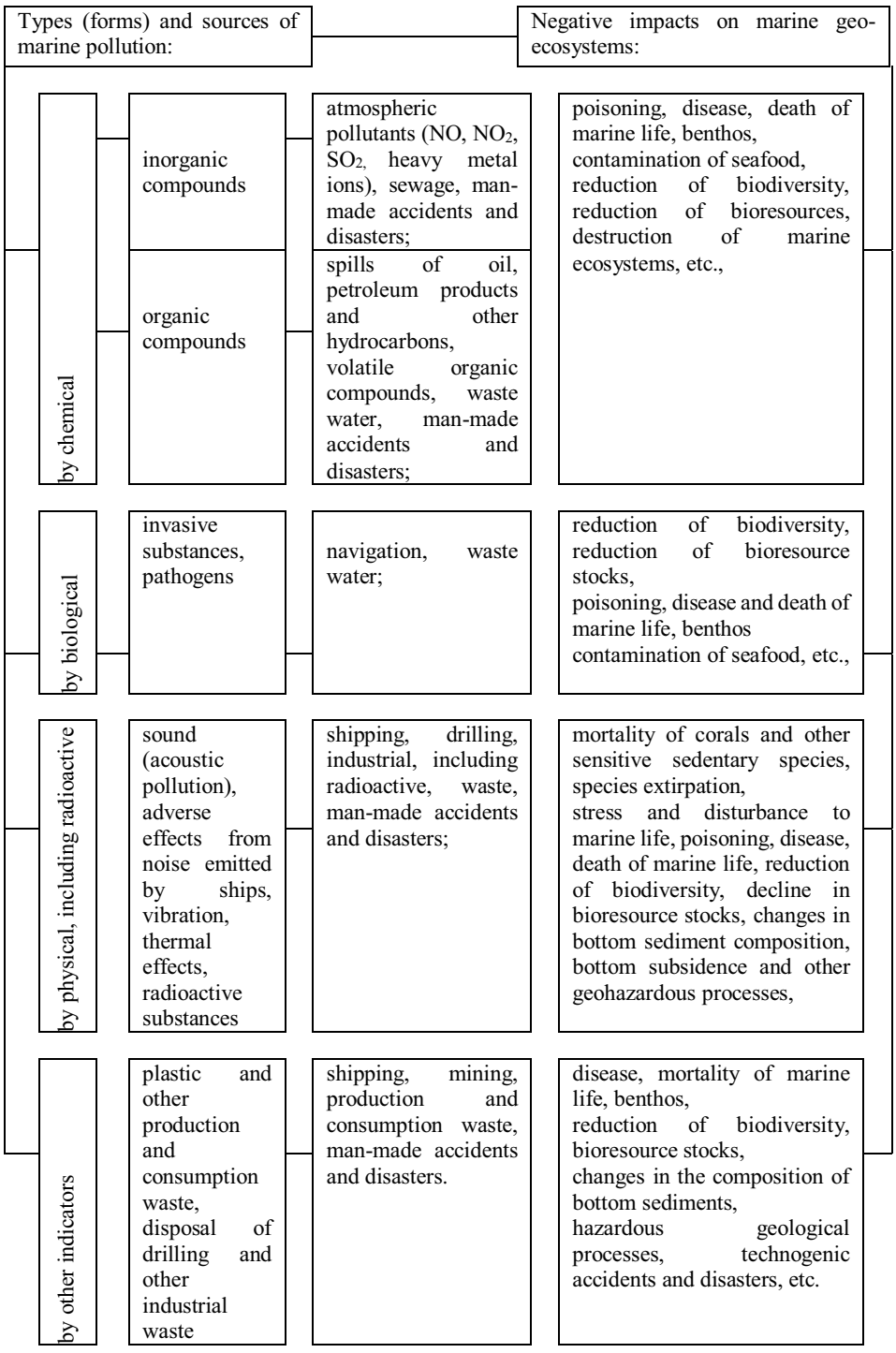

Fig. 2. Types (forms), sources of pollutants and adverse impacts on marine geo-ecosystems.

As is evident from the scheme, human economic activity in marine areas may lead to irreversible ecological processes - destruction of the currently existing marine geoecosystems.

