UDC [911.3:33](98)(045)
DOI: 10.37482/issn2221-2698.2020.38.21

New projects for the development of the Russian Arctic: space matters! *

© Aleksandr N. PILYASOV, Dr. Sci. (Geogr.), professor
E-mail: pelyasov@mail.ru
Lomonosov Moscow State University, Institute of Regional Consulting, Moscow, Russia
© Elena S. PUTILOVA, expert
E-mail: es_putilova@mail.ru
Institute of Regional Consulting, Moscow, Russia

Abstract. The article summarizes the results of the analysis of 23 recent projects for the development of Russian Arctic resources in terms of the spatial effects they generate or rely on. It is proved to be the feature of the economic and geographical approach to the analysis of Arctic projects. The most critical change, compared with the realities of the late Soviet era, is the reliance on the sea logistics of most new projects for the development of Russian Arctic resources.

Three main spatial effects of development projects are described in detail: the localization effect, the regional effect, and the corporate effect. The first one reflects the desire of companies to the utmost compactness and a sparsely populated production site, platform solutions using artificial intelligence, remote control, robotic mining, and processing schemes. The second effect revives the Soviet district effect within the contour of the resource corporation as their desire to provide cost savings on the "soft" infrastructure pairing of neighboring production facilities. The third effect characterizes the cooperation of usually competing companies in severe natural and economic conditions for the development of Arctic projects. It is untypical but may occur in some cases.

The territorial structures of the new development space are also affected by the desire of companies to absolute control of the resource chain, to rely on previously created development bases, technological, organizational, and institutional innovations, which usually have a spatial "dimension".

An "ideal" corporate scheme for the modern development of Arctic resources — a separate autonomous production platform where production and processing are deployed, with uninhabited technologies and remote control of production, contradicts state interests and creates sharp spatial and social contrasts.

Keywords: *Arctic resource development project, spatial effect, marine logistics, platform solution and contradiction.*

Introduction: Arctic projects as a subject to economic-geographical research

In the past decade, under the influence of clearly articulated (by priority) Russian federal policy in the Arctic zone and the rapid intensification of economic activity there, the number of scientific papers devoted to the topic of Arctic projects, i.e., economic measures implemented here by state and corporate actors, has increased significantly. In the eLIBRARY database, the total number of works that include this word combination in the title or text amounted to 36,451 units as of December 19, 2019. An analysis of the names of the first five hundred articles allows us to identify about ten rubrics-directions for the study of Arctic projects.

It is an analysis of the historical aspects of the theme, i.e., a comparison of the current situation (not in separate areas, but the economic, political, and social complex) in the initiation and implementation of Arctic projects with the one existed in Soviet times [1]. It is the study of the eco-

* For citation:
Pilyasov A.N., Putilova E.S. New projects for the development of the Russian Arctic: space matters! *Arktika i Sever* [Arctic and North], 2020, no. 38, pp. 20–42. DOI: 10.37482/issn2221-2698.2020.38.21.

nomic aspects of the Arctic projects' implementation onshore and shelf understood from the perspective of increasing the national economic effects from them, incl. through import substitution (localization) for the production of equipment and materials, the development of the Russian technologies and technological solutions, from the perspective of the competitiveness of Arctic projects under fluctuations in world prices for natural resources, etc. [2–5]. It is a study of various financing schemes for investment-intensive Arctic projects [6–7]. It is a study of management and organization of Arctic projects, esp. the most difficult ones — the development of hydrocarbon resources on the shelf [8–9] and large infrastructure projects in the Arctic. These are technological issues that determine Russia's readiness to produce necessary equipment, offshore drilling platforms for the implementation of oil and gas projects on the Arctic shelf [10]. These are the issues of staffing for specific Arctic projects and the Russian project for the new development of the Arctic zone [11–12]: over the past 30 years, the country has experienced significant losses of technical specialists who can service complex engineering structures and equipment, and for new Arctic projects, it becomes a real challenge to simultaneously find hundreds of high-class builders for the production of LNG plant modules, drilling platforms, work on ships of reinforced ice-class (tankers, containers, ships, cargo ships, lighter carriers, etc.).

It is a study of the logistical, regional aspects, issues of state support for investment projects in the Arctic, the problematic characterization of individual landmark plans. The matters of logistic (transport) support for Arctic projects are dominated by the development of hydrocarbon resources on land, in the coastal zone, and on the shelf, since the most multimodal schemes with numerous transshipments are usually implemented here [13–14]. In regional issues, the roles of the Arctic regions of the Russian Federation typically prevail in the implementation of land and offshore projects, the coordination of interests of districts, corporations, the federation, the consideration of traditional environmental management of the indigenous peoples of the North and the activities of resource companies, their corporate social responsibility in the territory of the Arctic project [15–16]. The theme of state policy and state support for Arctic projects often has a narrow, specific meaning in the form of tax and licensing policies concerning a particular type or even clearly defined plans, e.g., mining, oil, and gas, offshore; and wide sounding — as state support, state-owned partnership in the implementation of Arctic investment and infrastructure (North Latitudinal Railway, Belkomur, etc.) projects [17–19].

It is extremely interesting to look through the complex research of specific projects, which often includes all previously identified aspects, but in reference to a project planned for implementation or already being implemented: questions of the financial and economic substantiation of its feasibility, technological and transport, and logistics issues, questions of its state support. E.g., articles on the “Prirazlomnoye” project, which is at the stage of “commissioning” a deposit, articles on a unique project for developing the Tomtor rare earth deposits, Popigaysky industrial diamond deposit, etc. [20–24].

Is there a niche for the economic and geographical approach? What exactly is in its content under such a detailed study of Arctic projects? The difference of our article from the ones of colleagues is primarily ideological and methodological, i.e., we proceed from the fact that the zonal geographical factor creates the conditions for significant differences in Arctic projects compared to those that are implemented, e.g., in the temperate zone. We mean the adaptation to climatic severity and instability, to degrading permafrost, very rapidly changing ice conditions of the Arctic seas, etc. Besides, it is imperative to consider the cross-border nature of the Arctic zone, the coexistence of civil and defense activities there, and the fact that any Arctic project there, in addition to a purely economic one, always has a geopolitical function of confirming the country's presence, which means its sovereignty in these remote and extreme spaces.

Individually, all these features are perceived as just features. Still, when they are understood holistically, systematically, comprehensively, they begin to sound like a completely separate subspecies of typical investment projects for developing natural resource deposits. What our fellow economists call “complexity and complex nature”, we understand as a distinct, separate nature of Arctic projects, which determines its multilateral and multi-country character, the complicity of dozens and even hundreds of suppliers and contractors, frequent delays and cancellations of even iconic investment and infrastructure projects.

