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Strategic positioning of the Arctic region as an object of territorial development (on the example of the Khatanga-Anabar region)¹



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Abstract. The paper analyzes the current state and problems of social and economic development of the region located in the Arctic zone of Eastern Siberia at the territory of two entities of the Russian Federation (Krasnoyarsk region and Republic of Sakha (Yakutia), in the catchment of rivers Khatanga and Anabar, running into Laptev Sea of the Arctic Ocean. The possibilities, restrictions and prospects of implementation of priority investment projects of development of mineral raw material resources of the region are considered. Feasibility of forming of the aqua-territorial industrial complex (ATIC) based on the use of the integrated transport logistics of the Northern Sea Route and rational schemes of power supply in the region is shown. Scientific, methodical, organizational, economic tasks on development of strategy of forming of Khatanga-Anabar ATIC are considered.

Keywords: *strategic positioning, strategic potential of development of the region, priority investment projects, transport and energy infrastructure, the Northern Sea Route, aqua-territorial industrial complex (ATIC), strategy of forming of ATIC*

The development of the Arctic territories is essential for the sustainable development of Russia, providing its geopolitical interests, defense capability and environmental safety and is one of the most important and most difficult tasks for Russia in the 21st century. All this makes necessary the strategic positioning of the Russian Arctic, enabling to determine the map of promising projects of development of the Arctic regions. This article discusses the features of the

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strategic positioning of one of the most promising Arctic regions — Khatanga-Anabar region, located on the Arctic edge of the Krasnoyarsk Territory and the Republic of Sakha (Yakutia).

The strategic positioning of the region means to identify opportunities and constraints of its strategic potential. Within the frames of the strategic positioning it is necessary to determine the possibility of using available natural resources for the formation of modern high-tech industries, to identify mechanisms of organization of the development processes, including the mechanism of public-private partnership. The process of strategic positioning can be divided into the following main stages: 1) assessment of the current social and economic condition of the region; 2) identification of strategic potential of development and priority areas of sectoral specialization of the region in the external economic space; 3) the formation of rational industrial cooperation and social economic relations, intra- and inter-regional infrastructure; 4) determining the organizational and economical measures aimed at the efficient use of the strategic potential of the region.

Assessment of the current social and economic condition of the Khatanga-Anabar region

The economic and geographical situation and administrative and territorial division. The Khatanga-Anabar region is located in the Arctic zone of Eastern Siberia. Its territory includes basins of Khatanga and Anabar rivers flowing into Laptev Sea of the Arctic Ocean. The long-term specialization and possibilities of an integrated economic development of areas close to the Northern Sea Route in the western waters of the Laptev Sea, determined similarity of their resource potential, development prerequisites, social and economic problems and their solutions. The same factors stipulated feasibility to consider these territories as a single economic and geographical region and predetermined its name — the Khatanga-Anabar region.

The total area of the Khatanga-Anabar region is 482 thousand square km, and the population on 01.01.2016 was 8,902 people, including 6919 representatives of Indigenous small-numbered peoples of the North (ISPN). Within the boundaries of the region there is one municipal district of the Republic of Sakha (Yakutia) (Anabar settlement) and two rural settlements - rural settlement Khatanga of Taimyr municipal district of the Krasnoyarsk Territory and Zhilindinsky nasleg of Olenek settlement of the Republic Sakha (Yakutia) (Table 1)².

² Here and elsewhere: data of Federal Service of State Statistics are used as the statistical base of research, including Database of Indicators of municipalities. URL: [http:// www.gks.ru/free_doc/new_site/bd_munst/munst.htm](http://www.gks.ru/free_doc/new_site/bd_munst/munst.htm) (Accessed: 16 August 2016)

Table 1

*Administrative and territorial division and population size of the Khatanga-Anabar region
(as of 01.01.2016)*

Administrative territorial units	Administrative center	Number of residential places	Area, thousand sq.km,	Population size, people
<u>the Krasnoyarsk Territory</u>				
Rural settlement Khatanga of Taimyr municipal district	Khatanga	9	336,4	4,788
<u>the Republic of Sakha (Yakutia)</u>				
Anabar settlement Zhilindinsky nasleg of Olenek settlement	Saksylakh	2	55,6	3,430
	Zhilinda	1	90,0	684
Total		12	482,0	8,902

Geographical location of the Khatanga-Anabar region is characterized by remoteness from industrial centers and market channels (Tab. 2).

