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The Economy of the Arctic in the Modern Coordinate System

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ABSTRACT. *The article provides an overview of the modern Arctic economy. It demonstrates that in the sectors of the economy that are associated with the development of natural resources (primarily mineral resources) and that emphasize return on investment, there is a growing role of new knowledge and technologies, and a significant increase in the role and importance of various forms of cooperation between the parties involved in regional projects. This approach helps solve the problem of attracting investment for high-risk, high-yield projects – however, the implementation of these 'hybrid projects' significantly limits the opportunities associated with the development of domestic scientific and production base. A direct consequence of applying this model to the development of natural resources in the Arctic Zone of the Russian Federation is a noticeable growth of the technology-intensive service sector, which satisfies the demand for equipment and labor by adopting foreign cutting edge technologies and relying on the inter-regional model of work rotation. All of this leads, among other things, to the fragmentation of the country's economic space (to a reduction in the degree of interconnectivity between the economies of different regions), as well as to stagnation and*

eventual collapse of urban-type settlements in the Russian Arctic.

KEY WORDS *Arctic zone of the Russian Federation, economic activity, economies of scale, cooperation, risk sharing, new technologies, learning process, social impact*

Introduction. Globalization

The advance of modern economy, globalization and the development of new information technologies and means of transportation have radically narrowed the 'gap' between the Arctic and the rest of the world – not only in Russia, but elsewhere on the planet (including countries far from the high-latitude regions). Much of what previously seemed unimaginable is now becoming a reality. The reasons for that include both socio-political and climate change (the decrease in the area of year-round ice coverage being the key factor).

These two factors produce new challenges and opportunities. For example, Arctic tourism is developing rapidly, while cold and permafrost are turning into an advantage for liquefied natural gas projects and the creation of data storage centers. At the same time, neglecting the distinctive features and character of the Arctic can make nature itself push back in full force (thawing of the permafrost and the cataclysms associated with it, explosive growth of deer populations[1] and the resulting rise in animal diseases, rapid depletion of pasturelands and soils).

Climate change acts more as a catalyst for the transformations we are seeing throughout the world. Socio-economic factors – such as population growth, the need to maintain economic growth, rising demand for raw materials and energy, and globalization – are among the key drivers of change. Global trends are playing an increasingly important role: there is a steady rise in the influence of migration processes, raw materials and energy markets, investment markets, and political factors.

An increasing number of countries are moving to expand their economic interests into the Arctic. For example, over the past decade, China has been rapidly ramping up its activities there. These activities take a variety of forms: from establishing the Polar Research Institute of China (2009) and opening Arctic research stations (on Svalbard and Iceland) to participating in projects for the development of mineral resources (in Canada and in Russia's Yamal) [*Conley* 2018].

In our opinion, there is one defining feature that applies to all strategies used to combat socio-economic problems in the Arctic. The emphasis is increasingly put not so much on individual projects and solutions (related to construction, extraction, transportation, etc.), but on forming frameworks and environments that ensure consistent and sustainable development and maintenance of the vast Arctic region, and help establish, promote, and expand various modes of cooperation and joint participation, so that companies can join forces in implementing particular projects.

At the same time, when addressing the issue of sustainable development of the Arctic economy, the focus is gradually shifting from achieving certain target values or metrics (with regard to social, environmental or financial processes) to its capacity for adaptation to the changing conditions.

A significant feature of the proposed procedures and approaches to imple-

1 For example, in the Yamalo-Nenets Autonomous Okrug, deer population in 2010 was estimated at 660,000, while the expected number was below 450,000 [*Khorolya* 2012, p. 272-277]. Today, the situation in the region with respect to excess deer population remains a serious issue.

menting projects in the Arctic is their focus on integration and cooperation – ranging from individual indigenous communities to large interregional and international projects to various other areas of cooperation. An example of that is the increasingly intensive process of integrating local (largely practical) experience and scientific knowledge to solve a wide range of scientific, technical, and socio-economic problems and issues arising in the Arctic. Adaptation to change is turning into a continuous process, no longer tied to specific projects or management decisions [Adaptation Actions for a Changing Arctic 2017].

Adaptation through cooperation and integration of efforts by all the parties present in the Arctic is starting to involve all areas of human activity. In April 2019, the United States Coast Guard presented its Arctic Strategic Outlook, which prioritizes America's leadership in the region while actively promoting various forms of partnership, pooling efforts, and encouraging continuous innovation across all areas of human life in the region [*Howard* 2019; Arctic Strategic Outlook 2019].

Russia's approach to solving the socio-economic development issues in the Arctic Zone of the Russian Federation (AZ-RF) has so far been primarily focused of projects and their implementation – while cooperation and integration remain largely in the background. For example, subprogram no 1, "Creation of Core Development Zones, Maintaining their Operation and Creating Favorable Conditions for the Rapid Socio-economic Development of the Russian Arctic Zone", of the state program "Socio-economic Development of the Arctic Zone of the Russian Federation" focuses on "improving investment activity on the territory of the Arctic Zone of the Russian Federation; carrying out projects of economic development in the Arctic territories and on the continental shelf of the Russian Federation" [Order of the Government of the Russian Federation 2017].

This document, while important, does not explicitly address issues of cooperation or generation of new knowledge and competencies. In light of the trends outlined above, it would be worthwhile to explore just how relevant and necessary the modes and methods of cooperation and adaptation are to the economy of Russia's Arctic Zone.

