

# MASTER'S THESIS

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The impact of climate change and oil and gas companies operations in the Arctic on the life of indigenous peoples of the Russian North

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## **Introduction**

Indigenous peoples are among the first to feel the negative effects of climate change, as their culture, traditions and way of living are closely linked to natural resources and the environment. In particular, even minor changes in temperature or topography in the Arctic have a serious impact on reindeer herding, fishing, hunting and collection activities of the local population. As a result, indigenous communities living beyond the Russian Arctic Circle have to face and overcome new challenges: loss of land and resources, political and economic migration, unemployment, and violations of their rights and freedoms (Aipin, 2006).

For instance, a single pipeline that stretches through the land of indigenous peoples' may disrupt the whole lifecycle of them. In the first place, reindeer have to find bypass ways to reach their destination that may affect breeding cycles of these mammals, so fawns may be brought to light in a wrong place and also may not survive harsh conditions. Nature's balance is being violated in this case and it may jeopardise the issue of the peoples' survival, so indigenous people may face lack of livestock population which is vital for them, due to the fact that their economy is based on reindeer herding. In the second place, mentioned pipeline disrupts the temperature balance in the place. It is well known, that animals tend to stick closer to pipelines to warm up, in a long perspective this case may influence the genetic code of Arctic animals so they become less resistant to the cold. Taking into consideration that conventional hydrocarbon industry is to be replaced by sustainable sources of power in future, when this pipeline is cut off it may provoke mass extinction of arctic species because they will not be able to survive freezing cold of the region. Moreover, many scientists tend to state that proliferation of the Chronic wasting disease (CWD) (Al-Arydah et al., 2012.) among reindeer around the globe that is being provoked by prions may be connected with the Climate Change because it becomes easier for these spongiform infectious agents to survive in the Arctic ("Expanding distribution of chronic wasting disease | U.S. geological survey," 2023). It is necessary to underline that CWD is tremendously contagious and may genocide entire herd, undoubtedly, this epidemic issue also can destroy the whole tribe, due to

the fact that medics recommend not to stay in contact with infected animals, not to eat their meat and try to kill it, but still the dead body is dangerous both for people and animals ("CWD tracking," n.d.). This is just a tiny example of a single pipeline that may be that devastating for the vulnerable species of the Arctic, but cumulative impact of the whole industry should be multiplied and be taken into consideration by the humanity.

The special way of life, living conditions, and worldview of Arctic indigenous peoples put them in a special position, which is increasingly being taken into account by the Russian and international community. Political leaders at all kinds of forums, reindeer herders, hunters and fishermen in the taiga and tundra speak about it. It is important to emphasize that the aspirations of indigenous peoples are supported in the most important documents of the state. Thus, in 2020, the Strategy for the Development of the Arctic Zone of the Russian Federation and National Security until 2035 was developed and adopted, with an important priority of improving the quality of life of the indigenous peoples of the North living in the Arctic. The "Strategy of People's Saving in the Russian Federation for the period up to 2050", approved by the decision of the Coordination Council of the Public Chamber of the Russian Federation on National Projects and People's Saving of March 24, 2021, No. AG/9-KS, provides for the creation of the necessary socio-economic conditions to ensure a steady increase in the birth rate, a reduction in mortality, and an increase in life expectancy. It should be noted that these documents identify as one of the first tasks of state national policy the need to create conditions for the participation of small indigenous minorities in resolving issues affecting their rights and interests (Aipin, 2006).

Achieving a real partnership between indigenous peoples and industrial companies in the Russian North today becomes one of the conditions not only for the survival of these peoples, but also for protecting the geopolitical interests of the state and ensuring the operation of the most important sectors of the economy. Russia has a certain legal basis for regulating relations in the sphere of nature management, protection of indigenous peoples' rights, and development of the fuel and energy complex (Andrichenko L. V., 2005).

In modern conditions, the prospects of preserving and developing the culture of small indigenous minorities of the North are largely determined by the industrial development of the regions where they live. The extraction of hydrocarbons, the state policy in the sphere of subsoil use and the very presence of industrial companies in the North have significantly changed the socio-economic and ethno-cultural development of the peoples of the North (Benda-Beckmann K., 1999, pp. 9-13). At present, we can only talk about the beginning of the process of realizing mutual responsibility and mutual interest in establishing new relations. And the partnership cannot be established automatically, a certain work on its development and strengthening is necessary. In this research paper, we plan to investigate how oil and gas operations in the Arctic affect the development of the region (Buksina O.V. Vladimir Filanovsky-Zenkov, 2003). What programs, projects, and practices are oil and gas companies using in the Arctic to minimize the negative impacts of their operations on the region's ecology? We also intend to establish links between climate change, oil and gas operations, and Arctic indigenous peoples.

Purpose of the research work: to study the impact of oil and gas companies' activities and climate change on the daily life and survival of indigenous peoples of the Russian North.

The following research questions will be required to achieve the objective:

1. How does the traditional way of indigenous peoples' living being affected by the operations of oil and gas companies?;
2. What climatic and historical changes occurred in the past in the Arctic region due to the operations of oil and gas companies?;
3. How did the climate change influence the social aspects of life in areas of intensive natural resource use in the Arctic region?;
4. What are the possible prospects for the development of the Russian Arctic and its indigenous peoples in the context of climate change?;
5. What recommendations and proposals can be developed to address the identified problems?.

As a theoretical and methodological basis for writing the research work, the works of Russian and foreign scientists and researchers were used to study the

peculiarities of social and environmental issues of indigenous peoples, the development of global energy markets and climate change issues with the possibility of using this experience to model possible scenarios of industrial development in the long term (Berger P. and Lukman T., 1995).

Object of the study: changes in traditional forms of employment and seasonal migrations of the indigenous peoples of the Russian Arctic influenced by the operations of oil and gas companies.

Subject of the study: the impact of oil and gas companies' activities and climate change on the everyday life and social structure of indigenous peoples of the Arctic.

Issues of the impact of Russian oil and gas companies' operations on the traditional way of life of indigenous peoples of the North are addressed in the works of such Russian and foreign authors as: Agnyun V.V., Aipin E.D., Anderson D. Jr., Dr. Md. Shahidul Islam, Teresa Patricia Feria-Arroyo, Bogoyavlensky D., Bakhtin N., Golovko L.V., Gogoleva T.S., Vasilkova T.N., Evai A.B., Martynova E.P., Novikova N.I. and others.

A number of studies in international and Russian scientific literature are devoted to the study of reindeer breeding and migration in the Arctic. The problems of reindeer herd breeding, the threat of reproduction, and the breeding of offspring as a factor of survival of indigenous peoples of the Arctic have been covered by Glukhikh A., Md Rafiul Islam, Michael G. Tyshenko, Evladov V.P., Tamer Oraby, Wasserberg, Al-Arydah and others.

At present, there is a considerable number of scientific works devoted to the problems of interaction of indigenous and small peoples of the North with oil and gas companies operating in the Arctic zone, but the issues of the impact of climate change on this agenda are not so deeply covered. The problems and prospects of this interaction in the Arctic zone are mainly presented in the field of sustainable development and ecology in the works of professors of Tyumen State University (TyumSU) and Johns Hopkins University, United States.

But still there are not so many works devoted to the issue of changes and adaptation of traditional forms of employment and seasonal migrations of the indigenous peoples of the Russian Arctic influenced by the mentioned operations and

presence of oil and gas industry participants in the region (Buksina O.V. Vladimir Filanovsky-Zenkov, 2003). All aspects are covered separately whilst the constellation of factors becomes a basis for such research.

Scientific novelty of the research: we plan to realize our research project from the interdisciplinary point of view of social ecological economics. Our analysis of the specialized literature has shown that up to the present time the problematic issues related to the development of strategies and programs of oil and gas companies in relation to minimizing the negative impact of their activities on the climate of the Arctic region and indigenous peoples of the Far North remain beyond the attention of domestic and foreign scientists and ecologists. We expect to partially address this gap.

We plan to base our research in an institutional framework taking into consideration the fact that in the Russian Arctic there are two major groups of interest represented by indigenous peoples who are apt to stand for their interests preserving nature and their livelihoods as well as their traditional way of life and oil and gas companies that are aimed at value creation and economic profits, also there are state authorities that mitigate contradictions between two parties trying to meet the goals of indigenous peoples who are citizens of the state and industry that through its' revenues fulfils state treasury. This is why it is completely important to create proper institutions and power mechanisms that would fit both sides in order to meet the goals of all parties.

To carry out the research we used the following methods: theoretical (qualitative analysis, generalization), empirical (study of literature and method of expert evaluations).

The structure of the research work is conditioned by its objectives and content and includes: introduction, three chapters, conclusion and list of references. The introduction part covers the general information about the issue of climate change partly caused by the operations of Russian oil and gas companies and the impact of mentioned operations on traditional livelihoods of indigenous people. The first chapter describes the whole constellation of indigenous tribes that live in the Russian Arctic and also outlines their traditional ways of living (Bogoraz V.G., 1922).

Moreover, in the first chapter demographical and historical data is represented that depicts social aspects of their life throughout the entire history of the tribes. The second chapter represents contemporary tracks of social measures that companies are to take in order to face the issue of climate change that has aggravated by their operations. Also, the second chapter describes the affect of climate change on traditional livelihoods of indigenous people emphasising on interconnection between oil and gas companies and challenges that people face in terms of their traditional lifestyle maintenance. In the third chapter one can find proposals and recommendations how to overcome challenges that have already appeared and how to prevent future obstacles via implementation of brand-new methods and intergovernmental cooperation. Also, there are several scenarios presented with speculations on possible future development of the current situation. Conclusion of the article sums up the whole information in the thesis and shortly



## **Chapter 1: Indigenous Peoples of the Russian Arctic**

### **1.1 Origin, settlement, life**

The historical specificity of the indigenous peoples of the Russian Arctic is that they embody in this region the cultural, social and ecological heritage of a unique way of life (a kind of "Arctic civilization"), having mastered the natural environment and created life support systems several thousand years ago. On the other hand, the representatives of the so-called small indigenous peoples of Siberia (SMNS) have long been firmly rooted in the Russian state and in Russian history. Moreover, the circumpolar latitudes and their indigenous inhabitants represent, although remote, one of the necessary points of reference for understanding modern Russia. This is one of the brand characteristics of the image of Russia as a northern country.

Is the way of life of the Arctic inhabitants something that needs to be subjugated and remodeled into an all-Russian way of life? Or is it a world that it is desirable to preserve in its unchanged status? Or is there a possible third option, which we once referred to as "culturally oriented modernization"? These questions force us to think further about what Russian policy in the Arctic should be in the context of sustainable development, environmental security, and Russia's national interests as a whole. Since its establishment 82 years ago, the Institute of Ethnology and Anthropology of the Russian Academy of Sciences has been at the forefront of the study of the culture of the aborigines of the North. This report has been prepared on this basis (Bogdanov K.A., 1998).

The history of the indigenous peoples of the North goes back many millennia, but if we take the history of the Russian state, there were periods of a kind of allied (on the basis of trade) relations with the authorities of the empire, the incorporation of the aboriginal population several centuries ago into the Russian tribute system (through the payment of yasak), full or partial Christianization, and, finally, the rather total and harsh Soviet modernization, which included both a cultural revolution and a partial transition to sedentarization, and forced collectivization (Woodman G., n.d., pp. 13-20). In general, the policy toward the Arctic inhabitants has long been subordinated to utilitarian economic interests, ideological guidelines, and military-

strategic calculations. In many respects it remains so today, although the new Concept of State Policy in the Arctic has a deeper and more harmonious character.

Academic research into the history and culture of Arctic peoples has a long and remarkable history, starting with the first scientific expeditions and descriptions of the peoples living in the region (Butovskaya M.L., 2004). I would like to emphasize the Soviet scientific school of studying Arctic peoples. Today the study of indigenous peoples has intensified. Since 2014, the project "Indigenous Peoples and Industrial Development of the Arctic: Overcoming Risks and Development Strategies" has been implemented under the Basic Research Program of the Presidium of the Russian Academy of Sciences. A large number of regional historical, cultural and ethnographic studies are being implemented (SO, URO, FEB RAS), as well as joint international research. However, this cooperation is complicated not only by different ideological attitudes and different methodologies, but also by the lack of common approaches in interpreting the concepts used in Russia and abroad (Agnyun, 2009, p. 26-31.). This applies to the very concept of the Arctic. We start from the way the Arctic zone of the Russian Federation is defined in 2014 by the Decree of the President of the Russian Federation No. 296 "On the land territories of the Arctic zone of the Russian Federation". It includes the territories of eight subjects of the Russian Federation: 1) Murmansk Oblast; 2) seven municipalities of Arkhangelsk Oblast; 3) Nenets Autonomous Okrug; 4) Vorkuta Urban District of the Komi Republic; 5) Yamalo-Nenets Autonomous Okrug; 6) Norilsk Urban District, Taimyrsky Dolgano-Nenets Municipal District and Turukhansky District of Krasnoyarsk Krai; 7) five uluses (districts) of the Republic of Sakha (Yakutia); 8) Chukotka Autonomous Okrug.

Contrary to perceptions of nomadic reindeer herders, most Arctic indigenous peoples are sedentary. Some of them, like their ancestors, are engaged in herding, slash-and-burn agriculture, hunting, fishing, and maritime fur sealing ("Hunting regulations," n.d.). Some continue to lead a nomadic or semi-nomadic lifestyle of reindeer herding (Butovskaya M.L., 2004). About 20,000 people are nomadic in the Arctic. About 60% are in the Yamal-Nenets Autonomous Okrug.

Each indigenous people has its own language, epic, traditional occupations, unique way of life and methods of nature management inherited from ancestors and adapted to the harsh conditions of survival. In the modern Russian Arctic, only 18-25% of the Nenets, Dolgans, Chukchi, and Enets are engaged in traditional trades.

Representatives of small-numbered peoples of the North unite into communities. This is advantageous from an economic point of view: they receive state support and can use a simplified taxation system.

**The Saami** lived on the territory of the Kola Peninsula even before our era. They were reindeer herders, fishermen and hunters. They lived in communities - Siits - numbering from 70 to 300 people.

Until the 19th - early 20th centuries, the Sámi led a semi-nomadic way of life, making small seasonal migrations. Due to forced collectivization in 1920-1930, they practically stopped practicing traditional trades: as of 2011, only 13% were living a traditional way of life.

Today, the territory of the Sami people is part of several countries: Russia, Finland, Norway, and Sweden. The total number of representatives of this people is from 60,000 to 80,000 people, of whom 2,000 live in the Russian Arctic. The center of cultural life of the Sámi in Russia is the village of Lovozero.

The **Mansi** ethnos was formed as a result of the merger of local tribes of the Ural Neolithic culture and Ugrian tribes moving from the south through the steppes and forest-steppes of Western Siberia and Northern Kazakhstan. Therefore, the culture of this people combines the traditions of taiga hunters, fishermen and steppe nomadic herders.

Originally Mansi lived in the Urals and its western slopes, but Komi and Russians in the XI-XIV centuries displaced them in the Trans-Ural region.

Mansi are divided into groups of clans (fraternities): Por - descendants of aboriginal Uralians and Mos - descendants of Ugrians. They differ in origin and customs. Marriages are concluded only between representatives of opposite fraternities. Today about 60% of Mansi use the Russian language. 45% live in cities.

**Nganasans** are descendants of the oldest population of the Taymir - Neolithic hunters of wild reindeer. They are the northernmost people of Eurasia. They were formed as an ethnos by the XVII-XVIII centuries from several tribal groups.

The Nganasans hunted wild deer, waterfowl and furbearers, and fished. In 1921, a layer of large reindeer herders was formed. Today only about 100 people lead a semi-sedentary lifestyle necessary for hunting and fishing in the tundra. The rest live in a settlement built in the middle of the twentieth century. Nganasan language is spoken by only 14.5% of the representatives (according to 2010 data)

**Evenks** appeared as a result of mixing of aborigines of Eastern Siberia with Tungus tribes that came from Pribaikalia and Transbaikalia.

