Development of Northern Sea Route and Arctic Maritime Logistics

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Abstract Since the end of the twentieth century, globalization has had a huge impact on the development of all spheres of human activity in the Arctic. In these conditions, as well as considering the climate change, the discovery of new mineral deposits and the estimated assessment of not yet discovered deposits on the continental shelf and international territories, international competition is intensifying for the opportunity to use the Arctic Ocean as a shipping route and to develop Arctic resources. The article analyzes the risks and problems of economic development of the Arctic and possible scenarios for resolving territorial disputes. Obviously, the resolution of controversial issues requires a global consensus, international cooperation, international trade interaction.

1 Arctic Region: Regional Conditions and Challenges

1.1 Arctic and Arctic States

The Arctic is understood as the physical-geographical region of the Earth, bounded along the periphery either by the parallel of 66°33′ north latitude (the Arctic Circle), or bounded by the northern border of the tundra zone. It is sometimes emphasized that the center of the Arctic is the North Geographic Pole. The area of the Arctic, limited by the Arctic Circle, is 21 million km^2, and when limited by the northern border of the tundra zone, the area of the Arctic is approximately 27 million km^2. All this space, called the Arctic, consists of the following spaces: marginal parts of two continents—Eurasia and North America; The Arctic Ocean with all islands excluding the offshore islands of Norway; parts of two oceans—the Atlantic and the

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Fig. 1 Map of the Arctic with the Arctic circle in blue (United States & Central Intelligence Agency, 2019)

Pacific, adjacent to the Arctic Ocean. The length of the coast of the five Arctic countries is 38 700km.of which 22 600km. is the Arctic coast of Russia. http://rareearth.ru/ru/pub/20160804/02368.html, The Rare Earth Magazine, The boundaries in the Arctic will help determine scientists, 4 Aug 2016.

Figure 1 shows a map of the Arctic with the Arctic Circle in blue (United States & Central Intelligence Agency, 2019).

For a long time, the Arctic was considered a territory not adapted for human life ("dead land"), impassable either by water or by land. The Norwegian polar explorer Fridtjof Nansen called the Arctic "the land of icy horror." The first Russian sailors to sail the seas of the Arctic Ocean in the eleventh century. The eastern part of the Northern Sea Route was explored by Russian pioneers Ivan Rebrov, Ilya Perfiliev, Mikhail Stadukhin in the 1930–1940s. Semyon Dezhnev sailed from the mouth of the Kolyma River to the eastern part of the mainland and in 1648 opened the strait between Asia and America. Vsemirnaya istoriya, volume IV-M. 1958, p. 100. Vega Expedition (1878–1880) on the steamer "Vega" for the first time in the world carried out a through voyage (with wintering on the way) by Northeast passage from the Atlantic Ocean to the Pacific and through the Suez Canal returned to Sweden (1880), thus bypassing Eurasia.

Currently, the territory and boundaries of the Arctic have not been determined at the legislative level. Initially, the sectoral approach prevailed, according to which the Arctic was divided between neighboring circumpolar states, with the North Pole being the border of all interested states. The sectoral approach determined the legal status of the islands and lands but did not define the water areas of these sectors. In 1982, the Convention on the Law of the Sea was adopted, according to which the water area of the state extends only to the Arctic shelf, and the offshore zone is international. According to the 1982 Convention, the territorial waters are 12 miles, and the economic territory of the country is a 200-mile zone near the coast.

Countries, territories, continental shelves and exclusive economic zones of which are located in the designated physical and geographical region of the Earth are called "Arctic states." As a rule, two different groups of states are called "Arctic states."

The first group includes five states—Canada, Denmark, Norway, Russia, USA, the coast of which is washed by the Arctic Ocean. They have the coast of the Arctic Ocean, the space of some seas of the Arctic Ocean, they own the continental shelf and can dispose of an exclusive economic zone.

The second group consists of eight states—Canada, Denmark, Norway, Russia, USA and plus Finland, Iceland and Sweden. The coast of Finland, Iceland, and Sweden is not washed by the Arctic Ocean, but they have territories located within the physical-geographical region of the Earth called the Arctic.

The first group of five states until 1982 divided the Arctic into sectors, and this division of the Arctic was quite satisfactory not only for Canada, Denmark, Norway, Russia, USA, but for the whole world. Cold, white silence, icy horror attracted only brave and inquisitive researchers. But global changes in the world led to the abolition of sectoral division and the adoption in 1982 of the UN Convention on the Law of the Sea, but not ratified by all countries. In accordance with the UN Convention on the Law of the Sea, the sectoral division of the Arctic was changed to the country's ownership of the continental shelf within 200 nautical miles. A country can claim a continental shelf and more than 200 nautical miles if certain conditions are met, but with the consent of a special UN Commission created in 1992.

In 1996, at the initiative of Canada, the Arctic Council was created. The Arctic Council includes eight subarctic countries Denmark, Iceland, Canada, Norway, Russia, USA, Finland, Sweden. Six Arctic indigenous peoples' organizations have

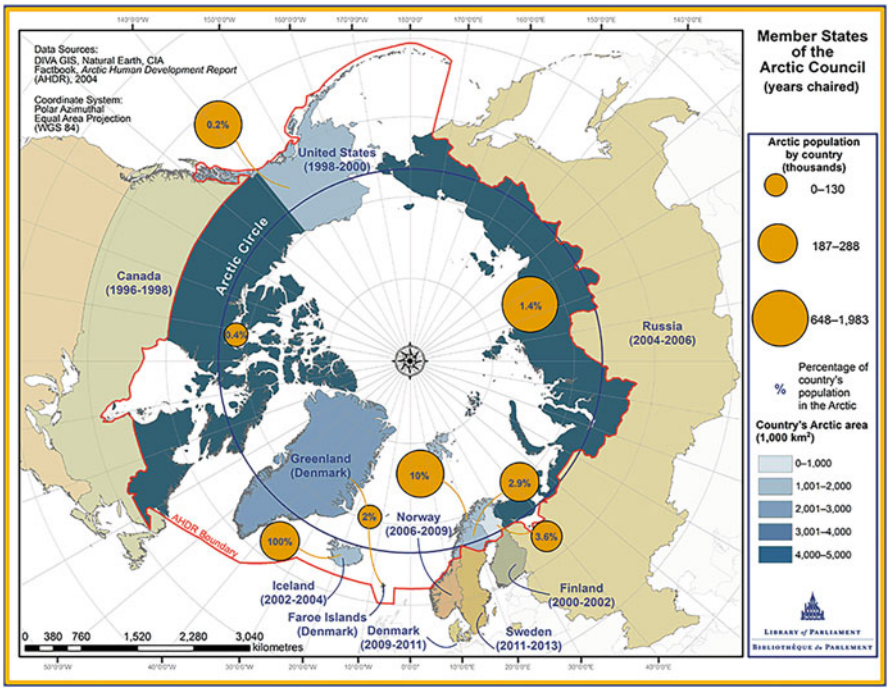

Fig. 2 States of the Arctic council (years chaired from 1996 until 2013) (United States & Central Intelligence Agency, 2019)

special permanent member status. The Arctic Council also includes observer countries, international organizations—observers and non-governmental organizations—observers. Figure 2 shows the member states of the Arctic Council, the population of the Arctic by Arctic countries, the share of the country's population in the Arctic, in percent.

