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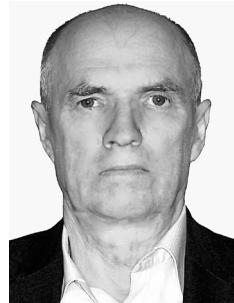
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# Assessment of Potential and Problems of the Arctic Development<sup>1</sup>

The paper explores the issues of development of the Arctic Zone of the Russian Federation at the example of the country's median region, which stands out among other regions in terms of its natural resource potential and socioeconomic development. The authors reveal social and economic problems as well as the specifics of industrial and transport development of the median Arctic region. They highlight the geopolitical importance of its resource potential and the region's role in the economy of both the Arctic Zone and Russia generally. Considerable attention is paid to the problems of forming human potential. The authors identify peculiarities of human potential formation and stress the significance of both natural reproduction and migration flows in providing the territory with workforce at different stages of its industrial and transport development; emphasize the role of indigenous peoples of the Russian North and difficulties they encounter during the interaction with subsoil users. In addition, the paper specifies major environmental problems resulting from past and recent damage to the natural environment. Finally, the priorities of comprehensive development of the area under consideration are formulated.

**JEL classification:** M12, A18, O15

**Keywords:** the Arctic Zone; comprehensive development; natural resource potential; human potential; economic development; median region.

## Introduction

The problem of the Arctic development is a global one. Recently the world has witnessed not only increased attention of circumpolar countries that promoted scientific research to evaluate natural conditions and natural resource potential of the region with the aim to establish their priority there, but the interest expressed by other countries of Europe, East and South Asia.

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Development of natural resource potential of northern territories, which remain poorly studied, is linked with environmental, social and financial risks. On the one hand, these risks are incurred by lack of necessary information, on the other hand, by the degree of adequacy of assessments of environmental, social, and ethnic consequences of implementing investment projects, what logically results in the need of working out methodological approaches to determine and measure natural resource potential of the Arctic territories, allowing for the whole set of natural resource, socioeconomic and environmental conditions. This will enable synchronizing the processes of economic, social and environmental changes in time and space.

The Arctic development is a thorny problem closely related to Russia's geopolitical and economic interests in the region. Both directions are connected with the Arctic's growing international importance, which is mainly due to its vast reserves of mineral and other natural resources, and expanded role of its water area, which is the shortest waterway between Europe and countries of the Asia-Pacific region.

The aforementioned conditioned the intense interest of the Russian academic community to the problems of the Arctic region that is confirmed by an increase in the number of publications, including the ones devoted to socioeconomic issues ([1; 3–10], etc.).

The Arctic Zone of the Russian Federation (AZRF) consists of territories with different level of development and population density. Its economy is based on the utilization of the potential of non-renewable (mineral and fuel resources), renewable natural (fish, game and wild crops) and recreational resources. Natural resource management, mainly reindeer husbandry, is the principal activity of daily living of the Arctic's indigenous peoples.

### Median Arctic region

The Arctic parts of Krasnoyarsk kray and Yamalo-Nenets autonomous okrug are the leaders in socioeconomic development and natural resource potential among AZRF territories. Besides, they occupy a median position, what gives grounds to identify them as a median Arctic region.

A median Arctic region is a territory facing all the challenges typical of any region of AZRF, including institutional, social, environmental, ethnic and economic problems, the solution of which should be aimed at fostering balanced and sustainable socioeconomic development.

The industrial potential of the territory relies heavily on the largest Norilsk copper-nickel deposits, proven reserves of oil and natural gas in the Yamal and Taymyr Peninsulas. It is represented by mining industries and enterprises processing mineral resources; companies involved into extraction and transportation of oil, natural gas and condensate with insignificant processing of the last ones within the territory. Reindeer husbandry, fishing, hunting are the key industries of the traditional economy that serve as a means of preserving cultural diversity and socioeconomic development of the indigenous minorities of the North.

Industrial and transport development of the territory, on the one hand, allowed meeting the needs of both the country and international market for energy resources and metal products, but, on the other hand, this process was of man-made character and the industries involved in it appeared to be the main polluters inflicting irreversible damage to the Arctic ecosystems. The vulnerability of the northern nature to human interference requires a search of a new approach that will be capable of neutralizing negative consequences of this process. With this end in view, the development of the region should be oriented towards not only economic efficiency, but also towards creation of conditions for preservation of the natural environment, traditional economic activities and quality of life of the indigenous peoples and people coming from other territories [2].