They have settled a vast territory from the Yenisei in the west to the Sea of Okhotsk in the east. They lead a nomadic lifestyle, are engaged in reindeer herding, but use reindeer as transportation. Subsistence is obtained mainly by hunting and fishing. The Evenk language includes several dialects. In addition, they usually speak Russian and Yakut (Anderson D.J. Tundroviki, 1998).

The ancestors of the **Chukchi** appeared on the territory of modern Chukotka in the IV-III millennia B.C. They first encountered the Russians in the XVII century: this confrontation resulted in a hundred-year war. In 1778 the Russians and the Chukchi concluded an official peace treaty.

The representatives of this people are divided into tundra and coastal tribes: some have a life and culture associated with reindeer herding, others with sea fisheries. Since the 1930s, the Chukchi have used an alphabet based on the Cyrillic alphabet with the addition of a few letters. Books are written mainly in Russian.

The ancestors of the **Eskimos** are Pacific Mongoloids who migrated northward. In Russia, the Eskimos are a small ethnic group living with or near the Chukchi on the eastern coast of Chukotka and Wrangel Island. Their traditional occupations are sea-farming, reindeer herding, and hunting.

The modern written language based on the Cyrillic alphabet appeared in 1937. The Eskimos of Chukotka and Alaska speak similar languages but write differently. The Eskimo language has many borrowings from English: it is the result of whaling, which involved ships from Great Britain, Scandinavia and America.

Chukotka Eskimos have preserved the practice of feeding the spirits of dead ancestors. Such rituals are performed both at home and in the tundra as a sign of respect for the deceased locals (Baiburin A.K, 1993).

**Koryaks.** The first mentions of this people are found in documents of the middle of the XVII century. According to their occupation and way of life, the Koryaks are divided into tundra (reindeer breeding) and coastal (sea fishing).

They speak mostly Russian, but 1,460 people retain the Koryak language, the written language of which is still based on Russian.

The ancestors of the **Selkups** occupied the eastern part of the Ob-Yenisei interfluvium, mixing with peoples of ancient Ugric origin. Since the 17th century, they divided into two territorial groups - southern (Naryn) and northern (Tazov-Turukhan).

The Selkups were first mentioned in sources of the 16th century. In the pre-Russian period they had fortified koch towns and developed pottery and weaving. The main branches of the southern Selkups' economy were hunting and fishing, and they used horses and dogs as transportation. The northern Selkups retained blacksmithing until recently.

Today, the integrity and culture of the Selkups are on the verge of extinction (mainly due to territorial separation). During the 20th century, the number has almost halved to 3,649 people (according to 2010 data)

In the 7th millennium BC the **Yukaghirs** lived east of the Yenisei and in the Sayan Mountains, hunted wild deer and ungulates, fished and bred dogs. In the XVII-XIX centuries their number decreased due to epidemics and feuds, and part of the Yukaghirs merged with Yakuts, Even, Russians, Koryaks and Chukchas. The Yukaghirs as an ethnos survived only in the Kolyma basin. Today 28% of the Yukaghir people in Yakutia speak the Yukaghir language.

**The Dolgans** are considered to be the northernmost Turkic people and the youngest in the area. The Dolgan nation was formed in the 19th - early 20th centuries from Evenks, Yakuts, some families of the Enets and the so-called Zatundren peasants (Anderson D.J. Tundroviki, 1998).

The Dolgan language is based on the Yakut language, and the written language based on the Russian alphabet was officially adopted in 1970. Dolgan art is represented by folklore: bylinas, songs, fairy tales, riddles and proverbs (Ernykhova, 2004).

The ancestors of the modern **Kets** appeared in the Bronze Age in the south of the Ob-Yenisei interfluvium: there was a mixture of Caucasoids of South Siberia with ancient Mongoloids. In the 1st millennium A.D. they migrated to the Yenisei North.

Before the arrival of the Russians, the Ket had already mastered metallurgy, but lived in a tribal system. They became part of the Moscow state in 1607. At that time the main occupation of the majority of the Kets was fishing and hunting.

By the way, the Ket language is the last living language of the Yenisei language family. In the 1930s, the Kets used an alphabet based on the Latin alphabet. In the 1980s they developed a new alphabet based on Cyrillic alphabet. Now less than 20% of the people over 50 years old consider Ket language to be their native language.

**The Türks** settled the upper reaches of the Chulym in the XII-XIII centuries and, mixing with local tribes, became the Chulym ethnos. Their main activities were hunting and fishing. Later they mastered farming and cattle breeding.

After the Chulym ethnic territory became part of the Russian state in the 16th-17th centuries, some of them merged with Russians, Siberian Tatars and Khakasses. Curiously, the Chulym language has no written language. Nevertheless, in 2010 it was spoken by 44 people.

At the end of the 19th century, the authorities of tsarist Russia assumed that the **Chuvans** were descendants of the Cossacks who conquered these places in the 18th century. In the past, the representatives of this people spoke the Chuvan language, today they speak Chukchi and the "Markov" dialect of Russian. There are 951 Chuvans living in the Chukotka Autonomous Okrug.

The ancestors of the **Even were** Tungus tribes that settled from the Baikal and Transbaikalian regions across Eastern Siberia in the 1st millennium A.D. The Even were engaged in nomadic reindeer herding, hunting for meat and fur animals, and fishing. The alphabet on the Latin basis for the Even language was approved in 1932. And already in 1936 there was a written language on the basis of the Russian alphabet.

In the 17th century, the territory of settlement of the **Kereks** extended from the Anadyr estuary to the Opuka estuary. They were engaged in hunting marine mammals and fishing. In the 18th century, during the clashes between the Chukchi and the Koryaks, the Kereks were also attacked, so their numbers declined sharply. In the 20th century they lived in the settlements of the Beringovsky district of the Chukchi Autonomous Okrug and almost completely mixed with the Chukchi. The Kereks speak Chukchi and Russian. But the Kerek language has been passively preserved!

The ancestors of the **Nenets** migrated northward from the forest-steppe regions of the Priirtysh and the Potobolye under the onslaught of nomads, Huns and Turks at the end of the 1st millennium BC. Some Nenets went westward to the White Sea and others to the Yenisei.

According to another theory, the Samoyedic ancestral homeland of the Nenets is located in the northern forests and tundras of the Urals and Trans-Urals, from where the ancestors of the Nenets, who mastered reindeer herding, began to move north and east at the turn of the I-II millennia AD.

The Nenets graze reindeer herds year-round, roaming in search of forage pastures, and are engaged in hunting and fishing. Thousands of Nenets reindeer herders, who own 500,000 reindeer, roam the Yamal Peninsula.

European Nenets live in the Nenets Autonomous Okrug, Siberian Nenets live in the Yamalo-Nenets Autonomous Okrug and Taimyr. Small groups are found in the Khanty-Mansi Autonomous Okrug, Murmansk and Arkhangelsk Oblasts, and the Komi Republic.

The Nenets language is divided into tundra and forest dialects. Only the first one exists in written form, which has many more speakers.

**The Khanty** are divided into three ethnographic groups: northern, southern and eastern (Dunin-Gorkavich, 1996). Their ancestors came from the south to the lower reaches of the Ob River and settled the territories of the present-day Khanty-Mansiysk and southern districts of the Yamalo-Nenets Autonomous Okrug, mixing with aboriginal tribes (Balalaeva O.E., 1999, pp. 139-156.).

Traditional trades of Khanty are fishing, hunting and reindeer breeding. The Khanty language together with Mansi and Hungarian make up the Ugric group of the Uralic language family (Adaev, 2007).

The ancestors of the **Enets** are North Siberian tribes and Samoyeds who came from the middle Yenisei and the Tom basin. Nowadays, the representatives of this people live on the eastern bank of the lower Yenisei and are engaged in reindeer breeding.

The Enets language belongs to the Samoyedic group of Uralic languages and is divided into two dialects: tundra and forest. Almost all Enets, in addition to their native language, speak Russian, and many understand the speech of Dolgans, Nganasans, and Evenks. According to the 2002 census, 116 people spoke the Enets language in Russia.

In recent years, activities have been carried out to support Arctic indigenous peoples. Their rights are recognized at the world level, and international norms are being revised. New laws and projects are aimed at preserving the traditions, culture, history and language of indigenous peoples, as well as their social and economic development.

The traditional economy has been the basis of indigenous peoples' everyday life for centuries. But today, the preservation of this way of life is under threat (Balalaeva O., Uiget E, 1998). And the reasons are as follows:

1. The once imposed transition to an urbanized society has changed traditional ways of life and disrupted the isolation of small peoples.
2. The area of reindeer pastures has decreased due to active mining of fossil resources.

Indigenous peoples living in small, isolated communities with underdeveloped infrastructure and weak public health systems are most vulnerable. The standard of living in rural areas and among nomadic peoples is below the national average. Fewer and fewer indigenous people know their ancestral language. The languages of the Nganasans, Russian Eskimos, Evenks, Selkups and Saami have practically disappeared.



Despite these challenges, Arctic indigenous peoples strive to maintain their identity. They organize themselves into associations, trade unions, and participate in conferences, forums, and internships. Since 1990, their interests have been represented by the Association of Indigenous Peoples of the North, Siberia and the Far East of the Russian Federation, which is a permanent member of the Arctic Council.

## **1.2 Statistics and demographics of indigenous people**

The area of the Arctic zone of the Russian Federation is about 9 million km<sup>2</sup> and is home to more than 2.5 million people. This is less than 2% of Russia's population and about 40% of the population of the entire Arctic on the planet. The Arctic only seems to be deserted. About 2,500,000 people - representatives of 127 nationalities - live in its Russian part. The most numerous of the Siberian peoples are the Yakuts. That's 500,000 people! Of the 2,500,000 people living in the Arctic zone of the Russian Federation, 82,500 are representatives of small indigenous peoples of the North, Siberia and the Far East.

By the way, indigenous peoples is a legal term (Gavrilenko V.G., Yadevich N.I., 1999). According to the List of Indigenous Minorities approved by the Order of the Government of the Russian Federation, they include 45 ethnic groups. To be included in this list, a national or ethnic group must meet the following criteria:

- Have a population of less than 50,000 people. For example, during the 2010 census only 4 residents of Chukotka called themselves Kereks.

- Live in the northern regions of Russia, in Siberia, in the Far East - in the territories of traditional settlement of their ancestors.

- To lead a traditional way of life, economy and crafts.

- Recognize themselves as an independent ethnic community.

The Russian Arctic is home to 82,500 representatives of small indigenous peoples (Nenets, Chukchi, Khanty, Evenks, Evenki, Selkups, Saami, Eskimos, Dolgans, Chuvans, Ketas, Nganasans, Yukaghirs, Enets, Mansi, Veps, Koryaks, Itelmens, Kereks) (Glukhikh A., 1996). Some of them lead a nomadic or semi-nomadic way of life associated with traditional types of nature management -

primarily reindeer breeding, fishing, sea fisheries, hunting. Most live in settlements and towns and are sedentary. According to our estimates, about 20,000 or about a quarter of the aborigines are nomadic in the Arctic for part of the year or year-round.

At the same time, about 60% of the nomadic population of the country lives in the Yamal-Nenets Autonomous District. According to Yamalstat, as of January 01, 2011, the number of small indigenous minorities of the North in places of traditional residence and traditional economic activities in Yamal-Nenets Autonomous Okrug was 37,125 people (7% of the total population of the Autonomous Okrug). The nomadic way of life was practiced by 14,667 people (3,139 families), or about 40% of the total indigenous population. More than 4,000 children lived in the tundra together with their parents, including more than 500 children under a year old.

It should be noted that not so long ago scientists and the public sounded the alarm about the decline (and even "extinction") of Arctic indigenous peoples. However, recent census data show that these fears have been exaggerated. In fact, the number of the most numerous groups by Arctic standards (Nenets, Chukchi, Khanty, Even) is even increasing, while the smaller groups manage to maintain more or less stable demographic dynamics (Balalaeva O.E., 1999, pp. 139-156.).

At least, we do not see any dramatic demographic changes among this part of the Russian population in the medium term, and even less reason to expect that some vast administrative territory with a predominance of representatives of Arctic groups will emerge, as, for example, it happened in Canada and led to the formation of a new autonomous territory of Nunavut with a predominant population of Canadian aborigines.

In terms of ethnocultural development in the Arctic region, there has been a tendency for members of local ethnic groups with native language skills to decline due to centuries of contact and integration policies since the 1930s. However, despite assimilation, ethnic identity is still preserved among them. After 1991, there has been a linguistic turn in favor of aboriginal languages, especially among Arctic, nomadic aboriginal groups (Duse & Glaskin, 2009, pp. 157-181). At the same time, Russian remains the main language of knowledge and communication.

Socio-economic situation. Due to various factors (natural, historical, socio-cultural, medical and biological), northern aborigines are in a less favorable position compared to the inhabitants of many other regions of Russia. The "Concept for the sustainable development of small indigenous minorities of the North, Siberia and the Far East of the Russian Federation" (2009) notes that the standard of living of a significant part of the population of small indigenous minorities living in rural areas or leading a nomadic lifestyle is below the national average. The unemployment rate in the regions of the North is 1.5-2 times higher than the average for the Russian Federation (Bakhtin N., 1993).

Unfortunately, industrial development in the Arctic has sometimes had a devastating impact on the natural environment and on indigenous communities. The situation is aggravated by the fact that industrial activity began before the relevant legal norms protecting the interests of indigenous peoples were adopted (David, 1967). Russia has not achieved the necessary parity in the relationship between aboriginal peoples and industrial companies in terms of mutual consideration of interests, mutually beneficial development and risk neutralization (Big Legal Encyclopedic Dictionary, 2000). Our and other studies point to the need to develop special government requirements for companies' activities, requirements that take into account the vulnerability of Arctic nature and the special rights of nomadic reindeer herding and marine fishing populations.

Today in the Russian Arctic among the Nenets, Dolgans, Chukchi, and Enets the share of those employed in traditional industries is 18-25%. Among other categories of aboriginal peoples of the Arctic zone of Russia it is not higher than 9-13%. The low competitiveness of traditional economic activities is due to small production volumes, high transportation costs, lack of modern enterprises and technologies for integrated processing of raw materials and biological resources.

The current legal and sociocultural status of small indigenous minorities of the North, Siberia and the Far East is regulated by the Constitution of the Russian Federation and a large number of normative acts, primarily the federal laws "On guarantees of the rights of small indigenous minorities of the Russian Federation", "On general principles of organizing communities of small indigenous minorities of

the North, Siberia and the Far East of the Russian Federation", "On territories of traditional natural resource use of small indigenous minorities of the North, Siberia and the Far East of the Russian Federation", "On territories of traditional natural resource use of small indigenous minorities of the North, Siberia and the Far East of the Russian Federation" and "On territories of traditional natural resource use of small indigenous minorities of the North, Siberia and the Far East of the Russian Federation". All these laws, in the drafting of which the Institute has been actively involved, are aimed at preserving the historical and cultural heritage and supporting indigenous languages and cultures. Measures of State support for culture include the organization of television broadcasts, documentaries, periodicals and mass media; the publication of educational, scientific and artistic literature; the launch of Internet projects in the languages of the small indigenous minorities of the North; and the holding of cultural festivals, reindeer herders', hunters' and fishermen's festivals and traditional sports competitions (Golovnev, 1995) .

Certain rights and benefits currently granted to small indigenous minorities of the North are an important factor of social adaptation to the market economy. In addition, additional state guarantees often become a factor in the choice of ethnicity in favor of aboriginal ethnicity by people from mixed families. Social preferences and quotas for the use of resources make it attractive for individuals of mixed descent to identify themselves as indigenous peoples. This is one of the new sources of population replenishment.