In Canada, for many decades, a project to develop hydrocarbon deposits and lay a pipeline in the Mackenzie River Valley has been postponed. In Russia, the recently actively discussed Shtokman project has been shifted for decades. Many offshore projects previously announced by Russian companies, i.e., the additional exploration and development of the “Pobeda” and “Medynskoe-more” deposits of Rosneft, Leningradskoe, Ludlovskoe, Rusanovskoe and Ledovoe (Gazprom), and Dolginskoe (Gazprom Neft), under unfavorable world prices, are postponed to the period after 2030 [1].

In addition to the general methodological approach to the “Arctic exclusivity” of the projects being implemented there, what are the other specific differences that exist between our economic-geographical approach and those of our colleagues? First, we consider Arctic projects in the context of the exploited space of the Arctic. It means an organic, strong link with the theory of exploration of the Arctic and the North, to update which, based on Soviet heritage and advanced foreign theoretical experience, we began a few years ago [25–28] with an emphasis on the spatial effects of new projects. Secondly, we understand Arctic projects more broadly than some of our colleagues. In essence, it applies not only to the economy and new technologies but also to the new organization of the economic space of the Arctic and the further deployment of its productive forces. Thirdly, it is the desire to obtain broad geographical generalizations of new laws related to the deployment of projects in the Arctic, which leads to the analysis of not one, but dozens of new and modernization of old resource projects in the Arctic.

[1] Mechty ne sburilis'. Osvoenie arkticheskogo shel'fa otstaet ot planov goskompaniy [Dreams could not get drilled. The development of the Arctic shelf lags the plans of state-owned companies]. URL: https://www.kommersant.ru/doc/4033100 (accessed 01 February 2020).

Project selection criteria

The list of projects was compiled based on the analysis of key characteristics of new and already implemented resource development facilities in the Arctic. The authors focus on the large extractive projects that run since 2007 approximately. The list of projects includes both new production and mining assets of companies, as well as projects of companies to modernize and restructure the production of old facilities, relying on new technologies.

A distinctive feature of the selected projects is the distinctness of the spatial effects they generate or rely on (platform, district, inter-corporate, etc.). Another criterion for the selection of projects was the attraction of substantial investments (at least 500 million rubles) for their implementation. One more principle was their potential in terms of the cargo base formation of the Northern Sea Route, an actively used transport route for the development of the Russian Arctic. Priority in the selection was given to projects that use innovative technologies for extraction, processing, and transportation of resources. They are implemented not by a single development company but based on cooperation and partnership with both Russian and foreign companies, combining finances, competencies, technologies, and supply and sales chains of products.

As a result, 23 projects that have already been completed or planned in the Russian Arctic were selected for analysis. Many of them are in the list “Implementation of the Mineral Resources and Logistics Potential of the Arctic”, prepared by the Ministry of Natural Resources and Ecology of the Russian Federation in 2019.

Arctic projects effects: comparison with Soviet time

In the Soviet model of development of the North and the Arctic, the main economic effects were tied to the areal pioneer arrangement of new territories, when vast resource areas of unique world-class deposits are simultaneously involved in the national economic turnover; construction material factories, large state district power stations, and thermal power plants forming huge territorial production complexes appear; a rapid infrastructural arrangement of the territory with roads, pipelines was going on; a network of new single-industry villages and towns was emerging. The classic embodiment of this model is the oil exploration of Western Siberia in the 1970s. In this model, the main economic supply and sales relations were “land ones” turned to the south, incl. along the basins of Siberian rivers, and the west of the country. It was in these areas that the routes of oil and gas pipelines were laid.

It was uninteresting to work out the point, isolated resource objects-deposits, they did not provide the the economy of scale effect of the areal involvement of the new resource province in the economic turnover. Therefore, their turn came only today.

The previous development model was not able to obtain an economic effect on point, average in reserves, isolated objects of the mining industry. Justification of the costs of a planned, multi-year infrastructure field (transport and energy network with centralized energy systems) and the network of permanent industrial settlements requires unique and extra-large reserves in the territo-

ries of new development. There should be several to include regional combinatorial effects. None of them, e.g., the Mayskoye, Peschanka, and Tomtor deposits, could previously be provided. It is not surprising that their real economic development was postponed for many years until the advent of technologies and corporate owners capable of working out points, average reserves, separate objects of the Arctic mining industry.

The development of large resource pools was also delayed if their arrangement and marketing of finished products needed to be carried out through the Northern Sea Route. The only (partial) exception here was the Norilsk industrial region.

The designers' approach to the marine scheme in recent decades under the influence of climate change and increased technological capabilities and new technological solutions for the processes of extraction, processing, and transportation of Arctic natural raw materials has become more daring in the sense of willingness to use the marine scheme. The first large-scale experience in this regard was the construction by Lukoil in the zero years of the Varandey terminal, which turned out to be a breakthrough due to the abandonment of the long-existing southern scheme for transporting oil by pipeline and the transition to an entirely new scheme for the sea oil export by reinforced ice-class tankers with subsequent transshipment to conventional tankers in the Kola Bay.

The realities of the last three decades demonstrate the emergence of the phenomenon of the sea logistics complex of projects for the new development of the Russian Arctic. An integral part of this complex is offshore development bases — ports, terminals, docking centers of various types, and coastal support bases. Many of these structures are mobile (floating), which was unusual and untypical for the Soviet development bases for the resources of the North and the Arctic. The new climate dynamics in the marine Arctic, the rapid decrease in ice cover on the NSR route, strengthen the popularity and investment attractiveness of the Arctic marine supply and marketing schemes for new projects.

The key elements of Arctic marine logistics that ensure the activation of a project usually include: 1) a year-round berth, which often has a significant share in the cost of a project; 2) vessels of either reinforced ice-class, or ordinary, but then with the supposed obligatory expensive icebreaking escort (either owned by the mining structure to insure against the risks of the opportunism of the transport partner or their use for the project is guaranteed under a long-term contract); 3) mandatory trial shipments, experimental flights. These pilot flights are designed to adapt the logistics system to unexpected, but inevitable Arctic weather and ice surprises.