From the administrative perspective, the median Arctic regions is represented by Yamalo-Nenets autonomous okrug (YaNAO), Taymyrsky (Dolgano-Nenets) municipal district with a special status, within which Norilsk city and Turukhansky municipal district of Krasnoyarsk kray are located.

Strategic importance of the region is determined not only by its natural resource potential, but also by its advantageous geopolitical position in relation to the Northern Sea Route (NSR), Trans-Siberian Railway and Central Asia, which allows it to actively participate in integration and cooperation processes between Russia and Kazakhstan and other post-Soviet states within the Arctic – Central Asia transport corridor. In the long term, the role of NSR will only be increasing due to the ongoing development of the gas fields near the Russian Arctic coast and in the continental shelf. At the moment, in the northeast of the Yamal Peninsula there is being constructed a plant for producing liquefied natural gas and the port of Sabetta, from where tankers will take and transport liquefied natural gas and condensate.

The railroad network of the transport corridor within the median Arctic region is represented by sections of tracks built across meridians and latitudes, further development of which will allow ensuring land connection between the territories of Yamalo-Nenets autonomous okrug and the north of Krasnoyarsk kray with simultaneous access to the Northern Sea Route through the ports of Sabetta and Igarka.

The median Arctic region accounts for 36.7% of the area, 30% of population and 70% of the GRP of the Russian Arctic. Both its parts are referred to as territories with rent-generating economic sectors and serve as donors of the federal budget. Therefore, unlike many other subjects of the Federation, both parts of the region have their own financial resources (regional and local budgets, private corporations) to invest in infrastructure, industrial and other facilities.

The development of the condensate fields in Yamal started in the late 2000. The Obskaya-Bovanenkovo railway line was built to maintain connection between them, and the system of pipelines through Baydaratskaya Bay to Ukhta and then farther into the center of the country was created to provide transportation. The 2004 saw the start of operation of the Vankor oil and gas field, the largest one having brought into development in the country for the last 25 years. After the start of its operation the region became not only the biggest gas producer in Russia, but also one of the major centers of oil and condensate production with the annual volume of more than 60 million t (in 2014).

### Human potential

The population of the median Arctic region consists of indigenous peoples of the North, old Russian settlers, rooted population and new settlers.

The most significant changes of qualitative and quantitative indicators of human potential as well as changes in its structure took place in 1970–1980s, and were caused by an increase in production in Norilsk industrial area and development of oil and gas fields in Yamalo-Nenets autonomous okrug (table 1).

**Table 1**  
**Population dynamics in the median Arctic region, persons**

Territory	1959	1970	1979	1989	2002	2010	2015
<b>Krasnoyarsk kray</b>	<b>180 173</b>	<b>200 033</b>	<b>254 567</b>	<b>379 432</b>	<b>284 361</b>	<b>229 328</b>	<b>227 205</b>
urban included	152 892	174 279	226 161	333 365	25 846	207 313	204 942
<b>Yamalo-Nenets autonomous okrug</b>	<b>62 334</b>	<b>79 977</b>	<b>157 616</b>	<b>494 844</b>	<b>507 006</b>	<b>522 798</b>	<b>539 985</b>
urban included	21 787	34 247	79 708	385 614	422 826	443 043	452 570
Total	242 507	280 010	412 183	874 276	791 367	752 126	767 190
Proportion of urban, %	72,0	74,5	74,2	82,2	86,1	86,5	85,7

Source: authors' calculations based on the data of the Russian Federal State Statistics Service and Statistics Service of Yamalo-Nenets autonomous okrug.

Since the early 1990s, the Yamal and Taymyr parts of the region have had different dynamics of demographic processes. The former has demonstrated slight growth, whereas the latter has experienced population decline, in this or that way affecting its sex-age structure.

A positive aspect is that all parts of the median Arctic region have better indicators of natural reproduction than most Russian regions, which is the main factor behind population growth here (table 2).