At the end of the twentieth century and the beginning of the twenty-first century, globalization has had a huge impact on the development of all spheres of human activity in the Arctic.

The globalizing world economy is characterized by the openness of national economies, regional integration processes, competition of national economies, competition for geo-economic spaces, population growth in the world, increasing international migration, inequality in the distribution of resources.

In a globalizing economy in the context of climate change in the Arctic, a decrease in the area and thickness of ice, the discovery of natural resources on the continental shelf and international territories, international competition between actors of international activity is intensifying for the opportunity to use the Arctic Ocean as a shipping route and to develop Arctic resources.

The following mineral reserves are located in the bowels of the Arctic: approximately 83 billion barrels of oil; approximately 1550 trillion cubic meters of natural

gas; 780 billion tons of coal, including 599 billion tons of energy and more than 81 billion tons of coking coal. The total cost of minerals is $30 trillion. Mineral raw materials include platinum metals, copper-nickel ores, iron, phosphorus, polymetals, gold, diamonds, titanium, tantalum, niobium, fluorite, chromium, manganese, mica, molybdenum, tungsten, vanadium.

The gaze of various countries was fixed on the Arctic. In addition to the Arctic countries, many others want to develop the Arctic space, which is characterized by the desire of countries to have access to the resources of the Arctic Ocean shelf and to develop a transport route along the Arctic Ocean.

Twenty-four countries of the world in addition to the members of the "Arctic Club," including Great Britain, Germany, South Korea, France, the Netherlands, China, and Japan, are showing interest in the development of the Arctic. The countries of the Asia-Pacific region also show Arctic activity. There is a theoretical and practical likelihood of the emergence of military-political, economic, investment pools in resolving controversial issues. The rights on the territory in the area of the Lomonosov and Mendeleev ridge are declared by the countries—Denmark, Canada, Russia, the USA. The NATO countries are building up their aggregate potential in terms of the number of ships in the waters of the Arctic Ocean. The industrial and transport development of the Arctic zone by economic entities is intensifying, and control over the information space of the Arctic is being carried out. A system for monitoring all types of situations is being formed—air, surface, underwater, on land. A set of measures is being taken to provide hydrometeorological and navigational support to control the safety of navigation in Arctic conditions.

Using the example of the Arctic, given its complexity and uniqueness, the apologists of globalization propose to conduct an experiment to introduce a new global model of management of such a geo-economic and geopolitical object—an international management model. The international model of management, according to the apologists of globalization, should (a) be built on the coordination of the interests of the participants in global processes—all states, non-governmental organizations, international organizations, various corporations, (b) provide a solution to existing problems; (c) prevent or reduce potential risks. The authors—supporters of the internationalization of the Arctic, say that globalization is forming a new world-political model of governance based on the triad—"state—business—civil society." At the same time, the Arctic is turning, no more, no less, into an independent political unit. And what should Russia do in this concept, given that it possesses a significant territory of the Arctic? Russia is assigned the role of the country-initiator of the "global historical project," not interested in the opinion of the Russians, and the Arctic is predicted "the century of the Arctic Russia."

When analyzing such concepts, one can see fundamental contradictions between the aspiration of transnational companies to market nature management and the need to save nature for the whole society, between the interests of large corporations and small indigenous peoples of the North, between the norms of national law of individual Arctic countries and the desires of countries dominating in the formation and maintenance of the world economic order.

The territory of the Arctic zone of Russia, in comparison with other Russian territories, is the territory to which the geopolitical, military, and geo-economic

interests of various states are more focused, including the interests of countries that are not subArctic.

The Arctic is a territory of international cooperation and rivalry. The richness of the Arctic resources, the strategic position of sea transport corridors—all this creates the basis for the emergence of geo-economic confrontation between the countries of the world as a way to achieve the political goals of states by economic methods. Objective external global environmental trends and processes of internal socio-economic development—categories so diametrical in nature also serve as the basis for the emergence of various risks.

1.2 Risks and Problems of Economic Development of the Arctic

Risk is understood as the possibility of an unfavorable situation for the life of the region. The risks are classified according to the following factors: Arctic climate change; clash of interests of countries on control over the Arctic territories; clash of interests of countries on the regulation of Arctic shipping; increasing anthropogenic and technogenic impact in the Arctic; low level of socio-economic development of the Arctic territories; insufficient level of development of systems to protect the safety of human life in the Arctic; insufficient level of development of Arctic science and technology.

Among the risks due to the warming of the Arctic climate, the following are highlighted: the intensification of the processes of global climate change due to the impact on the Atlantic meridional circulation and the reduction of the ice cap; changes in natural habitats for different types of flora and fauna; melting of permafrost and destruction of the infrastructure built on it; negative impact on the traditional life of the indigenous population.

Due to the clash of interests on control over the Arctic territories, the following risks are highlighted: military confrontation over the delimitation of the Arctic shelf; geo-economic confrontation on the delimitation of the Arctic shelf; loss of control over part of the Arctic shelf due to regulatory changes.

Due to the clash of interests on the regulation of Arctic shipping, the following stand out: military confrontation over the regulation of shipping; geo-economic confrontation on shipping regulation issues; loss of control over shipping along the NSR due to regulatory changes.

Among the risks of increased human activity in the Arctic are increased environmental pollution; changes and declines in the population of Arctic animals; changes in the traditional living environment of the indigenous population; increased pollution of sea waters; negative impact on biological marine resources; reduction of biological marine resources due to their intensive fishing; poaching of biological marine resources; negative impact on the traditional crafts of the indigenous population.

Risks arising from a low level of socio-economic development: lack of labor force; low labor productivity; low production potential; lack or insufficient development of transport and logistics, energy and information and communication infrastructure; absence or insufficient number of objects of housing and civil construction, trade, household, medical, cultural, educational purposes; poor provision of education and health services; lack of government funding; lack of investment for the renewal of fixed assets and the implementation of large-scale projects; wear and tear of the icebreaker fleet; lack of funds for monitoring the Arctic territories and water areas; the low standard of living of the indigenous population; negative demographic processes and population outflow.

Risks of insufficient level of development of science and technology are highlighted: lack of technologies in the field of exploration and production of minerals; lack of technologies for Arctic infrastructure and housing construction; lack of technologies for icebreaking shipbuilding; lack of technologies to ensure environmental safety; lack of energy-saving technologies; lack of technologies in the field of life safety; lack of technologies in the field of determining the boundaries of the Arctic shelf; reduction of joint international research. The importance of the Arctic territories for human life requires the establishment of a procedure for identifying, assessing and monitoring risks and their sources. The following is an analysis of the risk categories.

1.2.1 Risks of the Polar Regions Due to the Warming of the Arctic Climate

One of the global problems, practically not subject to human influence, is climate change towards warming, which provokes a whole range of risks (and not only for the Arctic countries). Climate change in the Arctic is dangerous not only for the ecology of the region. The Arctic region plays an extremely important role in managing the climate in other parts of the world. The warming of the Arctic climate could be considered a negative externality for all circumpolar countries, however, thanks to its influence, new prospects for the development of the Arctic appear.

The problem of global warming is most evident in the Arctic. In other words, the Arctic is warming much faster than other regions. According to NASA, over the past 50 years, the Arctic has warmed by two degrees—this is the highest rate of climate change on the planet. The most obvious manifestation of the warming in the Arctic is the melting of ocean ice. According to the American research center National Snow and Ice Data Center, the total area of oceanic ice cover in the Arctic has decreased by 30% over the past 30 years (Fig. 3).