In terms of development prospects, there is a widespread opinion among researchers and indigenous peoples themselves that government policy should not be based on ad hoc assistance to indigenous peoples, but on a system of state protectionism and active cooperation with them (Agnyun, 2009, p. 26-31.). However, neither compensation, subsidies nor sponsorship can solve the problem of sustainable development of indigenous peoples. Necessary measures and programs should be aimed at creating conditions for the independent development of traditional economic sectors and culture of the Arctic indigenous population. For a significant part of the Arctic indigenous population is characterized by an orientation to the so-called

traditional culture. This realizes the need to realize their identity, their connection with their native land, their people, and their beliefs.

At the same time, there is an understanding that in modern conditions it is important for the aborigines to establish a closer dialog with the surrounding society, with the authorities and industrial companies. Today, the concept of culturally oriented modernization and multi-variant self-development of indigenous minorities of the North is relevant, which implies not just "ethnic survival", but ensuring conditions for sustainable development of northerners with a combination of different types of economic activities, including the most modern professions, approval of self-organization mechanisms and assistance from the state.

The culture of small indigenous minorities of the North is a strategic resource for the development of the Russian economy based on knowledge, innovation and creativity. "Strategy for the Development of the Arctic Zone of the Russian Federation and National Security until 2020" provides for the active use of the experience of small indigenous minorities in the practice of economic activity, municipal and state administration. It is assumed that the integration of ethnic culture and the development of ethno-tourism, the development of original trademarks, urban planning (architectural design of Arctic cities with elements of national folklore) will provide support for the traditional knowledge of the peoples of the North (Ernykhova, 2004).

For the long-term development goals of the Russian Arctic, it is necessary to establish partnership relations between all participants in nature management and economic activity, and government control is also necessary, but the activity of the northern aborigines themselves is no less important. Over the last two decades they have acquired authoritative organizations such as RAIPON, have strong leaders, have ensured good representation in the authorities of different levels, have achieved success in the field of culture, development of handicrafts and arts and crafts. However, so far the "big economy" passes by the natives. They still do not find a place in it, there is no truly profitable local business. But the perennial problems of public health, education and employment of young people, decent support from private extractive companies, and even more so, compensation for damage caused

and potential damage remain. All of this needs to be addressed urgently in order not to accumulate socio-cultural risks in the development of the Arctic and in the system of national security as a whole.

### **1.3 Historical climate change and ethnogenesis**

The indigenous peoples of Russia's North have experienced numerous relocations throughout their history, related to both historical events and climate change. The ancient history of indigenous peoples is closely linked to the history of settlement of the entire Eurasian Arctic. Archaeological antiquities, evidence of settlement of the lower reaches of northern rivers such as the Yenisei, Lena, Yana, Indigirka, Kolyma, date back tens of thousands of years. This is also confirmed by the latest paleogenetic studies, which point to three waves of population migration in antiquity:

- 1) the northward advance of Europeans 25-30 thousand years ago;
- 2) migration of "ancient Paleo-Siberians" from the south about 20 thousand years ago;
- 3) migration from the south of the "Neo-Siberians" about 10 thousand years ago [Sikora et al., 2019].

During this time, geological epochs changed, the climate in the Arctic changed dramatically, steppes rich in vegetation and animal life turned into icy deserts, and then revived again. An important milestone in the ancient history of indigenous peoples are the archaeological monuments of the Middle Urals Paleolithic Culture, which are 17-13 thousand years old and whose genesis is connected with the cultural world of the North Asian Upper Paleolithic. It is not excluded that in ethnogenetic terms the monuments of this culture belong to the remote ancestors of modern Finno-Ugric peoples [Pavlov, 1997].

Of exceptional interest for the origin of Arctic indigenous peoples is also the anthropological interpretation of the findings of burials belonging to the Mesolithic population on Oleneostrovsky Island on Lake Onega. This Oleneostrovsky burial ground, which was left by the ancient population of southern Karelia about 7.5 millennia ago, is not only a reference, but also the most famous Mesolithic monument of the forest zone of Eastern Europe (Bakhtin N., 1993). It has for a very long time provoked a heated debate about the degree and origins of Mongoloidity of the population that left this monument, and consequently about the strength, direction

and geographical extent of migrations in Northern Eurasia in that era. "A recent anthropological study presenting a generalizing analysis of numerous ancient and modern series tilts the scales in favor of interpreting this population as an early representative of the undifferentiated Uralic race, which is the "third" race of Eurasia, rather than the result of mestizaje mongoloids and Caucasoids....

All methods of analyzing the obtained data on ancient DNA show an intermediate position of the population that left the South Oleneostrovsky burial ground: in general, it belongs to the West Eurasian genetic trunk, it carried in its gene pool and traces of genetic connection with the Urals and Western Siberia" [Balanovsky, 2015]. Thus, the indigenous peoples of the Arctic are simultaneously descendants of both East Eurasian (Siberian) populations and the Upper Paleolithic population of Europe. Most likely, they also include descendants of the Paleo-European population of the Komsa archaeological culture that came to the lands of Scandinavia in the Mesolithic and Early Neolithic eras (after the retreat of the ice cover at the end of the last ice age). Russian archaeologists have assumed that this culture originated from the northern part of Eastern Europe, which was confirmed by recent paleogenetic studies by Norwegian geneticists, who reconstruct the path of these people from the Onega Lake-Barents Sea area through Finnmark and further along the coast of Northern Norway.

Probably, the period of wide settlement of the Arctic indigenous peoples in antiquity, later assimilated by the speakers of Finno-Ugric languages, but leaving in their languages a significant Paleo-European substratum, coincided with the period of climatic optimum in Europe, dated to the period of 5-8 thousand years ago.

For example, the Protosaami lexicon is widely recorded in toponymy from Scandinavia to the borders of the Komi Republic, spread throughout Finland and Karelia, in the basins of the Northern Dvina and Mezen rivers. The toponymy data indicate that the Protosaami lived much to the south and east of their current range. According to V. Leskinen's calculations, there are about 800 hydraulic objects with names from the Saami language in the territory of modern Karelia. Researchers of Saami toponymy emphasize its substrate character in relation to Baltic-Finnish languages [Baltic-Finnish peoples of Russia, 2003: 45, 47-48].



From southern Finland and Karelia, the indigenous peoples of the Arctic migrated further north, escaping from the spreading Finnish and Karelian colonization and, presumably, from tribute. Following the migrating herds of wild reindeer, the ancestors of modern peoples and ethnic groups gradually reached the coast of the Arctic Ocean (this happened no later than in the 1st millennium A.D.) and reached the territories of their current residence. At the same time, they began to breed domesticated reindeer, but this trade became essential to Sami life only by the 16th century

The traditional nature use of indigenous peoples of the Arctic has changed throughout human history, its cultural adaptive function providing flexibility and adequacy of nature use methods to climatic or geographical changes. Traditional nature management is characterized by complexity - the combination of different types of activities in different landscapes of the same territory. This is clearly manifested in the traditional nature management of indigenous peoples of the Arctic region. The economic cycle depended both on the local landscape, and on the time of year and peculiarities of the behavior of economic objects (reindeer, fish, birds, animals).

In particular, answering the writer M. Prishvin's question why they are considered nomadic, the Sami reported: "And here is why they are nomadic:...One lives near a stone, another near a jagel bog, the third near the Zheleznaya Varaka. In spring a lopar near the rivers fishes for salmon, when Ilyin's day comes - he moves to the lake, in the half of September - again to the rivers... About Christmas - to the pogost, to the dust... That is why they are nomadic, because a lopar lives on fish and reindeer. In the hot season the deer moves from the mosquito to the ocean. The shoveler follows him. This is how God has shown us, he rules, he is the creator.».

One of the oldest types of traditional nature use of the ancestors of the Arctic indigenous peoples since the Mesolithic period was lake and river fishing. Mesolithic sites of ancient fishermen, which are about 10 thousand years old, contain a set of implements (bark floats, toothed points, harpoon tips, barbless hooks, hoops for nets, oars, fragments of nets, booms), which testify to the existence of all kinds of lake and river non-industrial fishing, preserved from the Mesolithic period to the present time.

They include fish catching without special tools or using only a net; the same with the help of closed-type traps - spits and venters; lock fishing - with open-type devices; the use of serrated spearheads, arrows and harpoons, as well as spears; fishing with oodile hooks, net fishing. The researchers note curious facts of continuity: fragments of nets allow to judge "...about the type of cord (double-stranded grass rope 0.1-0.2 cm thick), the mesh pitch - 4.5-5.5 cm. The knot is a scotovy knot, also called oblique, fishing or weaving knot, which is used even nowadays when making nets". In the Mesolithic period "...characteristic topographic types of long-term settlements were formed on a slightly elevated area adjacent to a not wide but deep river near the lake, flowing out of it". The river bed, where the ancient camps are located "...in many places is blocked with stakes, but the middle is left free. In winter in this strip they make ice-holes where they immerse venters and tops. They also catch fish for spawning in late spring". Reconstructing the way of life of the ancient population, the author points out: "Of course, fishermen did not live in isolation from hunters and even lived interspersed with them. Conflicting or exchanging their fishing prey, using boats, sledges and skis. At the same time, hunting, not to mention gathering, may have played a role in communities that specialized in fishing. The abundance of arrowheads and bones of beaver and elk probably testifies to the additional occupation of hunting with the help of fishing groups" [Burov, 2011].

The fact that the way of life may have been partially transformed under the influence of climate change and historical events is evidenced by an interesting historical fact, the so-called "Saami Iron Age", revealed by archaeologists. The term "Saami Iron Age" was introduced into Russian archaeological literature by the Finnish scientist K. Karpelan at the turn of the 1970s and 1980s to refer to the Late Iron Age and Early Middle Ages of eastern and northern Finland (Aipin, 1990). During this period, the population moved to a more mobile way of life, ceased the previously existing production of pottery, which in the territory of eastern and northern Finland, according to Karpelan, ceased by 300 AD. The reason for this is seen by him in the involvement of northern hunters, fishermen and gatherers through intermediaries in the fur trade with the Roman provinces, resulting in specialization

in the fur trade, less sedentary, the replacement of fragile ceramic dishes for imported metal ones [Spiridonov, 2013]. In turn, the "Saami Iron Age" coincides in time with the climatic pessimum of the early Middle Ages, or the pessimum of the Great Migration of Peoples - a general cooling of the climate in Europe that lasted several centuries after the Roman climatic optimum. The beginning of the pessimum is dated differently in different places and generally covers the period from 250 to about 450 A.D. The end is attributed to about 750. During the pessimum, the average annual temperature was 1-1.5 degrees below the present temperature.

For northern hunters, the market for fur in exchange for European goods expanded. The migration of the Goths from Northern Europe to Southern Europe and the invasion of Central Europe by the Huns in 375/376 belong to the same period. This is followed by the Medieval climatic optimum (X-XIII centuries), the Little Ice Age (XIV-XIX centuries) and finally the modern warming (XX century) (Gurevich, 1984).

The authors of the article "High-Latitude Climate Variations and the Development of Northeast Europe in the Middle Ages. 2012" recommend paying attention to the more "rapid alternation of cold and warm episodes, generally characteristic of high latitudes". The much larger amplitude of temperature fluctuations compared to the middle latitudes means that even during long cold epochs like the Little Ice Age (14th-19th centuries), there were relatively short warming episodes of 2-4 decades (e.g. 1350-1370, 1400-1440, 1470-1510, 1610-1620, 1770-1810), when temperatures approached or even exceeded modern levels. These short episodes are of particular interest, especially for the history of the traditional economy. During such periods of warming and cooling, different traditional activities could interchange and complement each other. For example, during periods of warming the rivers from the sea are poorly supplied with passable fish, and the main fishery shifts to forest lakes and is supplemented by hunting for waterfowl and game birds. While snow and ice prevented the breeding and seasonal migration of ungulates, which the Saami hunted in their usual places at the crossings, the coastal Saami groups were able to concentrate on the sea fur trade and coastal fisheries, which their distant ancestors did in ancient times [Shumkin, 2015], and

forest groups could focus on domestic reindeer breeding (the antiquity of which is probably confirmed by the preservation of such archaic features in Saami reindeer husbandry as the combination of free grazing with tethering of flocked fawns near the dwelling) (Bart, 2006). Probably, the facts of existence of ancient camps, which were periodically developed or abandoned for tens of years, testify to the not infrequent change of localization of settlement sites and types of nature use.

Thus, the leading role in the adaptive potential of traditional nature management is played by its complexity and cultural plasticity, its inherent ability, thanks to traditional knowledge and experience, to respond quickly and adequately to environmental changes. These qualities have proven the ability of traditional nature management of indigenous peoples of the Arctic for at least 10 thousand years to ensure the preservation and sustainability of their traditional culture even under the most unfavorable environmental changes (Balalaeva O., Uiget E, 1998). But only the future will show whether these qualities can help traditional nature management to survive in the conditions of today's harsh type of industrial development and market-oriented economic development.

## **Chapter 2: Social Consequences of Climate Change in Intensive Nature Management Zones in the Russian Arctic**

### **2.1 Social Aspects of Oil and Gas Producers' Activities in the Russian Arctic**

The development of the Arctic region has historically taken place in close cooperation between oil and gas companies and regional authorities. Developing natural resources, the companies faced the need to create the appropriate infrastructure. Solutions to these issues fell on their shoulders. As a result, new shift settlements appeared in the Arctic territories, which were transformed into settlements.

Thus, the active industrial development of the Nenets Autonomous Okrug began in the second half of the twentieth century, and in a short period of time the construction of social infrastructure was actively developed in the region. The most active construction of housing, educational and cultural facilities was observed from 1990 to 2000 - during the heyday of oil and gas corporations in Russia. Currently, the municipal structure of the region is represented by one urban district "Naryan-Mar City" and one municipal raion "Zapolyarny Rayon" consisting of eighteen rural settlements.

According to the Ministry of Natural Resources, the region has eighty-three hydrocarbon fields located in the Timan-Pechora oil and gas province. Most of the fields have high profitability of development. The Consolidated State Register of subsoil plots and licenses presents data on issuance of licenses on the territory of the region since 1993, where on March 20 the Council of People's Deputies of the Nenets Autonomous District issued three licenses to the organization "SE for prospecting, exploration, production and processing of minerals Arkhangelskgeologia". And the longest license was issued to PJSC Oil Company "Rosneft" for geological study, including prospecting and evaluation of mineral deposits, exploration and production of minerals at Cherpayskoye field of Gamburtsev shaft: the end date is January 31, 2182. A total of 349 licenses have been issued in the region since 1993, and about 275 licenses have been issued to 70 legal entities for the right of extraction and development.

Some of the companies present in the region are actively involved in the social development of the territory. Such companies include PJSC Rosneft Oil Company, Severgazprom, ZAO Pechorneftegazprom, Gazpromneft-Sakhalin, AGD Daimonds, Tatneft-NAO, Surgutneftegaz, Zarubezhneft, SK RUSVIETPETRO, Bashneft, Vostok NAO Oil Company, LUKOIL-Komi and others. OOO LUKOIL-Komi is a subsidiary of PJSC LUKOIL. The Company's participation in the social development of the Nenets Autonomous Okrug is realized through two forms: formal agreement and voluntary activities. These forms of interaction allow the Company to achieve positive social effects for the region.