Table 2

Distance table (km on map)

	Krasnoyarsk	Yakutsk	Saint-Petersburg	Murmansk	Vladivostok
Khatanga	1,914	1,551	3,300	2,475	3,597
Saksylakh	2,046	1,265	3,696	2,838	3,366
Zhilinda	1,914	1,155	3,729	2,904	3.234

The region is characterized by extremely high territorial disunity and inaccessibility of settlements, remoteness from administrative centers of settlements. There are no permanent roads between the settlements and towns within the settlements, inter-settlement infrastructural links, inter-settlement social, cultural and consumer services are difficult to provide.

Territories of the Khatanga-Anabar region are cut off from important transport communications. The region has no year-round communication with the nearest railway terminals (Yakutsk, Ust-Kut, Krasnoyarsk (Lesosibirsk), there is no year-round water transport connection, there is no reliable road transport communication between settlements. The possibilities of maritime transport are not practically used because of the lack of development of transportations along the Northern Sea Route and the limitations of the existing sea ports of the Eastern Arctic.

Prospects for the inclusion of the region into the global world economy are associated primarily with the development of the Northern Sea Route (NSR) and the creation in the region of transport and logistics hub based on the NSR. In the longer term the development of the region can go on the basis of the formation of the year-round land ways.

Resettlement and demography. In the structure of the resident population of the region it is possible to emphasize two contrasting groups significantly different in demographic and resettling behavior: 1) newcomers (non-indigenous) (social migrants, which primarily include the Russian and Yakut population, as well as representatives of a number of other important national regions of Siberia and the Russian Federation as a whole); 2) the indigenous population (the Indigenous small-numbered peoples of the North), mainly engaged in traditional economic activities.

The village of Khatanga and two settlements — Kayak and Ebel (now liquidated) — are the settlements of the first type in Khatanga-Anabar region. The second type settlements are 8 villages in the Khatanga rural settlement: Zhdaniha, Katyryk, Kresty, Novaya, Novorybnaya, Popigaj, Syndassko, Kheta, 2 villages in Anabar settlement (Saskylakh and Yuryung-Khaya), and village Zhilinda in Oleneksky settlement. Tab. 3 reflects the dynamics of the resident population of the Khatanga-Anabar region for the period of 2002-2014.

Table 3

*Changing of the resident population of the Khatanga-Anabar region
for the period 2002-2014 (assessment)*

	2002 r. (beg. of the year)	2015 r. (beg. of the year)	Changes for the period 2002-2014
Settlements with predominance of new comers (alien population)			
(Khatanga, Kayak, Ebelyak)			
- number of people	4,750	1,649	2.9-fold decrease
-share of ISPN, %	19.3	49.2	
Settlements with predominance of ISPN			
(Zhdaniha, Katyryk, Kresty, Novaya, Novorybnaya, Popigaj, Syndassko, Kheta, Saskylakh, Yuryung-Khaya, Zhilinda)			
- number of people	6,953	7,253	+4.3%
-share of ISPN, %	85.4	84.2	
All settlements of the Khatanga-Anabar region			
-number of people	11,703	8,902	-23.9%
-share of ISPN, %	58.6	77.7	

The analysis of the data about number and composition of the population of the Khatanga-Anabar region for the period of 2002-2014 leads to the following conclusions.

1. There is a steady decline in the total resident population of the region, primarily due to a sharp decrease in the alien population. The number of ISPN remains relatively stable. The number of resident population in Khatanga has been sharply reduced in the result of a significant reduction in administrative status (from the district center to the center of the rural settlement) and general economic stagnation of the surrounding areas. The total number of villages for reporting period decreased in more than doubled — from 3,450 in 2002 to 1,649 in 2015. In addition, the proportion of indigenous population increased from 23.2% in 2002 to 49.2% in 2015. At the beginning of the 2000s about 300 people lived in the village Kayak which is liquidated now. From 1947 to 2009, here

at the mine "Kotui" the extraction of coal for the needs of Khatanga was made. In liquidated village Ebelyak from 1999 to 2007, Anabar Mining and processing works of "Alrosa" acted and about 1 000 people lived there in the early 2000s. In contrast to the settlements with alien population, the second type places (settlements with compact residence of ISPN) show the relative demographic stability. The total population of the settlements with predominance of ISPN increased in 4.3%: from 6,953 people in 2002 to 7,253 in 2015.

2. The most numerous ethnic group among ISPN is dolgans. They compose 76.3% of the total number of indigenous people, and about 60% of the total population of the Khatanga-Anabar region. Resettlement of dolgans in the Khatanga-Anabar region is reflected in the tab.4.