The melting of ice is multiplied by the decrease in the reflective surface of the ocean. In other words, the smaller the Arctic ice, the faster it melts (This is called the albedo effect). Thus, in the article by (Bintanja & van der Linden, 2013) notes that climate warming in the Arctic occurs at a rate that is much faster than the rate of temperature rise in other regions.

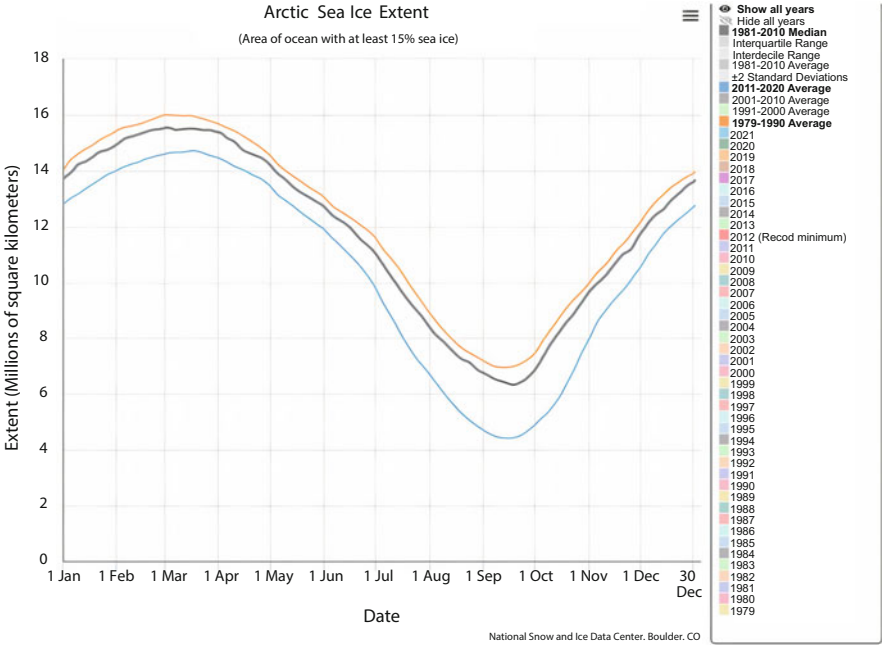

Fig. 3 Arctic sea ice extent. 1981–2010 median (gray line); 2011–2020 (blue line); 1979–1990 (yellow line) (Climate Change in the Arctic. National Snow and Ice Data Center, 2021)

According to Johansson et al. (2012), coordinator of the international research Arctic program INTERACT, the Arctic is an indicator of the ecological health of the planet (After all, too many global ecological processes are associated with the state of this region). According to the author, by 2050, the Arctic waters will be practically free of ice.

The influence on the climate of nearby territories is carried out, first of all, due to changes in the Arctic circulation. At the same time, the melting of Arctic ice can affect ocean currents, which, in turn, will cause a cooling in Europe, as well as reduce the amount of precipitation during monsoons (which is critical for South Asian countries).

Scientists from the Netherlands investigated the effect of melting ice and the resulting increase in oceanic evaporation on the growth of precipitation in the Arctic and regions close to it. According to the authors (Bintanja & Selten, 2014), the consequences of an increase in humidity and precipitation in the Arctic can increase the growth in the amount of snow falling, which will regulate the growth of the Greenland ice sheet and changes in the level of the World Ocean.

The article by Cohen et al. (2014) investigates the problem of the Arctic amplification (amplification of the amplitude of temperature fluctuations in the Arctic compared to the Northern Hemisphere). The authors consider the relationship between climate change in the Arctic and meteorological cataclysms occurring in

mid-latitudes (First of all, scientists were interested in excessively high or low temperatures).

Dani and Loreto (2017) draw attention to the relationship between the warming of the Arctic climate and the increase in the concentration of dimethyl sulfide, an organic sulfur compound, in polar waters and the atmosphere. Dimethyl sulfide is naturally produced by some algae and phytobacteria. The melting of Arctic ice stimulates the growth of these organisms, and therefore the concentration of dimethyl sulfide may increase. The release of this substance into the atmosphere can cause a cooling of the climate.

In conclusion, it should be noted (Hammill et al., 2021) the impact of the reduction of the ocean ice cover on the marine fauna. For example, the lack of ocean ice prevents seals from breeding (which endangers the survival of polar bears that feed on them). Reducing the sources of traditional hunting will affect the lives of indigenous peoples.

There is a possibility that fish species traditionally living in the ocean will not be able to adapt to changing conditions (McBride et al., 2014).

Permafrost melting carries a greater risk for the implementation of economic activities. Thus, according to Badina (2021), one should pay attention to the fact that 40% of the infrastructure of Russian cities located in the permafrost zone is in critical condition due to the thawing of frozen rocks. Moreover, the melting of permafrost will lead to emissions into the atmosphere of about 100 billion tons of methane (which is a greenhouse gas and will only enhance the effect of global warming).

Terry V. Callaghan (Johansson et al., 2012) writes that the volume of permafrost will significantly decrease by 2100. This will lead to sinkholes of the soil, drying out wetlands in some areas and the formation of marshes in others, increasing methane emissions and increasing sea level.

The common for the Arctic and subarctic countries of the world, a serious attitude to the environmental consequences of climate change in the Arctic is confirmed by the mention of such risks in almost all of the considered state Arctic strategies.

Analysis of the numerous sources of risks in the Polar Regions due to the warming of the Arctic climate makes it possible to single out the following:

- Strengthening the processes of global climate change due to the impact on the Atlantic meridional circulation and the reduction of the ice cap.
- Melting of permafrost and destruction of the infrastructure built on it.
- Changes in the natural habitat for various species of flora and fauna (as a result—their extinction and disappearance).
- Negative impact on the traditional life of the indigenous population.

1.2.2 Risks of the Polar Regions Due to a Clash of Interests on Control over the Arctic Territories

The Arctic territories are of interest to countries due to the fact that they have significant reserves of crude oil, natural gas, as well as coal and coking coal, deposits

of precious, rare earth and non-ferrous metals—gold, nickel, copper, tungsten, uranium, platinum, palladium, molybdenum, and others. Diamonds and other precious stones are mined here. Under the ice of the Arctic, about 83 billion barrels of oil (about 10 billion tons) lie, which is 13% of the world's undiscovered reserves. Natural gas in the Arctic, according to scientists, is about 1550 trillion cubic meters. At the same time, most of the undiscovered oil reserves lie near the coast of Alaska, and almost all of the Arctic natural gas reserves lie off the coast of Russia. Scientists note that most of the resources are located at depths of less than 500 m.

The main risk of the polar countries is the risk of actually losing control over the Arctic territories, both belonging to states in accordance with the current realities of international law, and losing control over territories, control over which is not legally fixed at the current moment for the applicants.

Taking into account the growing geopolitical tension every year over the past 15 years, possible scenarios for resolving territorial disputes (always being potential hotbeds of open conflict) include, among other things, military confrontation up to the use of nuclear weapons.

It is important to note that the Arctic struggle is waged not so much for territories as for direct rights to use polar resources. And if territorial claims exist for an extremely limited list of countries, then economic opportunities are of interest to almost all economically strong actors in the world arena, which significantly expands the list of countries that have their own voice in resolving this issue.

