

Aqua-territorial production complexes of the Arctic zone as a new type of real estate in contemporary Russia

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Abstract. The paper is devoted to the identification of basic requirements for the formation of a new type of real estate in the Arctic zone of Russia. Based on the review of aqua-territorial production complexes and the evaluation of the prospects for their expansion, the resource potential for sustainable development of the national economy can be substantially adjusted. This predetermines their prospective advantage. The need for a parallel solution of the environmental issues is a peculiarity of the strategic approaches to the development of the Arctic spaces. In this regard, the potential of the Arctic in scientific research in this area is being actualized. In addition, the Arctic is the most important region in the world for studying climate change and its consequences. Taking into account the attention paid to this topic in the leading countries and the likely amount of damage due to the global warming, large-scale complex climate studies can turn into a full-fledged branch of the economy, which together with investment construction projects of the point development allows the Russian innovation cluster to take the advanced positions in the world. Considering domestic experience in implementing investment construction projects in the extreme conditions of the North and Siberia, it is advisable to focus investments in the development of aqua-territorial production complexes, the features of which are presented in the article. Their study allows formulating basic requirements for the implementation mechanisms for the projects of the Arctic zones development.

1 Introduction

The modern nature of the development of the national economy of Russia is strategically beginning to reorient itself towards the implementation of transcontinental projects, among which the development of the Arctic spaces plays an important role. A cautious attitude to the Arctic is determined by the uncertainty of its potential, both from the viewpoint of assessing the explored reserves of hydrocarbons and a huge number of other minerals. At the same time, the ability to perform transpolar flights between Eurasia and America, transport cargo along the Northern Sea Route (NSR), restructure transport flows, and realize raw materials and transit potential is one of the strategic tasks of modern Russia. No one can predict how it will affect the state of the global economy. In addition, it is almost impossible

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to assess environmental risks and climatic changes before the development of the Arctic space [1].

The analysis has shown that interest in the Arctic resources periodically increases sharply due to a significant increase in energy prices. Improving technologies of extraction and transportation of hydrocarbons gives rise to some optimism about the activation of economic development of the Arctic territories. For Russia, the development of the Arctic is not only a large-scale project, in fact, the megaproject that expands reproduction of the resource base for sustainable development of the national economy, but a project that changes the geopolitical status of the country. At the same time, for Russia, the seas of which cover not less than 80% of the area of the Arctic basin, it is necessary to keep the achieved leadership in the military, economic and scientific development of this region. For this purpose, the State Program "Socio-economic development of the Arctic zone of the Russian Federation for the period to 2020" was adopted [2]. But it has not yet received the allocated funding. The ongoing economic downturn makes a full-scale implementation of the program unlikely. It is not permissible against the background of the increased competition around Arctic projects.

2 Materials and methods

Not only the states of the Arctic five (Russia, the United States, Canada, Norway, Denmark) and subarctic states (Finland, Sweden, Iceland) have recently intensified their activities, but also those located far from the polar latitudes - Japan, China, South Korea, Germany, France, Italy, Spain and others [3, 4]. These states consider their activities in the Arctic zone as an important part of their national strategies. Meanwhile, Russia has precious experience in implementing transcontinental developer projects for the development of resources in the water area and coasts of the Arctic Ocean, and extremely uncomfortable living and economic conditions have been successfully overcome in the framework of previously completed construction projects ("Yamal LNG", etc.).

The actualization of development programs for the territory of the Arctic should take into account high environmental risks of oil production and transportation in the polar latitudes [5]. Currently, it is believed that large-scale development of the Arctic shelf deposits will become possible after widespread introduction of ice-mining technologies, as well as ensuring the year-round accessibility of the Northern Sea Route [6, 7, 8]. At the same time, mainland investment and construction projects can be recommended for implementation. "The Yamal LNG" project has become one of the key drivers of the region's development and one of the most highly effective megaprojects of the country's spatial restructuring.

Undoubtedly, the accumulated domestic experience in implementing development of the northern territories creates a number of strategic advantages [9]. Moreover, the Arctic is important not only because of the presence of hydrocarbons. It concentrates a number of promising resources of the future. Thus, the world's largest deposit of valuable rare earth metal palladium, which has a huge military-strategic importance, is located not far from Norilsk. The world's largest Popigay deposit of highly abrasive diamond-lonsdaleite raw materials (impact diamonds), which is necessary for many high-tech industries, has been discovered on the border of Yakutia and the Krasnoyarsk Territory. The implementation of projects to develop these deposits will lead to the country's leading positions in a complex of new high-tech industrial segments.