1. Economic development of Russia's Arctic Zone – moving beyond the comfort zone

1.1 THE ECONOMY OF THE ARCTIC – ONE TERRITORY, MULTIPLE MODES OF COORDINATION

The economy of the Arctic is an integral part of both the Russian economy and the global economy, as a whole. Therefore, it features the basic economic principles typical for all types of economic activity found in any part of the world – first and foremost, the need to assess and compare costs and effects in a monetary form and, based on that, determine economic efficiency. At the same time, the factor of distance, the fact that seasonal fluctuations slow down the turnover of financial resources, and the absence of local markets (including factor markets) all have a significant impact. As a result, **the Arctic economy can be divided into three segments**:

- **basic economy** that operates by the same principles and rules as the economy in any other part of the world;
- **economic activity of indigenous peoples** (subsistence economy), based on obtaining (extracting) means of subsistence from the surrounding natural environment; historically, the indigenous peoples of the Arctic have developed and per-

fected a unique way of life and specific types activities to survive in extreme natural conditions;

- **transfer-based economy** – economic activity associated with the government performing its general functions (in addition to public administration, these include maintaining the military, ensuring border security, protecting law and order, etc.) and the provision of social services to the citizens, regardless of their place of residence [*Glomsrød, Duhaime, Aslaksen* 2015].

Economic activity in each segment of the Arctic economy has its own specific modes of coordination and cooperation – ranging from predominantly redistributive models in the state-funded (transfer-based) segment to market-based models in the 'basic economy' segment to non-market ones (barter or gift giving) in the traditional subsistence economy (which is still based, to a large extent, on subsistence farming).

1.2 BASIC ECONOMY – ECONOMY OF SCALE AT ITS CORE

Arctic's basic economy runs on extracting, producing and generating not just the essential products, but goods and services with unique properties. These properties are a consequence of the distinctive and rare characteristics of plant and animal life (including the sea biomes) found in the Arctic, and the unique properties of the mineral resources contained in the ground and water. These natural resources are unique because of their rarity, low availability and a relatively low cost of producing (including the cost of physical labor required for extraction and the cost associated with wear of the material means of production, including various machines, mechanisms, infrastructure, etc.).

It is the rarity, the unique properties and characteristics of the way products and goods are produced in the Arctic that determine both their value and the high final price charged for them outside the region. The price of most goods, products and natural resources extracted (ranging from forests and fauna to mineral resources) contains a significant proportion of what is called the 'interest part' – the part of the price that allows the producer not only to compensate for the high costs associated with conducting economic activities in high latitudes (including production and transportation to remote markets), but also to receive additional profit for the labor, fixed capital and financial resources spent in the process.

For the most part, the reason for the unique properties of these products lies in the natural environment itself, and the forces of nature that give rise to these properties. It should be noted, however, that in the modern world, it's not just nature, but also – and increasingly so – the unique knowledge and expertise (sometimes an amalgamation of traditional, indigenous knowledge and scientific data accumulated by generations of explorers and scientists devoting their lives to studying the Arctic) that form these unique properties. Another distinguishing feature of the Arctic economy is how much of it is a function of climate conditions and geographical environment. In addition, the loci of economic activity are widely dispersed across the region.

While traditional economic activities are ubiquitous, areas associated with the production and extraction of unique products are relatively rare, scattered over a vast territory. Creating something that would approximate a competitive market for goods and services within these remote enclaves is an extraordinarily difficult task to accomplish. Which is why the remoteness and the extreme natural conditions – the defining factors of economic activity in the Arctic – are also accompanied by monopolization and the creation of various eco-

nomic barriers. These factors inevitably affect both the performance of the existing Arctic economy and the emergence of potential new forms of economic activity.

We believe that such 'natural' limits to the development of market relations can only be overcome by state intervention or the introduction of effective civil society institutions (including those that have formed over a long period of time as part of the process of regulating traditional economic activities).

For example, in centrally planned and managed systems, this problem was addressed by creating so-called 'territorial industry-and-transportation combines' (large conglomerates of industrial enterprises) [*Slavin* 1961].

2. The Arctic: Within and Without

2.1 CAPITAL INFLOWS AND OUTFLOWS

"While the industrial-scale natural resource exploitation creates considerable wealth, these activities are mainly carried out to supply markets outside the Arctic regions. Moreover, the resources generally belong to sources of capital outside the Arctic, which control the activities and profits A few large corporations dominate the extraction activities, and some of them are present in several Arctic countries. This fits well with the concept of "Resource frontier regions," where the massive riches are destined for export and only a fraction of the income and profits remains. Due to the geographical isolation of most Arctic regions, production costs are high. While specific raw materials can be found within the region, technology, qualified labor, and capital have to be imported most of the time... As a result, costs are often too high to successfully compete with non-Arctic manufacturers who have more access to resources (including cheaper transportation systems). In general, the role of the circumpolar North in the global economy is asymmetrical: it exports raw materials on a large scale to developed regions and imports most finished products for its own domestic consumption. Only a part of the food supply is locally produced." [*Einarsson, Larsen, Nilsson, Young* 2002-2004, pp. 69-80; *Larsen, Fondahl* 2014, pp. 151-186].

It is for this reason that GRP per capita in the larger part of the Arctic is much higher compared to non-Arctic territories. However, the territories benefitting the most from these trends are those with higher population density, as well as a more diversified and, consequently, more stable economy. As a rule, in the system of national accounts, the economic outcomes of such activities are reported for the territories where the income is generated. This makes it difficult to use GDP to measure economic performance of these territories. It is also important to note that, most of the time, a significant percentage of workers involved in these economic activities are seasonal or shift workers. Most of the capital tends to be concentrated in the hands of non-residents, which means that the profits also leave the Arctic to be used elsewhere. As a result, the income that remains at the disposal of residents is significantly less than the cost of products produced in the region [*Goldsmith* 2017].

2.2 COOPERATION IS THE WAY

In the late 20th-early 21st century, the old ways of organizing basic economic activities inherent to the centrally planned system (with its emphasis on material assets) served as the foundation for new companies and economic entities that were able to coordinate using a different approach (not entirely driven by market forces, but rather a quasi–market approach characterized by a significant role of non-market – negotiated or implicit – procedures) [*Korostelev* 2008].