For example, the Company annually allocates funds to representatives of the indigenous minorities of the North under contracts with reindeer breeding farms as part of license agreements ("Private property rights in captive breeder deer: How wild are they?," n.d.). The annual amount of financial support has varied from 20 to 30.5 million rubles over the past ten years. The allocated funds helped to build and maintain roads from the winter road of JSC "NNK-Pechoraneft" to the settlement of Khorrey-Ver, to build a new slaughtering station in SPK "Erv", to buy snowmobiles and pay for helicopter transportation for SPK "Kharpa". Another equally important project is the "Red Chum" ("Nyaryana mya"), which was renewed in 2002 to provide health care services to indigenous people. This project not only provided medical assistance to the peoples of the North, but also collected a large set of data, which added to the fund of national science. A number of well-known figures (Mariam Wallet Med Abubakrin - UN representative; Leonid Roshal - Soviet pediatrician and surgeon) noted the project as necessary for expansion to other territories.

Another area of the company's involvement in the life of the region is support for local activists: the company annually accepts applications from NGOs for participation in the Contest of Social and Cultural Projects in the Komi Republic and the Nenets Autonomous District from February 12 to April 30. The main areas funded are the preservation of history and cultural traditions, support of scientific and educational activities. For example, in 2019, financial support was provided to eight projects from the Nenets Autonomous District in the nominations "Sport" and "Spirituality and Culture". In 2018, the company also took part in the construction of

a new movie theater, purchased tennis equipment and prizes as part of a tennis tournament. During the period of work, the company also sponsored Buran-Day races, traditional winter national games "Kanin Mebeta" ("Belt of Friendship"), classical music festival "Days of High Music in the Arctic", Interregional boxing tournament "Arctic Lights", scholarship program for schoolchildren, modernization of the school in Krasnoye settlement (purchase of equipment, purchase of a car), construction of sports grounds with trauma-safe surfaces and a skate park in Naryan-Mar, as well as participation of young singers in the New Year's concert of the Russian Children's Choir in the State Kremlin Palace.

When implementing strategic and operational plans in terms of social responsibility, oil and gas companies need to take into account the multifactorial nature of activities in the Arctic territory (Gaisin R., 2001). Let us dwell on the processes of interaction with indigenous small peoples of the Arctic. The high sensitivity of ecological systems to external influences, especially in the areas inhabited by the indigenous minorities of the Russian Federation, stands out in this aspect. We emphasize the low level of accessibility of quality social services and comfortable housing in remote areas, including the places of traditional residence and traditional economic activities of small-numbered peoples.

In the Nenets Autonomous Okrug there is a problem of abandoned drilling rigs in the Bolshezemelskaya tundra (where oil companies have been working for many years), where reindeer become entangled in the wires and die a painful death. The problem of overgrazing of reindeer is also characteristic of the Bolshezemelskaya tundra, where the most active geological work was carried out, followed by oil production. Disturbance of the water-vegetation balance could be a consequence of these works. This is the preliminary hypothesis based on assessments from experts at the N.P. Laverov Federal Center for Integrated Arctic Studies. In 2018, the initiative to create a map of the above-mentioned hotspots in cooperation with oil and gas companies was made by the leaders of the All-Russian People's Front of the NAO, then by the deputies of the District Assembly (Agnyun, 2009, p. 26-31.). There is no information open to the public about the results of such work, and the fact that it even

started, which shows the importance of forming a responsible team, including independent experts, to solve the above-mentioned problems.

We believe that the best practices of interaction between subsoil users and indigenous minorities should be replicated with the support of all levels of government and the authoritative public. In the meantime, it is worth mentioning once again the problem of development of the Severo-Khosedanskoye field, which is owned by SPK Put Ilyicha under a long-term lease, which has not been resolved since 2016. After calculations by LLC "Murmansk Land Surveying Company" of the amount of losses - nothing happens.

A similar situation occurred between LLC Bashneft-Polyus and SPK Kolkhoz Izhemsky Reindeer Herder. The representatives of the oil and gas companies did not cover the damage established in the course of the expert examination, after which the reindeer herders appealed to the prosecutor's office on the fact of land squatting. Specialists are sure that the reason is that it was not possible to agree on the amount of damages for the seizure of reindeer pastures (Zhukovskaya, 2008, pp. 71-78). The above examples of the activities of the NAO Reindeer Herders' Union headed by Vladislav Vyucheytsky, revealed in the course of journalistic investigation of IA "Ekho Severa" and "SM-news", should be available to the general public, as well as become the object of a possible competent investigation about the existing facts of official crimes.

In the new context, it is important to monitor best practices both internationally (e.g., the United States and Alaska, where oil and gas companies pay \$2,072 per year to state residents annually) and interregionally. It is important to monitor best practices both internationally (e.g., the USA and Alaska, where oil and gas companies pay USD 2,072 annually to the state residents) and interregionally. The interaction between the government, business and the public in the Yamalo-Nenets Autonomous Okrug can be considered an advanced one, where not only the amount of the state subsidy has been increased to 5 thousand rubles from 2020 (in the NAO it is 2 thousand rubles), but also more than fifty measures are in place to provide subsidies, grants and social support measures to indigenous minorities. This is a consequence of the implementation of oil and gas projects of Rosneft and Gazprom Neft in Yamal.



These are not only Yamal LNG, but also Mesoyakha Neftegaz. As part of the latter, original adaptive solutions for the environment were adopted, such as, for example, reindeer crossings on the Zapolyarye-Purpee oil pipeline, noise insulation of all pipelines, and sealing of the systems for collection, storage and transportation of extracted raw materials. Special crossings over the pressure oil pipeline were built on traditional reindeer migration routes - six above-ground and eight above-ground crossings. After consultations with representatives of public organizations and heads of reindeer herding communities, a route was chosen for laying the pipeline that does not cross the sacred places and reindeer grazing grounds for indigenous people. Messoyakhaneftegaz has developed a policy on interaction with indigenous minorities of the North (SIM), which applies not only to employees but also to representatives of contractors (Bart F, 2006).

Employees of the enterprise and contractor organizations regularly provide assistance to indigenous minorities (welding works, transportation services, minor repairs of equipment, free allocation of fuel and lubricants, boards, tools, spare parts). Fishing, hunting, picnicking, etc. are strictly prohibited in the field (Bart F, 2006). JSC Messoyakhaneftegaz closely cooperates with the Yamal to Descendants Association. An agreement was reached to provide local residents with access to social facilities of the Vostochno-Messoyakhskoye field: a medical center, a retail outlet for food and essential goods, a helipad with a warm waiting room, as well as the possibility of receiving air ambulance flights around the clock. Safety and environmental care is a top priority in Gazprom Neft's offshore projects: financing measures to preserve Arctic biodiversity such as walruses, polar bears, valuable and rare fish species. The effectiveness of interaction between subsoil users and all stakeholders is confirmed by the fact that for the first time in ten years, the number of the indigenous population of the YNAO has increased by 11%.

In terms of Arctic environmental policy, an oil spill response program has been developed and can be implemented if necessary, virtually eliminating the risk of environmental and social emergencies.

We consider it relevant to emphasize the great social and economic importance of participation of oil and gas corporations in the implementation of investment

projects in the Nenets Autonomous District, which, taking into account the knowledge of the specifics of the territory, will have a targeted effect in terms of job creation, reducing or stopping the outflow of population, improving the quality of public services and housing.

Lukoil makes the greatest contribution to supporting culture and sports in the region by sponsoring mass events, as well as to improving labor conditions in the region. This is not surprising, as a significant part of the NAO population is employed in mining: the share of those employed in this area ranged from 17.3% to 28.2% from 2003 to 2018.

At the same time, the transformation of the policy pursued was in the direction of the company's orientation towards the solution of existing problems of socio-economic development and the integration of the company's goals and the goals of regional policy.

Thus, oil companies make not only a significant contribution to the economic development of the region, but also actively participate in the formation of the social sphere. This situation has a dual character. On the one hand, the region reduces the financial burden on the budget, but on the other hand, the region becomes dependent on the companies' activities. In this situation, a competent policy of interaction between local authorities and companies comes to the fore. It is necessary to outline the expectations and directions of social activity of companies in strategic planning documents (S.V. Krut, 2009, pp. 38-47). This will make it possible to coordinate activities and solve existing problems in the most efficient way.

To date, in the Russian Federation, the development of unified standards of social responsibility in the oil and gas industry is at the stage of its development. At the moment, there is no monitoring to obtain information on the level of development of corporate social responsibility of oil and gas companies and the scale of the impact of their activities on the social environment (Vasilkova T.N., Evai A.B., Martynova E.P., Novikova N.I., 2011). The preparation of such an analysis would provide an impetus for the development of interaction with local communities, ensure openness in discussing programs, and ultimately encourage companies to improve their social policy.

Due to the relevance of this issue, there is a need to study Russian and foreign experience in the field of corporate social responsibility of oil and gas companies. Social programs for the local population and company employees, charity, sports and cultural projects, diverse interaction with territories and other aspects were studied. The list includes Russian and foreign companies operating in the YNAO as a region of the Arctic zone of the Russian Federation with leading indicators in terms of mineral production and service volumes in this area. Such companies include: Gazprom, Gazpromneft, NOVATEK, Rosneft, Transneft. Foreign companies included in the list and having a presence in this region are Baker Hughes, Halliburton, Schlumberger, Equinor, Total, Weatherford. These companies implement a range of social projects independently and in cooperation with regional and municipal authorities, local communities and non-profit organizations. The companies were evaluated based on the availability of projects and programs, their quality and diversity, and the scale of their impact on the social sphere of the region. The analysis was based solely on public information provided on the companies' official websites.

Among Russian oil and gas companies there is a multistructured nature of social responsibility with a variety of forms of implementation of social programs that serve as a tool for social security, support and development of the population and employees in the YNAO (Bakhtin N., 1993). In this way, the principles of commercial financing of social services are implemented, which contribute to the satisfaction of various social needs of the population. However, there are areas that remain practically out of the companies' sight: anti-discrimination, human rights protection, regional scientific research and surveys of the local population, prevention of dangerous diseases (Report on Human Development in the Arctic, 2007).

The main factors of the impact of the social responsibility of oil and gas companies on society today are: ensuring labor with a decent level of social guarantees; respect for human rights; increasing the social potential of the regions, promoting healthy lifestyles; charitable support for the needy population, local community initiatives; contribution to maintaining the traditional way of life of the peoples of the North in the regions where the companies operate.

The analysis has shown that oil and gas companies in the Arctic territories need to follow a problem-oriented approach in developing their social programs. Conscious social responsibility in the Arctic zone should become a mandatory element of all oil and gas socially oriented companies, whose goal is to achieve sustainable development. The basic principle of social responsibility implementation should be social partnership as a constructive dialog between personnel and employers to regulate social and labor relations (Barnokhodjaev R., 2005, p. 36). Also, for a successful comprehensive definition of the role of corporate social responsibility in the Arctic zone, an open discussion between companies and society is needed to determine the significance of the problem and to help realize the power of the impact on the business community. It is necessary to assess public expectations in the direction of social responsibility of oil and gas companies in the Arctic zone of the Russian Federation. In this case, not only the opinions of permanent residents of the region should be taken into account, but also the problems of shift workers and their families. It is important to study various aspects of their satisfaction with their life activities, the results of which should lead to the preparation of various regulatory documents.

Thus, in the long term, the achievement of high social results is possible only on the basis of a balance of interests of the state, oil and gas company shareholders, employees, consumers and public institutions. Russian and foreign companies in the Arctic zone should come to the conclusion as soon as possible that a balanced and effective social policy reduces business risks, increases staff efficiency and customer loyalty, and enhances the reputation of the company as a whole. The most important condition for the social well-being of the Arctic zone of the Russian Federation is the formation of a balanced responsibility of the state and oil and gas business, based on respect for human rights, equality of opportunity, and the priority of the law (Kazimirchuk, 1996).

## **2.2 Impact of oil and gas operations on the climate of the region**

Despite aspects such as the technological and logistical challenges of operating in extremely cold and remote environments, national commitments to climate agreements, and the risk of environmental impacts that could result from a major oil spill or other major event, the Arctic continues to hold the interest of major mining companies.

Due to oil and gas production, the Arctic environment is subject to negative impacts such as: hydrocarbon and other pollutant spills from offshore drilling operations, blowouts, rig accidents and shipping disasters, operational pollution from exploratory drilling; increased trash and wastewater; influx of people into the Arctic, increased air pollution, marine noise pollution, increased emissions from fossil fuel combustion, light pollution and cumulative impacts resulting from fossil fuel combustion, light pollution and cumulative impacts resulting from the use of oil and gas in the Arctic.

The rate of recovery of the Arctic marine environment in response to disturbance is slower. Combined with the fact that trophic chains in the Arctic are relatively short, even relatively low levels of operational pollution can have serious consequences for the functioning of the Arctic Ocean ecosystem. In addition, a number of factors can exacerbate the risk of impacts from an oil spill in the Arctic. For example, at lower temperatures, the density and viscosity of oil increases and the time for oil to decompose is much slower (Potapov et al., 2012.).

There is another aspect, scientific evidence points to the possibility that the likelihood of transboundary impacts may also be higher in the Arctic than in other basins because of the relationship (or potential relationship) between pollutants and ice.

The strongest anthropogenic impacts on the Arctic seas are concentrated on their shores, bays, sponges and coastal waters. This raises a number of issues that should be considered in the context of transboundary pollution - first and foremost is the issue of compensation if one state suffers damage as a result of transboundary pollution. Again, because it is demonstrated that the cost and feasibility of cleanup

and remediation after pollution incidents or cumulative pollution can be very different in the Arctic than in other basins, a number of legal and scientific questions arise. Arctic species are likely to recover more slowly than temperate species from a disturbance because many are long-lived and slow to reproduce, more susceptible to toxins than their temperate counterparts, and because of the increased toxicity of contaminants in cold waters. However, the extent of this effect remains incompletely understood.

From the danger of anthropogenic impact in the Arctic, we can recall the disaster of 1989. On March 23, 1989, the tanker "Exxon Valdez" with more than 135 thousand tons of crude oil on board, in order to avoid collision with an iceberg, the three-hundred-meter tanker deviated from its intended course and ran into the Bligh reef, well marked on the map as a navigational hazard in Prince William Strait. The oil spill caused extensive damage to flora, fauna and populations.

A potential solution could be to expand the application or adopt measures similar to those in the International Convention for the Establishment of an International Fund for Compensation for Oil Pollution Damage, which is financed by contributions from oil importers and exporters. Alternatively, the model used in the Protocol on Environmental Protection to the Antarctic Treaty could be utilized. Under the precautionary approach, an activity that is considered harmful is not authorized unless it is known not to cause (significant) harm, or unless measures have been or will be taken to prevent harm to the environment.

There is a need to adopt a more precautionary approach to the Arctic with respect to oil and gas activities. Alternative sources of oil and gas, for example, can be found anywhere in the world. Alternative energy sources such as tides, wind, and solar are also becoming more economically viable. Each of these points points to a reason to believe that a precautionary regime regarding oil and gas production in the Arctic could be successful.

Taken together, all these aspects point to two things: the need for further cooperation among the Arctic states and the need for a cautious approach to further oil and gas activities in the Arctic. A number of models need to be adopted to regulate

activities in the Arctic region, as well as to develop preventive measures to protect the environment, and to address potential environmental pollution.

### **2.3 Current approaches to the study of the social impacts of climate change in the Arctic and issues of adaptation of indigenous peoples' livelihoods**

Climate change can have a profound impact on many aspects of people's lives. Between two and four million people live in the global Arctic, depending on how its boundaries are defined. This is a large number of different indigenous groups and part of the population of eight countries. Studying the impact of climate change on the lives of these people is a hot topic of research and an important area of practice. Studying the Social Impacts of Climate Change: Foreign and Russian Arctic In the United Nations report *The Social Dimensions of Climate Change The Social Dimensions of Climate Change* (The Social Dimensions of Climate Change, 2011)states: "Addressing climate change without considering its social dimensions does not address climate change at all.