Special rules that provide the mechanism of legal regulation of the protection and conservation of the marine environment are established in federal laws "On continental shelf of the Russian Federation" (Chapter VI), of 17.12.1998 № 191-FZ "On exclusive economic zone of the Russian Federation" (Chapter V), "On internal sea waters in territorial sea and contiguous zone of the Russian Federation" (Chapter V) and of 23.11.1995 № 174-FZ "On ecological expertise". It should be noted that in accordance with the Federal Law "On Inland Sea Waters in the Territorial Sea and Adjacent Zone of the Russian Federation", state monitoring involves observation of state of marine environment and bottom sediments, indicators on physical, chemical and radioactive pollution, hydrobiological and microbiological indicators as well as assessment and forecast of their changes under the influence of natural and anthropogenic factors (Article 36). A different spectrum is specified in the Federal Law "On the Continental Shelf of the Russian Federation", where monitoring does not include observation of physical indicators of the marine environment and bottom sediments (Article 33). As mentioned above, the scientific literature notes that anthropogenic risks may lead to activation of dangerous geological processes [3], hence observation of physical indicators cannot be excluded, but must be supplemented by geological and geophysical parameters.

In accordance with international and environmental legislation, the Resolution of the Russian Federation Government of 30.12.2020 No. 2366 approved the rules for organising measures for preventing and eliminating oil and oil product spills on the continental shelf, inland sea waters, in the territorial sea and contiguous zone of Russia; the national standard GOST R 53241-2008 was developed. Group T58 "Marine Geological Exploration. Requirements to the Protection of the Marine Environment during Exploration and Development of Oil and Gas Fields on the Continental Shelf, Territorial Sea and Coastal Zone", etc. These normative legal acts contain prohibitions and restrictions when carrying out activities related to exploration and development of oil and gas fields and are aimed at preventing pollution of the marine environment by chemical, radioactive, and biological indicators, but there are no requirements to protect the marine environment by physical indicators (e.g., temperature, noise, vibration, acoustic pollution of water masses due to drilling operations, etc.).

International experience shows that oil and petroleum product spills occur more frequently in man-made accidents. According to studies by N.K. Arora, more than 40,000 tons of oil have been spilt into marine ecosystems in the last five years [26]; B. Batstone and S. Belford, almost 48% of oil enters the oceans as a result of spills and illegal discharges from ships [27]. The accident at the Norilsk fuel depot resulted in the release of 21,000 t of oil products, of which 6,000 t soaked in the ground; the remaining mass reached the Kara Sea by river and is now considered one of the biggest disasters in the Arctic [28, 29].

According to the Resolution of the Government of Russia No. 2366 of 30.12.2020, the Action Plan for Prevention and Liquidation of Oil and Petroleum Product Spills must contain measures for arranging temporary storage and transportation of collected oil and petroleum products, i.e. mechanical collection "by means of traditional methods of localizing the accident site with barriers and collecting hydrocarbons from the surface, which have not changed since the accident of the Exxon Valdez tanker in 1989" [3, 30, 31]. According to D.V. Kirakosyan and J.P. Molchanov, "if we compare the environmental consequences of oil and petroleum product spills, refined oil products pose a greater hazard than unrefined oil because they are less hydrophobic, which makes mechanical water treatment ineffective" [29]. There is an opinion in the scientific literature about the benefits of "self-purification" of the marine environment, but under the natural and climatic conditions of the Arctic, such processes are slow and the duration of self-purification may stretch for many decades [14].

The Rules for the Protection of Surface Water Bodies, approved by Russian Government Resolution No. 1391 of 10.09.2020, contain general provisions for the prevention of

pollution, littering of surface water bodies and water depletion, as well as for the elimination of the consequences of the above phenomena. Depending on the objectives of surface water body protection, the specified measures can be divided into two groups: 1) those aimed at preservation (clearing of bottom sediments, removal of objects of mechanical clogging, sodding and shrub vegetation of banks (preventive) and 2) those aimed at restoration (aeration and biological reclamation).

Scientific publications present studies not only on the negative impact and sources of pollution, but also on technologies of water body restoration. Modern science distinguishes three main methods of aeration of water bodies: hydromechanical (water extraction, aeration and return to a certain depth of the lake (applied in water bodies), cleaning bottom sediments), chemical and biological (reduced to stimulation of plankton and benthos development or use of herbivorous fish, stimulation of self-purification of water bodies) [32], technologies have been developed to reclaim land and water bodies when they are polluted with oil and oil products using biodegradable and chemical sorbents [32-34]. According to V. E. Pinaev and D. V. Kasimov, biological reclamation of water bodies (algolization and creation of bioplata) is applicable only for freshwater water bodies and in the conclusion of their study they note that the reclamation of deep-sea water bodies requires both normative and technical elaboration and is a matter of the future [32].