**Table 2**  
**Dynamics of annual average natural population growth, %**

Region	1996–2000	2001–2005	2006–2010	2011–2014
Yamalo-Nenets autonomous okrug	6,9	7,6	9,1	11,2
Krasnoyarsk kray	-0,3*	0,6*	2,5*	7,4

Source: authors' calculations based on the data from the Database of Municipal Statistics of the Federal State Statistics Service; Regions of Russia. Main Social and Economic Indicators of Cities. Statistical Yearbook. Moscow: Federal State Statistics Service, 2007–2014; Statistical Yearbook of Krasnoyarsk Kray. Krasnoyarsk: Statistics Service of Krasnoyarsk kray, 2014; data of Statistics Service of Yamalo-Nenets autonomous okrug.

\* The areas of the Far North and equivalent areas.

Yamalo-Nenets autonomous okrug is one of the most demographically healthy parts of the country demonstrating natural increase of population and, in some years, positive migration balance. The Arctic parts of Krasnoyarsk kray were also enjoying natural increase during 1990s and 2000s. Despite the fact that outward migration from the Arctic parts of Krasnoyarsk kray has been decreasing in recent years, it continues to contribute to the population decline. In Yamalo-Nenets autonomous okrug a higher level of natural reproduction maintains steady growth of the population (table 3).

**Table 3**  
**Population migration balance, persons**

Region, municipality	2010	2011	2012	2013	2014
Yamalo-Nenets autonomous okrug	-4 953	6 249	-1 127	-8 124	-6 068
Norilsk city	-2 648	782	-1 211	-2 864	-2 038
Taymyrsky municipal district	-582	-183	-546	-424	-705
Turukhansky municipal district	-389	-261	-453	-549	-453

Source: authors' calculations based on the data from the Database of Municipal Statistics of the Federal State Statistics Service; Regions of Russia. Main Social and Economic Indicators of Cities. Statistical Yearbook. Moscow: Federal State Statistics Service, 2010–2014; data of Statistics Service of Krasnoyarsk kray and Statistics Service of Yamalo-Nenets autonomous okrug.

The reasons behind the changes in directions of migration flows and their quantitative indicators are principally of economic nature: reengineering of industrial production, reduced volumes of new construction, completion of development of large mineral deposits, and situation in the world commodity market.

Migration processes influenced qualitative composition of labour resources. In the inflow of workers, immigrants from the republics of Central Asia and North Caucasus with low level of qualification tend to dominate. For them, the major employers are companies involved in service business. At the same time, in the labour market qualified personnel for primary and infrastructural industries is always in strong demand. The shortage of skilled labour is compensated using fly-in fly-out (FIFO) method of employment, which was extensively applied in the territory of Yamalo-Nenets autonomous okrug in Soviet times, especially at the initial stages of the region's development.

In connection with the movement of industrial development to the northern outskirts of the region and to the areas of seas of the Arctic Ocean, the utilization of FIFO method will allow attracting workforce from other regions and thus limiting resident population in extreme environmental conditions. In work sites, people live in temporary settlements having all necessary utilities. The FIFO method is employed the most extensively in oil and gas industry, primarily because of disperse location of hydrocarbon fields, short period of operation of most of them, and lower labour intensity of their development compared to enterprises of mining and coal industries.

The role of the basic centers is played by the cities, which have grown here and can offer comfortable housing and other social infrastructure, labour resources, transport support. Noyabrsk, Novy Urengoy, Nadym and other cities exemplify well such centers, used presently as the places of permanent residence and as a transit points for fly-in fly-out employees.

### **Indigenous minorities of the North and industrial development**

Development of oil and gas and mineral resources directly affects the interests of indigenous minorities of the North, the majority of whom (78%) live in rural areas, accounting for 42.5% of rural population in Yamalo-Nenets autonomous okrug and 32.4% of it in the Arctic parts of Krasnoyarsk kray. They lead a traditional way of life, practice reindeer husbandry, fishing, hunting and crafts. Despite being relatively small in number, indigenous peoples are widely settled in the territory, and their ancestral fishing and hunting grounds often coincide with places of extraction of natural resources. The 2010 national census estimates that there are 41.4 thousand people living in Yamalo-Nenets autonomous okrug and 10.1 thousand people in Taymyrsky (Dolgano-Nenets) municipal district. A characteristic feature of the rural population is that a substantial number of them are nomads. In Yamalo-Nenets autonomous okrug, nomadic population makes up 36.5% of the total number of indigenous ethnic groups and in the Taymyr municipal district this figure reaches 20%.