All the late Soviet development of the resources of the North and the Arctic was set up for year-round work of the mines and quarries created here. Seasonality was allowed when mining placer deposits. The modern scheme of seasonal (October – April) development of a field (e.g., Tomtor) for Soviet designers meant an absolute violation of all accepted canons of the technological process and the failure to obtain the main economic effects that the previous development system was tuned for. It means economies of scale due to the large volumes of production (production and processing), achieved mainly due to year-round loading and simultaneous commissioning of several

unique naturals. The object is a large area of a new industrial zone with simultaneous fast road pad channels, and energy facilities, repair, other industrial infrastructure. The same violation of the Soviet developmental canons is the planned "push-pull" winter and summer transport scheme for the Kekura gold-silver deposit in the Chukotka Autonomous Region. It is along the Pevek-Bilibino area, and further along, the production winter road owned by HGM, until the deposit; in summer, through the year-round dirt track Pevek-Ilirney, where cargo storage will take place for their subsequent delivery along the winter road to the production site [2].

Discussions about the specific logistics scheme of the project, as never before, are characteristic today for many new Arctic projects. A genuine innovative search is here and sometimes more intense than when choosing a specific mining scheme. And this is not surprising. The issues are not the point impact of the project on the home environment, but the essentially political and economic issues of transforming the areas of space on which various actors claim ownership. It is how to coordinate the interests of "transit countries", through the territory of which export routes are laid (the concerns of Yakutia in transit of rare-earth concentrate and Denmark under the Nord Stream-2 subsea gas pipeline are phenomena of the same genesis). And it is also how to establish common use of transport infrastructure facilities owned by the state or corporation (e.g., disputes between Lukoil and Rosneft regarding the conditions for using the Varandey terminal in the NAO). And how to enter multi-actor commercials without losing control of the entire project? Russian practice shows that companies are sometimes willing to spend billions of rubles on maintaining sole control over the project, even contrary to the economic logic of the rationality of cost-sharing and the economic feasibility of cooperative partnerships with another company.

It is through the logistics of the Arctic project, through the formation of the logistics complex that the local specificity of the specific properties of the natural asset of the field, its economic-geographical and transport-geographical position, the characteristics of the natural and climatic local environment are linked; and global issues of world markets, which need to orient the products of the new project, national interests, and sovereignty of the country, strengthening its Arctic facade. As soon as the marine logistic scheme of supply and output of final products is selected, the project acquires not purely economic, but geopolitical and geo-economic importance. There are no politically neutral sea traces in the Arctic: all sea routes, even in the zone of Russian jurisdiction, are geopolitically significant and are automatically "loaded" with sovereignty issues. It is the fundamental political and economic difference between the marine, northern, and southern land schemes for transporting household resource products.

In Soviet practice, there has never been strict isolation of the pioneer and subsequent stages of development. Yes, for the pioneer stage, mass innovation and search behavior were also characteristic, but only so that in the following steps, the finds of the pioneer stage would be fixed and legalized in real life of the project.

[2] Dostavim gruzy na mestorozhdenie Kekura [We deliver goods to the Kekura deposit]. URL: https://as-sib.com/napravleniya/chukotskiy-ao/kekura (accessed 01 February 2020).

Now, the findings of the experimental search stage may well be canceled at subsequent stages, and something wholly new or long-known, but waiting when starting experiments fail, e.g., in energy supply schemes or transport logistics, will be offered. Practice shows that the experimental period can last a long time. Moreover, sometimes it may even be beneficial for the company itself to delay it so as not to be bound by the state regulation of work, as in the case of the Varandey terminal of Lukoil, which has been operated under experimental conditions for years.

The Soviet effects of Arctic exploration are the ones on the formation of large regional territorial production complexes that linked production issues from unique large deposits, road facilities, energy supply, social facilities, and others into a single system on a vast newly developed area. What effects come to replace them?

The effects of spatial localization of exploratory "growth poles" (economic platforms and islands)

In recent years, a new scheme of the spatial organization of productive forces in pioneering development projects has emerged in the Russian Arctic — platforms and economic "islands": the Prirazlomnaya platform in the Nenets Autonomous Okrug, the port and the liquefied natural gas plant in Sabetta, the Varandey terminal in the Nenets Autonomous Okrug, the gold ore deposit Kupol in the Chukotka Autonomous Okrug and others. On the artificial islands in the Kola Bay, there is a Center for the construction of large-capacity marine structures — an analog of a marine shipyard, a factory of plants that will manufacture marine complexes for liquefying natural gas, storing and shipping LNG, repair and maintenance of marine equipment [3].

It is about applying technically revolutionary solutions, relying on artificial intelligence, to develop Arctic deposits that are radically different from those that we are used to in industrial times. Developers of platform solutions for the development of Arctic resource projects focus on the possibilities of low-occupancy schemes due to the use of robotic mining complexes, uncrewed trucks and other equipment, remote unified control from production to shipment through the use of intelligent telecommunication systems, and the use of a floating processing plant on a gravity platform and residential floating modules for placing shift workers [29]. Production facilities are also similarly located in the foreign North: e.g., the metallurgical plant of Alcoa Corporation in Iceland also represents an extremely isolated site — an "island" platform.

A key feature is an emphasis on the ultimate localization and compactness in the placement of industrial and social facilities: as if the unspoken imperative "Do not spread over the surface!" Platform solutions provide for a clear delineation of the economic space of the new development, with the frequent assignment of special legal status to it (e.g., the Beringovskaya advanced development area in Chukotka).

What is the essence of the resulting economic "platform" effect? Modern models of endogenous economic growth rely on marginal localization, compact placement of production factors at a

[3] Megaproekt strategicheskogo znacheniya v Belokamenke [Megaproject of strategic importance in Belokamenka]. URL: https://арктик-тв.рф/news/murmanskaya-oblast-arktika/megaproekt-strategicheskogo-znacheniya-v-belokamenke (accessed 01 February 2020).

minimum of space. It is no coincidence that by default, they assume the presence of an isolated enclave, an island, a separate localized area on which the main production effects unfold due to intensive communication and the conjugation of compactly located production forces.

The configuration of the Arctic project in the form of an offshore platform or an artificial island deliberately leads the development process to such a small spatial dimension: a shift camp, offshore platform or alluvial island, an independent source of energy supply, a boiler room, a quarry/drilling, an LNG plant or an enrichment plant — this is a gentleman's set of recent Arctic projects. At these new isolated developmental "poles of growth" as from textbooks, it is possible to obtain the effects of endogenous growth "from below" from the properties of space itself. In regional science, they are called externalities on localization, effects of localized collective learning (that is, savings on the total experience gained).

But not only new projects for the development of Arctic resources "include" the platform effects of marginal economic localization. It is also characteristic of modernization projects of old mining facilities. E.g., to extend the life cycle of the Norilsk industrial district, the Southern Cluster project is being implemented, which provides for the simultaneous modernization of closely located mining and processing facilities, and the abandonment of the use of "distant" ore supply schemes of the Talnakhsky unit to the Norilsk Concentrator.

