

An aerial photograph of a research station in a swampy area. The station consists of several wooden buildings with corrugated metal roofs, a cluster of white trailers with blue accents, and several small boats docked at a wooden pier. The surrounding area is lush with green trees and vegetation. The text is overlaid on the left side of the image.

“Even the Paris Agreement, which provides the basis for organizing international efforts to combat climate change, did not single out the Arctic as a special item of political interaction for the coming decades, albeit it is a barometer of the health of the global ecosystem.”

– Irina KARAPETYANTS, MIIT, Moscow

Image Source: The research station of Kaibasovo in the Vasyugan Swamp area, the largest swamp in the Northern Hemisphere, in Southwestern Siberia. Photo by courtesy of Andrei Kuznetsov (photographer) and prof. Sergei Kirpotin, director of the Bio-Clim-Land Center of Excellence, National Research Tomsk State University, August 2021, all rights reserved ©.



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Fragments for sustainable Arctic infrastructure systems

The modern Arctic is rapidly integrating into regional and global processes of socio-economic development, becoming increasingly vulnerable from the point of view of its sustainable development. Issues of comprehensive environmental safety of the Earth's territory, which is 27 million sq. km with its huge reserves of minerals, the absence of a recognized international legal status, the division of the continental shelf of the northern latitudes into zones of national strategic interests with the exclusive right to their industrial development are becoming particularly relevant in the international infrastructure agenda. The activities of states to intensively build up the transport and energy potential in the Arctic, expand investments and support the commercial interests of business in the field of exploration of deposits and extraction of mineral and bioresources, the deployment of military offensive complexes has a direct impact on the nature of the systems being formed that support the functional and spatial organization of objects,

facilities and services in the Far North.

The transformation of the Arctic non-social infrastructure has gone from the creation of the early settlements, ports, warehouses, providing trade in fur and fish, the first wave of industrialization and urbanization caused by the discovery of gold mines in Alaska, the construction of meteorological services, rescue stations, polar bases, observatories under the influence of the concern of the international expert community in connection with global warming to the construction of roads, pipelines, processing plants, transport and communication facilities, local energy centres, oil and gas production complexes serving intensive production and transnational transportation of hydrocarbons.

Obviously, given the forecast of an increase in global energy consumption in 2050 by 50% compared to 2018¹, taking into account the undiscovered oil and gas reserves on the Arctic shelf, estimated at 90 billion barrels and 47 trillion cubic meters of natural gas², of a decrease in oil reserves in the former places of their development, will lead to an expansion of the presence of extractive industries, intensification of exploration and drilling in the Arctic, turning it, thanks to intercontinental transport corridors, primarily sea ones, into a raw material donor for the planet. A significant amount of fresh water will satisfy the needs of countries with arid climates, bioresources will fill the food needs of the population, which will amount to 9.8 billion people by 2050.³ The desire to quickly develop the mineral potential

of the Far North will contribute to an increase in global consumption, which contradicts the concept and principles of sustainable development.

It is difficult to agree with the statement that due to the active industrial development of the region, its social sustainability, measured by indicators of accessibility, quality and standard of living, and fair distribution of benefits, has been achieved. In the mega-space of the Arctic, the uneven settlement in remote and hard-to-reach places generally does not allow people, with the exception of residents of several northern cities, to be really involved in the process of managing the Arctic territories, to be provided with reliable communications and transport communications, or to influence the adoption and implementation of economic business projects.

The current path of active industrialization in the Arctic regions increases the risks of environmental disasters, negatively affects the development of usual types of economic activities for 50 groups of indigenous people, leading traditional forms of nature management. The formation of the industrial and social infrastructure necessary for its functioning is tied exclusively to oil and gas fields, which upsets the balance of the integrated development of the territory beyond the Arctic Circle. The economic and raw material colonization of the Arctic increases the social dependence of the indigenous people on the sale of resources that, in fact, do not belong to them and the main incomes

are received by extractive companies. The conditions of existence of the peoples of the Far North are in the focus of multiple, often conflicting political decisions taken at the local, regional and global levels. Proceeding from this, some scientists call the social regional development of the Arctic a mystery, and the state management of this process a sphere of uncertainty.⁴

Political tension in the Arctic caused by the intensification of the struggle of countries for national sovereignty, the priority right to possess the resources of the circumpolar region, turns local residents into hostages of possible military conflicts.