As a result, over the past 25-30 years, the economy of the Russian Arctic has

changed (because the above-mentioned specifics of the Arctic economy were not fully accounted for) in the following ways:

there is a sharp decline of economic ties with the regions to the south of the Arctic circle (the main outflows of products and resources now go either westward or to the non-Russian East);

there is visible erosion of ties between the industries and a decrease in cooperation (the fact that timber is no longer exported along the Northern Sea Route; a sharp decrease in the import of goods for the needs of a significantly reduced population; the outflow of working-age population from the Arctic regions – the people not directly related to the high-impact projects for the extraction of mineral resources);

economic activity is now concentrated around large-scale projects for the extraction of mineral resources carried out by massive enterprises (usually with state participation);

the development of small and medium-sized businesses within the boundaries of public (state funded) social services sector is given preferential status;

specific skills and ways of regulating standard economic activities based on traditional knowledge and experience are gradually fading away (which results in such phenomena as: overgrazing of deer in the tundra, overfishing in the rivers, sharp decline in the role of fishing and hunting activities in the lives and income of the Northerners).

As a result, there is an de facto departure from integrated development and the implementation of socio-economic projects as a way toward long-term development in the Arctic (none of the numerous attempts at formulating a new model for solving complex problems in the North and in the Arctic – ranging from "comprehensive programs" to "core development zones" to "mineral resource centers" – have yielded any positive results).

2.3 THE MARKET KNOWS THE PRICE?

As is well known, pricing makes it possible to compare and contrast various alternatives to the use of the resources commanded by various economic agents. Relative prices are one of the key factors that change the structure of the economy and help choose the course of its development.

In the Arctic, it is virtually impossible to have "accurate" pricing or measure basic economic performance, because of the monopolies dominating entire regions and the distance to the markets the products are exported to.

A telling example of the destructive impact of changing price rations (transport tariffs, energy tariffs, borrowing costs) can be found in the way export routes for timber and wood are shifting and redirecting in Russia's east. Specifically, in 1989, the volume of timber exports from the Yenisei river (the town of Igarka) started to decline rapidly, going as low as several tens of thousands of cubic meters. The volume of sawn timber production has also been reduced significantly. There were three deciding factors: 1) due to rapid growth of fuel and energy prices, as well as rising taxes and growing credit payments (compared to the prices for forest products) in Igarka, sawmilling became unprofitable; 2) demand for imported lumber in Western Europe decreased; 3) traditional suppliers of wood and timber (from the Lower Angara region) started to modify their shipping routes: now their shipments went by rail and then through the sea ports of European Russia; the competitiveness of the Northern Sea Route declined due to rising tariffs [*Granberg, Peresypkin* 2006, p. 276-280].

The reason why the Northern Sea Route was no longer as popular for timber and lumber shipments lies not only in the so-called ice (winter surcharge) fees and transportation tariffs, but also, to a large extent, in the ways the forest industry has changed over the years. "Since the early 1990's, the number of forest industry enterprises has

more than quadrupled, accompanied by a five-fold decrease in the volume of wood export. It was only by 1999 that the volume of transported forest products started to rebound, but even to this day, there is still a lot of small enterprises with limited cargo traffic remaining in the industry. At the same time, the forest industry itself is spread across a huge territory with weak infrastructure...The bulk of the freight traffic (over 70%) is roundwood, followed by lumber, crushed wood, particleboard and fiberboard, impregnated sleepers, firewood, non-impregnated sleeper products, plywood and veneer sheets, and different types of timber ...According to water transportation workers, the main problem is the port fee, which is charged to maintain the nuclear icebreaker fleet (even in summertime, the icebreakers must be present the Kara sea)" [*Yambayeva* 2005]. The situation with energy tariffs is just as problematic: prices for heat and energy in the Arctic and the North-East of Russia are growing at a higher rate (and are, generally, higher) than similar prices in other regions of the country.

3. Markets in the Arctic

The key question with regard to economic activity in the north, and especially in the Arctic, is whether and to what extent it can be carried out on market economy principles (i.e., the costs incurred in the production of a product can be recouped by selling it). This question is more than acute than ever in the case of "secondary" types of economic activity, especially those related to ensuring the functioning of socially significant facilities.

3.1 HOW TO OVERCOME ARCTIC ISOLATION

The main obstacle is not only (and not so much) regional price increases (due to remoteness, for example), but also the local and often self-contained nature of economic systems in the north and the Arctic. This obstacle can be overcome by:

a) ensuring transport accessibility (which is often difficult);
b) introducing various government programs and initiatives to support the economy (in this case, the goal is not to improve the effectiveness of economic activity, but rather to make a shift to transfer-based economy, with all the underlying socio-political effects);
c) creating "spatially distributed effects" within supply chains – in particular, having those closest to the beginning of the chain receive a portion of the revenue from the sale of the final product [*Delgado, Mills* 2018; *Ito, Vezina* 2016].

It is widely accepted that the Northern Sea Route has always been part of the solution to the problems of development in Siberia (its southern and middle parts, and the Arctic zones). This is "the route traveled by Nordenskiöld and Wiggins, the same route that was so actively promoted in the 1860s and 1870s by our compatriots Sidorov and Sibiryakov" [Northern sea expedition 1906, p. 5].

Many researchers, both in Russia and beyond, hold this view. For example, experts from the Korea Maritime Institute in Seoul explain the stable and steady economic development of the southern and middle parts of Russia's East by the strong economic ties that exist between northern Siberia and the Arctic zones. They believe it is precisely this unity that not only ensures stable economic relations of the macroregion with its neighboring territories (European Russia and the Far East), but also actively contributes to its participation in the international division of labor.