The platform approach to the development of new resource projects in the Russian Arctic involves reliance on water transport: the Northern Sea Route and river transport. The project operators are trying to minimize the use of expensive icebreakers. They rely on their fleet of reinforced ice-class vessels and, as in the case of the Pavlovsk project, adapt the export scheme for seasonal transportation of mined ore.

Regional effects and new industrial districts with a reference project

The initial impression that, in the new development model, the previous regional effect, tied to large state territorial production complexes created on the territory of the new development, is replaced by the corporate effect of maximum localization on the compact site of the new economic cluster, with a detailed analysis of dozens of project deployment cases new development is not real. Indeed, state economic development is being replaced in breadth, with the creation of a network of permanent industrial settlements, permanent roads, power transmission lines, stationary mining and processing complexes, and construction materials factories are being provided with "facilitated" corporate or state-corporate development in-depth, without a constant full arrangement of the territory, with an extremely compact production site, a shift camp assembled from factory modules, the active use of seasonal water and land routes (winter roads).

However, a more substantive acquaintance with the spatial behavior of resource companies in the new territory of presence reveals their persistent desire to form a regional network here from several organizational, technological, and infrastructurally related enterprises located relatively close by Arctic standards (up to hundreds of kilometers from each other). At the same time, the start-up

project (s) begins to play a pilot role, and the subsequent ones play the role of "clones" that replicate (scale) the success of the first, considering the experience gained in overcoming climate, resource-operational / technological and organizational challenges.

Almost all large companies operating in the Arctic persistently seek to obtain this regional, synergistic effect on the general use of the pioneer development of corporate infrastructure created in the region, the general labor market of the corporation, the flow of knowledge, competencies, and technologies between the divisions created here. That is, there is a classic Marshallian industrial district, with all its external effects (externalities) well described [30].

E.g., the Kinross Gold Company constructively uses this regional effect. In 2007, it began to develop the Kupol gold ore deposit, and in 2010 it acquired the Dvoynoye deposit located 100 km to the north. The mined ore from the Dvoynoye deposit is processed at the Kupol mine's refining plant, where it is delivered daily on ore dump trucks via the specially constructed year-round Kupol-Dvoynoye road.

Gazpromneft hopes to actualize the district effect so that the flagship Novoportovskoye field in the future forms a single cluster around itself together with other company fields in the Yamal Peninsula. The next stage in the development of the field is the launch of the Yamal Gas project — the creation of infrastructure for the transportation of gas from the company's fields on the Yamal Peninsula. The gas infrastructure will make it possible to combine up to 15 Yamal fields and develop a new oil and gas province based on the Novoportovskoye field [4]. The new key object will be a 116 km subsea gas pipeline from the Novoportovskoye field to the Yamburgskaya compressor station, connected to the Yamburg-Tula gas pipeline. Commissioning of the project is scheduled for 2022 [5].

Rosneft plans to obtain a district effect in reducing current and capital costs, firstly, by turning the Vankor field into a base for the entire territory in terms of testing advanced technologies in the most traditionally problematic areas of oil production and their subsequent replication to other objects of the Vankor cluster. Secondly, since Rosneft organizationally and infrastructurally unites the Vankorskoe, Lodochnoe, Tagulskoe, and Suzunskoe fields in the Turukhansk and Taimyr Dolgan-Nenets municipal districts of the Krasnoyarsk Krai into a single cluster. The individual operator of all cluster deposits is RN-Vankor LLC, a subsidiary of Rosneft. The integration of the transport, production, and energy infrastructure of the fields is currently going on. The district effect may become even more powerful when the group of Payakh deposits of Neftegazholding JSC is joined to the Vankor cluster and the merger of the objects into the joint Vostok Oil project. The project involves the construction of an oil pipeline between the Vankor and Paiyakh group of fields, which allows the

[4] Proekt «Novyy port» ["New Port" Project]. URL: https://www.gazprom-neft.ru/company/major-projects/new-port/ (accessed 01 February 2020).

[5] Gazprom planiruet vvesti gazoprovod s Novoporta v 2022 godu [Gazprom plans to introduce a gas pipeline from Novoport in 2022]. URL: https://gasandmoney.ru/novosti/gazprom-neft-planiruet-vvesti-gazoprovod-s-novoporta-v-2022-godu/ (accessed 01 February 2020).

transportation of products of all fields of a single industrial region through the oil terminal via the NSR [6].

The main difference of the Arctic from the classic Marshall industrial districts is that the main actor of the district effect is not a small business, peeping at each other's innovations, creating a unique creative atmosphere of the industrial region, but a large anchor corporation, which locates its mining and processing units there. Self-sufficient and autonomous sites of the local production and transportation system of the company strive to integrate among themselves in the circuit of the pioneer development area. It causes a struggle for obtaining adjacent, closely spaced license areas. And this is demonstrated, e.g., by NovaTEK PJSC. The company created a corporate "empire" in the Gulf of Ob from autonomous, but relatively closely located production and license areas of the Yamal and Gydan peninsulas.

Compared to the Soviet era, these regional ties, of course, are more mobile, more temporary, they are not materialized by a network of permanent roads and constant energy infrastructure. Therefore, they are more difficult to detect! Companies seek to obtain a regional, synergistic effect on the territory of their presence. They try to link local and development platforms in a unified network of infrastructure, personnel, competencies, etc. And this district effect has geographical limits: hundreds, but not thousands of kilometers.

Sometimes the district effect extends to the interregional level: when raw materials from mining facilities of the Arctic territory are processed at southern factories within the same corporate owner to which all these facilities belong. E.g., Polymetal PC connects several deposits of the same ore genesis dispersed in different far-eastern regions to a single center for processing gold refractory ores, with a particular technological scheme configured for these ores, to its Amur hydrometallurgical plant.

Intercorporate spatial effect: where and when does it manifest?

The inter-corporate effect arises as a result of the cooperation of several corporations in the development of a new resource object. By no means always do corporations manage to agree on the distribution of responsibilities, powers, and terms of interaction in the territories of new development. There are examples of wasteful duplication for society in the creation of ultra-expensive objects of new infrastructure when it would be possible to limit the use of one if there was a mutually acceptable agreement on operating conditions between several companies. In the NAO, Lukoil and Rosneft failed to agree on the terms of the use of the Lukoil Varandey terminal [7]. As a result, the terminal remains underloaded. Rosneft does not use it and has to create its alternative logistics.

[6] Rosneft' i Neftegazolding narastyat gruzopotok SMP [Rosneft and Neftegazolding increase the NSR cargo flow]. URL: https://oilcapital.ru/news/markets/28-02-2019/rosneft-i-neftegazholding-narastyat-gruzopotok-smp-smi?ind=1892 (accessed 01 February 2020).