Table 4

Resettlement of dolgans in the Khatanga-Anabar region (people, as per 01.01.2015)

	Number of people	Share in total number of population of the region, %
Rural settlement Khatanga	3,789	71.8
Anabar settlement	1,489	28.2
Total:	5,278	100.0

Other significant ethnic groups of ISPN in the region are the Evenki and Evens (1,521 people, 22% of all ISPN), specializing in reindeer herding and living in nasleg Saskylakh and Zhilinda. The remaining representatives (Nganasan, Enets, Nenets) accounts for less than 2% of the number of the indigenous people.

The current situation in the economy. Extreme climatic conditions (duration of the heating season in the region ranges from 296 days (Zhilinda) to 325 days (Yuryung-Khaya, Novorybnaya, Syndassko), low population density, high resource consumption, the focal nature of industrial and economic development, the use of decentralized systems of electricity and heating, a significant remoteness from major economic centers, and the dependence of life on the northern delivery stipulate a significant rise in the social and economic development of the Khatanga-Anabar region.

The situation becomes complicated that during the years of the market reforms the serious dilapidation happened, physical and moral depreciation of fixed assets of all sectors of the region: transport, energy, social infrastructure and public utilities.

Currently the level of budget expenses on one inhabitant is 200-220 thousand rubles per year. This is much higher than in average in the municipalities of the European part of the country (20-25 ths. rub.), of the Siberian Federal District (28.1 ths. rub.) and several times higher than in the regions of the Ural (53.0 ths. rub.) and Far East (84.5 ths. rub.) federal districts.

Incomes of the main economic activities in the region (wild reindeer hunting, fishing, hunting of fur animals) and domestic reindeer herding are not able to provide the required level of

budgetary expenditure. The average annual income per person employed in the sector is less than 8-10 ths. rub. per month when minimum living wage for the 1st quarter of 2016 in the rural settlement Khatanga is 26.7 ths. rub. per month, and in Anabar and Oleneksky settlements — 18.4 ths.rub. per month³.

Specific support for the population and local budgets of the Anabar and Olenek settlements is activity in extraction of alluvial diamonds, which is arranged by the company "Diamonds of Anabar" (subsidiary of JSC "ALROSA") on the territory of these areas. The volumes of sales of "Diamonds of Anabar" (15 489.4 mln.rub.) correspond to the level of 600 largest Russian companies, and net profit (1 697.4 mln.rub.) to the level of 200 largest companies in Russia^{4, 5}.

At the same time, the share of settlements (taxes to the local budgets and payment of wages to local workers) is not more than 2-3% of the income of the diamond mining company, and the rest is distributed to the federal and republican budgets, for payment of wages to employees - residents of other regions of the republic, as well for as the implementation of investment programs of the company.

Region belongs to zone of shift development. The number of non-permanent population (working in the region in shifts) varies significantly during the year due to the seasonal nature of employment. For example, the total average number of shift workers of the company "Diamonds of Anabar", involved in the territory of Anabar and Olenek settlements, is about 1.2-1.4 thousand people (varies throughout the year from 1 thousand to 3 thousand people). The share of the local population in this number does not exceed 20-30%, and the rest of shift workers of the company "Diamonds of Anabar" is formed by the inhabitants of other regions of the Republic of Sakha (Yakutia).

Under these conditions, the main source of financing of the sphere of life in the region is subsidies and grants. Incomes of local budgets in 35-40% are formed at the expense of grants, and the share of own tax and non-tax revenues does not exceed 20-25%.

Strategic potential of the development and priority areas of industry specialization of the region in the foreign trade field

Prospects of development of the Khatanga-Anabar region are connected with the development of significant reserves of solid minerals and hydrocarbon resources, some of them have federal significance. Among top-priority objects are: Tomtor deposit of rare earth metals (REM); development of the Laptev Sea shelf and coastal waters of Khatanga and Anabar Bay;

³ Resolution of the Government of the Republic of Sakha (Yakutia) № 166 dd 24.05.2016.

⁴ Reiting 600 krupneishikh kompanii Rossii. URL: <http://raexpert.ru/> (Accessed: 16 August 2016).

⁵ Godovoi otchet kompanii «Almazny Anabara» za 2015 god. URL: http://alanab.ykt.ru/uploads/files/2016/07/otchet_2015.pdf (Accessed: 16 August 2016).

development of deposits of alluvial diamonds of Ebelyakh-Gusiny; the development of Kotui coal deposit; the development of Popigai field of impact diamonds (Fig. 1).