As a result of comparing the normative regulation and existing measures (measures) aimed at the protection of water resources, a scheme of methods of protection of surface water bodies and their normative regulation (Scheme 3) was created. Depending on the applied methods of protection of water bodies, we distinguished biological (application of biological organisms), chemical (application of chemical substances) and conditionally technical (use of technical means and devices for clearing bottom sediments, extraction of objects of mechanical contamination) reclamation. Clearing of bottom sediments and removal of objects of mechanical debris is closer to the preservation of water bodies than to their restoration, but only in the case when as a result of debris there have been no changes in the state of water according to ecological indicators.

The presented scheme demonstrates, on the one hand, the lack of technologies for water body remediation and, on the other hand, the lagging legal regulations for such works when technologies are present. Many currently available technologies for reclamation of water bodies cannot be used in the marine environment, but this is a matter for the future. Of course, thoughtless application of chemical or biological reclamation of the marine environment can cause profound irreversible processes in marine ecosystems, and therefore requires additional scientific research. Scientists have developed a technology to filter and decompose oil slicks and oil products on the basis of fucus algae [31-33]. An interesting study was conducted by A.A. Ermolov, he developed geomorphological zoning and assessed ecological sensitivity of the shores of the Kara and Laptev Seas to oil and petroleum product spills, recommendations on selection of acceptable methods of oil spill response depend on ecological sensitivity and determine zones preferable for natural recovery in small spills and remote areas, in other cases - mechanical removal and bioremediation [14]. It is imperative that the zoning of the coasts of all Russian Arctic seas be continued and that areas where extraction is inadvisable be identified according to geo-ecological criteria, for example, according to the degree of geoprocessing, unique marine landscapes, etc. (5). The issue of criteria for oil and oil products spills classification into small, small and large remains open, such criteria should be unified and reflected in the international law.