[7] Lukoyl gotov sporit' s Rosneft'yu po tarifam na Varandeyskom terminale do pobednogo [Lukoil is ready to argue with Rosneft on tariffs at the Varandey terminal until victory]. URL: https://neftegaz.ru/news/gosreg/195599-lukoyl-gotov-sporit-s-rosneftyu-po-tarifam-na-varandeyskom-terminale-do-pobednogo/mr/ (accessed 01 February 2020).

Gazprom and NovaTEK often fail to agree on the joint use of offshore development bases, terminals, and winter roads in Yamal [8].

A generalization of a dozen cases of conflict and cooperation allows us to conclude that the inter-corporate effect occurs when 1) companies specialize in their resource value chain, e.g., gas, oil, condensate. In this case, even an equal "weight category" of partners does not interfere; 2) in the case of one specialization, but with different statuses of partners included in the alliance, when there is a "senior" company and a "junior" company. The difference in status facilitates the achievement of partnership arrangements; 3) when it comes to a genuine technological challenge for both parties, and it helps to overcome the contemporary natural, technological, financial difficulties and risks, e.g., when operating offshore facilities, competing companies in other territories here are ready to cooperate.

The first case is the cooperation of Gazpromneft and Rosneft in a project to develop the Messoyakha fields. Here, Rosneft is responsible for the oil chain, and Gazpromneft is accountable for the gas chain. Cooperation is carried out within the framework of a general agreement between the companies of 2006, which touches on practically all aspects except for sales: production, transportation, processing of hydrocarbon raw materials, informational, scientific, technical, and personnel interaction [9].

The second case includes the logistic communication of Rosneft and Neftegaz-holding in integrating the development of the Vankor and Payakh group of fields into a single Vostok-Oil region[10]. The third case consists of the preliminary intention of Gazpromneft and NovaTEK to create a joint venture for the development of offshore projects [11].

The Vostochno-Messoyakhskoye field development project is the product of a successful intercorporate agreement. The license for field development is owned by Messoyakhaneftegas JSC, a joint venture of Gazprom Neft PJSC and Rosneft PJSC, with equal shares in the project. The operational management of the event is carried out by PJSC Gazprom Neft, which uses the East Messoyakhskoye field as a testing ground for testing new technologies.

The layout of the part of the analyzed Arctic development projects for the three spatial effects described is in Table 1.

[8] Gazprom i Novatek ne dogovorilis' o prodolzhenii sotrudnichestva [Gazprom and Novatek did not agree to continue cooperation]. URL: https://www.vedomosti.ru/business/articles/2013/06/06/gazprom_i_novatek_ne_dogovorilis (accessed 01 February 2020).

[9] Umenie dogovarivat'sya. Partnerstva «Gazprom nefti» kak strategicheskiy instrument [Ability to negotiate. Gazprom Neft partnerships as a strategic tool]. URL: https://www.gazprom-neft.ru/press-center/sibneft-online/archive/2019-september/3592575/ (accessed 01 February 2020).

[10] Neftyanye admiraly. «Rosneft'» namerena zagruzit' Sevmorput' syr'em so svoikh mestorozhdeniy [Oil admirals. Rosneft intends to load the Northern Sea Route with raw materials from its fields]. URL: https://www.kommersant.ru/doc/3896485 (accessed 01 February 2020).

[11]

Table 1

Spatial effects Arctic projects rely on

Project name (16)	Location	License holder	Project start	Effects		
				Localization	Regional	Intercorporate
Development of the Prirazlomnoye field	Nenets Autonomous Okrug	Gazpromneft	2013	+[12]	+	
Yamal LNG	Yamal-Nenets Autonomous Okrug	PJSC Novatek	2017	+	+	
Arctic LNG-2	Yamal-Nenets Autonomous Okrug	PJSC Novatek	2023	+	+	
Pavlovskoye Lead Zinc Ore Deposit	Arkhangelsk Oblast, Novaya Zemlya Archipelago	JSC First Mining Company (State Corporation Rosatom)	2023	+		
Kirov mine and processing plants (modernization of Apatit OJSC)	Murmansk Oblast	Apatit OJSC (PhosAgro PJSC)	2013	+		
Southern Cluster of the Norilsk Industrial Region	Krasnoyarsk Krai	PJSC MMC Norilsk Nickel	2021	+		
Development of the Novoportovskoye field	Yamal-Nenets Autonomous Okrug	PJSC Gazprom Neft	2006		+	
Vankorskoe field	Krasnoyarsk Krai	PJSC Rosneft Oil Company	2009		+	
Development of the Bovanenkovo 2012 field	Yamal-Nenets Autonomous Okrug	Gazprom			+	
Development of the Payahskoye field group	Krasnoyarsk Krai	JSC "Neftegazholding"	2023		+	+
Yaro-Yakhinskoye field	Yamal-Nenets Autonomous Okrug	Arktikgaz OJSC — (a joint venture of PJSC NOVATEK and PJSC Gazprom Neft)	2015		+	+
GOK “Nezhdaninsky”	The Republic of Sakha (Yakutia)	Polyus Zolot PJSC and Polymetal JSC	2021		+	+
“Kupol” deposit	Chukotka Autonomous Okrug	CJSC ChGGK (Kinross Gold group of companies)	2007		+	
“Kukura” deposit	Chukotka Autonomous Okrug	CJSC Bazovie metalli (holding Highland Gold Mining	2023		+	
Group of Messoyakha deposits	Yamal-Nenets Autonomous Okrug	Messoyakhaneftegas JSC (a joint venture of Gazprom Neft PJSC and Rosneft Oil Company PJSC)	2016			+
Development of the Vaneyvisskoe and Lavayozhskoe	Nenets Autonomous Okrug	Joint venture PJSC Gazprom and PJSC Lukoil	2023			+

[12] + means the presence of the effect.

deposits						

Other spatial effects

When understanding the emergence of other spatial effects, it is useful to refer to Dunning's concept of the multinational company [31]. According to it, any large corporation has three “pillars” — O — a system of control (property) over all its assets (natural, labor, intellectual, material) and financial resources); I — organizational structure (flat, vertically integrated, hybrid, the presence of individual target units outside the general hierarchy, etc.); L — territorial structure (location of the "productive forces" of the company). In the current activities of the corporation, all three components are usually linked to each other. Changes in the organizational structure or control system are noted in shifts in the spatial distribution of company assets.

E.g., many features of the spatial behavior of Arctic corporations can be understood as the desire for the sole complete control of the resource chain in all its transformations: for government agencies, control issues were less significant than for modern Russian resource companies. Often, companies go for the sake of creating new objects of the territorial development structure (new ports, terminals, temporary roads, etc.); that is, they change the initial properties of the Arctic space. The new logistics scheme may be more expensive than the existing one, but it provides the owner with sole full control in the resource project.