Thus, the resolution of controversial issues of ownership of the Arctic territories, in contrast to standard border conflicts, requires a truly global consensus or the consensus of key actors in world politics.

The actual loss by a polar country of the continental part of the Arctic territories in the current configuration of the world order can occur only under one scenario—a scenario of a military conflict. Despite the fact that most experts consider such a conflict unlikely (especially in view of the disputes between the fundamental nuclear powers, which, technically, are capable of destroying not only each other, but also, according to some estimates, put an end to human civilization), in practice we see strengthening the military presence of all subjects of territorial disputes.

Various forms of military presence are considered. It is proved that from the point of view of the country's defense capability at the moment, none of the Arctic states has a real need to deploy a large number of military facilities in the Arctic territories.

Note that plans to increase the military presence are contained in the national Arctic strategies of a number of states (for example, Norway, Canada, Denmark).

The loss of the disputed Arctic territories, which are perceived as their own, is possible not only in a military conflict. Given the extreme impact of globalization processes, the loss of territories can take the form of a lack of opportunities for economic exploitation, realized with the help of a wide range of information and economic pressure tools.

Any forms of non-military pressure can undoubtedly be overcome by the actual economic development of space, which legally may not belong to the state, with the support of military force as a factor in the absence of foreign economic agents.

One of the key opportunities for using the Arctic territories is international cooperation, international trade interaction (a significant reduction in transport costs). The greatest benefits from the acquisition of the Arctic territories will be received by the states that can ensure the maximum possible openness for foreign economic entities, for foreign capital and technologies while preserving the national interests of the state. Neither the military, nor the economic, nor the information blockade will obviously make it possible to realize these opportunities.

It seems obvious that all applicants to the polar territories are striving not to increase tensions but to create an optimal balance between demonstrating their own interests in the region and demonstrating informational, legal openness, readiness for dialogue and compromise, and for international cooperation. However, in this conflict of interests, different parties have fundamentally different possibilities of pressure on other actors, the only aspect in which relative parity is observed is the military one. Otherwise, there is a likelihood of a situation in which applicants weaker in terms of the totality of factors can be forced out of the region.

Only Russia (relative) and the USA (real) have actual political sovereignty among the polar countries, and all the rest follow in the wake of the USA. Thus, Russia's position in international disputes is the most unstable. In addition, at the moment, the leaders of the USA and some EU countries are demonstrating negative rhetoric towards the Russian Federation.

Therefore, since the 2000s, in the global information field, through the efforts of the countries of the USAs and Western Europe, a negative image of the Russian Federation as a state with an expansionary-imperial worldview has been formed which does not correspond to reality. The logical consequence of this discriminatory approach is economic sanctions, which undermine the country's competitiveness both in the world arena in general and in the Arctic region in particular. Similarly, it is possible to exclude from the process of distribution of the Arctic territories and other players ideologically opposed by the supporters of the unipolar model of the world order.

Summing up, it can be noted that the risks of losing territory can be realized both through a military clash and through geopolitical confrontation in the information and economic field.

A separate item can be highlighted the likely changes in international legal norms, for example, the UN Convention on the Law of the Sea of 1982, which is currently the key document securing the rights of polar states to the respective territories. The withdrawal of politically influential countries from this document may entail irreversible consequences both in the Arctic region and throughout the world. What is especially important, at the moment, the country, which is a recognized world leader—the USA, has not yet joined this Convention.

Thus, among the risks of the polar regions due to a clash of interests on control over the Arctic territories, the following can be distinguished:

- Military confrontation over the delimitation of the Arctic shelf (and the Arctic resources located on it).
- Loss of control over part of the Arctic shelf due to regulatory changes.

- Geo-economic confrontation on the delimitation of the Arctic shelf (Manifested in the form of refusal to implement joint projects, suspension of scientific and technical cooperation, acceptance of tariffs and non-tariff barriers that are unfavorable for other parties, pressure in the media).

1.2.3 Risks of the Polar Regions Due to Conflicts of Interest on the Regulation of Arctic Shipping

The melting of the Arctic ice, in addition to many negative consequences, will undoubtedly contribute to the development of navigation along the Northwest Passage and the Northern Sea Route. Figure 4 shows possible routes for Arctic shipping (Humpert, 2011). The economic benefits of managing shipping and organizing services along the entire Arctic route can be reaped by countries such as Russia and Canada. At the same time, not all states agree with the establishment of national jurisdiction over these sea lanes.

For example, the US Arctic policy emphasizes the need to ensure freedom of the high seas. According to this logic, the Northwest Passage is a strait used for international shipping.

Fig. 4 Arctic sea ice extent. 1981–2010 median (gray line); 2011–2020 (blue line); 1979–1990 (yellow line) (Humpert, 2011)

Note that the dispute over the status of the Northwest Passage has been ongoing since the 1960s. Canada claims that the waterways passing through the Canadian Arctic Archipelago are its inland waters on the basis of "historical right" (Based in historic title) property. Consequently, the jurisdiction of the Canadian state extends to the Northwest Passage. The USA claims that the Northwest Passage is an international strait, which gives foreign states the right to navigate its waterways without the consent of the Canadian side.

The legal and regulatory confrontation between states has been going on for a long time and is complicated by the fact that the USA has not yet ratified the UN Convention on the Law of the Sea. Canada, on the other hand, signed it and, moreover, initiated and promoted the introduction into the 1982 Convention of a special regime in areas covered with ice, enshrined in Article №234 of the document.

According to the Convention, "coastal states have the right to enact and enforce non-discriminatory laws and regulations to prevent, reduce and control pollution of the marine environment from ships in ice-covered areas within the exclusive economic zone, where climatic conditions are particularly severe and the presence of ice covering such areas during most of the year create obstacles or increased danger to navigation, and pollution of the marine environment could seriously harm the ecological balance or irreversibly disrupt it. Such laws and regulations take due account of shipping and the protection and conservation of the marine environment on the basis of the best scientific evidence available."

Canadian scientist Michael Byers (Byers & Lodge, 2019) writes that the Northwest Passage is a network of several sea routes through the Canadian Arctic Archipelago, consisting of 19,000 islands, many rocks and reefs. However, the Northwest Passage is deep enough for heavy ships (which the Panama Canal does not pass). According to M. Byers, the ownership of the Northwest Passage is beyond doubt: after all, the path runs past the islands of the Canadian archipelago. The US claims that the NWSC meets the criteria for an international strait, as it connects two parts of the high seas (the Arctic and Atlantic oceans) and is used for international shipping. From this point of view, the waterway is considered Canadian territory, but foreign ships have the right to transit through it.

A similar situation has developed around the Northern Sea Route (NSR). According to Russian legislation, the Northern Sea Route is a historically established national transport communication; the water area of the Northern Sea Route includes the water area, covering the internal sea waters and the territorial sea.

The same position was adhered to in the USSR, noting that the NSR is the internal waters of the state. In the late 1980s. M. Gorbachev proposed to open navigation for foreign ships along the Northern Sea Route with the support of Soviet icebreakers.