The main argument for why this is so is that it is people who are at the center of the transition to a world of reduced emissions and increased resilience, a world with special attention to vulnerable groups, including indigenous people and their role in decision-making. The UN report lists the aspects of people's lives that are affected by climate change. These are three groups of needs: basic, individual and community needs (Report of the Secretary-General on the Programme of Action for the Second International Decade of the World's Indigenous People, 2005). Basic needs are water and food, energy, shelter and means of transportation, and security. Individual needs are health, decent work, social protection, rights and opportunities, and movable property. Community needs cover equality and social inclusion, human rights, participation in public life, governance, education, cooperation and solidarity.

Research on the social impacts of climate change focuses on these aspects. The international report "Assessing Climate Impacts in the Arctic" (ACIA 2005) focuses on the impact of climate change on people's lives (ACIA, 2005) addresses the impact of climate change on people's lives in sections on biodiversity and traditional practices of indigenous peoples of the North, commercial fisheries, the impact on agriculture and forestry in the Arctic, health, crop viability, and infrastructure. The authors of the report believe that the effects of climate change on Arctic residents will include damage to buildings, roads and other infrastructure due to thawing



permafrost, impeded river travel, health problems associated with changes in dietary patterns and ultraviolet radiation levels, and likely increased work opportunities.

For indigenous peoples, climate change may lead to reduced food security due to reduced access to traditional foods, difficulties in reindeer herding and reduced hunting and fishing opportunities. The international reports "Arctic Climate Challenges: Changes in Arctic Snow, Water, Ice and Permafrost" address the social impacts of climate change in the section "Changing Living Conditions in the Arctic". The implications are examined in terms of economic opportunities and challenges, indigenous peoples' concerns, and health risks. The authors conclude that climate change will bring both opportunities and challenges to the Arctic economy.

Changes in the ice cover lead to strong changes in ecosystems, up to species extinction, so livelihoods based on bioresources (fishing, hunting, collection of wild plants and others) may be severely affected. There will be new opportunities to expand shipping, mining and tourism, including cruise tourism. However, these will mainly benefit companies based outside the Arctic. Tourism can bring benefits to local, indigenous people only in some cases.

From a health point of view, the risk of food poisoning may increase, since the traditional storage of food in glaciers and permafrost for a year will not be possible for indigenous peoples living in the Arctic. If thawing permafrost or floods damage sewage systems, diseases will spread (Oraby et al., 2014.). The SWIPA 2011 report showed that the projected effects of climate change are coming quickly. Whereas the ACIA 2005 report merely assumed that transportation systems would deteriorate due to shortened operating periods for roads on ice or frozen tundra (Evladov, 1992), the SWIPA 2011 report documented that this is already happening in many places. For example, the mild winter of 2009-2010 in Manitoba, Canada, resulted in the closure of 2,200 kilometers of ice roads. Whereas in 2005 it was only expected that summer shipping along the Northern Sea Route would be possible in the coming decades, the 2011 report noted that the number of trans-Arctic summer cruises has increased, and in 2009 two ships traveled the route with only a little help from icebreakers. The conclusions of ACIA 2005, SWIPA 2011 and 2017 and other international reports are based on a large number of studies and scientific publications.

However, there are significantly fewer works devoted to the impact of climate change on the lives of people in the Arctic than those that study this impact on biological and ecological processes. Finnish, British, Canadian, and Norwegian scientists are most actively researching the impact of climate change on the lives of people living in the Arctic. The main areas of their research are: - social impacts of climate change on indigenous peoples in the Arctic, including the collection of field evidence on changes in the lives of indigenous communities; - climate-induced health risks for Arctic residents, risks to infrastructure, transportation accessibility of human settlements and management of these risks; - economic challenges and opportunities emerging at the local and regional levels due to climate change; - the need to change the international governance and regulatory regime in the Arctic, taking into account the high rate of The most discussed topic in the foreign scientific literature in this area is the social impact of climate change on indigenous peoples of the Arctic (Glukhikh A., 1993).

Active research on this issue is being conducted in Greenland, Canada, Finland and Alaska. The main approach is case studies, i.e. real situations on the ground. They conduct field research, expedition work and document the changes taking place on the basis of information received from representatives of indigenous peoples (Dahl, 2003) . The goal of the research is to understand how the lives of indigenous people in the Arctic are affected by climate change and how indigenous people deal with the problems caused by it. Today, quite a lot of data has been collected at the level of local indigenous communities and regions in the foreign Arctic. In 2015, a book by Greenland specialist F. Sejersen, "Rethinking Greenland and the Arctic in the Age of Climate Change. New Northern Horizons", which brought a broader understanding of the role of indigenous peoples in processes related to climate change. The author investigated the changes in Inuit life caused by climate change. In contrast to the mainstream current approach, where Arctic indigenous people are seen as victims of climate change, the author of the book raises the issue of indigenous peoples' active role in decision-making regarding the effects of climate change. He suggests that indigenous populations should be seen not only as stakeholders, but also as rights-holders, active creators of the Arctic's future, capable of acting within legal

and political frameworks, especially with regard to adaptation strategies (Vasilenko A.B., 1997).

In Russia, research into the social consequences of climate change in the Arctic is not as active as abroad. In 2011, Roshydromet published a report "Assessment of macroeconomic consequences of climate change in the Russian Federation for the period up to 2030 and beyond". It determined that climate change poses higher social risks for the Russian Arctic than natural and environmental ones.

This is due to the large population of the Arctic zone of the Russian Federation and a significant number of industrial and infrastructural facilities on its territory. The authors of the report believe that the decrease in ice cover will not only contribute to the development of navigation along the Northern Sea Route, but will also hinder many maritime activities due to the high degree of variability of ice conditions. Changes in ice time and ice structure will increase risks for indigenous peoples, reducing the timing and effectiveness of hunting. Easier access to the Arctic's natural resources will open new opportunities for economic development, but will also create problems for the environment and economic activities, including traditional ones. A particular danger arises from the combined effects of climate change and human-caused pollution.

The report concludes that warming may lead to the development of some fisheries in the Arctic, but the habitats and migration routes of many fish species will change. Fish that traditionally live in colder waters will move farther north. Increased thawing of permafrost will adversely affect infrastructure facilities. Changing water bodies will increase the risk of flooding and erosion of sea shores due to storms. The expected invasion of new species will lead to changes in ecosystems and pose threats to human health and life. Particularly severe impacts may occur on the health of indigenous populations, including through changes in lifestyle, diet and employment patterns.

In Russia, research on studying and forecasting climate change in the Arctic and its biological and ecological effects is more active than research on the effects of climate change on the people living in the region. The following areas of research on the social consequences of climate change in the Arctic have emerged in domestic

studies: - economic effects of climate change in the Russian Arctic for individual sectors and the country's economy as a whole; - climate-related risks - for industry and housing in the permafrost zone, for the transportation accessibility of enterprises and settlements, and for public health; - climate risk management; - social consequences of climate change for indigenous and local communities; - environmental and social impacts of climate change in the Russian Arctic; - environmental and social impacts of climate change in the Russian Arctic; and - social impacts of climate change on indigenous and local communities. The main focus is on the economic effects of climate change on individual sectors and the country's economy as a whole.

Field studies of economic impacts at the local level, in indigenous communities, in industrial cities and towns, and in single-industry towns are very rare. Research on climate risks is actively conducted, especially for settlements and enterprises located in the permafrost zone. Scientists have revealed that thawing permafrost leads to rapid wear and tear of pipelines and buildings. In Russian Arctic cities, there are already examples of houses and other structures being destroyed for this reason. Reduced use of winter roads due to warming temperatures reduces the transportation accessibility of settlements. During the trackless period, foodstuffs become more expensive in settlements that have no other land connection. Early thawing of winter roads, which are often the main roads in oil and gas production areas, reduces the periods of movement of people and cargo. This creates risks for the supply of oil and gas in the Arctic. Preventing climate risks for the population is an important topic. The Report on Climate Risks in the Russian Federation published by Roshydromet in 2017 is largely devoted to this topic. It states that climate change exacerbates the most acute socio-economic problems, affecting health, demography, employment, and migration processes. Thus, for the demographic situation, the risk factor is the growth of abnormal climatic phenomena, which affect the dynamics of mortality (Bogoyavlensky D., 2004). The report emphasizes that the way of life of small indigenous minorities of the North is at greatest risk due to climate change. Their way of life and traditional activities (fishing, reindeer herding and others) directly depend on climatic conditions.

Adaptation measures (e.g., resettlement to other territories, acceptance of new, non-traditional forms of nature use, changes in traditional means of transportation and ways of subsistence) may force them to change their way of life, which leads to psychological stress, and in time only a few representatives of these peoples will be able to return to the model of nomadic reindeer herding, to their cultural traditions. While in foreign studies the topic of social consequences of climate change for indigenous Arctic communities is one of the most topical, there are very few such works in Russia. We can only mention the works of A. N. Davydov, G. V. Mikhailova, and WWF-Russia.

The article by G. V. Mikhailova, "The Basics of Life of the Nenets of the Arctic Island of Kolguyev", provides information that reindeer herders emphasize the multidirectional nature of climate change and talk about sharp changes from warm to cold periods. Climate change-induced degradation of reindeer pastures leads to mass deaths of reindeer and a lack of reindeer meat to feed local residents. The Nenets of Vaygach Island believe that climate change is having a noticeable impact on their lives. Earlier melting of ice makes the island more accessible to sea vessels, and this creates conditions for locals to sell or exchange the island's biological resources (fish, fox, reindeer and polar bear skins) for alcohol. This negatively affects people's lives and changes the nature of natural resource use, as local residents, in order to sell as much of the biological resources as possible to visitors, have begun to extract them in amounts far in excess of what is necessary to sustain the local community. Thus, the natural balance of the island was disturbed.

It is widely recognized that climate change will affect all segments of the population, especially the poorest. One way of addressing the problem is adaptation - the process of adjusting to the actual or expected climate and the effects of climate change. In social systems, adaptation aims either to mitigate or avoid harm or to take advantage of favorable opportunities. Adaptation to climate change at the national, regional and local levels in the Arctic has been investigated by the international scientific community. Adaptation issues are reflected in the three regional reports of the Arctic Monitoring (Guldin, 2008) and Assessment Program (AMAP) working group for the project "Adaptation Actions for a Changing Arctic - AACA, 2017".

These reports focus on the challenges faced by Arctic residents and adaptation measures in response to changes in climate, landscape, natural and socio-economic systems that have occurred in recent decades and are expected in the future. Reports have been prepared for the Barents Sea, Baffin Bay-Davis Strait, and Bering Sea-Chukchi Sea-Beaufort Sea regions. The report, *Adaptation Action for a Changing Arctic: Perspectives from the Barents Region*. The report emphasizes that adaptation takes place in the face of multiple stressors. These factors are created by the mutually reinforcing effects of climate change, globalization, demography, and market conditions (Woodman G., 1999, pp. 112-118). Changing socio-economic, environmental and political conditions create complex challenges for people, communities, economic sectors and municipalities. This set of changes requires adaptation and itself influences its processes (Vasilenko A.B., 1997). The report notes that adaptation can take different forms depending on the development of public institutions, access to knowledge, human and economic resources (Report on Human Development in the Arctic, 2007).

Adaptation strategies may include technical solutions, such as new infrastructure development, new means of transportation. These strategies may also include regulatory (legislative) actions - introduction of new building and health regulations, land use planning (Viget E., 1999, p. 157-214), regulation of access to natural resources (Andrichenko L., 2004, p. 100-120). They can also include economic mechanisms - insurance policies, incentives, subsidies and taxes. Adaptation strategies can be based on innovation - for example, such as diversifying tourism activities, using new crop varieties, developing aquaculture. They can also include the activities of institutional (governmental, public) structures - provision of climate data, work of services to counteract natural, anthropogenic and environmental emergencies, interagency coordination.

Adaptation actions can also take the form of changes in activities and settlement systems, education and awareness-raising, training on the impacts of climate change, research and knowledge on these issues. Adaptation needs, capacity to adapt, barriers to adaptation depend on local, regional, national and international contexts. Adaptation management must take them into account. Effective adaptation

management requires the use of scenario analysis techniques. Scenario forecasting is particularly valuable for understanding processes with a high degree of uncertainty, such as climate change and adaptation.

In our view, it is particularly important to continuously generate knowledge in ways that lead to acceptable solutions between groups with conflicting interests. For example, it is essential to systematically obtain knowledge from local and indigenous communities, exchange information on climate change issues, and develop shared knowledge among authorities, local and indigenous communities, business organizations, and the scientific community. Only on this basis can effective climate change adaptation strategies be built in the Arctic.

The time has come to pay closer attention to the study of the social impacts of climate change in the Russian Arctic, given that climate change in the Arctic has an increased risk of social risks, especially for the indigenous peoples that inhabit the region. The study of the social impacts of climate change on indigenous and local communities in the Russian Arctic stands in stark contrast to the state of this research in foreign scholarship - domestic research on this topic is sparse. However, collecting and documenting data on changes in the lives of indigenous and local communities in the Russian Arctic as a result of climate change is absolutely necessary for the development of effective adaptation measures at all levels. Incorporating indigenous knowledge of change and adaptation into decision-making processes will enable strategic planning and the development of realistic climate change adaptation strategies in the Arctic at all levels, from local to global.

## **Chapter 3: Prospects for the Future Development of the Russian Arctic and its Indigenous Peoples in the Face of Climate Change**

### **3.1 Scenarios for the development of the Arctic region in the context of climate change**

We are currently witnessing transformations in the Arctic, the full picture of which has not been formed. They are influenced by two interrelated factors: climate change and globalization, followed by technological, geopolitical, institutional and institutional reforms. The meaning of the latter lies in the directions and choice of instruments of public policy in the Arctic region.

The Arctic is one of the regions of the world recognized by the experts of the UN Intergovernmental Panel on Climate Change as the most vulnerable (along with island states, Africa, and African and Asian river deltas) (Report of the Secretary-General on the Programme of Action for the Second International Decade of the World's Indigenous People, 2005). The Arctic is the center of numerous and insufficiently studied processes and feedbacks operating in the climate system involving air masses, sea ice, specific stratification of the Arctic Ocean, the cryosphere and terrestrial biota.

In the 20th-21st centuries, temperature trends in the Arctic have changed repeatedly, and imperfect instrumental weather observations for a long time did not allow us to draw conclusions about the directions of climate change.

The increase in air temperature in recent decades, in addition to natural causes, may be related to anthropogenic activities occurring outside the Arctic (Fig. 1).



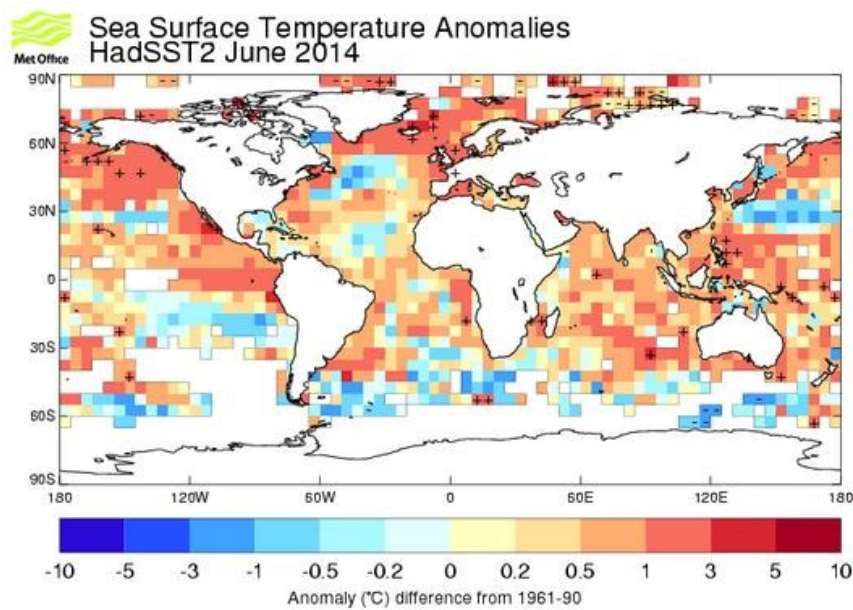


Figure 1. Sea surface temperature anomalies, June 2014.