Figure 1. The review scheme of the projects of development of mineral raw resources of the Khatanga-Anabar region.

Identification marks:

- ★ – oil and gas
- ★ – rare earth metals
- ★ – alluvial diamonds
- ★ – impacting diamonds
- ⚙ – cogenerative energy plants
- – winter snow roads
- – water ways
- ⚓ – ports (sea and river ports)

The development of Tomtor deposit of the rare earth metals (REM)

The feasibility and possibilities of development. The development of Tomtor deposit is one of the main elements of the program of mining and processing of rare earth metals up to 2020 (in the framework of State Program of RF "Development of industry and increase of its competitiveness for the period till 2020", approved by the Government Decree of RF dated 15.04.2014, № 328)⁶.

Stocks of only one section Buranniyi (comprising about a third of all the resources of the deposit) can provide domestic and export needs of Russia, set by the program, for hundreds of years in advance. At the same time, minerals of the deposit (including the ratio of world prices of rare elements) are the most attractive among all the Russian deposits and significantly (more than 2 times) excel in this parameter the minerals of the world's largest rare earth deposit Baiyun Obo (China)⁷.

Technological and transport scheme of development. For the development of the deposit the Russian Academy of Sciences (Institute of Geology and Mineralogy (IGM), Institute of Chemistry and Chemical Technology (ICCT) and the Institute of Economics and Industrial Engineering (IEIE)) proposed a three-tier production chain: 1) extraction of ore (at the first stage up to 100-200 thousand tons, at the second — up to 500-1000 thousand tons); 2) processing of the initial ore to produce a collective carbonate of the rare earth elements (REE or individual oxides of the rare earth elements; 3) separation of oxides and individual rare earth elements in chains and getting more valuable end products [1, Pokhilenko N.P., Kryukov V.A., Tolstov A.V., Samsonov N.Y., pp. 22-35]. Primary processing of Tomtor ore can be produced at Zheleznogorsk MCC (transportation of the Tomtor ore — Zheleznogorsk on the winter road to the pier Yuryung-Khaya and then by river-sea vessels), the ultimate recycling — at the plant of production of rare metals company (Novosibirsk or Krasnoyarsk) [2, Yatsenko V.A., pp. 26-30]. The selection of specific technological schemes of deep and complex processing of primary concentrates, as well as the establishment of the necessary facilities to obtain the end product, requires additional research.

The prospects of the project implementation. Currently, the joint venture "TriArk Mining" (under the auspices of the State Corporation Rostech and ICT Group) launched the development of

⁶ Gosudarstvennaia programma «Razvitie promyshlennosti i povyshenie ee konkurentosposobnosti» (podprogramma 15. Razvitie promyshlennosti redkikh i redkozemel'nykh metallov). URL: <http://programs.gov.ru/Portal/programs/passport/17> (Accessed: 16 August 2016).

⁷ Gosudarstvennyi doklad «O sostoianii i ispol'zovanii mineral'no-syr'evykh resursov Rossiiskoi Federatsii v 2014 godu» (Redkozemel'nye metally p. 239-246). URL: <http://www.mnr.gov.ru/regulatory/detail.php?ID=143955> (Accessed: 16 August 2016).

the richest area of Tomtor — Buranny .The project cost is about \$ 1 billion, for the period until 2021-2023, it provides the creation of the mining production in Tomtor with the capacity of 100 thousand tons of ore, development of monazite dumps in Krasnoufimsk (Sverdlovsk region) and the creation of a hydrometallurgical plant (the placement has not been defined yet) with a capacity of 4.5 ths. tons of ferroniobium and 10 ths. tons of the rare metal earth oxides per year⁸.

Weaknesses and risks of the project. Tomtor ores are radioactive, due to the presence of uranium and thorium. This stipulates the need to to keep the relevant safety precautions working with them and requires additional costs for disposal of radioactive wastes. The emergence of new foreign competitors in the countries of the South East Asia (Korea, Japan), the development of their own high-tech production of REM and products using them, creates additional competitive challenges for the prospects of the Tomtor project. REM prices are subject to significant fluctuations. High volatility of REM prices creates additional difficulties in attracting investments for this project. Insufficient level of development of high-tech industries, forming the demand for REM in the domestic market, increases the risk of low liquidity of the obtained products.