The Northern Sea Route includes a fairly wide area. "The water area of the Northern Sea Route is understood as the water area adjacent to the northern coast of the Russian Federation, covering the internal sea waters, the territorial sea, the contiguous zone and the exclusive economic zone of the Russian Federation and bounded from the east by the line of demarcation of sea spaces with the United States of America and the parallel of Cape Dezhnev in Beringovo strait, from the west by the meridian of Cape Zhelaniya to the Novaya Zemlya archipelago, the eastern

coastline of the Novaya Zemlya archipelago and the western borders of the Matochkin Shar, Karskiye Vorota Yugorsky Shar straits." (Gavrilov, 2015).

Such a broad definition of the boundaries of the water area of the NSR is explained by the fact that this route does not have a single and fixed route. Nevertheless, under any circumstances, in its significant part, this route is located within the exclusive economic zone of Russia, its territorial sea, or even in Russian internal waters, that is, it passes in areas falling under the sovereignty or jurisdiction of Russia.

However, according to the USA, the Northern Sea Route (as well as the Northwest Passage) includes straits used for international shipping. The creation of the Administration of the Northern Sea Route and the adoption of a federal law regulating icebreaker escort of ships and the procedure for navigation helps to strengthen Russian jurisdiction and increase the competitiveness of the NSR (Khan et al., 2018).

It is obvious that the closure of internal national waters to foreign ships is completely contrary to the interests of Canada and Russia: on the contrary, both countries are striving to expand the volume of shipping in order to extract maximum economic benefits. However, the establishment of national jurisdiction over the straits makes it possible to ensure the sovereignty of states, protect their interests and protect security (including environmental).

Among the risks of polar states due to a conflict of interests on the regulation of Arctic shipping are:

- Military confrontation over shipping regulation.
- Loss of the Russian Federation of control over shipping along the Northern Sea Route due to changes in the legal and regulatory nature.
- Geo-economic confrontation on the regulation of shipping (Manifested in the form of refusal to implement joint projects, suspension of scientific and technical cooperation, acceptance of tariffs and non-tariff barriers unfavorable for other parties, pressure in the media).

1.2.4 Risks of the Polar Regions Due to the Increase in Anthropogenic and Technogenic Impacts in the Arctic

The identified risks of increased human activity in the Arctic are quite similar in some of their manifestations to the risks of climate change. Nevertheless, if the ability of mankind to influence the processes of global warming is rather limited, then the risks of increasing anthropogenic and technogenic impact directly depend on the position of states on the development of the Arctic (Efremova et al., 2017).

Nevertheless, the idea of conserving the Arctic and leaving its nature almost intact is not supported by even the most active fighters for the preservation of the polar ecosystem.

What could be the consequences of increased human activity in the Arctic? According to a group of researchers (many of whom work for the World Wildlife

Fund), active development of the Arctic increases the risks of environmental problems (in particular, the reduction of biodiversity due to active resource extraction and shipping).

The authors (Moore & Reeves, 2018) analyze the habitats of populations of rare cetaceans (beluga whales, narwhal and bowhead whales) and argue that the development of oil production and the laying of new sea routes can cause irreparable harm to the fauna of the Arctic seas and, thus, undermine the well-being of indigenous peoples, whose occupation is associated with sea hunting.

In the joint work of scientists from Germany, Russia, and the USA (Kuemmerle et al., 2014), it is shown what harm can be caused to the wildlife of the Russian tundra (namely, the population of reindeer) the development of Arctic oil and gas fields.

Scientists of the Murmansk Marine Biological Institute of the Kola Scientific Center of the Russian Academy of Sciences, after conducting a sea expedition, came to the conclusion that at present, the seas of the Russian Arctic as a whole retain a relatively low level of anthropogenic pollution, with the exception of a few areas. These areas fall within the zones of local activity and are mainly associated with the areas of the port infrastructure. In other words, the long-term anthropogenic impact on the Arctic marine environment has a focal character with the formation of centers of anthropogenic pollution in the estuarine areas of large rivers and zones of port infrastructure. The scientific team within the framework of the project "Russian Federation—Support to the National Action Plan for the Protection of the Arctic Marine Environment" of the United Nations Environment Program (UNEP) and the Global Environment Facility (GEF) carried out a diagnostic analysis of the state of the environment in the Arctic zone of the Russian Federation. According to this analysis, scientists have come to conclusions that support the research of their Murmansk colleagues. Strong and moderate negative impacts of anthropogenic impacts on coastal marine ecosystems in the Arctic are most often limited to a local or local scale. And although pollution accompanies most types of activities on the coast and at sea, the maximum possible fishery damage from modern pollution of the Arctic does not exceed the loss of 0.01% of the biomass of commercial species inhabiting the waters of the Arctic shelf of Russia.

At the same time, there is currently a "greening of the Arctic competition"—increased pressure from environmental organizations and an increase in environmental standards and requirements, which may complicate activities in the region, but is an objective direction for the development of international relations. Anthropogenic and technogenic activities—aspects that can be directly controlled by states through the establishment of environmental standards; however, there is currently no single international environmental standard. But there are examples when individual countries are trying to rectify the situation. Thus, Finland, during its chairmanship of the Arctic Council, created a database on the sources of air pollution in the Arctic with soot (black carbon) and methane emissions. The main sources of soot emissions in the Arctic are transport and households, where wood and coal are used for heating, as well as forest fires, power plants and gas flares in oil fields.

Linda Nowlan (2001), published with the support of the International Union for Conservation of Nature (IUCN), notes the need to develop a unified regulatory framework aimed at preserving the Arctic ecosystem and achieving sustainable development. Indeed, the national Arctic territories have their own environmental standards: for example, Denmark, Finland, and Sweden are subject to European environmental legislation, and the USA and Canada are members of the North American Agreement on Environmental Cooperation (NAAEC). Linda Knowlan considers the Arctic Environmental Protection Strategy adopted in 1991 (Strategy, 1991) by all polar states as a basis for the emergence of such uniform standards. The Strategy declares that the Arctic countries are committed to the idea of international cooperation in the field of protecting the Arctic environment and its sustainable and equitable development and, thereby, protecting the culture of indigenous peoples.

The countries that signed the Strategy commit themselves to cooperate in the field of scientific research on environmental pollution processes, assess the potential environmental impact of development activities, implement measures and consider further measures to control pollutants and mitigate their negative impact on the environment. Environment of the Arctic. At the moment, Russia is developing a standard for the environmental safety of the Arctic—a kind of polar environmental code, the adoption of which is aimed at generalizing the environmental problems of the region and ensuring environmental safety.

Thus, among the risks of an increase in anthropogenic and technogenic impact (increased human activity in the Arctic), one can single out:

- Increase in environmental pollution (including an increase in the likelihood of an environmental disaster due to an oil spill).
- Changing the traditional living environment of the indigenous population.
- Negative impact on the population of Arctic animals (change and decline).
- Increased pollution of sea waters.
- Reduction of biological marine resources due to their intensive fishing.
- Negative impact on biological marine resources (both due to pollution and due to increased noise and intersection of sea routes with the trajectory of movement of fish and marine animals).
- Poaching of biological marine resources.
- Negative impact on traditional crafts of the indigenous population.

1.2.5 Risks of the Polar Regions Due to the Low Level of Socio-Economic Development of the Arctic Territories

The next group of risks is associated with the low level of socio-economic development of the Arctic territories. Undoubtedly, the degree of exploration and development of the Arctic space depends on the level of socio-economic development of the nation states to which the Arctic territories belong.