In the new century, industrial development will expand further shifting to the Arctic territories, capturing new areas of traditional economic activities of indigenous peoples of the North. This may lead to conflicts of interests between indigenous communities and developers of the natural resources in the Arctic Zone. The intersection of interests of indigenous peoples and subsoil users causes problems that are to be addressed without prejudice to the interests of the indigenous population [2]. First of all, this refers to reducing the technological advances' environmental damage to the traditional activities of the indigenous minorities of the North. It is necessary to design a procedure of socio-ethnic and environmental examination of the strategy for the Arctic Zone development. The primary objective of studying this area from environmental and social perspectives will be to identify zones that are suitable and acceptable for economic use.

### **Environmental problems**

The interest to the Arctic natural resources expressed both on the part of the state and business community will result in a new round of industrial development. Hence, it is important to take preventive measures for preserving natural environment and traditional way of life of indigenous peoples, particularly, to organize specially protected natural areas and ethnic territories (territories of traditional nature management).

Over the years of man-made development of the Arctic parts of Russia both during Soviet and post-Soviet times, a constant process of accumulation of departmental environmental waste of presently closed and currently operating industrial enterprises of oil and gas, non-ferrous and gold mining industries and some others has been unfolding without allowing for any environmental impacts. Pockets of accumulated environmental damage are widely dispersed across the Arctic territory as well as in the adjacent waters of the northern seas.

Tightening competition for the access to subsoil resources makes it increasingly relevant to expand the resource base at the expense of development of the Arctic parts of Krasnoyarsk

kray and Yamalo-Nenets autonomous okrug, which possess unique natural resources, primarily, mineral ones, development and processing of which intensively affect the environment leading to serious ecological consequences.

These effects result from both past and current economic as well as other activities in the Arctic, where the process of recovery of the natural environment is rather slow. In this connection, it is vitally essential to identify environmentally hazardous objects, and employ measures for their correct elimination and disposal.

The draft subprogram "Economic and social development of the Arctic Zone of the Russian Federation" of the state program of the Russian Federation "Regional policy and federal relations" includes such event as "Ensuring environmental security in the Arctic Zone of the Russian Federation" planned for implementation in 2014–2020".

The Arctic parts of Krasnoyarsk kray and Yamalo-Nenets autonomous okrug due to past and current human activities differ in the degree of environmental pollution. Zones and localities of the former economic use became pockets of pollution and damaged natural landscapes. They represent the direct consequences of suspended operations of the mining industry enterprises, disbanded military units of the Ministry of Defense of the Russian Federation, abandoned settlements, etc. In these territories, there are left thousands of accumulated tons of oil in barrels and reservoirs, discarded equipment, dilapidated transport equipment, remains of buildings of household use and so forth.

Abandoned and deactivated objects in varying condition accompany dump sites of production, construction and household waste. The major pockets of pollution having the greatest impact on the environment are located in the following places:

- Norilsk industrial area in Krasnoyarsk kray;
- Labytnangi town and Salekhard city, territories of Nadym, Pur and Yamal districts in Yamalo-Nenets autonomous okrug.

In addition to already inflicted environmental damage, most of them continue to accumulate industrial and household waste as well as remain the principal polluters of water and air.

Environmental health of the territory of the Arctic part of Krasnoyarsk kray is largely determined by the production activities of OAO MMC "Norilsk Nickel" (Norilsk city) involving extraction and processing of non-ferrous and precious metals through exploiting copper-nickel sulphide deposits of Taymyr. The major pollutant is sulphur dioxide emitted into the air by metallurgical enterprises during pyrometallurgical processing of concentrates, namely by Norilsk and Talnakh Enrichment Plants. In 2014, the share of emissions of MMC "Norilsk Nickel" in the total emissions of Krasnoyarsk kray accounted for approximately 78%. In 2002–2014 the annual average emissions of MMC "Norilsk Nickel" amounted to 1964.2 thousand t<sup>1</sup>.