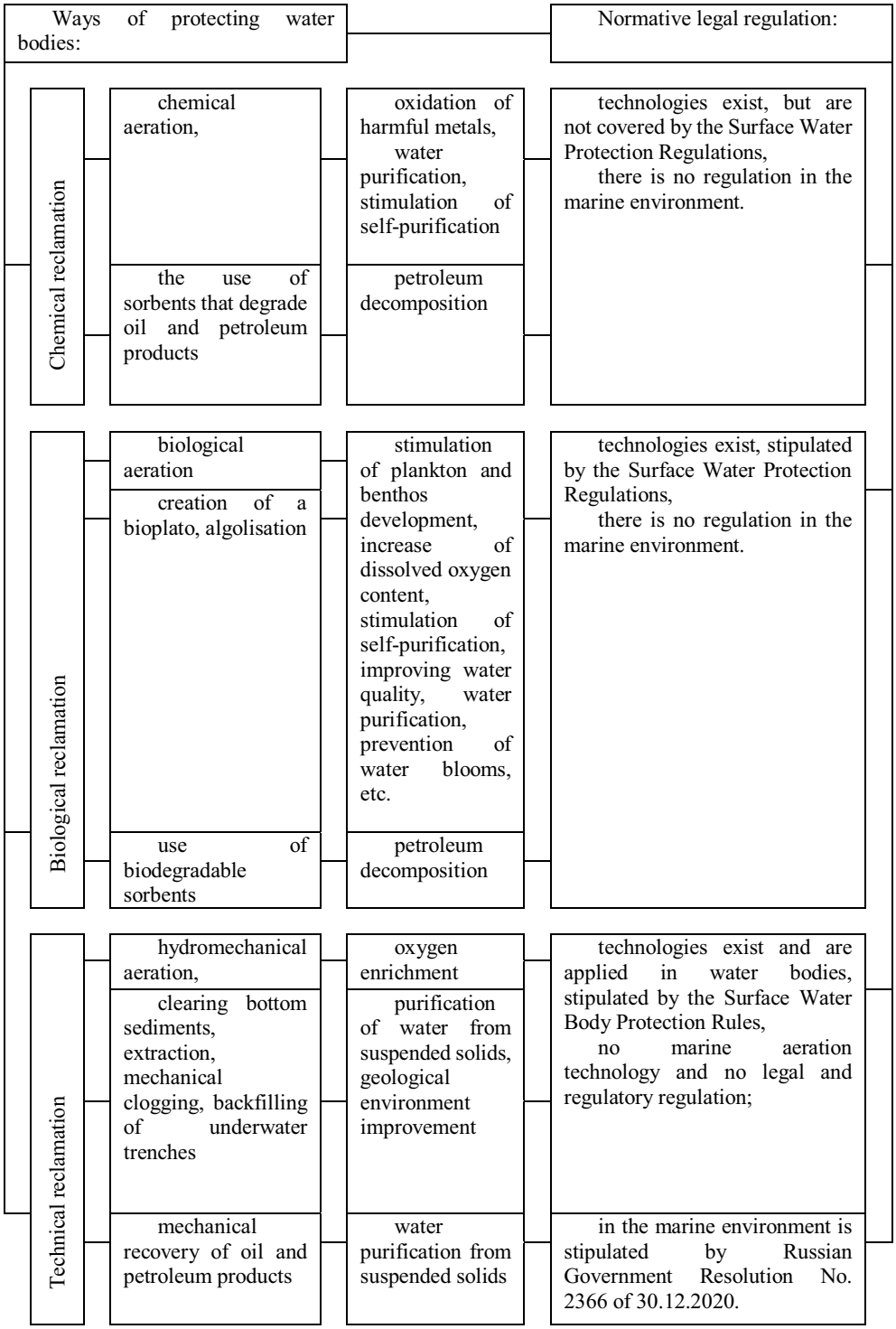

Fig. 3. Modes of protection of surface water bodies and legal regulation.

It is necessary to pay attention to the absence of special requirements to drilling devices and other mechanisms, used in sea territories. Scientific studies point to the lack of scientific

data on the state of marine ecosystems in the areas of planned drilling operations, which raises concerns about the further safe development of the oil and gas industry in this region, carrying out drilling operations is not considered sufficient to ensure accident-free drilling on the Arctic shelf, similar concerns have been raised in the USA [3]. Here it is necessary to regulate by means of technical norms stipulating maximum permissible levels of noise, vibration and other physical indicators (MPLs) to technical means, devices, other mechanisms used in subsoil use, including drilling works on sea territories and in the Arctic seas. This kind of TOR requires scientific justification and should be reflected in the legal regulation at the international level.

Thus, the legal regulation of protection of the marine environment provides for measures aimed at protection and preservation of the marine environment and does not regulate measures aimed at its restoration in case of oil and oil product spills - the use of sorbents that decompose oil and oil products.

4 Discussion

This study does not aim to disclose all aspects of the impact of economic activities on the marine environment of the Arctic zone of Russia. Rather, it is a review of the current scientific, technological and technological opportunities and current problems of legal regulation of relations in the field of marine environment protection during the development of subsoil areas of the Arctic seas by oil and gas companies.

I. As of today the norms of international law in the field of marine environment protection are aimed at its protection and preservation. We believe that under current conditions of expanding economic activity in the marine environment, it is not enough to hope for its "self-purification", it is necessary to change approaches and principles of protecting the marine environment at the level of international law, and in order to prevent degradation it is necessary to designate 1) not only a preventive and precautionary approach, but also aimed at its recovery in case of oil and oil product spills, in particular the use of sorbents that degrade their compounds and recommendations for assessing the scale of oil and oil product spills (classification of accidents by scale of spread); 2) setting requirements for acceptable exposure limits of noise, vibration and other physical indicators (AEL) for technical means, devices and other mechanisms used in subsoil use, including drilling operations in the sea Improvement of approaches and principles of international law will be the basis for improvement of Russian and other countries' legislation to prevent degradation of the marine environment.

II. In Russian law, in contrast to general rules on the protection of water bodies, which regulate not only the conservation but also the restoration of water bodies, the legislation on the subsoil and protection of the marine environment makes no provision for measures aimed at the restoration of the marine environment. The choice of optimal measures for the restoration of the marine environment depends on the cause of pollution, financial, as well as material, technical, technological, and other capabilities of those carrying out activities in marine areas. How justified will the chosen methods and types of reclamation be and what effect they will have on the state of the marine environment and aquatic biological resources is difficult to determine in advance and therefore requires scientific support. One of the legal means that could contribute to an optimal choice of reclamation type and methods is to require subsoil users to develop and approve a reclamation project for oil and petroleum product spills in the marine environment. Legal regulation of the development of such a project will lead to the financing of scientific research, search and development of new technologies by oil and gas producing companies, which will ensure safer development of subsoil areas of the Arctic seas and ensure protection of the marine environment. The state monitoring of the continental shelf should include a system of observations of both physical

indicators of pollution of the marine environment and bottom sediments, as well as observation of geological and geophysical parameters and their changes under the influence of natural and anthropogenic factors.