Concern about environmental issues is a peculiarity of strategic approaches to the development of the arctic areas, in connection with which the potential of the Arctic with regards to scientific research in this field is actualized. The Arctic is the most important region in the world to study climate change [10]. This topic is given great attention throughout the world. In this regard, large-scale complex climate studies can turn into a full-

fledged branch of the economy, which, together with investment and construction projects of the point development, allows the Russian innovation cluster to take leading positions [5, 11].

3 Results

At present, it is impossible to consider the whole of the Arctic zone as a territory of prospective development and intensive project financing, both because of extreme conditions and the lack of modern production infrastructure, and the extremely high costs of projects for developing resources of the Arctic coasts. It is proposed to focus efforts in clearly delineated economic complexes – *aqua-territorial production complexes (ATPC)*. They are to be formed on the basis of resources (hydrocarbons, solid minerals, and forest resources) located directly on the coast or in the interior of the mainland at a distance of up to 300 km.

Requirements for ATPC projects are primarily related to the basing facilities.

Projects should be based on:

- 1) port-industrial units formed or reconstructed;
- 2) objects of energy, transport infrastructure and life support system;
- 3) seaside villages, accumulating trained labor resources.

It is also advisable to include in the ATPC oil and gas production facilities on the shelf and on land, mining and metallurgical, processing, maritime transport, ship repair, etc.

The analysis allows us identifying the main contours of the future Arctic ATPC. Within their boundaries, there are existing new aqua-territorial production complexes currently being formed or proposed for creation in the future: Kolsky, Arkhangelsk, Nenets, Yamal, Norilsk-Turukhansk, Taimyr, North-Yakut, and Chukotka. They reach the main transport polar ports of Russia: Murmansk, Arkhangelsk, Kharasavey, Dixon, Dudinka, Khatanga, Tiksi, Pevek and in the foreseeable future - Indiga.

4 Discussion

Each of the ATPC is characterized by special conditions that need to be briefly summarized.

1) *The Yamal ATPC* is characterized by the strategic importance of both territory and resources. It has large scale production, as well as peculiar conditions for the location of populated areas and transport system. In addition, the Yamal ATPC is characterized by rich deposits in the continental part of the region. Being the first large-scale area of development of the Arctic zone with freezing water, the Yamal ATPC is a pilot project for the formation of mechanisms for the organization of investment and construction activities in the water area and the coast of the seas of the Arctic Ocean. The target focus of the Yamal ATPC projects mainly deals with the development of resources of the West Siberian oil and gas province. So, in Yamal, the Bovanenkovskoye field is being developed and will be put into operation in the near future. Giant deposits of gas and oil and gas condensate are also discovered in the limits of the Yamal-Nenets Autonomous District. Their total reserves exceed 11 trillion cubic meters. Also, this ATPC has resources that can support the trend of import substitution. The unique Raiz field of chromite ores in the Polar Urals in case of its development will cover the need of ferrochrome producers, which currently produce from imported raw materials. In general, the implementation of investment and construction projects for the development of new deposits and organization of extraction of rare metals will allow not only satisfying the demand for niobium and rare earth metals, but also, under favorable conditions, to export these metals to the global market.

2) *The Norilsk-Turukhansk ATPC* (The Krasnoyarsk Territory) specializing in the field

of non-ferrous metallurgy, based on the Norilsk group of fields. Their share in the explored all-Russian reserves is characterized by: 43% of copper reserves, 71% of nickel reserves, 98% of platinum group metals, and 7% of gold.

The prospective development projects of the Norilsk-Turukhansk APTC are defined by *the three main tasks of federal significance*:

1. Conducting reconstruction of the Norilsk Mining and Metallurgical Integrated Plant (NMMIP), as the largest base of non-ferrous metallurgy. This will require an increase in the total volume of ore mining; further growth of geological exploration; application of new enrichment technologies; creation of modern metallurgical facilities replacing obsolete ones, which allows the production of 100% of commercial nickel, cobalt and copper.

2. Implementation of the development of a new oil and gas region - Turukhansk group's fields with a total production of up to 40 million tons by 2030. Moreover, at the first stage it is planned to build an oil pipeline to Purpe. With transition to the large-scale extraction with an access to Dudinka, it is planned to create there refining capacities to provide the Norilsk industrial area from a long distance and then to Dixon for the export of oil by tankers in the western and eastern directions.