This requires fundamentally different ideas and approaches – from exploring ways to implement these projects to creating a different technological framework (with a focus on reducing the need for out-

side labor resources, for an integration of various types of economic activities, for mobility, etc.). Economic development of the inner part of Russia's East is the basis for the sustainable functioning of the Northern Sea Route and a prerequisite for involving the Arctic in the economic system of the whole country.

It should be noted that the three solutions to the economic problems of the Russian Arctic outlined above could be facilitated by establishing a single regulatory body: a single body to manage state resources, a single coordinated plan of action, etc. When considering this possibility, many bring up the experience of Glavsevmorput (The Chief Directorate of the Northern Sea Route), Dalstroy (The Far North Construction Trust) and other trusts that operated there back in the 1930s and 1950s. We believe that, unfortunately, such unified system of management would not be able to boost economic growth in the North and in the Arctic, or even maintain the current economic activity at an acceptable level: "The system of management that formed in the North-East of Russia, manifesting in Dalstroy, was a radical operation, singular in its nature. It could almost be regarded as a special form of administration in a region with no constitutionally established bodies of state authority, a region where Dalstroy reigned supreme – a state within a state. This led to the creation of the 'Dalstroy management system'" [*Grebenyuk* 2007, p. 44-45].

3.2 BLAZING NEW TRAILS?

A number of projects have been launched in the Arctic coastal zone (on the coast of the Kara Sea and at the mouths of the three "great Siberian rivers"): natural gas and LNG (the Yamal LNG projects), coal ("VostokCoal-Dikson"), oil (Rosneft-Rosneftegaz, the Payakha oil field); there is also a project in the works to develop one of the largest deposits of rare earth elements (the Tomtor field in northwestern Yakutia), etc.

A common feature of all these projects is how "typical" they are for the Arctic. They are all characterised by a weak connection to central Russia and the southern regions of Russia's East; they also focus on local (or, more precisely, project–based) financial and economic efficiency. That said, the projects are implemented by large companies that usually command enough influence to be able to profit from the preferential tax regime. These companies also attract foreign partners – not only as investors, but also as suppliers who provide necessary equipment and a wide range of services related to production and technology.

For example, in 2019, they launched the industrial development of the Payakha oil field. "This means, first and foremost, a rise in oil production – not by a percentage, but by several-fold. Within five years, Krasnoyarsk Krai will see an increase of at least 2-3 times in terms of oil revenues entering the budget, compared to what the oil industry provides today, which is 30 billion rubles," said Krasnoyarsk Krai governor Alexander Uss [at the Payakha oil field, 2019].

3.3 TRANSPORTATION: THE LONG ROAD FROM SINGLE TRANSPORT CORRIDORS TO A LARGER NETWORK

Realizing the potential social value of Arctic projects (as well as forming the conditions for development; innovating and adapting to change) is impossible without appropriate infrastructure.

Unfortunately, so far the dominant approach has been to focus on the development of transportation in terms of latitudes – from west to east and vice versa.

In order to seize the potential social value of Arctic projects, it is necessary to create specific conditions that would allow to use the opportunities not only of the regions to the west and east of Rus-

sia's Arctic, but also the territories stretching southwards. In other words, it would require stronger economic and production ties between the economy of Russia's Arctic, on the one hand, and the economies of the central and southern parts of the Russia's East, on the other. Therefore, an important area of focus is to expand and extend the longitude component of transportation, as well. It is necessary to actively develop transportation infrastructure and basic production facilities in those areas that generate cargo within the "North – South" corridor (Northern Sea Route – ports in the upper reaches of Siberian rivers).

In the case of Eastern Arctic, for example, this involves:

1. development of the shipping industry: interconnection (and more active use) of the Lena river routes with an access to the Northern Sea Route (in both directions), on order to establish, among other things, cooperation in terms of cargo traffic between the Lena River routes and the Asia-Pacific countries;
2. active use of new opportunities provided by the "fourth industrial revolution" (big data, smart transportation, etc.);
3. creation of a network of logistics centers that combine different types of transportation (Northern Sea Route; river, rail, road and air transport);
4. establishing a stronger connection between the adjacent transportation infrastructure and the projects underway in the central and southern parts of Siberia and Russia's East.

Currently, the discussion on the issues of improving Russia's transportation network is dominated by solutions that focus on developing the Northern Sea Route and increasing the capacity of the Baikal–Amur Mainline. However, the relationship and interaction between these subsystems have only recently been put on the agenda [*Kozlov, Makosko* 2019].

It should be noted, however, that the issue itself has been debated for a considerably long time – at first, some disputed the importance of railway transportation, and now the underestimated component is the role of transport communications along longitudes. Researchers have no choice but to admit: "Extending the 'effective transportation zone' of the Northern Sea Route thousand or more kilometers deep into continental Siberia and the Far East proved to be a difficult, if not insurmountable obstacle to the northward expansion of the economic and geographical boundaries of the railway network" [*Lamin, Plenkin, Tkachenko* 1999, p. 140]. Because of this, "Russia's transportation system, despite some growth and addition of the road and air component, still retains the old economic and geographical outlines it secured in the early 20th century" [*Lamin, Plenkin, Tkachenko* 1999, p. 142].

Only in September 2018, "after more than two years of discussion between Russia's Federal Agency for Rail Transport (Roszheldor) and the SShKh company (established as a contractor for the project), the concession for the Northern Latitudinal Railway was finally signed. Russia's VTB bank may be put in charge of financing the railway megaproject. The idea of building a railroad in the northern part of Western Siberia was first explored over 50 years ago. Work on the project resumed in 2006, but it wasn't fully restarted until March 2017, when Russian Railways and Gazprom signed an agreement on the joint implementation of the Northern Latitudinal Railway project "[*Georginov, Zvorykina, Ivanov, Sychev, Tarasova, Filin* 2019; Order of the Government of the Russian Federation 2018].