The Arctic Council's Arctic Climate Change Assessment report (ACIA, 2005) analyzes observed and expected climate transformations, and reveals the impact of these processes on ecosystems, populations (including indigenous peoples), and natural resource use in countries with Arctic regions and territories to the south. Similar assessments are contained in the reports of the Arctic Council working groups published between 2010 and 2014. The Arctic Monitoring and Assessment Program has confirmed Roshydromet's data.

All documents emphasize that the increase in air temperature entails the most significant reduction in the area of sea and land (on the islands of the Arctic Ocean) ice over the last 40 years, which has an impact on global environmental management [3, p. 69]. Ice melting, confirmed by the North American Aerospace Agency (NASA) (Fig. 2), contributes to the expansion of mineral exploration and mining, determines changes in cargo transportation in the Arctic Ocean, affects the livelihoods of indigenous communities, and causes systemic shifts in natural resource management.

The consequences of climate change concern complex for calculation in the ultra-long term (50-100 years) risks of management of northern territories [4, p. 645]. 645], put forward issues related to the organization of scientific research based on network observations of weather and climate in Russia and abroad: precipitation in the Far North, permafrost behavior on land and in the Arctic Ocean [5; 6, 7, p. 50],

models of the atmosphere-ocean system interaction for 50-100 years (Climate Forecast System, version 2, CFSv2) [8, p. 1460]. Climate change modeling is carried out at the Institute of Computational Mathematics of the Russian Academy of Sciences.

Russian Academy of Sciences, where INMCM3.0, INMCM4 (Institute of Numerical and Mathematical Climate Models, versions 3.0 and 4) and other models are used [9, p. 231].

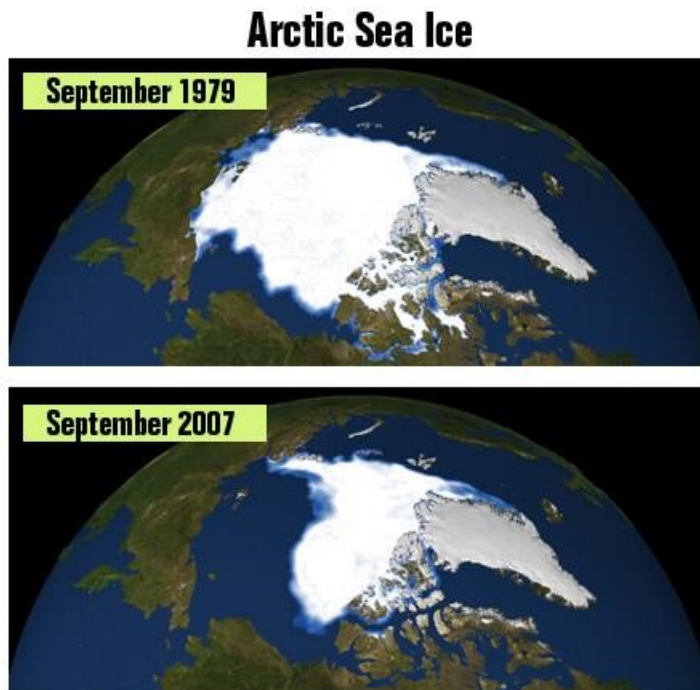


Figure 2. Changes in Arctic sea ice extent in September 1979 and September 2007 from NASA data.

At the beginning of the 21st century, a number of foreign countries and their corporations have developed strategies for the development of Arctic territories. The strategies have been adopted in Denmark, Canada, Iceland, Norway, the USA [11], Finland, Sweden, China, and India. The countries that have developed strategies differ in size, location, historical development and state structure (federal and unitary). Specific economic systems have been formed in the Arctic regions of foreign countries: American, Canadian, European (island and continental), Russian. The strategies differ, but still have several common features. The decades-long interest in the Arctic is dictated by Russia's increasing activity in the Arctic

(especially after the 2007 expedition to the North Pole). This is due to the growing demand for raw materials and fuel. At the same time, we see the depletion of mineral resources in old mining areas, caused by the desire to control intercontinental transportation routes - the Northern Sea Route (NSR) and the Northwest Passage (NWP), to develop tourism in the North and in the Arctic, to preserve indigenous peoples, to create scientific consortia and to study (Gould, 1999).

The European countries that developed the Arctic strategy proceed from the assumption that the problems of the vast and non-standard natural and socio-economic conditions of the Arctic cannot be solved without the involvement of the most significant countries - world leaders. These are the leading emitters of greenhouse gases (China and India), as well as hydrocarbon-importing countries that are considered technological leaders of the world economy (Japan and the Republic of Korea). Regional strategies focused on solving the issues of Arctic development without the participation of non-Arctic states have no chance of success [12, p. 98; 13, p. 85].

The search for answers to the challenges of Arctic development is complicated by the high degree of uncertainty occurring in this region due to our insufficient knowledge of their nature and consequences. Russian and foreign Arctic strategies have a time limit of 2020. In this regard, it is advisable to analyze several ready-made scenarios describing the directions of development of the Arctic and its natural resources from interdisciplinary positions: geography, economics, ecology, geopolitics. [14, c. 22].

The authors proposed options for Arctic development in the long term. They based them on the scientific foundation presented in scientific articles and Arctic strategies, taking into account the readiness to create a specific Arctic governance and develop international relations (Gogoleva, 2009) .

Several factors influence the content of Arctic development scenarios.

1. Physiographic and geographic features of the region: extreme climatic conditions and climate change dynamics.

The long period with negative air temperatures, short growing season, specific photoperiodicity, spread of perennial rocks make the development of industry and

infrastructure more expensive, cause increased energy consumption, and impose special requirements on the communal systems of settlements. Almost 70% of the Russian Arctic is permanently under ice. This necessitates the development of special measures to ensure safety in the extraction of minerals, the functioning of infrastructure and support the defense capability of the state in the northern (Arctic) direction.

The natural extremity is intensified by the peripheral location of the Russian Arctic, dispersed and poorly studied deposits of raw materials and fuel on land and in the waters of the Arctic Ocean, remoteness of industrial centers from coastal supply bases, national and foreign markets, insufficient development of transport, energy and communications.

In the Russian Arctic, natural problems of resource development are evident in the eastern sector. This is evidenced by the absence of significant investment projects there for several years. The eastern regions, islands and archipelagos in the western part of the Russian Arctic are characterized by the dependence of economic activity on the supply of fuel, food and essential goods from other territories, the need to create a stock of goods there, given the limited transport accessibility, i.e. the short navigation period.

The geographical location, natural conditions and economic development of the Arctic (historically raw material and practically mono-resource nature of the local economy) make the local nature vulnerable. Low biodiversity and the speed of biological processes determine the poor sustainability of the Far North ecosystems and their high susceptibility to pollutants from outside the Arctic.

This issue has attracted international attention and is at the core of the Arctic Council's work. Efforts to overcome natural extremes, including the development of transportation, substitutes for traditional energy carriers, and the development of information and communication technologies can form the basis of an innovative scenario for Arctic development. Insufficient efforts in these areas will be the hallmark of an inertial scenario.

The multitude of factors influencing climatic processes, the short period of weather observations, the physical and geographical position of the Arctic, taking

into account the Arctic Ocean water area, make it possible to make long-term forecasts of climate change. We can talk about the trends that have emerged in the last 40 years: increase in air temperature, decrease in the area of ice, decrease in the thickness of perennial rocks (Alekseev S.S., 2000). International scientific research to fill the vacuum of knowledge about the nature of high latitudes and the use of indigenous knowledge is reflected in the Arctic strategies of many states. Relevant for Russia. After the collapse of the USSR, the country lost its leadership in Arctic research, especially in climate issues (Glukhikh A., 1995).

2. The global economy and demand for hydrocarbon resources. On the one hand, the growing need of different countries (especially Asian countries) for fuel and the desire of corporations to increase the profitability of its transportation (for example, using the NSR) make the Arctic attractive to the proponents of development from a geopolitical point of view. The desire to control the production of hydrocarbons in the Arctic and the delivery of fuel dictated the development of the U.S. Arctic strategy. On the other hand, the raw material orientation creates dependence on world energy prices. We should add that some of the unique fields in Alaska and Western Siberia have passed the peak of production, and another part of the reserves is categorized as potential, i.e. their role may increase in the future (Gracheva, 1988).

3. The status of the technology and its possession by a limited number of countries. In the medium term, this factor will not allow organizing and developing profitable and environmentally safe oil and natural gas production in the Arctic. Expensive production and processing, technological unpreparedness of the sites, poor quality of seismic exploration (in Russia), the need to adjust geological models and environmental constraints were the main reasons for BP, Shell and Gazprom to decide to suspend production near Greenland, Alaska and the Kara Sea. It should be remembered that some of the promising oil and gas fields are located in disputed areas.

4. The state of international relations and the role of Russia. The system of international relations is currently undergoing a crisis, manifested with varying degrees of acuteness in different parts of the world and affecting many

countries and regions (Gogoleva, 2009). The well-being of the population living in the Arctic depends on the degree of contractual capacity of the leading Arctic countries, especially. U.S. and Russia, the governments' reliance on international law, "freedom" from taking into account factors indirectly related to the Arctic (e.g., exclusion from bilateral relations between Russia and Canada, Russia and the U.S., the "Ukrainian issue," etc.), and the full use of the potential of interstate dialogue organizations. Against the backdrop of the progress made in Russia's relations with foreign countries in preparing for the utilization of Arctic resources, the Nordic countries, Canada and the United States have imposed restrictions on cooperation with Russia, thereby calling into question mutual security commitments in the Far North and the Arctic.

In formulating scenarios for the development of the Arctic, it is advisable to refer to the article by Young O.R. "The Future of the Arctic: The Role of Ideas", where the prospects of Arctic development in an uncertain period were considered from two positions: geopolitical and socio-ecological systems.

Young O.R. wrote that most authors of popular science books have described the changes by looking at the Arctic from a geopolitical perspective. There were suggestions that we are witnessing a new stage of the "big game" for resources, another round of the Arctic "gold rush", which will lead to an increased clash of interests between different countries, but primarily between the United States and Russia.

The roots of the ideas of the "forceful partition of the Arctic" are brought in the mass media, which form the public consciousness, introducing visual images of such changes, for example, the reduction of the area and power of sea ice, attempts to claim ownership of previously unowned territories (Bakhtin N., Golovko E., Schweitzer P., 2004).

An important sign of the geopolitical scenario, according to Young OR, is the expected escalation of territorial claims in the Arctic. Examples include Denmark and Canada negotiating ownership of the Hans Islands between Greenland and Baffin Land, i.e., several uninhabited ice-like rocks about 1.5 km<sup>2</sup> ; the UK, Denmark and Iceland are disputing the 570 m<sup>2</sup> uninhabited Rockall Rock located in the Norwegian

Sea north of the Shetland Islands; Greenland is discussing the idea of secession from mainland Denmark. Russia, Canada, the USA, Denmark and Norway continue to study the Arctic Ocean floor, collect information on the outer boundaries of the continental shelf, and prepare applications to the UN specialized commission on whether the Lomonosov and Mendeleev Ranges belong to land structures (Fig. 3).

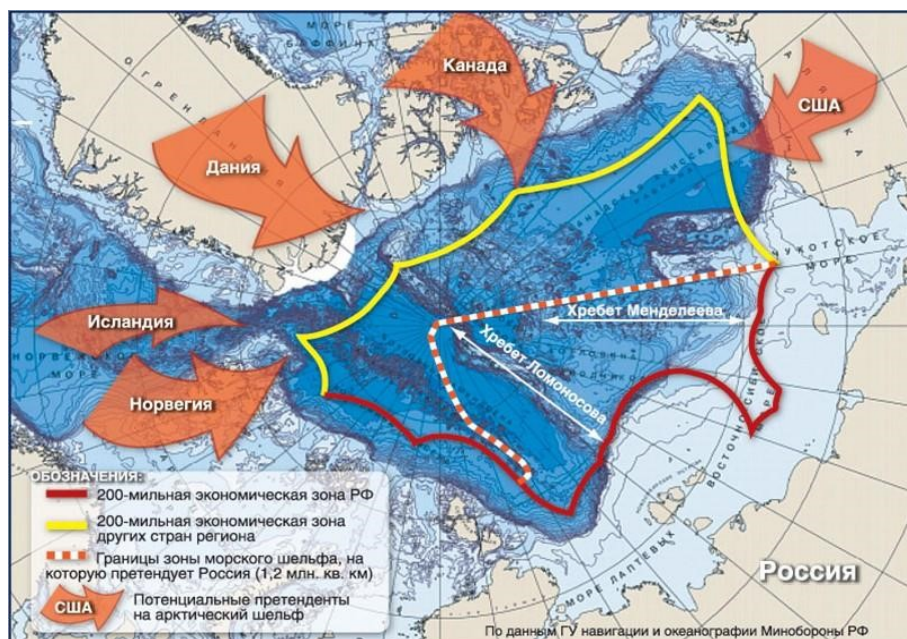


Figure 3: Claimants for the Arctic Ocean water area.

A special situation remains around Svalbard. In 1920 in Paris, 40 states signed a treaty granting Norway sovereignty over the archipelago, but with the right of access for all interested states. The Soviet Union conducted scientific research on Spitsbergen (now the Russian Science Center is located there). In several settlements, coal mining for the needs of the NSR was organized. Ensuring Russian presence on the archipelago is one of Russia's political priorities in the Arctic. In 1976, Norway established a protection zone around the archipelago, detaining fishing vessels in the exclusive economic zone (EEZ) of the archipelago, which contradicts the 1920 treaty.

Considering the future of the Arctic from the point of view of the division of world forces, some authors predict a catastrophe that will lead to "...violent bloody clashes between great powers desperately fighting each other for the right to possess the world's dwindling reserves of natural resources" [19]. [19, p. 10]. Indeed, the reasons for territorial claims stem from the availability (or projected availability) of

mineral and fishery resources in the Arctic and Atlantic Oceans, the passage of strategic sea routes of communication.

In the Arctic strategies developed, especially. In the American special place is occupied by a block of military-strategic issues, reflected from the position of NATO (Danchevskaya, n.d., pp. 611-621) . Military preparations of foreign countries in a strategically important region of the Earth are considered a destabilizing factor in the international situation. The USA has not ratified the UN Convention on the Law of the Sea. It declares its interests in the Arctic through the strengthening of military groups, readiness to act unilaterally outside the national Arctic zones. In the Arctic strategies of foreign countries we see the need to organize exercises of fleets and land mobile units, modernization of transport infrastructure, airfields on land and in the Arctic Ocean. In Northern Europe, the possibility of creating a "mini-NATO" on the basis of military infrastructure located above the Arctic Circle in Norway is being studied.

It should be noted an important, if not the main, feature of the geopolitical approach to understanding the processes in the Arctic region: the categorical thinking of the proponents of this scenario and their desire to attract attention to their works corresponds to a small extent to reality. Russia's position is that the situation in the Arctic is positive, stable and predictable, and there is no need to involve new military and political structures in solving development issues [20, p. 20]. However, in response to the challenges and in the interests of protecting the sovereignty of the AZRF strengthens the state border, deploying the forces of the Ministry of Defense and the Ministry of Emergency Situations. A Joint Strategic Command has been established in the Northern Fleet. A system of emergency rescue centers is being developed on the coast of the Arctic Ocean. Topical tasks: ensuring national security in the Russian Arctic, increasing the efficiency of interaction between military and special services and border agencies of neighboring countries, protection of bioresources, assistance to vessels in distress, and elimination of the consequences of natural disasters.