3. Formation of a new configuration of the transport system "Yenisei-NSR". Prospects for the development of the port of Dudinka are closely related to the future development of NMMIP. In accordance with the Transport Strategy of the Russian Federation to 2020 [12] and the Strategy for the Development of Railway Transport to 2030 [13], the Nadym-Salekhard railway is planned to be laid.

The creation of the new port facilities (Dixon Port), located on the Arctic coast of the Yenisei Bay, should ensure the processing of sea-going vessels. Its importance is increasing in connection with the development of mining (oil and gas, coal, placer and ore gold) on the Taimyr Peninsula. In the near future, it is also necessary to create a terminal for oil loading by sea tankers in Efremov Bay, which is caused by the beginning of development of the Vankor group of hydrocarbon deposits.

3) *The Taimyr-Yakutsk APTC* is expected to develop as the development of apatite-rare metal deposits in the Essei district will take place. The plans for intensification of works on its development are of a long-term nature and refer to the period after 2030. On the basis of the Essei group of deposits, it is planned to create large ore-dressing plants. Alternatively, mined ore can be used in Norilsk. Apatite concentrate from the ore-dressing plants can be delivered to Lesosibirsk and used for the production of phosphate fertilizers. It is possible to deliver them to the Kola Peninsula via Northern Sea Route to replace the supplies of this product to other regions of the country or for export. The creation of new transport routes will require the implementation of a number of related infrastructure projects of railway construction:

First, the construction of a railway to Norilsk with a subsequent exit to Igarka or Dudinka;

Secondly, the construction of a railway with direct access to the port of Khatanga.

The implementation of cross-border and transcontinental infrastructure projects will make it possible to put into practice the projects of development of the Uboyninsky group of copper-molybdenum deposits. We would also note the presence of the unique deposits of technical (impact) diamonds discovered in Khatanga in the vicinity of the Popigai Hollow. They contain more than half the world's stock of this raw material, and the basins of the rivers Khatanga and Kotui are rich in natural gas and oil. If these deposits are developed, the Khatanga Sea Commercial Port, the third largest in Taimyr after Dudinka and Dixon, will need to be reconstructed.

4) *The North-Yakutia APTC* will develop in the direction of creation and maintenance of the international air corridor Transpolar-3. In addition, it requires a spare airfield, as well as facilities for servicing the international transport corridor of the NSR. The North Yakutia

ATPC is represented by minerals - mostly tin (Deputatskoe deposit) and gold (mostly placer gold - Kularskiy region). The regions on the East of the Lena River are the leaders in Russia for the extraction of tin and antimony, gold and silver. Platinum placer deposits have been intensively exploited in recent years. In Anabar (Yakutia), the Tomtor rare-metal deposit is explored with extremely high content of niobium, which does not require enrichment. As a result, the ore can be immediately used in the chemical and metallurgical division to obtain the final marketable product. The explored reserves of raw materials make it possible to implement a project for the construction of processing plants with a long service life (at least 50 years). Thus, in the lower reaches of the Lena River, the creation of industrial hubs on the basis of the development of the Tomtor deposit of rare metals and tin-bearing deposits is absolutely advisable. And the commissioning of the Amur-Yakutsk railway will help revive the main transport axis of Yakutia - the waterway along the rivers of the Lena River basin from the port of Osetrovo (Ust-Kut, Irkutsk region) to the Laptev Sea with the main seaport of Tiksi on the Lena River.

With respect to *the Chukotka ATPC*, we note that a navigation support base for Transpolar-4 will be formed in Pevek with a spare airfield for it; as well as facilities for the Northern Sea Route as an international route. It is important that the implementation of the project assumes an innovative approach to energy supply - the use of the first floating Nuclear Power Plant in the Arctic, which is likely to become a prototype for the energy sources of the Arctic zone until 2050.

Currently, the possibility of implementing a large-scale investment and construction project to form the industrial core of the Chukotka ATPC on the basis of fossils, among which tin and gold predominate, including processing technogenic placers is being assessed. Most of these deposits of the region are located directly on the coast and on the islands, so the Northern Sea Route plays a decisive role in the supply of equipment and other goods for geological exploration and mining, and therefore in the successful implementation of the project.

Despite the many resources that make up the resource potential of Russia's sustainable development, exploration and development of the uranium deposits is needed to ensure the country's strategic advantage. Currently, in the conditions of 80% dependence on imports of the uranium ores, intensive geological exploration is planned not only within the limits of land, but also on the shelf of the East Siberian Sea. It is also planned to study the issues of involving federal resources in the economic circulation due to the implementation of infrastructure projects and the organization of a year-round communication on the direction of Vladivostok (Nakhodka, Vostochny, Vanino) - Egvekinot – a motorway - Pevek.