Currently, more than 800 northern projects are connected in one way or another with the destruction of the natural environment and increased environmental tension in the Arctic⁵ is due to significant losses of the ice sheet from 1993 to 2019, an average of 279 billion tons per year in Greenland and 148 billion tons per year in Antarctica, and an increase in temperature more than twice as compared to other territories.⁶ However, not the melting of permafrost, leading to the release of 300 to 600 million net carbon per year into the Earth's atmosphere, neither warming, which causes global climate change, rising ocean levels, fires and flooding in different parts of the world, are perceived as a fatal threat to the population living in the Arctic.⁷ In a certain sense, the development of companies business is still constrained by the high cost of Arctic projects, prob-

lems with their payback, and climate risks. At the same time, natural changes in the Arctic may quickly expand economic benefits, since they enlarge the availability and access to raw resources, make them growingly attractive for investors to extract, process and transport them along regular routes, paths and roads that are free of ice. As a result, the Arctic regions receive significant volumes new types of pollution with heavy metals, persistent organic and radioactive substances, and oil products. Surprisingly, even the Paris Agreement, which provides the basis for organizing international efforts to combat climate change, did not single out the Arctic, which is a barometer of the health of the global ecosystem, as a special item of political interaction for the coming decades.⁸

The concentration of the arctic states and other countries interested in the development of the natural resources of the Arctic, on the growth of GDP and profits from the export of raw materials, determines the strategic course for the sustainable development of the circumpolar region as open and problematic. Of course, it should be based on the separation and insurance of possible environmental risks from project and economic activities, on the distribution of social responsibility for its negative consequences between states and the private sector. In the meantime, statements by some countries about the ability to use low-emission and resource-saving technologies everywhere in the Arctic, alternative energy sources for transport and industrial facilities do not sound very convincing due to their high cost

or the impossibility of using these technologies due to the sanctions policy, for example, in relation to the Russian Federation, which owns more than 3 million square kilometres' of the Arctic area (18 % of the entire territory of the Russian Federation), and which is home to about 2.5 million inhabitants.⁹

The regional development of the Arctic infrastructure requires significant investments, the volume of which, according to some estimates, amounts to approximately 1 trillion dollars, which, of course, is beyond the power of any national budget and requires international or joint financial investments with the participation of two or more states.¹⁰ However, the nature of such infrastructure projects needs to be clarified. A number of states, thereby emphasizing their rights to own part of the Arctic territory, declare the allocation of considerable funds for the implementation of infrastructure projects, but they are mainly aimed at the construction of production facilities that ensure the extraction and processing of minerals, transport and military complexes.

For example, the Russian Federation plans to invest more than \$ 67 billion in the Arctic for the period up to 2030, of which 38.9% will be allocated for mining, 18% for transport development, and 5% for the social sphere.¹¹ At the same time, the environmental assessment of Arctic infrastructure projects is likely to be cancelled, considering that

this procedure scares off potential investors.¹² Non-Arctic countries interested in the development of the region's fossil resources, such as China, invested \$ 2 billion in the Greenland mining industry from 2012 to 2017, and \$ 1.2 billion in Iceland in order to obtain rare earth minerals, iron, copper, and uranium.¹³ The strengthening of military potential in the Arctic, the construction of dual-use facilities, the development of polar military technologies, training of servicemen for work in extremely low temperatures is alarming. Denmark announced the allocation of \$ 1.5 billion for the defence of the North Atlantic and the Arctic in 2021.¹⁴ A US Air Force military base with a bomber squadron is being created in the Norwegian Arctic. Canada is strengthening the naval forces in its northern regions, after several decades of under investment.

On the contrary, as the COVID-19 epidemic has also affected the population living in the Arctic, has exposed the inadequacy, heterogeneity and inconsistency of infrastructure policy. On the one hand, it showed the insufficiency of local doctors, medical institutions equipped with modern facilities, lack of transport accessibility to the points of receiving help or vaccinations, the Internet, which allows supporting telemedicine capabilities. On the other hand, the existing transport provision did not allow the region to be socially isolated from the ongoing exploration of mineral deposits, the increasing flow of tourists, exposing the indigenous people to the risk of infection with coronavirus infection.

The Arctic remains vulnerable in terms of efficiency and the possibility of global control over the safety of the living population, changes in its ecosystem, of monitoring the consequences of industrial exploitation of the subsoil, which directly affects the intensive melting of ice. The fragility of the natural environment of the region, the climatic changes of which are of planetary importance, necessitates the restoration of the status quo of the Arctic, which at the end of the 80s of the last century was declared a conservation area, a territory of peace and international cooperation. At the same time, it is necessary to determine what type and nature of urbanization, the volume of industrialization of the Arctic can ensure its sustainable development.

In conclusion, echoing initial ideas developed within the T20 Infrastructure taskforce in 2019 and 2020, the development of infrastructure friendly and safe for the natural systems of the Arctic should take into account the need to:

1. create of sufficient and reliable support of the vital activity of the indigenous peoples of the Far North;
2. form a modern research base with its scientific laboratories, hydrographic vessels and rescue stations, centres of regular environmental monitoring;
3. provide free (without hindrance) transfer of "green" technologies;

4. create a compatible geoinformation support system;
5. ensure transparency and information openness in relation to the implementation of national Arctic projects;
6. create of treatment facilities and systems for the disposal of accumulated environmental damage;
7. increase the use of low-carbon transport and expand opportunities for eco-tourism;
8. develop and apply the common environmental standards in the construction of industrial and transport facilities.

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