Analysis of Arctic strategies of Russia and foreign countries shows that all countries approach the Arctic from the perspective of developing international



cooperation. The recent shift from the confrontational rhetoric of the Cold War to increasing convergence has expanded the range of technological and educational interactions among the Arctic states. A typical example is their participation in the development of the Arctic Council Agreements on Cooperation in Arctic Aviation and Maritime Search and Rescue and Arctic Oil Pollution Response Preparedness and Rescue. Within the International Maritime Organization (IMO), under the Convention for the Safety of Life at Sea (SOLAS) and the Convention for the Prevention of Pollution from Ships (MARPOL), the Polar Code, i.e. the rules of navigation for countries using the Arctic Ocean, has been developed. Despite the sanctions imposed on Russia, enterprises with foreign participation are operating in the Arctic. This is, for example, the Yamal-LNG project, which involves more than 40 countries and aims to produce unique hydrocarbons while developing the industry and infrastructure of the Yamal-Nenets Autonomous District. Vietnam is producing hydrocarbons in the Nenets Autonomous District. China is interested in the Belkomur project, which is designed to connect the Arkhangelsk region and Perm Krai and continue to Asia.

States interested in the sustainable development of the Arctic and the use of its resources recognize the leading role of the Arctic Council, the Barents Euro-Arctic Council, the European Union's Northern Dimension, and the University of the Arctic as platforms for policy development regarding resources, transport and logistics, nature conservation, support for indigenous peoples, science and education, especially weather (e.g., polar cyclones) and climate issues. In the few areas of the Arctic where there are disputes over territory and water ownership, the parties either make efforts to resolve relations through negotiations, as seen in the UN Convention on the Law of the Sea, which establishes jurisdiction over parts of the continental shelf (beyond the 200-mile EEZ but not exceeding 350 nautical miles). The Russian-Norwegian Treaty on Maritime Delimitation and Cooperation in the Barents Sea and Arctic Ocean (2010) is another example of an alternative version of "soft power" expressed in non-military instruments. The Agreement delimits the Russian-Norwegian border in the Barents Sea. It means delimitation of the disputed territory of 175,000 km<sup>2</sup> or about 12% of the sea area formed by the western boundary of

Russia's Arctic sector (Russian version) and the median line (Norwegian version) drawn at an equal distance from the archipelagos of Spitsbergen, Novaya Zemlya and Franz Josef Land. Sovereignty over maritime areas in the western Arctic sector is relevant for Russia in terms of realizing the right to free access to the Atlantic, developing fisheries, maintaining trade, civil and naval communications, developing mineral fuels, and solving applied and fundamental scientific issues.

Why, despite obvious examples of active interstate dialog in the Arctic, are ideas of geopolitical confrontation viable and dominant in political forums? The answer may lie in the fact that such interpretations are easily picked up by the media and quickly take root in the public consciousness shaped by World War II, the division of the world, and the military confrontation between the USSR and the United States (Hirtz K., 2004). An equally important reason for the confrontational "pictures" may be the continuing fragmentation of the view of the Arctic, and the weak development of an alternative paradigm that would demonstrate a more logical and scientifically sound interpretation of Arctic change at the beginning of the 21st century.

Turning to the second direction of Arctic development, O.R. Young writes: "The changes occurring today in the Arctic are systemic, nonlinear, rapid and irreversible". On the Earth, anthropogenic ecosystems play an important role. Here natural biogeophysical processes are superimposed on socio-economic transformations of the environment. In some regions, this leads to complex dynamic systems in which traditional methods and management techniques do not work. An approach to the future of the Arctic, i.e. alternative to the geopolitical one, which could contribute to the development of new management options for the region, could be a scenario based on social and ecological systems, understood as interrelated social and environmental factors of development. [14, c. 32].

Nowhere on Earth is the anthropogenic factor more pronounced than in the Arctic: climate change and globalization are anthropogenic and mutually influence each other. Climate warming, according to the Arctic Council and Roshydromet, is mainly due to human activity. Moreover, outside the Arctic, in countries that emit greenhouse gases, warming is leading to increased economic activity. Such states are

moving to previously inaccessible areas, such as the Arctic. However, in a socio-ecological system, the anthropogenic factor has a comparable and sometimes more significant impact than the natural factor. Attempts to understand what is happening in the Arctic must therefore focus primarily on human activities, and in developing measures to manage change, the impact on nature and human activities in the future must be considered. Success in Arctic development can be achieved by modernizing the management system. This means turning it into a set of problem-oriented blocks (part of the multidimensional geographical location, geopolitical status, natural resource potential, socio-economic development, transport and logistics, socio-cultural and environmental potentials), which could function separately. But, at the same time, be interconnected to solve different tasks and adapt to changes in the Arctic. Effective, safe and conflict-free interaction between the subjects of socio-economic development in the territories of the Arctic zone can be ensured within the framework of Arctic partnerships at the international, regional and local levels. Their content is well known [21, p. 15]. Foreign experience in the development of the Far North demonstrates the advantages of partnerships between federal and regional authorities, between Arctic governments and corporations, between civil and military structures, between the state and indigenous peoples, between the state, corporations and indigenous peoples, between universities (research centers) and industrial enterprises (corporations). It can be stated that the potential for such interaction in the Russian Arctic is not fully utilized. Scenarios of Arctic development based on socio-ecological systems, starting with the idea of responsible management, bring to the fore bodies and organizations responsible for environmental control and management of terrestrial and marine bioresources. The challenge is to ensure the safety of the population, to utilize indigenous knowledge to develop nature management in the Arctic. The interconnectedness of social and ecological systems in the Arctic is evident when analyzing Arctic strategies. Abroad, the principles of rational environmental management and secure polar countries are being laid down. These ideas are shared in the Russian Arctic strategy.

Foreign strategies are not focused on preserving the natural environment of the Arctic. This was characteristic, for example, 25-30 years ago. Now their attention is

focused on non-exhaustive nature management with international participation, the development of alternative energy, the use of advanced standards of natural resource development, rational nature management, safe and consistent with international law use of energy resources with a gradual transition to the development of deposits in more difficult conditions. In the institutional sphere, unique structures are being created that will monitor the profound changes in the Arctic and fulfill the function of early warning, increasing the safety of enterprises and the population living in the Arctic. Marine (aquaterritorial) clusters will be based on universities and scientific centers of the Arctic. The priority is a gradual transition to the development of offshore fields with high environmental standards for subsequent use when moving to significant depths.

The Strategy for the Development of the Arctic Zone of the Russian Federation and National Security until 2020, approved by the President of Russia V.V. in 2013, laid out two scenarios for the socio-economic development of the Russian Arctic. They took into account scenario conditions for the functioning of the Russian economy and parameters of the socio-economic development forecast developed by the Ministry of Economic Development, as well as scenarios generated by the Arctic Council, such as the Scenario Report "Future Arctic Maritime Shipping in the Mid-Century" and others.

The innovation scenario will, on the one hand, correspond to the competitive advantages of the Russian Arctic, the use of its natural resource potential, and on the other hand - the manifestation of a new quality of economic growth, the use of advanced technologies in various sectors of the economy, the development of information and communication. This scenario assumes the renewal of the institutional environment, the formation of specific Arctic governments, the advanced development of the service economy, the modernization of industrial and energy infrastructure, the creation of deep processing facilities aimed at obtaining products with high added value, the introduction of technological and organizational innovations, the development of universities producing globally competitive knowledge. These goals will be equally effective in both civilian and defense-industrial segments of the economy.

The innovation scenario is based on optimistic estimates of the development of the most important sectors of the Arctic economy. It is associated with the launch of megaprojects (Shtokman and Bovanenkovo fields, Pomorskoye and Dolginskoye fields, Varandey-Sea and Medynskoye-Sea areas, development of pipeline transportation, increase in cargo traffic along the NSR) in the Russian Arctic, cooperation between Russian Arctic territories to use each other's development potential. Inter-subject investment projects "Industrial Urals - Polar Urals" and "Belkomur" will be launched.

The innovative scenario proceeds from the cooperation of circumpolar countries in the development of the Arctic shelf and therefore at a much faster pace than in the inertial scenario. A.N. Pilyasov calls such a phenomenon the "Arctic Mediterranean", considers the Arctic region "...just as the Mediterranean was .... the center of international cooperation in antiquity". Russia will continue to work on the delimitation of maritime spaces and ensuring mutually beneficial Russian presence in Svalbard, which is in line with Russia's policy in the Arctic until 2020 and beyond.

The inertial scenario reflects the prolongation of current trends in critical sectors of the Arctic economy. It is based on conservative estimates of the growth of key indicators. It is assumed that the growth rates of the gross regional product of the Arctic territories, real incomes of the population, labor productivity growth will be lower than the Russian average. Structural shifts and private investment growth will be slow. The resource orientation of the Russian Arctic in the system of geographical division of labor will remain. The world price environment for natural resources will be favorable but unstable. Population outflow will continue and the quality of life will decline. Due to delays, megaprojects will have little impact on the economic parameters of territorial development. NSR cargo transportation, fishing, and the research fleet will fall, and the research fleet will remain in crisis. Contrasts between the dynamic western and depressed eastern sectors of the Arctic will intensify. With regard to international cooperation in the Arctic, the inertial scenario reflects the conflict of interests of circumpolar countries and aggravation of the struggle between them for natural resources, including increased pressure on Russia in Svalbard.

Using the author's approach to the development of scenarios of Arctic development until 2035, the prospects for its future are optimistic, pessimistic and intermediate. The object of the study is socio-economic and political factors, since the development of the Arctic is possible with the participation of Arctic and non-Arctic states in the rational use of the natural resource and its transportation capabilities.

Signs of an optimistic scenario for Arctic development:

- progressive (despite cyclical) development of the world economy; the need for Arctic natural resources and Arctic Ocean transportation routes (primarily the NSR, although it remains low compared to the Suez Canal). All of this and international involvement are helping to further hydrocarbon exploration in new areas of the Arctic;
- rallying the world community around the values of the Arctic region (territorial integrity, compliance with international law, sustainable socio-economic growth, population welfare, high environmental quality, production of new knowledge and joint scientific research - these postulates are in every Arctic strategy of Europe and North America);
- development of "people's diplomacy" - cooperation between municipalities of the Barents Euro-Arctic region and transfer of knowledge and experience;
- Increasing the role of the Arctic Council, which makes decisions binding on other countries and invites new states interested in resource utilization and sustainable development of the Arctic region to join its work;
- The U.S. ratifies the UN Convention on the Law of the Sea and as a result is preparing a bid to increase its EEZ; growing activity by U.S. corporations in the Arctic;
- mutual understanding between the Russian Federation and the main countries of the region - the United States, Canada and Norway - on subsoil use and transportation routes; this will reduce political and military tensions in the area;

- Russia's initiatives to find new partners for environmentally safe and economically beneficial development of Arctic natural resources among non-Arctic states, primarily Asian and Latin American, on the basis of public-private partnerships.

An illustration of the pessimistic scenario would be, unlike the previous one, the deterioration of bilateral and multilateral relations between states in the Arctic. Signs of such a scenario:

- the tense nature of interstate cooperation due to territorial disputes (including the "Spitsbergen issue"); the willingness of countries to defend their interests beyond their national Arctic territories; promoting the idea of free borders in the Arctic; seeking a UN ban on mineral exploration and mining in the Arctic; defending the right to free navigation in the Arctic Ocean;
- growth of military presence; involvement of foreign Arctic states through NATO. Militarization does not meet Russia's interests in the Arctic;
- Arctic Council as a discussion club; its role in addressing Arctic issues is diminishing;
- cyclical moderate growth of the global economy is being replaced by stagnation; demand for Arctic oil and natural gas is declining amid the development of shale energy; production at developed fields in the Arctic is falling; exploration rates are declining; transportation along the NSR remains uncompetitive; and the Northwest Passage is increasingly ice-free during the navigation period;
- against the background of international isolation, Russia is looking for new partners for the development of hydrocarbon deposits among Asian companies; environmental organizations are concerned about the aggravation of the environmental situation in the Arctic due to the poor readiness of deposits for development; the activities of environmental organizations near the places of extraction and transportation of natural resources are interpreted as environmental terrorism.

In the case of the moderate scenario, the development of the Arctic will balance between optimistic and pessimistic scenarios. Territorial disagreements and

the desire to control shipping routes will remain, but these processes will not be acute, with states' expressed desire to find a solution on the basis of international law. The state of bilateral relations between the Russian Federation and Western States remains tense. Sanctions pressure from European and North American states will continue; Asian countries will become key partners in Arctic projects. Assuming the risk of losing control over shipping lanes in the Indian Ocean and representation in the scientific community on Svalbard will force India to promote its interests in the Arctic cautiously, with continued interest in the region. Developments in the global economy are driving economic activity in the Arctic, which is helping to keep international environmental organizations focused on the region. North American oil and gas companies, by pooling technological and financial resources, will aggressively pursue their interests in exploration and production of minerals onshore and offshore in the Arctic Ocean.

For the moderate scenario, implicit and random factors should be considered. By implicit factors we mean unpredictable aspects of development, i.e., those that depend on events that do not directly affect the Arctic. For example, the successes of the shale revolution and, in the long run, hydrogen energy, albeit briefly, may change attitudes toward Arctic resources that will have multidirectional development in the region. Signs of negative consequences include the conservation of Arctic projects for the development of natural resources and their export to foreign markets, a decline in the standard of living of the local population and, as a consequence, desertification of Arctic spaces. The positive value lies in preserving resources for future generations, reducing the anthropogenic load on ecosystems, and preserving a favorable environment. Neither positive nor negative sides can be accepted unequivocally at present due to the insufficiency of our knowledge about such processes.

Random factors that can affect scenario selection include natural disasters, man-made accidents, acute and prolonged financial crises, arms races, information wars, terrorist attacks, new discoveries, unexpected technological innovations, increased market volatility, or an increase in the rate of climate change.

At the beginning of the 21st century, the attention of governments and scientific community of many countries of the world is focused on the Arctic region.



This is due to the unique and insufficiently studied natural-resource, socio-economic, transportation and logistics, environmental, tourist and socio-cultural potential. All these points determine the global geopolitical (including military-strategic) importance [17, p. 17]. Both successful examples of international dialog and disagreements can be found in the Arctic. The peculiarities of the geographical location of the Arctic, the changes taking place in this region, caused by climate change and against the background of the struggle of various countries for resources and communications, are the basis for scenarios of Arctic development. Both basic geopolitical and socio-ecological scenarios require the development of a global approach to Arctic management. They choose priorities: resolving territorial-legal disputes, retaliatory (possibly aggressive) actions by states when attempts are made to limit their sovereignty in the Arctic, or focusing on international cooperation, building trust among Arctic states, ensuring the ecological well-being of the region by applying the principles of precautionary approach and biodiversity conservation, or combining these two paradigms (Aipin, 1994, p. 40-46). The solution should take into account the results of scientific research and the involvement of highly qualified specialists in extreme Arctic conditions.

The prospects for sustainable development of the Arctic and subarctic territories shape the positioning of states and their corporations. Competitive advantages of the region determine the goals and directions of their activities. Practical solutions to the territorial and environmental problems of the Arctic can be provided using the experience (but without mechanical transfer) and knowledge accumulated in the main sectors of the northern economy in different countries. Disputes arising in this process should be resolved using the principles of international law. The priority should be the sustainable development of the Arctic: preserving its environment and utilizing its natural resources without endangering future generations. This socio-ecologically responsible approach, realized through the innovative scenario and the scenario of socio-ecological systems, seems to us more realistic than the theses about "war for resources", "crisis of governance", "redistribution of the world", which is the basis of the geopolitical scenario (Gurevich, 1996, pp. 43-46).