Summarizing the above characteristics of the ATPCs, *the main imperative of their integrated development* and their strategic importance is determined by the following factors:

1. As oil and gas fields deplete, projects for the extraction of hydrocarbons from the Arctic shelf and land are actualized. The warming of the Arctic climate and the progress of exploration and production technologies on the shelf in the long term makes this mining economically viable [14].

2. There are mineral deposits in the Arctic that are in demand not only in Russia. On the composition and reserves of minerals, some of them are the largest or unique. This significantly expands the resource potential of the Arctic and has high chances of capitalization.

3. The dynamics of global transport flows and the need to strengthen the interconnection of the Russian regions necessitate the implementation of a number of infrastructure investment and construction projects, including ports. Icebreaker support of vessels and development work will contribute to the scientific research on weather forecast and ice conditions, etc.

4. The closeness of the borders of the Arctic countries, the presence of entrances to the

Arctic Ocean from the Atlantic and Pacific, necessitates the protection of the northern borders of Russia. The essence of a special Development Program is the deployment and support of defense facilities in the Arctic. In a broader sense, ensuring national security also requires the achievement of social, economic and environmental well-being of the northern regions.

The transport inaccessibility and the extreme climate of the Arctic territories determine the focal character of construction, accomplishment and industrial development both in the world and in Russia. Nevertheless, the absolute imperative is the complex nature of development on the basis of the emerging ATPCs. To ensure their economic efficiency, it is necessary:

1. to coordinate (in space and time) the deployment of investment and construction projects to support geological exploration, extraction of resources, energy and transport infrastructure, since all imbalances and "gaps" are particularly costly in the Arctic, discarding development back to decades [15, 16].

2. to deploy and support projects not only in mining, but also in processing of raw materials, related services, production of equipment, development of technologies for extraction, transportation, and processing. This increases the multiplicative effects of implementing complex projects for the economy, raises the level of social returns from the development of the Arctic territories, attracts human capital, and accelerates investment and construction processes.

3. to ensure proportional investments in environmental safety, transport, industrial and social infrastructure, informatization of all processes, human capital. In the post-Soviet period due to migration outflow, the Arctic lost a significant part of the population. At the same time, currently there is no task of "building cities beyond the Arctic Circle". However, it is necessary to define and maintain a format of vital activity that will ensure the optimal population in the Arctic zone. For this it is required to ensure:

- Transport connection of settlements with the centers of the country,

- Accessibility of education and medicine,

- Decent level of income, compensating for living in a harsh climate.

A special task is to ensure socio-cultural reproduction and social well-being of the ingenious peoples of the North.

4. The economy of the Arctic zone should develop in connection with the industrial and agrarian regions of the south of Siberia and the Far East. The Arctic demands for food, machinery and equipment, technological developments, engineering and services should be the engine for the development of industrial and scientific and technological centers of the Siberian macro-region.

5 Conclusion

Russia's historical experience in the development of the North and Siberia shows that the initiative and the leading coordinating role should belong to the state, since the implementation of such large-scale investment and construction programs and projects does not have the potential for immediate economic efficiency [17, 18]. It is prolonged in time. Nevertheless, private companies (including Russian Railways and resource producers) should receive a commercial effect from the projects implemented in the framework of the Programs of spatial restructuring [19, 20]. The tariffs should not be included in the investment component, and this is the peculiarity of the Programs. Only in this case there will be freight flows from deposits of resources in the territories remote from the sea coasts, and, consequently, the most problematic area for modern Russia is activated. The state will necessarily indirectly return to itself from other sources all expenses, as was the case with the Trans-Siberian Railway more than 100 years ago. This railway was built as a deliberately

unprofitable project, but the subsequent rapid development of Siberia and incoming taxes exceeded costs after only 10 years of operation. Demand for transportation significantly exceeded the forecast expectations, so the carrying capacity of the railway happened to be inadequate. There are the opposite examples - the delay in construction of the railway led to economic losses. Thus, the delay in the construction of the Tyumen-Tobolsk-Surgut railway for five years led to the additional costs of \$ 25 billion to the country. This testifies to the need to timely solve the emerging problems of creating a new type of real estate – namely aqua-territorial production complexes, which will become the basis for the promising territorial development programs, synthesizing in their compositions a lot of projects for various purposes with high potential for economic efficiency and the provision of economic security.

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