The Arctic economy is increasingly becoming a part of the global economy. Due

to this, foreign researchers – specifically, from China and Korea – are also raising the above-mentioned issues of flexibility and accessibility of transportation services in the Arctic. "Most of China's researchers focused on the need to create an infrastructure in the Russian Arctic that would connect sea routes and railroads into a single network, a 'land-sea' system. More specifically, China suggested creating a railway network in Northeast Asia that would connect the Chinese port of Dalian with a Russian seaport" [*Zabrovskaya* 2019; *Kim Jong-Deog, Lee Sung-Woo* 2017].

3.4 RESOURCES OF THE ARCTIC: INVESTMENT, NEW EXPERTISE AND MODERN TECHNOLOGIES

The core of the Arctic economy is the exploration and production of the natural resources. Over time, the sources of these products (furs, gold, oil, coal, gas, diamonds, etc.) have changed significantly. Resource sites are shrinking; their useful content is decreasing; the distance, depth, etc. to the natural resources are increasing [*Innis* 2001].

For a long time, the only way this problem was addressed was by moving further north, to the Arctic, to explore new sources of raw materials and resources. While this approach to solving the problem of depleting resources remains popular, there is an increasing emphasis on exploring at greater depths, as well on introducing (and ensuring wider use of) cutting edge technology and new scientific ideas. However, effective use of new technologies and new approaches when developing natural resources in increasingly complex and risky environments also requires different models of coordination between the participants [*Kryukov* 2014, p. 184-187].

For a system of norms and regulations (a "resource regime") to be adequate to the new conditions in the Arctic, it has to create and improve models of cooperation that organize all parties involved in the extraction and development of natural resources. Active cooperation between companies that differ in terms of their level of competence and their approach to the development of natural resources allows them not only to reduce individual risks, but also to ensure an effective exchange of experience and best practices.

The most radical option (in the case of extracting mineral resources) is to grant a license (the right to exploit an area for minerals) to several companies at once (after reaching mutual agreement on the conditions and procedures, and with one company being appointed/invited to serve as the operator). The second option is to grant a license to just one company, and then entrust the functions of the project operator to another legal entity (with the participation of several companies, giving priority to the ones with unique experience and technologies).

Most Arctic countries practice the first option. In Russia, however, the second approach is commonly used. In the first case, the state, as owner of the mineral resources (with the exception of USA), usually forms a license group (a group of companies) in a way that provides a synergistic effect, giving all national stakeholders a chance to enhance their competence and improve their level of scientific and technological development. In the second option, the right to elect the project operator and form the group lies with the company that owns the mineral rights. In most cases, the deciding factor is the desire to attract investment for the project.

An example of the first option is the Kupol Gold Mine developed by the Canadian company Kinross Gold. Although there is only one company with the rights to extract mineral resources, this example still falls under the first category – there are very few cases when foreign-owned companies have the rights to develop resources (especially the so-called 'minerals of strategic importance').

As a rule, the choice of either option and the specifics of its implementation are determined by a Russian company that already holds the license, i.e. the mineral rights. Therefore, corporate (commercial) priorities usually shape the course of such projects.

Successful examples of that include the joint LNG projects of Russia's NOVATEK PJSC (the second option). The first project – Yamal LNG – with a capacity of 17.4 million tons has already been implemented [*Toporkov* 2017]. The company also owns significant gas resources on the Gydan Peninsula, which are planned to be used for the second and third projects – Arctic LNG-2, and Ob LNG [Yamal LNG project].

NOVATEK's approach to LNG projects in the Arctic is distinctive in how it involves large foreign financial and oil/gas companies as partners (co–investors). Participants of the Yamal–LNG project include NOVATEK PJSC (50.1%), Total (20%), CNPC (20%) and the Silk Road Fund (9.9%) (it is too early to classify Chinese companies as owners of unique technologies or skills with respect to projects of this type). France's Total, which has a lot of experience in the area, has also purchased a 10% stake in the Arctic LNG-2 project in 2019. Binding agreements on the terms of entering into the Arctic LNG-2 project have also been signed with China's National Oil and Gas Exploration and Development Corporation (CNODC, a subsidiary of China National Petroleum Corporation) and China National Offshore Oil Corporation (CNOOC). Both agreements provide for the acquisition of a 10% stake in the project. The consortium of partners for the project has not yet been formed. The plan is to sell up to a 40% share in Arctic LNG-2 [*Chervonnaya* (1) 2019; *Chervonnaya*, *Toporkov* 2019].

Unfortunately, the above-mentioned projects (both Arctic LNG-2 and Yamal LNG) are largely 'import-oriented' – in terms of providing an impetus for the development of domestic engineering and shipbuilding. So far, the positive socio-economic effect of these projects for the Russian economy – and for the Arctic region itself – has been rather limited.

An example of an agreement aimed at forming cooperative ties in the Arctic is the long-term deal between Gazprom Neft and Gazprom for the development of Yamburg field's Achimov oil deposits in the Yamalo-Nenets Autonomous Okrug (the second option, as defined above). Achimov deposits are classified as hard-to-recover hydrocarbon reserves. They are located deep (3-4 km underground) and characterized by a complex geological structure. Gazprom is known to produce gas from Cenomanian deposits, which are located much closer to the earth's surface – at a depth of up to 1.7 km [*Starinskaya*, *Toporkov*, *Chervonnaya* 2019].