### **3.2 Proposals to address the identified problems**

In selecting the development drivers, we used both previous scenario studies and interview data. A total of seven drivers were identified: climate crisis, social development, demographic change, economic value of the Arctic region, technology and innovation, institutional landscape, and enabling environment.

The climate crisis is reflected in the accelerating rate of change in the Arctic. Warming is occurring three times faster than anywhere else in the world (AMAP, 2021). Its effects are being felt locally in melting ice and permafrost, and globally in global warming. Researchers previously predicted that the Arctic Ocean could be completely ice-free by 2100, but more recent estimates suggest this could happen in 20-30 years (Guarino et al., 2019). Key factors to consider : sea level rise, melting ice and permafrost, infrastructure degradation, transformation of the natural environment, physical accessibility of resources and routes.

Social development is linked to the overall economic well-being of the Arctic region. This will depend on future solutions that allow Arctic residents to free themselves from the "Arctic paradox" in which local and indigenous peoples are left behind due to their lack of benefits from economic development (Nymand Larsen et al., 2013). While GDP per capita in the Arctic is high, disposable income per capita is much lower and poverty rates are much higher than the national average. Projections indicate that the Arctic will experience a maximum of 1% population growth until 2055. However, significant regional differences are expected to persist, with positive trends in some and negative trends in others. There will be more urbanization and multiculturalism in the Arctic in the future. Arctic cities are at risk of climate change and must adopt climate change adaptation policies. The Arctic is becoming increasingly multicultural, so cities will need policies that integrate indigenous, local and migrant populations. Key factors to watch for: population dynamics and out-migration, changing patterns of labor migration, urbanization of indigenous peoples, increasing social inequalities (the "Arctic paradox").

Although remote, the Arctic is an important part of the global economy. With only 0.1% of the world's population, the Arctic regions produce 0.5% of the world's

GDP (ECONOR, 2015). More than 70% of the Arctic economy accounts for Russia's gross regional product (GRP). Currently, the Arctic economy is dominated by industrial activities such as fishing, mining and quarrying, manufacturing, electricity, gas, heating and air conditioning, water supply, sewerage, waste management and recovery, and construction. The second largest sector includes public sector activities (including public administration and defense, education, health, social work, etc.) and services, including wholesale and retail trade. (Nordrejo, 2019). Key factors to watch for: the level of knowledge accumulation, the increasing race for Arctic resources, the rate of economic diversification, and freight transportation.

Several aspects of technology development and innovation are particularly related to the Arctic: transportation technologies and infrastructure, communications, space technologies, renewable energy, and climate-resilient technologies. However, the level of innovation and R&D, as well as the integration of innovation with indigenous knowledge, varies across the Arctic and will require investment in the future. Key factors to consider: the pace of Arctic digitalization and connectivity, the Arctic energy transition, the commercialization of sustainable shipping technologies, the development of extraction technologies, and the cost of doing business in the Arctic.

For decades, the geopolitical situation in the Arctic region has been characterized by a certain stability and peacefulness due to the common interest in economic growth and the reduction of military tensions since the end of the Cold War. Key factors to consider: stability in the Arctic, the pace of militarization, and the pace of Arctic globalization.

The institutionalization of Arctic cooperation was marked by the establishment of the Arctic Council (AC) in 1996 with a focus on climate change, the environment and sustainable development. Related to this was the Arctic Economic Council (AEC), created to promote sustainable business development. Although the Arctic remains one of the most stable regions in the world, the resurgence of great power rivalry has affected the geopolitical environment. With the increasing pace of change in the Arctic, the limitations of cooperation through the AC and AEC are underscored by the need to create "rules of the game" to ensure standards for sustainable business

development in the Arctic, transportation, R&D, and other economic activities. Key factors to be addressed : environmental policies and regulations, disaster response effectiveness, demographic and social policies, financial and non-financial incentives, public recognition of business in the Arctic, international consensus and governance (Andrichenko L., 2004, p. 100-120). Any initiatives to develop the Arctic, including shipping, require special attention to public perception, both in the Arctic itself and globally. Public opinion becomes a key factor in the development of regulatory frameworks as well as corporate strategies and policies of local governments.

We then mapped all key factors by uncertainty and influence. The influence/uncertainty grid is a two-dimensional matrix with an x-axis for uncertainty and a y-axis for potential influence (on future outcomes). Critical uncertainties are those that will have a significant impact on future Arctic development. They are marked with an ellipse in Figure 2. For the mapping, we used data collected through interviews with various stakeholders. We developed a customized interview protocol to identify the key drivers of the region's development, their uncertain rates and impacts using the Oxford Scenario Planning Approach (OSPA) methodology (Ramirez & Wilkinson, 2016).

A critical step in the scenario planning process was to identify the two or three drivers with the greatest influence and uncertainty about the likely future development of the Arctic from among the critical factors. After many meetings and rounds of discussions with stakeholders and respondents, consensus was reached on the two most important and uncertain drivers of the scenario.

Based on the two-by-two matrix of influence and uncertainty (see Figure 3), two uncertainties stand out as having the greatest magnitude and influence. Table 1 summarizes these two: (1) the quality of the institutional environment relevant to the Arctic; and (2) the speed of technological development and innovation. The quality of the institutional environment will be critical in determining economic and social development and determining the effectiveness of mitigation and adaptation measures in the face of accelerating climate change. The pace of technological development and innovation will be critical to achieving economic intensification while

maintaining environmental sustainability and social equity (Gnedovsky M., 1996 p.19).

The Arctic region requires a comprehensive and coordinated enabling environment - a set of laws, regulations, policies, international trade agreements, and other soft infrastructure elements such as public awareness and acceptance - that will promote progressive but sustainable development in the Arctic region.

In the Arctic, extreme weather conditions require the development of specialized technologies for each industry and sector. Social and environmental considerations place additional demands on new technologies. Those needed for Arctic development will require significant funding, political will, and entrepreneurial risk-taking for implementation.

In addition to the two critical uncertainties, experts cited the dynamics of geopolitics and international consensus as an important factor. Stability in the Arctic is determined by changing geopolitics, which will remain a critical uncertainty in the region's development. Geopolitical intensification, fueled by the national interests of Arctic states as well as the interests of extra-regional actors, may change existing patterns of cooperation. It is unknown whether the quality of consensus will improve or deteriorate and how this will affect the regional landscape in terms of political cooperation and economic development (Gnedovsky M., 1994, pp. 8-20). Based on these critical uncertainties affecting how the Arctic region may develop through 2050, four scenarios were constructed. Each reflects the strength or weakness of the quality of the institutional environment and the pace of technological development and innovation

From the many future options that can be created by the interaction of critical uncertainties, we selected four mutually exclusive and collectively exhaustive (MECE) scenarios to explore. These plausible versions of the future help create a safe space for dialog about strategic leadership and can stimulate collaborative action. Oxford's scenario planning approach is particularly suited to creating scenarios in times of turbulence, unpredictability, innovation, and uncertainty.

The slow pace of change and the lack of coordinated national and international structures and governance, as well as the lack of new technological developments and

deployments, all combine to halt Arctic development. The Arctic region remains stagnant for a decade and then rapidly declines. In the Middle Ages scenario, the only engine of economic growth is the exploitation of natural resources. This is done irresponsibly, which in turn has severe climatic consequences and leads to the overall degradation of the Arctic ecosystem, making it uninhabitable.

The Arctic is being deforested and devastated by ruthless exploitation of the environment. Nation-states and corporations, both public and private, continue to dominate the Arctic economy.

In this scenario, GDP grows for about 10-15 years (until 2030-2035) due to accelerated exploitation of natural resources. It then declines sharply and by 2050 is half of what it was in 2020. The reason is that environmental degradation in the Arctic makes it impossible to continue exploitation projects. Therefore, they are being abandoned, which not only slows GDP growth, but ultimately halts the Arctic economy. Extractive industries prevail, avoiding diversification and new market opportunities. This cuts global Arctic GDP in half from its current size to nearly \$220 billion. Economic activity and rapid climate change continue to damage the natural ecosystem. Melting permafrost is causing natural and man-made disasters, destroying biodiversity and the traditional way of life of indigenous peoples. These people are either integrating or migrating. By 2050, the population will be reduced by 60%. Most of those remaining will be shift workers from the southern regions of the world. In this scenario, all aspects of sustainability (social, environmental and economic) perform poorly.

Competition for Arctic resources, fueled by government-funded innovation, is leading to exploration of Arctic riches, boosting the economy, and attracting opportunity seekers to the region. Both environmental regulation and disaster response are fragmented and inadequate, unable to stop ecosystem destruction. Indigenous peoples' natural habitats and livelihoods are deteriorating as the climate crisis intensifies. In the Great Age of Discovery scenario, we are mainly referring to the disproportionate prioritization of the economic dimension over the environmental and, especially, the social dimension in the triple bottom line concept.

The Arctic states cannot agree on how to protect a region that has become a global battleground for superpowers. Global competition is constantly on the verge of escalating into confrontation. The growing militarization of the region is the new reality. Without effective governance and without venues for dialog, the situation is becoming increasingly dangerous. Some call the Arctic the "new Middle East," meaning that any spark can cause an explosion.

The race for dominance in the Arctic is driving governments to invest in research and development. Rapid technological advances and the increasing availability of diverse and innovative solutions are improving access to Arctic resources and thus creating new business opportunities. This impetus for innovation is driving modern economic activity. In 2050, the Arctic is becoming increasingly lucrative and attractive to private investors. Massive government guarantees insure against all risks. While the Arctic economy remains largely resource-based, it has become as high-tech and digital as possible. Economic considerations override environmental considerations, with the result that mining continues to damage the Arctic ecosystem. Natural disasters are more frequent, but the ongoing global climate crisis is forcing regional actors to consider whether they are causing the Arctic's deterioration or whether the Arctic is just one component of a much more general deterioration.

Arctic society is fragmented to the point where urban communities and job seekers thrive while indigenous peoples suffer. Social and environmental organizations continue to express concerns on global platforms, but their voices are ignored. Greenwashing and "bribing" local communities to remain silent in exchange for short-term economic gain are tactics that are tacitly adopted by the main actors in the region. Bribery involves irresponsible short-term practices of giving back in unsustainable ways, such as offering financial or other material support to local communities without the certainty that this will have a positive long-term impact. Thus, business practices in the Arctic are not ESG 1 compliant and businesses do not have adequate engagement with local communities (Bakhtin N.B., 2002, p. 316-331).

Global public recognition of Arctic exploitation is at an all-time low, and many consumer and financial brands not only avoid doing business with companies

engaged in Arctic-related activities, but also support a growing global consumer/citizen activist movement. The focus on the economic dimension means ignoring ESG practices, which ultimately results in narrowing companies' access to markets and capital. This includes the most "reputation-conscious" category of consumer brands, which are the first responders to any interruption in the supply chain. In this scenario, the economic dimension is emphasized at the expense of the social and environmental.

The Arctic is becoming a showcase for everything good for the ecosystem - only sustainable energy and transportation, no mining and extraction, and restoration of natural processes. Money is being withdrawn from the Arctic. What was once a global magnet for business has become something of a movie set for National Geographic.

The Paris Agreement, followed by the Green New Deal, set a strong precedent for prioritizing long-term environmental benefits over immediate economic gains. A global agreement to preserve the unique ecosystem of the Arctic has led to the development of perhaps the world's most stringent environmental regulatory framework and enforcement mechanisms. Social and environmental non-governmental organizations are collaborating with academia to deepen our understanding of the Arctic ecosystem and develop guidelines for all human activities in the region. Climate change is being closely monitored to reduce potential risks to the environment. The Arctic Council has developed into one of the most influential supranational organizations in the region, with full legislative and regulatory authority.

In the Arctic, economic activity has been limited to sustainable fishing and reindeer herding, local crafts, and sustainable tourism. Indigenous peoples retain their traditional way of life and receive government assistance. All extractive activities have ceased and Arctic GDP has fallen 80 percent from 2020 levels to approximately \$88 billion. The main driver of innovation has been the tightening of sustainability standards. This is heavily subsidized by governments and international development agencies. The Northern Sea Route is navigated exclusively by ships powered by clean fuel. Local energy needs are fully met by CO<sub>2</sub>-free technologies.



Global public support is strong because other countries consider the Arctic to be the world's largest national park. Although it benefits the environment and indigenous peoples, Arctic cities have been abandoned and local infrastructure has fallen into disrepair. With no more large companies operating in the Arctic, all social and infrastructure responsibilities have been handed over to governments struggling to justify ever-increasing costs. Economic stagnation and deteriorating living standards have accelerated the exodus of professionals and urban populations. Apart from scientists and environmentalists who work in shifts, there is no talent in the region. The natural attrition of indigenous peoples has slowed but not stopped, so that by 2050 the Arctic population will be less than 20% of what it was in 2020. In this scenario, the environmental aspect of sustainability displaces the social and economic aspects.

Countries are agreeing to make Arctic exploration a symbol of international cooperation and humanity's eternal quest for progress and invention. Many governments are agreeing on standards for doing business in the Arctic, hoping to encourage the use of the latest and most innovative technologies.

## **Conclusion**

Business development in the Arctic has been made possible by a worldwide consensus on the importance of economic prosperity and environmental sustainability. Previously inaccessible Arctic resources are now available both physically and institutionally. As one element of a business development strategy, governments are helping businesses make long-term investments in research and development to create a unique technology platform in the Arctic, such as the Arctic ecosystem. Through advances in technology and the creation of new industries, businesses have introduced advanced mining and construction methods, sustainable energy, shipping and digital technologies, and other new industries in the Arctic. These advances are driving economic growth and enabling businesses to mitigate many of the impacts of climate change. The Arctic is emerging as an example of economic growth while reducing environmental impacts.

Even the Arctic cannot escape global warming, but some measures have helped slow the process by giving habitats time to adapt to new circumstances. Through a system of regulations, behavioral changes and advanced technology, the environment has been restored. There has been an increase in public recognition of economic activity in the Arctic. As the demand for creative and innovative products in the Arctic grows, people are moving there to fulfill these needs. Sustainable construction, energy, transportation, and public spaces contribute to the well-being of Arctic cities. People throughout the area not only retain their traditional lifestyles and native languages, but also participate in public life and decision-making processes. In this scenario, all social, economic and environmental aspects of sustainability work equally well.

These four scenarios have similarities with previous work. For example, the Middle Ages are characterized by the most pessimistic Arctic future, as in "Polar Minimums" (AMSA 2009) and in " Exploited Colony" by Haavisto et al. (2016). What distinguishes our scenarios from previous ones is our consideration of the social, economic and environmental dimensions of sustainable development and our attention to the institutional environment, technology and innovation. In the most

favorable "Renaissance" scenario, all social, economic and environmental aspects are equally important and supported by a strong institutional environment with agreed standards for doing business in the Arctic in the most responsible way possible. Moreover, sustainable development in Renaissance is underpinned by technology and innovation focused on the specific needs of the Arctic.

Global Arctic modeling predicts what will happen by mid-century. The Arctic will be very different, with Arctic ecosystems hard to recognize, with less snow and sea ice, more warming, more vegetation, and an average temperature increase of 4 °C. Future changes in the Arctic may have even more far-reaching effects elsewhere because of greenhouse gas emissions from the tundra and changes in both oceanic and atmospheric circulation.

While scientists have clear projections for the effects of climate change in the Arctic, the future of economic and social development is less certain. In this paper, we present four scenarios for Arctic development through 2050 that are based on estimates of how uncertainties such as the quality of the institutional environment and the pace of technology and innovation might play out. Our study takes into account the changing geopolitics, turbulence, unpredictability, innovation, and uncertainty of future Arctic development. The study contributes to a plethora of future Arctic research using the Oxford Scenario approach and focusing on the three pillars of sustainability (economic, environmental and social). Our scenarios are not predictions; rather, they are tools for envisioning the future and detecting key turning points, new opportunities, and potential threats.

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