Oil and gas complex (development of the Laptev Sea shelf and coastal waters of Khatanga and Anabar Bay)

The feasibility and possibilities of formation. According to US Geological Survey estimates, the North-Western and Eastern Laptev Sea shelf plates are among the 25 largest hydrocarbon reserves of the Arctic provinces of the world, ranking among them, respectively, the 20th and the 8th place in the resource potential. Their probable reserves amount to 1,425 million tons of oil equivalent (2.5% of total hydrocarbon resources in the Arctic)⁹. Taking into account the inventory of available resources (with the extraction ratio 0.3-0.4), it is possible to create a large oil and gas complex in the region, in future (with a peak production of 5-6 million tons of hydrocarbons per year), ensuring its continual stable functioning for several decades. Location of the Laptev Sea shelf in the region of the Northern Sea Route and in the area of coastal infrastructure of the Khatanga-Anabar region (Khatanga and Yuryung-Khaya ports) provides the necessary conditions for a stable and competitive production and transportation of oil to areas of consumption.

Technological and transport scheme. For the arrangement of oil and gas deposits in the waters of the Laptev Sea, the technology development scheme of Pirazlomnaya field can be used, which is situated in Pechora Sea on the basis of the marine ice-resistant stationary platform

⁸ Gruppya Ist i «Rostekh» imeiut vidy na Tomtor (25.04.2013). URL: <http://www.yktimes.ru/%D0%BD%D0%BE%D0%B2%D0%BE%D1%81%D1%82%D0%B8/gruppya-ist-i-rosteh-imeyut-vidyi-na-tomtor/> (Accessed: 16 August 2016).

⁹ Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle, 2008 URL: <http://pubs.usgs.gov/fs/2008/3049/fs2008-3049.pdf> (Accessed: 16 August 2016).

(MISP)^{10, 11}. MISP (capacity up to 6 million tons per year) is designed for year-round operation for 25 years in extreme natural climatic conditions under cyclic loads of drifting ice. The transport scheme of the project involves the use of multifunctional icebreaking vessels and two shuttle tankers. The coastal infrastructure has been created for efficient production management and delivery of shift personnel and cargo on the platform. Its structure includes transshipment base with Varandey field camps for the temporary placement of personnel, supply base and production base services in Murmansk.

The prospects of the project. A number of domestic companies have already showed their interest in geological exploration and development of the Laptev Sea shelf. Rosneft and Lukoil at the end of 2015 divided the East Taimyr deposit in Khatanga Bay. Rosneft received the marine field of the deposit (Khatanga section) with expected resources of 82,8 mln tons of oil and 228.2 billion cubic meters of gas. LUKOIL acquired a license for exploration and development of the coastal (East Taimyr) area. The resources of this section are 4.5 million tons of oil, 9.3 billion cubic meters of gas, 0.5 million tons of condensate^{12,13}. Further development of events will depend on the speed of confirmation and volume of the oil potential of the acquired areas, as well as hydrocarbon market. Taking into account a period from pre- exploration till making of the investment decision, as well as the duration of the development and approval of projects, construction and installation of the platform, tanker and the icebreaker fleet, preparations of the necessary marine and coastal infrastructure, the beginning of exploitation of the deposit and the production of the first tons of oil is expected not earlier than in 2025 in the most optimistic scenario.

Weaknesses and risks of the project. Hydrocarbon potential of the eastern Arctic shelf has not been practically studied. Potential oil and gas waters of the Laptev Sea are very poorly explored geologically. The density of seismic works of the Laptev Sea (0.08 lineal km/sq km) is significantly lower than in the western Arctic seas (in the Kara Sea — 0.21 lineal km/sq km, in the Barents and Pechora Seas — 0.5 lineal km/sq. km), as well as in the Norwegian part of the Barents Sea (1.01 lineal km/sq km) [3 Konoplyanik A., Buzovsky V., Popov U, Troshina N.]. Similar level of

¹⁰ Razrabotka mestorozhdeniia Prirazlomnoe URL: <http://shelf-neft.gazprom.ru/d/blockonthemainpage/04/4/prezentatsiya-proekta-prirazlomnoe.pdf> (Accessed: 16 August 2016).

¹¹ Transportnaia skhema osvoeniia Prirazlomnogo mestorozhdeniia URL: http://ru.rfwiki.org/wiki/Fail:Transportnaia_skhema_osvoeniia_Prirazlomnogo_mestorozhdeniia.jpg (Accessed: 16 August 2016).