It is logical that changes, e.g., in the state of the company’s assets as a result of innovative transformations of the stages of extraction, processing, and transportation of the resource, characteristic of many of the projects we have analyzed, are necessarily accompanied by spatial effects in the form of a new arrangement of productive forces (material assets and labor resources) or rationalization of the previous scheme if we are talking about old mining projects of the industrial era.

As a rule, companies make efforts to actualize the effects of spatial localization, organize production space in such a new way as to provide a more in-depth and more complete extraction of minerals. E.g., it is assumed that the increased clarity of specialization as a result of the modernization of production facilities at the Kola MMC in the Murmansk Oblast will improve economic efficiency by streamlining the territorial structure of the company's facilities and reducing the volume of transport work.

In full accordance with the Dunning concept, not only innovative technological modernization of the company's material assets, but also internal organizational transformations, e.g., as a result of the merger of several nearby production facilities (while at the same time establishing intensive infrastructure, personnel, and telecommunications links between them) reflected in the territorial structure of the company. E.g., in 2015, Apatit JSC carried out an organizational merger of two mines, the Central and Rasvumchorr mines, into a single Rasvumchorr mine. A 3.5 km long road was built between the mines. Due to the new organizational structure, it was possible to reduce the costs of main-

taining buildings, facilities, and mine lifting, as well as transportation of necessary materials and to administrative staff [13].

In addition to the platform, regional, intercorporate, and other spatial effects, modern exploration projects in the Arctic actualize the Jack London effect described by Alaskan economist Lee Huskey — anchoring a new layer of development to the infrastructure of the previous development, previous development cycles [14, 15]. Thus, the owners of new resource facilities can significantly save on a new development of the production facility.

It is necessary to understand this effect very broadly: not only as a support for new projects on roads, power lines and other linear infrastructure facilities of the previous cycle of industrial development, laid 50–75 years ago, but also as the gravity of new projects that are being developed from scratch, to not far located river, seaports, airports, other point infrastructure facilities that can be effectively used for economical new development (e.g., the Vankor project to the airport of Igarka). The Tomtor project is naturally looking for such an anchor with the objects of previously created infrastructure. We are talking about using sections of the winter road of Almazy Anabara JSC for 80 km, strengthening port facilities in the village of Yuryung-Khaya, Khatanga port.

Conclusion

1. An economic-geographical study of the projects of the new economic development of the Arctic allows us to form new ideas about the features of spatial organization and spatial effects of both individual projects and the entire modern process of economic development of the Arctic as a whole. The projects selected for the analysis of the resource “greenfield” and “brownfield” indicate that technologically breakthrough solutions will necessarily entail a new spatial organization, a further distribution of productive forces, and new spatial effects.

2. The most important difference of modern development from a similar process of the Soviet era is the unprecedented role of corporate structures, which determines the generation of new effects, new opportunities, and limitations in the operation of resource resources in the Arctic. A radical change in the main development actor makes it possible to develop separate point objects that were unattractive for the previous state development model.

Extreme localization and compact packaging of all elements of the new project on a separate island platform become characteristic, which saves transport and production costs and receives positive externalities from localized integration of technologically related items.

[13] «Apatit» zavershil sliyanie Tsentral'nogo i Rasvumchorskogo rudnikov [“Apatit” completed the merger of the Tsentral'noe and Rasvumchorsky mines]. URL: https://regnum.ru/news/economy/1908461.html (accessed 01 February 2020).

[14] London Jack. The Economics of the Klondike. Review of Reviews. January 1900. URL: https://thegrandarchive.wordpress.com/the-economics-of-the-klondike/ (accessed 01 February 2020).

[15] Huskey L. Alaska’s Economy: The First World War, Frontier Fragility, and Jack London. Northern Review, [S.l.], 2017, no. 44, pp. 327–346. ISSN 1929-6657. URL: http://journals.sfu.ca/nr/index.php/nr/article/view/639 (accessed 01 February 2020).

The role of the regional effect, which was the main one in the development of new territories and resources in the Soviet era and was implemented as industrial Territorial production complexes, is changing. Now it is not the state that seeks to receive it, but the corporations due to the close location of several production facilities connected by each other with another, not expensive round-the-clock objects of physical infrastructure, but more economical, often seasonal, temporary objects of telecommunication and transport infrastructure. The district effect of the new intra-corporate pairing takes on either the centripetal form ("pilot clones") when the best practices of the first project are replicated for subsequent ones or a network form of parallel projects.

Very characteristic is the desire of the new main development actors — corporations — to obtain/maintain full control over the created resource chain at all stages of processing and transportation. It determines many decisions in the spatial distribution of development objects (e.g., development bases), in the entire organization of the productive forces of new development.

3. Climate mitigation and new technological opportunities determine a shift in the logistics of many Arctic projects: earlier they relied on the southern land transportation scheme by road, rail or pipeline, and now on the Northern sea transportation scheme by specialized ice-class vessels with or without partial icebreaking support her along the Northern Sea Route. This new logistic maritime scheme causes reconfiguration of the old bases and development routes, the creation of a network of new sea bases (transshipment points) and routes, and even more — changes the production schemes of resource extraction and processing. The new marine production and transport model for the development of Arctic resources is, as a rule, also the platform, island, that is, extraordinarily localized and combined in the mining and processing stages.

4. Dozens of new projects for the resource development of the Arctic turn out to be exceptionally geographically restricted: in terms of capital investments, a significant part of them is concentrated in the Ob Bay of the Yamal-Nenets Autonomous Okrug, in terms of quantity — in the Yamal-Nenets Autonomous Okrug and Taimyr. But this means that in the land spaces and the water areas of these places, there are powerful territorial (and often intercorporate) effects from interfacing projects on the same infrastructure, from the use of common ports, terminals, transshipment points, etc. Therefore, a separate study of the phenomenon of two Arctic regions of new development is needed, i.e., the water (marine) one in the Gulf of Ob and the land one on Taimyr. It will contribute to an objective understanding of the new effects that arise here with a new, corporate development of the resource s and spaces.

5. The ideal scheme for the modern development of the Arctic resources, as it is seen by corporations and to which they are striving, can be characterized in the ultimate setting as follows. It is an absolutely isolated autonomous production platform, where production and processing processes are developed, with unmanned technologies due to the remote control of all production processes (therefore, even shift camps are not required since everything happens according to space, moon-moving scheme).