Reaching an agreement in this case was largely made possible by the strong "familial ties" of the two companies participating in the project. Unfortunately, reaching agreements for effective cooperation in the mineral resources sector of the Russian Federation remains a very daunting undertaking. For example, the Federal Agency for Mineral Resources (Rosnedra), Rosneft and Gazprom were unable to reach a compromise on the issue of developing the Arctic shelf. Rosneft and Gazprom have disputes over a number of territories in the Arctic. For example, "in 2013, they submitted a single application for the North Wrangel zone in the East Siberian and Chukchi seas, agreeing to divide it into two parts. Later, both companies were bidding for the Murmansk oil field on the Barents Sea shelf. Ultimately, Rosnedra refused to give the oil field to any of the bidders, delaying the issue until a law is passed that would require auctions to be held to resolve such disputes. At the same time, the Agency imposed a moratorium on issuing new licenses for the devel-

opment of the Arctic shelf until the conditions of the existing licenses were met. Besides Rosneft and Gazprom, LUKOIL also seeks to develop the Arctic shelf. However, shelf areas suitable for exploration or oil and gas production can only be secured by companies with more than 50% of shares owned by the state" [Gazprom and Rosneft failed to strike a compromise 2019].

The situation is just as complicated in the case of solid minerals – particularly, complex ores and diamonds. In 2018, after years of confrontation, Norilsk Nickel and Russian Platinum reached an agreement to establish a joint venture. "Norilsk Nickel's contribution to the joint venture's capital would be its license for the development of the Maslovskoye deposit, while Russian Platinum would contribute its licenses for the Chernogorskoye deposit and the Norilsk-1 deposit. All these deposits are located in the Norilsk Industrial Area and contain impregnated complex ores" [*Terentyeva* 2018].

It should be noted that the agreement on establishing a joint venture became possible only after the parties signed a general agreement on strategic partnership in the presence of the President of the Russian Federation Vladimir Putin [Historic agreement signed in Krasnoyarsk Krai 2018].

The approach taken by large companies is understandable and reasonable – they are seeking to preserve their status quo on a territory historically entrusted to them. This can be observed by analyzing the strategy and behavior of ALROSA, a diamond mining company, in the Sakha Republic (Yakutia). This is also the reason why the Ministry of Natural Resources and Environment expressed its concerns about the declining growth of Russia's diamond reserves: Russia's largest diamond mining company ALROSA is only exploring areas where geological prospecting has already been completed, said Minister of Natural Resources and Environment Dmitry Kobylkin in an interview with Interfax" [Ministry of Natural Resources Concerned with ALROSA Exploration Strategy 2018].

4. How to ensure 'social and economic returns'

The role and place of the Arctic economy in the global economy and in Russia, in general, has to do not only with meeting the needs for raw materials, energy resources, and biological resources, but also with creating new jobs and providing tax revenues at various levels. Within modern Russia's economy, the Arctic plays the role of a "territory of the future." This role involves following environmental principles and environmentally sound practices when conducting economic activities, preserving the habitat of the indigenous peoples of the North, broad cooperation and integration of all participants within the economy: from micro-level issues to global pan-Arctic problems, focusing on the use of advanced scientific and local (practical) skills and expertise.

A unifying feature of all the principles outlined above is the priority development of science and technology. It is the basis for the development and adoption of new approaches and practices both on the continent and in the Arctic. These, in turn, allow for a significant increase in both economic and social 'output' of the various activities currently carried out in the region or expected to be carried in the future.

4.1 INPUTS COUNT AS MUCH AS OUTPUT DOES

Numerical estimates of the multiplier effect differ greatly depending on the country, the conditions under which the projects are implemented, and modes of assessing the results. For example, when considering the multiplier effect of the oil and gas sector in general, for devel-

oped countries it varies from 1.6 (Norway) to 2.4 (Australia). In the case of Russia, the multiplier is 1.6–1.9 [*Nikitin, Kibitkin* 1999].

At the same time, shelf projects, which are more capital-intensive than onshore projects, also have a greater multiplier effect in terms of their impact on related industries. For example, in 2014, Rosneft CEO I. Sechin stressed that "every dollar invested in the shelf generates $7.7 in other sectors of the economy" [Quotes from interviews with the head of Rosneft 2014].

Our research shows that in other countries (Norway, Canada, the United States (Alaska)), the non-resource sector is more actively involved in the development of Arctic oil and gas resources. In this case, the multiplier is dominated by indirect effects (creating additional demand for equipment and supplier services from other regions of the country). In Russia, for the time being, the multiplier is defined primarily by direct local effects (total additional output that either goes to the end consumer locally or is exported). This indicates that there is no proper coordination between the Arctic economy and the socio-economic processes taking place both in the regions where the product reaches its end consumer and in the industrialized regions further south – primarily, Siberia and the Far East.

Lack of complexity or unity of approach in terms of management inhibits the multiplier's effect.

On one hand, there is certain progress. For example, Rosneft and NOVATEK announced the launch of projects in the Far East and the Murmansk region (shipbuilding and construction of submersible platforms for future LNG projects). At the same time, these projects are aimed at mass-replicating previously tested foreign technological solutions, while discounting the shipbuilding experience of Tyumen, Krasnoyarsk, and Omsk (which have existing shipbuilding and ship repair facilities).

As part of Rosneft's projects, the participation of Russian suppliers from Siberia and the Urals is still limited to ensuring the supply of materials for Arctic projects. An example of that is the delivery of rolled metal products for the Zvezda shipbuilding complex currently under construction in the Far East. It must be acknowledged that a significant proportion of domestically-produced equipment does not meet the requirements in terms of product range, quality, or delivery time, since Russian companies working in the field have no experience of participating in large-scale Arctic projects. The Russian manufacturing industry – including knowledge-intensive production required for the Arctic – finds itself in an institutional trap.

The experience of NOVATEK, a pioneer of high-tech business in Russia's North, is especially telling. Since the economic efficiency of a project is in direct relationship with the level of technology and equipment, operators usually prefer to buy ready-made solutions offered mainly by foreign suppliers providing equipment and technologies.