In other words, national social and economic problems in many ways give rise to the risks of a low level of socio-economic development of the Arctic territories

associated with the opportunities that states have for the development and development of these regions (Romashkina et al., 2017). Despite the importance of geopolitical, environmental, and research issues, the resource potential of the Arctic contributes to the socio-economic development of the Arctic territories.

We have identified the risks that appear under the condition of a low level of socio-economic development for Russia (Since it is the geo-economic Arctic strategy of Russia that is a priority for us). Let us present the highlighted risks:

- Lack of labor (especially qualified).
- Low production potential (insufficient number of production facilities).
- Low labor productivity.
- Lack or insufficient development of transport and logistics, energy and information and communication infrastructure.
- Poor provision of education and health services.
- Absence or insufficient number of objects of housing and civil construction, trade, household, medical, cultural, educational purposes.
- Lack of investment for the renewal of fixed assets and the implementation of large-scale projects.
- Lack of government funding.
- Deterioration of the icebreaker fleet.
- Low standard of living of the indigenous population.
- Negative demographic processes and population outflow.
- Lack of funds for monitoring the Arctic territories and water areas.

To understand the existence of similar problems of socio-economic development in other countries, let us consider the features of the socio-economic development of Alaska, Yukon, Nunavut in comparison with the patterns of development of the Russian Arctic territories.

About 85% of Alaska's budget is replenished from oil revenues. It is the oil and gas industry (as well as the mining of gold, zinc, silver, molybdenum, and other mineral resources) that is the driving force behind the development of this region. Other sectors of the economy are associated with fishing, tourism, and logging.

The predominance of the oil and gas industry in the economy and the decline in oil prices in 2015 lead to an increase in unemployment in the region (according to specialists from the Alaska Department of Labor and Workforce Development) (Fried, 2018).

According to experts from the Department of Labor and Employment of the State of Alaska, the region has the highest degree of "turnover" of the population (In other words, the composition of the population of Alaska changes frequently: some people come to temporary work and then leave the state). This is also due to the presence of large American military bases in Alaska (In 2014, there were about 22,000 people at the military bases of Alaska out of 735,000 of the total population of the state).

The state's remoteness from the main territory creates a number of additional difficulties. In particular, according to some experts, food prices in Alaska are higher than the national average, precisely for this reason (Note that in Alaska, per capita incomes exceed the national average and amount to about 32,000 and 28,000 dollars,

respectively, the average income of families is 69,000 and 52,000 dollars. Development problems of Alaska are also associated with the mono-directionality of the economy; experts note the subsidization of the region.

To protect the interests of the indigenous peoples of Alaska, the Alaska Native Claims Settlement Act was passed in 1971 on the granting of land ownership rights and resolving a number of issues related to the use of natural resources in the territory of traditional residence of the indigenous population. The indigenous people were allocated land holdings in the territories of their traditional residence, which provided them with the opportunity to maintain livelihoods through the use of surface and underground resources. Moreover, this law also determined the creation of the Alaska Native Regional Corporations. Local corporations and their shareholders receive financial support from the federal government through regional corporations. Interestingly, ethnic requirements were imposed on the shareholders of corporations: they had to possess at least a quarter of the blood of one of the indigenous peoples of Alaska. Thus, the state's land and natural resources were privatized, and a private-collective popular form of ownership was formed (Berman, 2018).

State aid to its Arctic regions is also provided by Canada: Yukon, Northwest Territories and Nunavut. The Territory budget, including grants, is maintained by the Federal Department of Aboriginal Affairs. The specificity of socio-economic development is illustrated by the following statistics: according to 2011 data, Canada ranked 6th in the world's HDI ranking, while its northern territories (Yukon, Northwest Territories, Nunavut) were, respectively, 17th, 3rd, and 38th. In terms of life expectancy of the population, the country was in 13th place in the world, the northern territories occupied the last three places in the country and, respectively, 40th, 38th, and 100th in the world. In terms of the average length of study, Canada was in sixth place in the world, the Yukon—in fourth; The Northwest Territories are in tenth place, Nunavut is in the last, 13th place in the country, and, respectively, 9th, 12th, and 30th in the world. In terms of income, Canada is in 16th place in the world ranking; the northern territories are leaders in this indicator and are ranked 1, 3, and 6 in the country, 5, 3, and 11 in the world. Yukon is an extremely sparsely populated region; as of 2012, only 0.1% of the total population of Canada lived in it; at the same time, the population density was lower than in the Chukotka and Nenets Autonomous Okrug, the two most "deserted" regions of the Russian Federation.

Experts from the Department of Economic Development of the Government of the Yukon note that in 2018 the rate of GRP growth in the region was the lowest in the country. The reason for this was the reduction in the extraction of mineral resources. The specificity of the region, which lies in the low population density and, at the same time, the desire to develop the extractive industries, positively affects the value of the unemployment rate, which in the Yukon is the lowest in the country. Nunavut is the most sparsely populated region in Canada. The region is also very rich in minerals (gold, hydrocarbons, zinc, silver, etc.). Nunavut is also a special region in terms of legal and regulatory aspects: it was created in the early 1990s by separating a separate Inuit area from the Northwest Lands.

So, the main problem of the socio-economic development of the Arctic territories of Canada is the demographic sphere and the associated lack of labor resources. To improve the skills of the local workforce and develop education in Nunavut, the Arctic College was established, which functions by distributing educational centers in aboriginal communities and developing priority educational programs for the indigenous population. Nunavut also has Aboriginal corporations similar in purpose to the regional corporations of Alaska Natives. Aboriginal corporations play a role in creating their own industries that operate on the principle of "dualism," ensuring the preservation of traditional economic activities while actively participating in the development of natural resources in northern Canada. Indigenous corporations serve to create jobs for Aboriginal people.

Nunavut, Yukon, Alaska, and the Arctic regions of Russia are united by a number of common problems associated, first of all, with the poorly populated territories, and, consequently, with the lack of personnel.

So, for example, the Nenets Autonomous Okrug ranks last in the list of subjects of the Russian Federation in terms of population (43,373 people as of January 1, 2015, of which 23,939 people, i.e., 55% of the population are in Naryan-Mar—the administrative center of the region). Chukotka Autonomous Okrug ranks last in the list of subjects of the Russian Federation in terms of density (and the penultimate in terms of population): 0.1 people per 1 km^2 and 50,000 people, respectively).

The economic mono-orientation of the Arctic regions of Russia, Canada, and the USA is also similar. The Arctic territory of the Republic of Yakutia is rich in deposits of gold, tin, lead, tungsten, mercury, and semiprecious stones. The basis of the economy of the Yamal-Nenets Autonomous Okrug is the oil and gas complex (Subsidiaries of OJSC Gazprom and OJSC NK Rosneft operate in the Yamal-Nenets Autonomous Okrug). The Nenets Autonomous Okrug possesses large reserves of oil and gas, as it is located in the northern part of the Timan-Pechora oil and gas province, which is ranked fourth in terms of oil reserves in Russia. The region is rich in natural resources (Deposits of iron, apatite-nepheline, copper-nickel ores, raw materials for building materials, semiprecious stones, etc., as well as the most famous hydrocarbon deposits—the Shtokman and Prirazlomnoye deposits should be highlighted).

Thus, the Arctic territories of the countries of the world have similar problems of socio-economic development.