Along with air, the combine and other enterprises adversely affect the whole environmental complex, including water and soil. A new large polluter of the environment appeared on August 11, 2009 when ZAO "Vankorneft" started operating (mainly due to associated gas its emissions into air amount to 136.9 thousand t in 2013)<sup>2</sup>.

The observed warming to an extant exacerbates existing environmental problems of the Arctic, associated with environmental pollution caused by human economic activities. As the temperature increases, accumulated harmful substances may move out of the snow, ice and permafrost through waterways to human environment. It raises the risk of toxic substances releasing into the environment from burial sites of chemical and radioactive waste.

<sup>1</sup> State Report on Environment Protection in Krasnoyarsk kray in 2011. Krasnoyarsk: Ministry of Natural Resources and Ecology of Krasnoyarsk kray, 2012, p. 172 (in Russ.); State Report on Environment Protection in Krasnoyarsk kray in 2014. Krasnoyarsk: Ministry of Natural Resources and Ecology of Krasnoyarsk kray, 2015, p. 148 (in Russ.).

<sup>2</sup> State Report on Environment Protection in Krasnoyarsk kray in 2014. Krasnoyarsk: Ministry of Natural Resources and Ecology of Krasnoyarsk kray, 2015, p. 150 (in Russ.).

The aforementioned dictates the need to carry out research work to draw up a register of areas damaged during past and current activities; identify sources of pollution and their impact on the environment (specify the effect of emitted exhaust gases, wastewater discharge from stationary sources and placement of waste of different class of hazard); develop measures with simultaneous evaluation of their costs to eliminate these sources of pollution and thus limit the negative outcomes.

Another priority environmental problem of the Arctic territories is uncontrolled use of biological resources, particularly, excessive killing of whitefish and salmon species, harvesting of seafood, poaching of wild reindeer, fur-bearing animals and waterfowl, as this causes the loss of biodiversity. The loss of biodiversity, transformation of natural habitats and decline in the number of rare species in the Arctic has been a phenomenon of the last decades, when a large-scale economic development made the remote areas of the Russian Arctic more accessible for man, thus leading to an increased load on the biological resources. Poaching in the Arctic is even a financially comparable sector of the local economy. Poachers are mainly local population of villages and towns, who are not involved in modern economy, and have extremely low incomes.

Currently, for implementation of environmental projects aimed at elimination of accumulated damage of various scale and duration there is only one viable investment mechanism, namely, federal target programs<sup>1</sup>. Target programs in the field of environment protection are adopted both at federal and regional and municipal levels. The sources of financing of target environmental programs include federal budget and budgets of the subjects of the Federation as well as various non-budgetary sources. State financing is usually provided within the programs of support of environment protection activities at federal level, because handling environmental problems requires, in general, rather considerable sums of money, which subjects of Federation or non-budgetary funds often cannot afford. The state support of environmental projects is commonly justified by the fact, that investments into projects are required for social (environmental) reasons, and private investors will not give money on them. The subjects of the Federation and non-budgetary funds can only finance entirely small programs and offer large projects just partial financial support. Big companies operating in the region should obviously contribute to implementation of investment projects targeted at environment protection. The list of such companies includes OAO "Gazprom", OAO MMC "Norilsk Nickel", OAO "Rosneft Oil Company", OAO "Lukoil".

After specifying the priority projects for investment according to environmental, geographic and other criteria, it is necessary to prepare an enlarged valuation of selected events. In our work<sup>2</sup> while preparing approximate calculations of project budgets, we used the materials of previously undertaken studies, analogous projects and so forth.

Because of heterogeneity of infrastructural development of the territory and its bioclimatic conditions, it is rather difficult to establish indirect integral indicators to estimate costs. For instance, coefficients of increase in the costs of works (events aimed at reducing or eliminating accumulated and current environmental damage) cannot be found out using calculation methods, because there are no statistics on the factors behind the costs increase, hence, it is only possible to assess them on a one-time basis applying the expert method. A perfect example are transport costs, the principal factor behind costs increase, for which there is no statistical database at all.

<sup>1</sup> On the state forecasting and programs of socioeconomic development of the Russian Federation. Federal law of July 20, 1995 no. 115-FZ. *Legislation Bulletin of the Russian Federation*, 1995, no. 30.