After the launch of the Yamal LNG project and the start of preparations for the Arctic LNG-2, NOVATEK began concentrating more on the participation of Russian contractors. At the same time, Russian industrial production is largely founded on localization of foreign technologies and capacity expansion; the resulting effects are 'latitudinal' in nature and, as of yet, never go beyond the borders of Russia's regions that house new production facilities or ports. In fact, most Russian LNG projects are based on import substitution and localization of imported technologies. However, it is expected that NOVATEK's third LNG project in the Arctic – Ob LNG – will be powered by a Russian patented LNG technology called Arctic Cascade [*Chervonnaya* (2) 2019].

This makes one wonder: why is it taking Russia so long to launch these LNG

projects in the Arctic? We believe there are several key reasons:

- a weak and inefficient state system of scientific and technical programming (the scientific and expert community has been talking about LNG-related trends in training and education for decades);
- lack of willingness within the domestic business community (primarily large corporations) to cooperate and interact with domestic companies working along the same lines; proclivity to seeking and implementing the most economically viable solutions by adopting an 'individualistic' approach based on seeking preferential treatment and circumventing rules (which at first may seem much more profitable than relying on the synergy produced by cooperation, whose benefits are not as easy to see at the early stages);
- a management system for the development and use of natural resources (both in the country as a whole, and, more specifically, in the Arctic) that is inadequate to the tasks and challenges of the modern economy.

Each country has its own customs and norms regulating the management of its land, water and mineral resources. Still, all positive experience deserves to be studied and analyzed (as a way to improve the system even further). Our analysis of the system used to manage the mineral resource potential of the Norwegian continental shelf explains the reasons behind its success:

- proactive scientific and technical analysis (including the socio-economic component) and assessment of emerging problems and potential solutions;
- 'forcing' companies with mineral rights to cooperate (in the form of joint financing of scientific developments and university laboratories, support for 'common' specialized organizations, such as SINTEF);
- existence of a close relationship (from the stage of granting mineral rights) between the development of natural resource sites (not only hydrocarbons) and the creation, development and subsequent use of domestic scientific and technical potential.

As a result, Norway creates, applies and exports 40% of all scientific and technical services and products used in the development of hydrocarbon resources, which earns them more than 450 billion Norwegian krones (over $50 billion) annually (!). The strategy of the Norwegian University of Science and Technology titled "Better Resource Utilization in the 21st century" (BRU21) is based on an approach that focuses on multiplier effects of cooperation between different scientific fields and different companies [*Kryukov* 2003, p.94-95; *Weber, Kryukov* 2016, p. 32-55; NTNU Strategy for Oil and Gas 2017; *Leskinen, Bekken, Razafinjatovo, García* 2012].

In our view, the fact that the development of Russia's Arctic is dependent on several major projects is one of the limiting factors towards the goals of both achieving necessary multiplier effects and realizing the socio-economic potential of Russia's natural resources. What we need is not just large-scale projects, new shale platforms or LNG plants – but also an innovation-oriented environment that stimulates the growth of various types of companies. Small and medium-sized businesses are simultaneously the end product and the driver of such an environment. Small companies can work effectively with small oil fields and deposits, and the service sector – which is currently covering the needs of large companies with their massive projects – can become a place for small companies to apply their strengths, and also an environment that allows to make use of unique local skills and expertise.

4.2 FOR PEOPLE – OR AT PEOPLE'S EXPENSE?

More than 5 million people live in the Arctic Zone of the Russian Federation. A significant proportion of these people live in cities and urban-type settlements. The indigenous people of the Arctic (the peoples of the North) either live in settlements or lead a nomadic lifestyle. Russia's Arctic is significantly more urbanized compared to other countries.

A considerable number of its population centers are single-industry cities and towns (mono-towns). They were created for the development of region-specific resources. Managing these population centers turns especially difficult when the development of the local resource nears its the final stage – followed by the closing of the single enterprise holding the town together. One of the modern features of mineral resources development both in general and in the Arctic, specifically, is wider use of minimally manned (or unmanned) technologies for managing technological processes. In these cases, usually the most skilled and qualified personnel can live at a considerable distance from the facilities they manage – in other towns and settlements located outside the Arctic.

Using remote operations centers to monitor the production and make decisions in real time (based on data collected from multiple facilities) with limited physical presence at the field is an example of the many ways the oil and gas industry can benefit from digitization. This trend is expected to reduce the number of field personnel, improve the quality of management and move highly qualified workers from the fields to operations centers. These centers can help reduce the costs associated with moving the workforce, but also significantly reduce the number of jobs available in the Arctic. This reduction in employment in the mining regions is expected to be partially offset by the creation of 20 thousand new jobs in remote population centers. Remote operations will also allow companies to identify problems at an early stage, leading to increased production volumes. The planned cumulative effect is expected at about $140 billion. For example, in Yamalo-Nenets Autonomous Okrug, an operations center was opened for Gazpromneft Muravlenko, giving it the ability to make decisions based on data from remote monitoring and live analysis of production processes. The company can now make decisions remotely with respect to stabilizing and increasing oil production, tackling emergency situations, operating wells, equipment, measuring instruments, facilities and communications.

All of the above highlights the 'perennial' issue of settlement policy in the Arctic. It is becoming more and more obvious that we need to follow a path that would:

a) provide all Arctic residents whose physical presence and work is required in the region with decent and modern living conditions;
b) give the indigenous peoples of the North an opportunity to lead a traditional way of life in places and territories where these activities are determined by natural, cultural and historical factors and conditions.

Again, it should be emphasized that every approach with respect to settlement in the Russian Arctic or solving the social problems of its various population groups is based on procedures and norms closely tied to the process of management of natural resources in each specific area.