1.2.6 Risks of the Polar Regions Due to the Insufficient Level of Development of Life Safety Protection Systems

Among the risks of polar states due to the insufficient level of development of life safety protection systems, the following were highlighted:

- Insufficient effectiveness of search and rescue operations.
- The risk of terrorist attacks.

The life safety protection system in the Arctic includes the appropriate security infrastructure (It includes reconnaissance and monitoring tools, attack prevention, various military bases, systems for organizing search and rescue operations, etc.), as well as measures taken by the state in this area.

The Arctic is a sparsely populated region and, probably, therefore, not the most attractive for large-scale demonstration terrorist attacks. Nevertheless, for example, an attack on the infrastructure facilities of the Northern Sea Route will significantly undermine the prestige of this transport corridor and reduce the volume of shipping, which is extremely disadvantageous for Russia. Graça Ermida (2014) wrote about the threat of terrorism in the Arctic.

Almost all polar states are deploying military formations to the north, creating special bases and developing monitoring systems. Perhaps this is due not only to the desire to ensure the security of these territories but also to an ordinary demonstration of military power.

For example, Canada has developed the Polar Epsilon military program, designed to create a unified system of all-weather control of vast water areas with a radius of up to 1000 nautical miles from the coast of Canada and the Arctic sector of Canada (Canada, 2009). Further, in Canada there is a coast guard system NORDREG, in which all ships entering the country's maritime territory are required to register.

Canada and the USA envisage the further development of aerospace tracking and control systems within the joint NORAD system (North American Aerospace Defense Command).

Norway in its Arctic strategy also states the need to increase the country's military presence in the region. Note that Norway is a training ground for the annual NATO Cold Response exercises. Also in the press you can find reports of additional large-scale NATO exercises codenamed Joint Viking. The Norwegian government plans to increase the participation of allies in military exercises and maneuvers in the north and will make efforts to maintain interest in them from allied countries and partners (Affairs, 2006).

Denmark draws attention to the need for cooperation between countries on maritime safety issues (For example, for a ship in distress to receive timely assistance from other states). To ensure the safety of navigation, Denmark introduces special rules for the inspection of ships and recommends that other countries have recourse to the same, having adopted the Polar Code in the near future.

In addition to inspections, it is necessary to promote the modernization of infrastructure, for which in 2009 Denmark created a special Transport Commission. The emphasis is on the use of satellite navigation technologies. In particular, ships entering Greenland waters must regularly report their position to the GREENPOS system.

Also in Denmark, it is proposed to create a special unit—Arctic Response Force (Arctic unit of rapid response).

Denmark has long and actively cooperated with the USA on military issues. In 1951, the USA and Denmark entered into an agreement on the joint defense of the island, as a result of which the largest American base in the Arctic region appeared in the town of Thule (Denmark, 2011).

Denmark signed an agreement of understanding with Canada aimed at strengthening military cooperation in the Arctic, including conducting joint exercises and cooperation in search and rescue operations.

Note that Roskosmos plans to implement a project to launch the Arktika-M1 and Arktika-M3 satellites. These satellites will provide Roshydromet with meteorological information, control emergencies, monitor the passage of ships along the Northern Sea Route, and carry out environmental monitoring of the environment. The constellation will also include the Arktika-R radar control satellite, which will carry out measurements related to the exploration of mineral deposits, and the Arktika-MS communications and communications satellite. The devices will contribute to the development of the information and communication system of the Russian Arctic.

Further, one of the elements of ensuring security in the Arctic zone of the Russian Federation is the federal system of search and rescue support for maritime activities of the Russian Federation, which is planned to be created (according to the Concept for the development of the search and rescue support system of the Navy for the period up to 2025) for the search and rescue of people and objects of maritime activities in the water space.

Thus, it seems that the main polar states are striving to build up forces in the Arctic space, and this is not associated with possible terrorist risks.

With regard to the risk of insufficient effectiveness of search and rescue operations, the polar countries seek to cooperate in this matter. For example, on May 12, 2011, in Nuuk, an Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, or in an abbreviated version—Arctic Search and Rescue Agreement (SAR) developed at the initiative of the Russian Federation and the USA. This document was the first legally binding instrument created within the framework of the Arctic Council.

By agreement, each state is assigned an area of responsibility for conducting search and rescue operations in Artik. In 2012, the first operational SAREX 2012 search and rescue exercises of eight Arctic states took place.

Among the most recent activities in the field of joint search and rescue, the joint exercises between Russia and Norway, completed on June 4, 2015, should be noted. In addition to practicing the rescue of the crew of a ship in distress, oil spill response drills were held.

For Russia, the effectiveness of search and rescue operations is associated with the implementation of the provisions of the Concept for the development of the search and rescue support system of the Navy for the period up to 2025. As an example of the implementation of measures to support search and rescue operations, one can single out the opening in Arkhangelsk of the third of ten search and rescue centers that are planned to be located on the Northern Sea Route. The first centers were opened in Naryan-Mar and Dudinka; In 2009, 910 million rubles were allocated for the construction of a complex of search and rescue centers.

1.2.7 Risks of the Polar Regions Due to the Insufficient Level of Development of the Arctic Science and Technology

The Arctic is a territory of harsh climatic conditions, a fragile ecosystem and a place where the interests of various countries of the world collide due to the richness of resources and the strategic position of sea transport corridors; that is why, in almost any area of the Arctic life, the development and application of special technologies is required.

The development of science and technology is the basis that will make it possible to carry out effective development and achieve sustainable development of the Arctic territories. It is the level of scientific and technological development that largely determines the state's ability to minimize the other risks highlighted above.

For example, the warming of the Arctic climate is causing the permafrost to melt, which contributes to the destruction of the foundations of buildings. The development of technologies for Arctic construction will help to minimize the consequences of the risks of soil failure and will allow the construction of buildings that do not require subsequent repair and reconstruction after the frozen ground thaws.

If the state possesses technologies to eliminate the consequences of an oil spill, then the environmental damage of such disasters will be reduced.

An important area requiring the use of new scientific and technical developments is the electric power industry. There are a number of problems here that are the same for all polar states: the need to develop energy conservation, difficult climatic conditions and the high cost of importing energy resources. Obviously, the latter problem should be solved through the use of local resources, but this requires the construction of oil refineries (and not just production platforms), which is a very long process, and after all, the implementation of energy conservation needs to be established at the very first stage of the development of new remote Arctic territories . In this case, the use of small-scale energy technologies seems to be optimal (in particular, wind energy, because the Arctic is the land of severe winds).

Finally, to carry out exploration of the Arctic shelf and submit applications to the UN to designate an exclusive zone, a number of studies and development of technologies for determining the shelf boundary are required.

The development of Arctic science and technology, of course, is determined by the general state of this area in each polar state, as well as the ability to implement joint research projects. Of course, the state influences the directions of fundamental and applied research by allocating funds and identifying priority areas.

Scientists from Canada and the USA made a great contribution to Arctic research (The analysis was carried out by the number of publications registered in the WoS system; some of the research work was carried out by joint teams of scientists (Didenko et al., 2020)).

On June 1, 2015, Canada adopted the Canadian High Arctic Research Act, which announced the formation of the Polar Knowledge Canada organization (can be translated as the Canadian Polar Research Organization). The goal of this organization is to "strengthen Canada's leadership in Arctic technology and conduct world-class breakthrough research." This organization will be responsible for the

operation of the new research station, The Canadian High Arctic Research Station (CHARS).