In this case, no additional social obligations are required to be fulfilled due to the lack of permanent indigenous or alien residents and workers. The operator company has all the maximum possible tax benefits for the project and uses the production infrastructure created at the expense of the state for the project.

The corporation has absolute control and predictability in production and logistics processes because both the means of production and the means of sea and land transportation belong to it. It is for this reason that this scheme does not involve the use of atomic icebreakers because it always means weakening personal control over the space of movement of the resource chain.

The main goal of the corporation is for the field to be put into circulation as quickly as possible for the project to promptly reach the breakeven point and start generating profits and working to increase the company's stock indices. It is clear that the goals of the state in implementing a new project for the development of Arctic resources are different: maximum tax revenue for the company; not fast, but effective from the point of view of loading domestic enterprises, the development process; maximum use of the potential of domestic science; maximum economic and social return from the project for the country and territory of the company's presence. There is a definite contradiction of positions, which forms the dramaturgy of the modern process of Arctic exploration and provokes an increase in spatial and social contrasts.

Acknowledgments and funding

The research results of the RFBR grant No. 18-05-00600 A “New theory of the Arctic and Northern development: multiscale interdisciplinary synthesis” and the RSF grant No. 19-18-00005 “Eurasian vectors of maritime economic activity of Russia: regional economic projections” were presented in the article.

References

1. Zubkov K.I., Karpov V.P. Rossiyskie proekty v Arktike: preemstvennost' zadach i resheniy [Russian projects in the Arctic: the continuity of tasks and solutions]. *Vestnik Tyumenskogo gosudarstvennogo universiteta. Gumanitarnye issledovaniya* [Tyumen State University Herald. Humanities Research. Humanities], 2019, vol. 5, no. 1, pp. 173–187.
2. Kryukova V.A., Kryukov Ya.V. Kak razdvinut' ramki arkticheskikh proektov [How to expand frames of the Arctic projects]. *EKO* [ECO], 2017, no. 8, pp. 5–32.
3. Minakir P.A. Arkticheskiy proekt: ekonomicheskoe izmerenie [Arctic project: economic dimension]. *Severnyy morskoy put': razvitie arkticheskikh kommunikatsiy v global'noy ekonomike "Arktika-2015": materialy konferentsii* [Northern Sea Route: the development of Arctic communications in the global economy “Arctic-2015”]. Murmansk, Murmansk state technical university Publ., 2015, pp. 25–29.
4. Mastepanov A.M. O konkurentosposobnosti neftegazovykh proektov arkticheskogo shel'fa v usloviyakh nizkikh tsen na energoresursy [On the competitiveness of oil and gas projects on the Arctic shelf at low energy prices]. *Delovoy zhurnal Neftegaz.RU* [Business magazine “Neftegaz.RU”], 2017, no. 1, pp. 20–30.
5. Krupitskaya N.E., Krupitskaya O.S. Ekonomicheskiy aspekt realizatsii arkticheskikh proektov po razrabotke uglevodorodov sovmestno s mezhdunarodnymi partnerami [The economic aspect of the realization of Arctic hydrocarbon development projects in association with foreign partners]. *Rossiyskoe predprinimatel'stvo* [Russian journal of entrepreneurship], 2015, vol. 16, no. 14, pp. 2257–2270.
6. Vorotnikov A.M., Tarasov B.A. Finansirovanie investitsionnykh proektov v arkticheskoy zone Rossiyskoy Federatsii v tselyakh ustoychivogo razvitiya [Financing of investment projects in the Arctic zone of the

Russian Federation for sustainable development]. *Zhurnal ekonomicheskikh issledovaniy* [Journal of economic studies], 2018, vol. 4, no. 9, pp. 47–53.

7. Balobanov A.E., Vorotnikov A.M. Finansirovanie klyuchevykh infrastrukturnykh proektov v arkticheskoy zone Rossiyskoy Federatsii. Soglasovanie interesov gosudarstva i biznesa [Financing of key infrastructure projects of the Russian Arctic. Coordination of state and business interests]. *Zhurnal issledovaniy po upravleniyu* [Journal of Management Studies], 2018, vol. 4, no. 6, pp. 16–28.
8. Sultani A.N.M. *Organizatsionno-ekonomicheskiy mekhanizm realizatsii proektov osvoeniya neftegazovykh mestorozhdeniy Zapadno-arkticheskogo shel'fa*: dis. … kand. ekon. nauk [Organizational and economic mechanism for the implementation of projects for the development of oil and gas fields of the West Arctic shelf: Cand. Econ. Sci. Diss.]. St. Petersburg, Saint Petersburg Mining University Publ., 2012.
9. Vovk V.S., Rabkin V.M., Samsonov R.O., Mirzoev D.A., Cherbanich N. Strategiya i metody upravleniya slozhnymi proektami osvoeniya arkticheskikh neftegazovykh mestorozhdeniy [Strategy and management methods for complex projects for the development of Arctic oil and gas fields]. *Nauka i tekhnika v gazovoy promyshlennosti* [Science and Technology in the Gas Industry], 2007, no. 4 (31), pp. 4–16.
10. Medvedev N.V. Neftedobycha v Arktike: est' li v Rossii neobkhodimoe oborudovanie dlya razvitiya neftegazovykh proektov na arkticheskom shel'fe? [Oil production in the Arctic: Does Russia have the necessary equipment for the development of oil and gas projects on the Arctic shelf?]. *Delovoy zhurnal Neftegaz.RU* [Business magazine "Neftegaz.RU"], 2015, no. 7–8, pp. 52–55.
11. Kostylev I.I. Kadrovaya obespechennost' arkticheskikh proektov [Staffing for Arctic projects]. *Sbornik nauchnykh trudov professorsko-prepodavatel'skogo sostava Gosudarstvennogo universiteta morskogo i rechnogo flota im. admirala S.O. Makarova* [Collection of scientific papers of the faculty of the Admiral Makarov State University of Maritime and Inland Shipping], 2016, pp. 174–182.
12. Markin V.V., Silin A.N. Chelovecheskiy i sotsial'nyy potentsial v realizatsii arkticheskogo proekta Rossii [Human and social potential in the implementation of the Arctic project of Russia]. *Chelovek v Arktike: innovatsionnye tekhnologii resheniya sotsial'nykh problem* [Man in the Arctic: innovative technologies for solving social problems]. Tyumen, 2017, pp. 6–19.
13. Fadeev A.M. Sovremennye perspektivy osvoeniya arkticheskogo shel'fa i transportno-logisticheskie vyzovy v obespechenii proektov v Arktike [Current prospects for the development of the Arctic shelf and transport and logistics challenges in ensuring projects in the Arctic]. *Arktika: obshchestvo i ekonomika* [Arctic: society and economy], 2013, no. 10 (10), pp. 23–27.
14. Ruksha V.V., Golovinsky S.A., Belkin M.S. Ledokol'noe obespechenie krupneyshikh natsional'nykh arkticheskikh uglevodorodnykh proektov [Icebreaker support for the largest national Arctic hydrocarbon projects]. *Arktika: ekologiya i ekonomika* [Arctic: ecology and economy], 2016, no. 4 (24), pp. 109–113.
15. Didyk V.V., Serova N.A., Emel'yanova E.E. Proekty osvoeniya neftegazovykh resursov arkticheskogo shel'fa i sotsial'no-ekonomicheskie interesy regiona [Projects for the development of oil and gas resources of the Arctic shelf and the socio-economic interests of the region]. *Sever i rynok: formirovanie ekonomicheskogo poryadka*, 2007, no. 1 (17), pp. 107–114.
16. Sosnin D.A. Rol' Murmanskoy oblasti v realizatsii arkticheskikh proektov i razvitii Severnogo morskogo puti [The role of Murmansk Oblast in realisation of Arctic projects and in development of the Northern Sea Route]. *Transport Rossiyskoy Federatsii* [Transport of the Russian Federation], 2015, no. 5 (60), pp. 23–26.
17. Lunden L.P. Rossiyskaya nalogovaya i litsenzionnaya politika v otnoshenii shel'fovykh proektov [Tax and License Policy in Russia: Assessing the New Offshore Setup]. *EKO* [ECO], 2014, no. 3, pp. 30–54
18. Lunden L.P., F'yortoft D.B. Rol' gosudarstvennoy podderzhki v razvitii proektov "Yamal SPG" i "Prirazlomnoe" [The role of government support for the development of the Yamal LNG and Prirazlomnoe projects]. *Energeticheskaya politika* [Energy Policy], 2014, no. 4, pp. 52–60.
19. Tarasova O.V. Otsenka perspektiv gosudarstvenno-chastnogo partnerstva v arkticheskikh infrastrukturnykh proektakh [Assessing the prospects for public-private partnerships in Arctic infrastructure projects]. *Gosudarstvenno-chastnoe partnerstvo v sfere transporta: modeli i opyt — 2018 sbornik tezisov dokladov konferentsii* [Public-private partnership in the field of transport: models and experience — 2018]. Saint Petersburg State University Publ., 2018, pp. 59–64.
20. Lunden L.P., F'yortoft D.B. Dvadtsat' let osvoeniya, a nefti do sikh por net: Prirazlomnoe — pervyy muchitel'nyy arkticheskiy shel'fovyy proekt Rossii [Twenty years of development, but still no oil: Prirazlomnoye is Russia's first excruciating Arctic shelf project]. *EKO* [ECO], 2013, no. 4, pp. 56–77.