For example, in 2017, the town of Mirny in the Republic of Sakha (Yakutia) faced serious problems after the closing of the Mir diamond mine following an accident. We believe that these problems have to do not so much with the city or its population, but rather with the Russian diamond industry, in general. When the development of a natural resource has passed the peak of production, it is the duty of the

state to rethink the approach to the development of the remaining resources. We need to endorse new innovation-oriented companies, encourage different approaches to exploration and development, and formulate new social and environmental guidelines. It is thanks to this approach, for example, that single-industry mining towns in Canada's Arctic are doing much better at the moment, and can still look into the future with hope. Each new step is determined not so much by the amount of minerals left in the earth and how to extract them, but by the associated risks to the town's integrity (both economic and social) and how these risks can be safely distributed across all the parties involved.

One of the key features of modern systems of management used for the development of natural resources – both in general and, more specifically, in the Arctic – lies in their integrated approach and their focus on socio-economic well-being. Unfortunately, the dominant model is still the one that emerged back in the 'fat years' during the 2000s (when oil prices were high) – provision of resources and decision-making take place at the federal level, straightforward taxation, preferential advantages, ease of administration. These approaches do not meet modern requirements and standards when it comes to the use of natural resources; in no way do they contribute to solving socio-economic issues that are becoming more and more prominent on the agenda.

In addition to the above-mentioned modern problems related to the development and use of natural resources in the Arctic, there is also a wide range of 'retrospective' problems: specifically, elimination, rehabilitation and remediation – with respect to the damage done to nature and subsoil over the years. Earlier, the approach was simple: we will start addressing these problems when the time comes, but for now we can set them aside. The time has finally come – but now we have insufficient financial resources to develop practical solutions [*Anashkin, Kryukov* 2012, p. 18-27].

5. Ways of helping the Arctic economy – the search continues

Actions taken by different countries in terms of economic development of the Arctic are aimed primarily at setting frameworks and creating conditions for the launch of innovative processes that are expected become the foundation basis for solving any arising issues. The keywords are 'interaction', 'cooperation', 'skills and knowledge exchange'. For example, Norway's Ocean Strategy (much of the country's activity in the oceans takes place in high latitudes) is built on the assumption that, "if we are to ensure that Norway remains a leading ocean economy, public authorities must facilitate further growth of established ocean industries, the development of new industries, and, not least, that sector specific knowledge is shared and utilized across the industries. The policy measures put forward by the strategy will contribute to furthering and strengthening the efforts for increased transfer of knowledge and learning across the ocean industries, and to facilitate collaboration." [New Growth, Proud History 2017]

The details of modern Russia's return to the Arctic were outlined in the State Policy of the Russian Federation in the Arctic for the Period until 2020 and Beyond, approved by Vladimir Putin on September 18, 2008. The provisions of this document were re-imagined and expanded in the Strategy for the Development of the Arctic Zone of the Russian Federation and National Security up to 2020 (approved by the President of Russia on February 8, 2013) and in the state program "Socio-economic Development of the Russian Arctic Zone up to 2020" (approved by the order of the Russian government on April 21,

2014), as well as the presidential decree no 296 dated May 2, 2014 ("On the Land Territories of the Arctic Zone of the Russian Federation"). These documents outline Russia's strategic interests in the Arctic. These interests include, above all, the use of Russia's Arctic Zone as a 'strategic resource base' for the country and the role of the Northern Sea Route as Russia's single transportation corridor in the Arctic. Given the specifics of the region, the proposal was to advance Russia's presence in the Arctic by creating so-called 'core development zones'.

Currently, a new bill on the development of the Arctic is being drafted, with a focus is on providing benefits, preferences and incentives to companies that are planning to launch their projects in the region. "The idea is to extend the reach of the existing institutions working in the Far East so that they would cover the Arctic region, as well. This means helping people buy land, easing the burden of inspections, providing loans at a reduced rate. Preferences will be granted to both small and large businesses, but only in case they are working on new projects. Hydrocarbon production, LNG and other projects will also be able to receive preferences... for each specific project, the terms and details of financial incentives will be discussed individually. We will also consider a zero tax on profits, land and property for a limited period, and the option of reducing the tax burden for the entire time the project is under construction, Trutnev explained" [*Trifonova* 2019; *Petlevoy*, *Sterkin* (2019].

Conclusion

Russia's Arctic is in search of a model that, when realized, would allow for a better integration into the national economy. That said, the success of any chosen model would depend on whether it is able to successfully combine the distinctive character of the Russian economy with the overall economic trends observed in the Arctic. How does one strike a balance between these general trends, on one hand, and national (historical and geographical) features, on the other? The solution to this complex problem must integrate best practices of the past (such as the role of large-scale projects) with further efforts aimed at stimulating businesses and promoting entrepreneurial activity. In this context, science and education play a particularly significant role, which was the reasoning for the establishment of federal universities in Arkhangelsk, Yakutsk, and Krasnoyarsk.

The key feature of the Arctic economy is that nature-related risks and economic risks are very closely interconnected. Economic activity in the Arctic (its market, state-run, and traditional segments) is characterized by its own specific forms of coordination. This is why, for example, both the North and the Arctic region reject the intense competition and rivalry inherent in the economy of their southern neighbors. More specifically, it is perceived as impractical to have a separate transfer economy (primarily defense-oriented) and an independent market-oriented economy at the same time. Many facilities (primarily infrastructure) are designed with multifunctional use in mind – to support both the needs of state administration (including defense) and various economic activities (for example, ports and terminals, warehouses, settlements, etc.). At the same time, the Arctic economy is in the process of continuous change, as the ways and modes of managing the region's economy are undergoing transformation. Models based on a strict line of authority, on governance from a single decision-making center will gradually give way to a different model – one based on cooperation, partnership and reciprocity.

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