The experience of Canada's creation of a network of research centers ArcticNet, which serves to facilitate interaction between scientists and indigenous organizations, municipalities, federal and local agencies and the private sector for Arctic research, is extremely interesting for Russia. More than 145 researchers from 30 Canadian universities, 8 federal, and 11 local agencies carry out joint research activities with scientists from Denmark, Finland, France, Japan, Norway, Poland, Russia, Spain, Sweden, Great Britain, and the USA; at the moment the network is implementing 41 research projects in various fields. The main goal of ArcticNet's work is to promote the development and dissemination of scientific knowledge for the development of national policies and adaptive strategies to minimize the impact of Arctic climate change and modernize the Canadian Arctic.

In 2013, the trilateral Transatlantic Ocean Research Alliance (The Transatlantic Ocean Research Alliance) was formed between the USA, Canada and the European Union, one of the activities of which is cooperation in Arctic research.

Interestingly, back in 1998, experts from the Canadian scientific community noted the existence of a deep scientific crisis in the field of Arctic scientific research, which was caused by the lack of formal scientific policy and government funding.

Interest in the Arctic, accompanied by an increase in polar research programs, occurred, most likely, in all countries, in 2004–2006, when the world started talking about the rapid melting of ice and about the prospects and problems that such climatic changes open and provoke.

In the USA, there is an independent agency that advises the Congress and the President of the country on polar research—USARC (United States Arctic Research Commission), created back in 1984. The objectives of the Commission are:

- Carry out the development of national policy, priorities, and goals necessary for the formation of a federal target program for the development of Arctic fundamental and applied scientific research.
- Promote the implementation of research projects and develop recommendations for the President and Congress in this area.
- Collaborate with the National Science and Technology Council and the National Science Foundation.
- Lead the Interagency Arctic Research Policy Committee to develop national Arctic research projects and a five-year implementation plan.
- To interact with local and international research organizations and programs.

To coordinate Arctic research activities in the USA and implement a five-year development plan for this area, the Interagency Arctic Research Policy Committee (IARPC) created a special structure, IARPC Collaborations, consisting of 12 thematic groups of scientists.

IARPC Collaborations serves for the cooperation of research initiatives of scientists from various federal and non-governmental organizations, industrial enterprises, representatives of indigenous peoples, etc. The main areas of activity (and areas of work of 12 thematic groups, respectively) are related to environmental,

meteorological research, work in the field of health and systems development collection of information and monitoring.

Alaska also has a large International Arctic Research Center (IARC), founded in 1999 with the support of the American and Japanese governments.

Since 2001, the international network of Arctic research stations SCANNET has been developing. Initially, it included the stations of the polar states. The network was founded at the initiative of the European Union and initially included nine stations, and then expanded to 33 [70]. At the initiative of SCANNET, on the basis of the Royal Academy of Sciences of Sweden, the INTERACT network was launched, uniting research stations and organizations of both eight polar states and non-Arctic countries. In total, the INTERACT network includes 73 stations in 18 countries of the world (Only 33 stations included in the SCANNET system are located in the Arctic zone; the southernmost of the stations is located in Kyrgyzstan on the slopes of the Tien Shan mountain range).

Russia is represented by 18 INTERACT stations (for example, in the village of Chokurdakh, on the White Island in the Kara Sea). Also, since 2005, a joint Russian-German station has been operating on Samoilov Island in the Lena River delta. For comparison: Canada has 17 stations, Alaska—2, Svalbard (Spitsbergen)—5, Finland—8, Sweden—3.

The partners of the project are such organizations as the Institute for Biological Problems of the Cryolithic Zone of the Siberian Branch of the Russian Academy of Sciences, the Yugorsk State University and the Faculty of Geography of Moscow State University.

In Russia, the situation with Arctic science has recently begun to improve. In 2015, the program of drifting stations was restored, which was suspended in the summer of 2013. The opened station was named "North Pole—2015." Previously, all stations after the words "North Pole" had a serial number; the last one, evacuated in 2013, bore number 40. Note that the world's first drifting station "North Pole—1" was founded in 1937 in the USSR on the initiative of O.Yu. Schmidt. It is interesting that it was over this station that Valery Chkalov's famous flight took place. In 2012, an article containing a review of N. Marchenko's book "Seas of the Russian Arctic: Navigation Conditions and Accidents" mentioned that out of 67 Soviet polar stations located along the NSR route, only 16 remained operational.

Among the latest projects in the development of Arctic science and education, the creation of the Northern (Arctic) Federal University named after M.V. Lomonosov in Arkhangelsk (NArFU). On the basis of the university, cooperation with the international consortium "University of the Arctic" is carried out. The University of the Arctic is an international network of universities, colleges, institutions, and organizations working in the field of higher education and research activities in the North (a total of 150 educational institutions and about one million students of circumpolar countries). Russia is represented by 32 educational institutions, with NArFU occupying one of the leading positions.

Thus, at present, Russia is striving to develop cooperation in the field of Arctic science with the countries of the world. For example, according to the Russian Academy of Sciences, in 2014, certain successes were achieved in the development

of scientific cooperation with Japan in the Arctic. Also, for quite a long time, cooperation with Norwegian institutions has been carried out.

The need for scientific cooperation in the study of the Arctic is proved, among other things, by the duration of international relations in this area. For example, since 1982, a global research event, the International Polar Year, has been taking place. As part of the first International Polar Year, which was attended by representatives of 12 countries of the world, for example, the first Russian polar station was founded in the Malye Karmakuly camp in the Novaya Zemlya archipelago.

Nevertheless, in the current geopolitical situation, there are risks of a possible rupture of scientific research relations for reasons outwardly in no way connected with the Arctic. There are reports in the press that Canada may refuse scientific cooperation with Russia for political reasons (with an eye on the opinion of the USA).

Undoubtedly, scientific exchange is mutually beneficial for all countries of the world and is extremely necessary for overcoming the scientific and technological backwardness of Russia that arose in the 1990s. It seems that any limitation of the circulation of knowledge and the rupture of scientific research relations with Russia will be dangerous for the development of international science as a whole (Although it will probably be more painful for our state in the short and medium term).

Thus, the following risks of an insufficient level of development of science and technology were identified:

- Lack of technologies for the Arctic infrastructure and housing construction.
- Lack of technologies in the field of exploration and production of minerals (as a result—the impossibility of realizing the raw material potential).
- Lack of technologies to ensure environmental safety (technologies for removing pollution, oil spill response, etc.).
- Lack of energy-saving technologies.
- Lack of icebreaking shipbuilding technologies.
- Lack of technologies in the field of defining the boundaries of the Arctic shelf.
- Lack of technologies in the field of life safety.
- Reducing joint international research.

Risks that are common to countries can be identified. For the polar countries, the common risks are provoked by global warming, the impact on the manifestations of which is rather limited. The danger is also posed by the risks of geo-economic and military confrontation in connection with the collision of interests of countries on the basis of control over Arctic resources.

Identifying the conditions (sources) and risks of the formation of the Russian Federation geo-economic strategy in the Arctic includes identifying the sources and identifying the risks they provoke. Identifying sources allows you to establish a causal relationship with the totality of risks generated by them. In other words, for each source, it is necessary to identify a number of associated risks. Assessment of risks and sources of their occurrence (conditions, the fulfillment of which leads to the formation of risks) makes it possible to highlight the priority directions of the state's activity in the emerging geo-economic strategy.

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