¹² «LUKoil» nachinaet razrabotku neftianogo mestorozhdeniia v Krasnoiarском krae URL: <http://fedpress.ru/news/econom/industry/1450160746-lukoil-nachinaet-razrabotku-neftianogo-mestorozhdeniya-v-krasnoyarskom-krae> (Accessed: 16 August 2016).

¹³ Rasporyazhenie Pravitel'stva RF ot 17.12.2015 «O peredache uchastka nedr federal'nogo znacheniiia v pol'zovanie OAO «NK «Rosneft'» URL: <http://government.ru/docs/21193/> (Accessed: 16 August 2016).

study of the waters of the Barents and Pechora Seas will be essentially complicated due to climatic factors and will lead to a significant cost increase for the development of identified fields.

Transportation conditions of the functioning of the oil platform in the Laptev Sea are more complex (compared to deposit "Prirazlomnoe" in Pechora Sea). In order to organize year-round vessel voyages in the area, the strengthened ice class vessels will be required (Arc7 and above). However, nuclear-powered icebreakers of this class will not be able to enter the shallow mouth of the river Khatanga because of their drafts. Therefore, the year-round use of Hatanga port will require to build a special fleet.

In oil market the pricing environment remains unfavorable. Profitability of the project of the development of the field "Prirazlomnoe" substantiated at oil price of \$ 100 per barrel, while in 2015-2016 it did not exceed \$ 50 per barrel.

The development of alluvial diamond deposit Ebelyakh-Gusiny

Long-term development strategy of the leading Russian and world diamond mining company Alrosa, including its subsidiary company Diamonds of Anabar, is based on the priority development of large deposits of diamonds prepared for the industrial development. Alluvial deposit in the river Ebelyakh and creek Gusiny (hereinafter Ebelyakh-Gusiny) is Russia's largest deposit of alluvial diamonds with proven reserves of 25.6 mln. carat (2.1% of the total balance reserves of the Russian diamonds). The diamond placers of the deposit Ebelyakh-Gusiny (1.43 carats/cub.m) exceed in quality and content the actively developed alluvial Ghana objects (1 carat/ cub. m) and Guinea (0.7 carats / cub.m)¹⁴. The development of this field will allow the company Alrosa (and Diamonds of Anabar) to maintain and strengthen its position in the diamond market for a few more years.

Technology and transport scheme. Technology and transport scheme of the development of the project of deposit Ebelyakh-Gusiny is based on the actual experience of the operation of the similar alluvial diamond deposits in Oleneksky and Anabar settlements by the company Diamonds of Anabar (placers of the rivers Morgogor, Mayat, Kula, Ol, Kurung-Yuryakh). The development of alluvial deposits by the company Diamonds of Anabar is based on a three-stage scheme: 1) carrying out of strip mining with the extraction of diamond sands; 2) transportation and primary processing of the sands in concentrate at the sites of mobile sorting and processing facilities; 3) transport and final extraction of diamonds in production units of the seasonal enriching factory

¹⁴ Gosudarstvennyj doklad «O sostojanii i ispol'zovanii mineral'no-syr'evyh resursov Rossijskoj Federacii v 2014 godu» (Almazy p. 221-230) URL: <http://www.mnr.gov.ru/regulatory/detail.php?ID=143955> (Accessed: 16 August 2016).

(SEF) (Udachninsky MPP). This technology has proved its economic efficiency and environmental safety¹⁵.

The prospects of the project. The realization of the project goes according to the plan. The section Ebelyakh-Gusiny already in 2014 went on the design performance of diamond mining sand — 1.6-1.8 mln cubic meters per year (2.2-2.5 mln. carats of diamonds). The total volume of recoverable diamonds for the period of operation of the field in 2014-2021 will amount to 16.7 mln. carats (2.3 mln. carats per year), including the river Ebelyakh 13.4 mln. carats (1.7 mln. carats per year) and the creek Gysiny 3.3 mln. carats (600 thousand carats per year). In the developing of the fields in accordance with the calendar schedule of the project, creek Gusiny reserves will be exhausted by 2019. The development of the field of Ebelyakh river can be extended to 2027¹⁶.

Weaknesses and risks of the project. Threats to the project are related to the general trends of the development of the diamond market and long-term downward trend in the average prices for natural diamonds. According to some forecasts, natural diamonds (including gem diamonds) in 15-20 years will completely give up their place in the market to the synthetic diamonds¹⁷. There are general risks associated with environmental protection, labor protection and industrial safety in the area of mining of the fields of Ebelyakh river and creek Gusiny.