21. Pokhilenko V.P., Kryukov V.A., Tolstov A.V., Samsonov N.Yu. Tomtor kak prioritetnyy investitsionnyy proekt obespecheniya Rossii sobstvennym istochnikom redkozemel'nykh elementov [Tomtor as priority investment project to provide Russia with its own source of rare earth elements]. *EKO* [ECO], 2014, no. 2, pp. 22–35.
22. Yatsenko V.A., Kryukov Ya.V. Otsenka napravleniy postavok redkozemel'noy rudy mestorozhdeniya Tomtor na pererabotku: prostranstvennyy aspekt [Evaluation of Areas of Supply of Rare Earth ore Deposits Tomtor for Processing: the Spatial Aspect]. *EKO* [ECO], 2016, no. 8, pp. 37–50.
23. Pokhilenko N.P., Tolstov A.V. Perspektivy osvoeniya tomtorskogo mestorozhdeniya kompleksnykh niobiy-redkozemel'nykh rud [Prospects for the development of the Tomtor deposit of complex niobium-rare-earth ores]. *EKO* [ECO], 2012, no. 11, pp. 17–27.
24. Samsonov N.Yu., Kryukov Ya.V. Popigayskoe mestorozhdenie almaz-lonsdeylitovogo sverkhabrazivnogo materiala — arkticheskiy proekt s vysokim innovatsionnym potentsialom [Popigay deposit of diamond-lonsdalite superabrasive material — an Arctic project with a high-innovative potential]. *Arktika: ekologiya i ekonomika* [Arctic: ecology and economy], 2018, no. 1 (29), pp. 15–25.
25. Pilyasov A.N., Zamyatina N.Yu. Osvoenie Severa 2.0: vyzovy formirovaniya novoy teorii [Development of the North 2.0: challenges of making a new theory]. *Arktika i Sever* [Arctic and North], 2019, no. 34, pp. 57–76.
26. Zamyatina N.Yu., Pilyasov A.N. Sovremennaya teoriya osvoeniya: poiski integriruyushchey platformy [Modern theory of the northern development: in search for integrating platform]. *Sever i rynok: formirovanie ekonomicheskogo poryadka*, 2019, vol. 64, no. 2, pp. 16–28.
27. Zamyatina N.Yu., Pilyasov A.N. Novaya teoriya osvoeniya (prostranstva) Arktiki i Severa: polimasshtabnyy mezhdistsiplinarnyy sintez [The new theory of the Arctic and Northern development: multi-scale interdisciplinary synthesis]. *Arktika i Sever* [Arctic and North], 2018, no. 31, pp. 5–27.
28. Zamyatina N.Yu., Pilyasov A.N. *Rossiyskaya Arktika: k novomu ponimaniyu protsessov osvoeniya* [Russian Arctic: towards a new understanding of development processes]. Moscow, URSS Publ., 2018, 400 p. (In Russ.)
29. Zhigalov V.I. *Platformennye resheniya dlya kompleksnogo osvoeniya malonaselennykh i trudnodostupnykh territoriy (PR KOT). Proekt osvoeniya mestorozhdeniya «Pavlovskoe». Rosatom. VNIIEF. 17-18.10.2019* [Platform solutions for the integrated development of sparsely populated and inaccessible territories (PR COT). Development project for the Pavlovskoye field. Rosatom. VNIIEF. 10/17/2019].
30. Marshall A. *Osnovy ekonomicheskoy nauki. Glava 10. Kontsentratsiya spetsializirovannykh proizvodstv v otdel'nykh rayonakh* [Fundamentals of Economic Science. Chapter 10. The concentration of specialized industries in certain areas]. Moscow, EKSMO Publ., 2007, pp. 286–294.
31. Dunning J.H. The eclectic (OLI) paradigm of international production: past, present and future. *International Journal of the Economics of Business*, 2001, no. 8 (2), pp. 173–190.

Received on February 19, 2020