<sup>2</sup> Works on assessment of accumulated environmental damage in the Arctic parts of Krasnoyarsk kray and Yamalo-Nenets autonomous okrug with justification of events to eliminate them and reduce environmental threats caused by expansion of economic activities in the region. Report on Scientific Research Works. Yekaterinburg: Institute of Economics (Ural branch of the Russian Academy of Sciences), 2013.

There are also risks of forced reductions in the financing of environmental projects after the works have already started. In this case, the damage caused by cancelled works will only add to the already accumulated damage. Generally, for both typical and specific Arctic conditions, there are no special techniques for assessing environmental damage, and the access to existing information about objects and areas, which are potentially hazardous from ecological perspective, is restricted.

### Production potential

The industry dominates in the structure of gross regional product (GRP) in the majority of the Arctic territories. Its share, depending on the level of regional development, varies from 52 to 80% in GRP (Nenets and Yamalo-Nenets autonomous okrugs), which means it substantially influences its overall value. Besides, the said regions feature the highest share of mineral resources extraction in GRP.

Here we should point to some differences observed across the subjects of the Federation and in some years, which depend on the type of extracted mineral resources. For instance, the regions possessing fuel resources, which logically prevail in the total volume of extraction, have a relatively higher level of added value in GRP (among these regions Krasnoyarsk kray has the highest annual average added value in GRP – 78%). In 2007–2014, the share of mineral resources extraction in GRP was increasing in most subjects. Triggered by the growth in hydrocarbon production, this process was unfolding particularly fast in Krasnoyarsk kray.

Investment attractiveness of highly efficient natural resources development leads to high rates of growth of production in some natural resources areas achieved for comparatively short period. Subjects of the Federation with specialization in oil and gas (Krasnoyarsk kray and Yamalo-Nenets autonomous okrug, and some other) are likely to remain the most attractive regions for investment in the long term.

In market conditions, the median Arctic region retains its narrow sectoral specialization, which has even increased after reengineering of production in the key industries of cities and divesting of non-core assets. Currently, the economy is diversifying towards the processing of raw materials and broadening the range of natural resources involved in the economic turnover.

To stabilize socioeconomic situation in northern territories the government is taking certain steps to diversify economy relying both on non-renewable and renewable factors of growth. The natural resource-based part of the Arctic economy is diversified into new sectors, for instance, expansion of services sector, development of information communications, and utilization of recreational potential, etc., although extracting industries keep their dominant position.

### Conclusion

The median Arctic region is a territory with clear specialization in raw materials, the economy of which is based on extraction of oil and gas, ores of ferrous, non-ferrous and precious metals that are in strong demand both in domestic and world markets.

Oil and gas as well as mining and metallurgical industries, which gained traction in the region, on the one hand, have maintained high living standards, thus supporting extended natural reproduction of the local population. On the other hand, they caused economic, social, ethnic, and, what is more crucial, environmental problems, typical of such areas. These problems are equally the legacy of previous years and results of current economic activities, directly affecting balanced and sustainable socioeconomic development of the territory at present.

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## Оценка потенциала и проблемы освоения Арктического региона

В. Г. Логинов, В. В. Балащенко

Рассматриваются социальные и экономические проблемы и специфика промышленно-транспортного освоения Арктической зоны Российской Федерации на примере ее срединного региона, являющегося наиболее значимым по природно-ресурсному потенциалу и развитым в социально-экономическом плане. Подчеркнуты геополитическое значение его ресурсного потенциала и роль в экономике, как Арктической зоны, так и страны в целом. Выявлены особенности формирования человеческого потенциала и значение естественного воспроизводства и миграционных потоков в обеспечении рабочей силой на разных этапах промышленного и транспортного освоения территории. Подчеркнута роль коренных малочисленных народов Севера и проблемы взаимодействия их с недропользователями. Обозначены экологические задачи, обусловленные прошлым накопленным и текущим ущербами окружающей природной среды. Сформулированы приоритеты комплексного освоения рассматриваемой территории.

**Ключевые слова:** Арктическая зона; комплексное освоение; природно-ресурсный и человеческий потенциал; экономическое развитие; срединный регион.

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