The development of Kotui coal deposit

The feasibility and possibilities. Total demand for coal for heating needs of rural settlement Khatanga is 40-50 ths. tons of coal per year. Delivery of such quantity of coal in the conditions of underdeveloped transport infrastructure and remoteness from the coal-mining regions (Norilsk industrial area, Sakha (Yakutia), the Kemerovo region, Murmansk, etc.) creates high risks for local sustainment of the people and is very expensive. However, the area of rural settlement Khatanga has significant reserves of its own coal. The development of these reserves will reduce the costs of coal provision and will increase the reliability of heat supply of the economy and population of the region. The reserves of Kotui coal deposit (40 km from Khatanga) are more than 320 mln.tons and

¹⁵ Godovoj otchet kompanii «Almazy Anabara» za 2015 god. URL: http://alanab.ykt.ru/uploads/files/2016/07/otchet_2015.pdf (Accessed: 16 August 2016).

¹⁶ Otchet nezavisimyykh ekspertov o zapasakh i resursakh mestorozhdenii almazov gruppy kompanii «ALROSA», gl.11 «Economicheskii analiz», p. 11.8 «Otrabotka mestorozhdeniia reki Ebelyakh i ruch'ia Gusinyi» URL: http://www.alrosa.ru/wp-content/uploads/2013/11/Alrosa_Independent_Expert_Report-2013.pdf (Accessed: 16 August 2016).

¹⁷ Iskusstvennye almazy ostaviat lakutiiu bez deneg (interv'iu s ekspertom almaznoi otrasli luriem Danilovym). URL: <http://yakutia.com/diamond/558/> (Accessed: 16 August 2016).

allow to provide reliable long-term supply of coal for the population and enterprises of rural settlement Khatanga¹⁸.

Prospects of the project. Despite reasonable economic and high social efficiency, Kayak-2 mine construction project has not been realized yet and will not be implemented in plans of its participants. The main reason for this is that the main beneficiary of the project - the regional and local budgets can not become the investor due to deficiency (limitations) of their financial capabilities. For private investors, the project is not of much interest due to the fact that the budget savings for the "northern delivery" associated with the project, is out of their "purse". Project funding problem can be successfully solved by the creation of an effective mechanism of state and public partnership.

The development of Popigai deposit of impact diamonds

The feasibility and possibilities. Nowadays the global sales of diamonds of technical purposes (15,7 bln. dollars) exceed in 1.5 times the volume of gem diamond sales and is developing much faster. It is expected that the market of the industrial diamonds will grow at the average annual rate of 7% in period of 2016-2023¹⁹. These circumstances actualize the issues associated with the development of the unique Popigai field of impact diamonds. The giant reserves of technical diamonds (impact diamonds) are placed within this field. The estimated total number of diamonds contained in Popigai meteorite crater is several trillion carats. These volumes will be enough to meet the modern world technical diamond market needs (10 billion carats per year) for hundreds of years.

Technology and transport scheme.

The development of Popigai deposit does not have any technical and technological difficulties. The technological and organizational scheme can be used for this purpose, which has been using successfully for many years in fields of alluvial diamonds in Anabar and Oleneksky settlements. Two explored areas — Skalny and Udarny (0.5% of the total area of the field) — can become the primary targets for the development. Their total reserves (A + B + C1 and C2) reach almost 268 billion carats, while the average diamond content in the ores are unique (in 2-3 times

¹⁸ Dolgosrochnaia tselevaia programma «Stroitel'stvo shakhtnogo uchastka №2 Kaiakskogo kamennougol'nogo mestorozhdeniia» (reshenie Dumy Taimyrskogo Dolgano-Nenetskogo munitsipal'nogo raiona ot 12.12.2008 g. №02-0017). URL: <http://zakon-region3.ru/4/147741/> (Accessed: 16 August 2016).

¹⁹ Synthetic Diamond Market — Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2015–2023 URL: <http://www.transparencymarketresearch.com/synthetic-diamond-market.html> (Accessed: 16 August 2016).

higher than the maximum concentrations of kimberlite diamond pipes) — 18,47 carat /ton and 7, 13 carat / ton respectively²⁰.

Bearing in mind such a high concentration of diamonds, their production costs can amount to \$ 2.5-3/carat. Taking into consideration the small load capacity of production of Popigai deposit, air transportation is the most advantageous for its transportation. Depending on the final processing site of the receiving of diamond concentrate, different options of transport routes can be chosen: Saskylakh — Udachny (Mirny) — Novosibirsk or Saskylakh — Khatanga — Krasnoyarsk [4, Kryukov V.A., Samsonov N.Y., Kryukov Y.V., pp. 51-66].