5 Conclusions

The Action Plan for Oil and Petroleum Products Spill Prevention and Response should contain not only measures for arrangement of temporary storage and transportation of collected oil and petroleum products, but also a project for reclamation of the marine environment in case of oil and petroleum product spills, conditions, and cases of application of sorbents, their types that degrade oil and petroleum product compounds (Scheme 4).

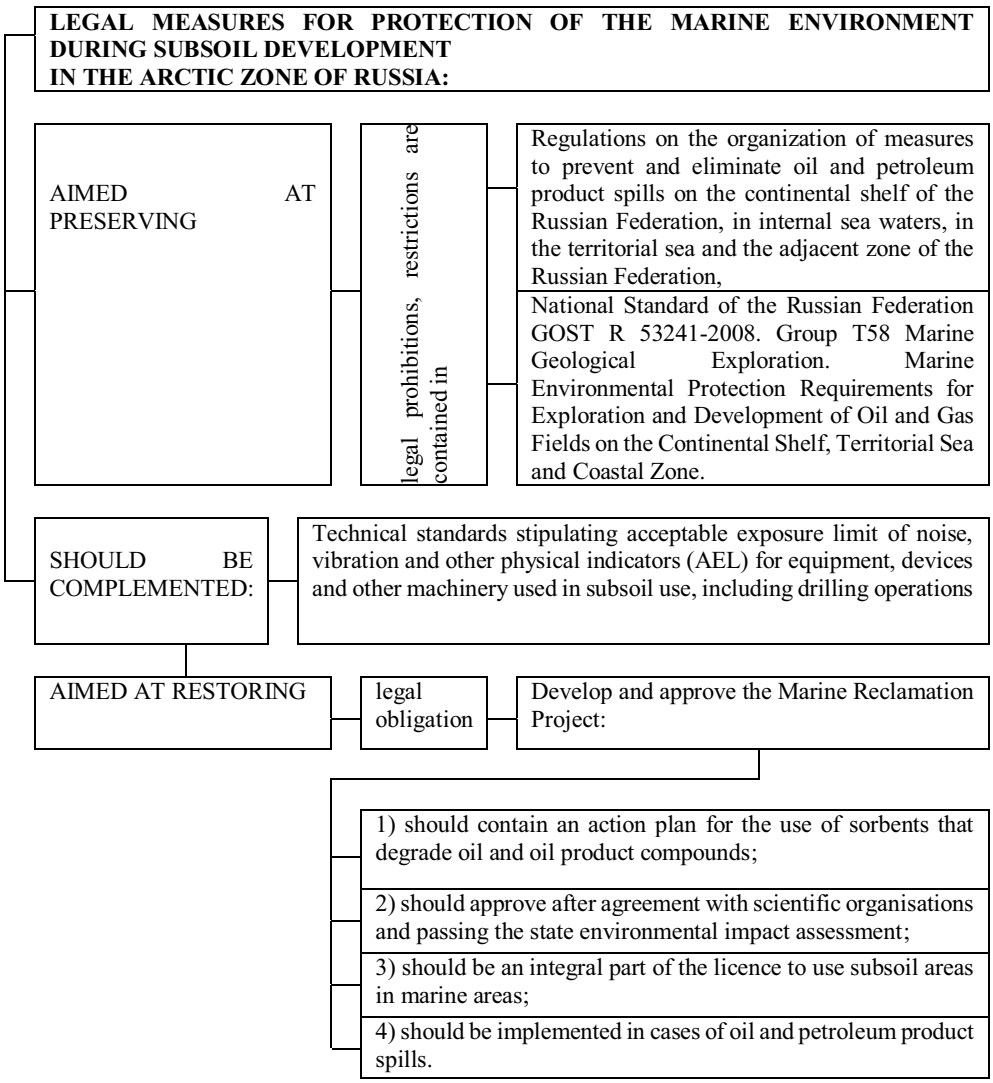

Fig. 4. Legal measures for the protection of the marine environment during subsoil development in the Arctic zone of Russia.

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