Prospects of the project. Preliminary estimates show that the use of impact diamonds of Popigai deposit can form the basis of formation of a new generation industrial diamond market and products based on them. Formation of such a market requires the development of a long-term system strategy and a wide range of scientific and complex technological research. The concept of such a strategy has been proposed by the scientists of the SB RAS. On the basis of scientific and technological complex of RAS, enterprises of the republic of Sakha (Yakutia) and the Krasnoyarsk Territory, as the final stage of project implementation can become the creation of the technological platform for the processing and use of diamonds for the purpose of technical and scientific application projects of natural micro, nanopolycrystal diamonds [5, Pokhilenko N.P., Kryukov V.A., pp. 30-35].

***Formation of rational cooperative industrial social and economic relations,
intra- and inter-regional infrastructure***

Features of the present social and economic situation, as well as the complexity of the tasks related to the implementation of the development projects in Khatanga-Anabar region, stipulate the need to consider the strategy of development based on the use of program-oriented approach and the concept of aqua-territorial and industrial systems (ATIS), aimed at the implementation of programs (strategies) of the development of the coastal areas [6, Baklanov P.Y.; 7, Baklanov P.Y.; 8, Bondarenko L.A., Ionova V.D., Malov V.Y., Tarasova O.V.].

The objective prerequisites for the formation of ATIS in the Khatanga-Anabar region are the following factors: 1) the objects of the specialization of the region operate on the shores of seas and at the areas of seas; 2) there two sections in the structure of economic: territorially fixed (industrial activity on the shore) and aqua-territorially migrating (mobile production activities in the water area); 3) connection of the sections into a single unit is provided by sea transport. In

²⁰ Gosudarstvennyi doklad «O sostoianii i ispol'zovanii mineral'no-syr'evykh resursov Rossiiskoi Federatsii v 2014 godu» (Almazy p. 221-230) URL: <http://www.mnr.gov.ru/regulatory/detail.php?ID=143955> (Accessed: 16 August 2016).

general, the ATIS includes sea ports (and river ports, available for "river - sea" vessels), industrial enterprises, coastal settlements;

4) the key requirement for the formation of industrial structure of ATIS is observed: the objects of sea transport, objects of oil and gas offshore and onshore, mining companies not only co-exist at the territory, but also interact; 5) the effectiveness of the interaction is manifested not only in increasing the level of technical and technological capacities of economic activity, but also in strengthening of the revenue of the regions, where ATIS will be formed (Krasnoyarsk Territory and the Republic of Sakha (Yakutia)); 6) significant role in the economy of the region is given the external economic relations.

The main advantages of the implementation of regional development projects in the ATIS format is the integrated approach, providing expand cooperation ties and effective interwork between the participants at the expense of integration (in the rational scale), production (transport, energy) and social infrastructure. By means of it, the cheapening of the projects, increasing of value and in the end the increase in the revenues of the administrative units. As a consequence, it can create better conditions for the solution of other economic, social and environmental objectives. There is also one more important result here — the emergence of real prerequisites for the creation and improvement of the investment climate, conducive to investments, including foreign ones.

Transport infrastructure. A key factor in the effective implementation of development projects and economic development of the Khatanga-Anabar region is the establishment of intensive and reliable transport links with major Russian and world commodity markets. Despite the well-known difficulties of its economic and geographical location, the Khatanga-Anabar region has good opportunities to meet this challenge. Prospects for the region's output in the external economic space is connected with the development of the transport corridor "the Northern Sea Route", inclusion of ports Hatanga Yuryung-Khaya in it, and the formation of the corresponding port and coastal infrastructure.

Today Khatanga sea port (Fig. 2) has a low level of development adequate to the level of social and economic development of the areas of the rural settlement Khatanga, the port serves for. The port handles food and refrigerated cargoes, different general cargoes for the Arctic settlements, timber, bulk cargo (coal, sand and gravel), oil cargo. The port also works with regular passenger traffic on the river Khatanga and its tributaries to the settlements of Khatanga rural settlement. The port operates only during the summer season (from mid-June till end of September). Vessels with drafts up to 4.6 m may call this port. The transshipment from sea vessels

is provided at Kosisty Cape. Port capacity is 95 thousand tons of cargoes per year (maximum cargo turnover of of 350 thousand tons was recorded in 1976)²¹.

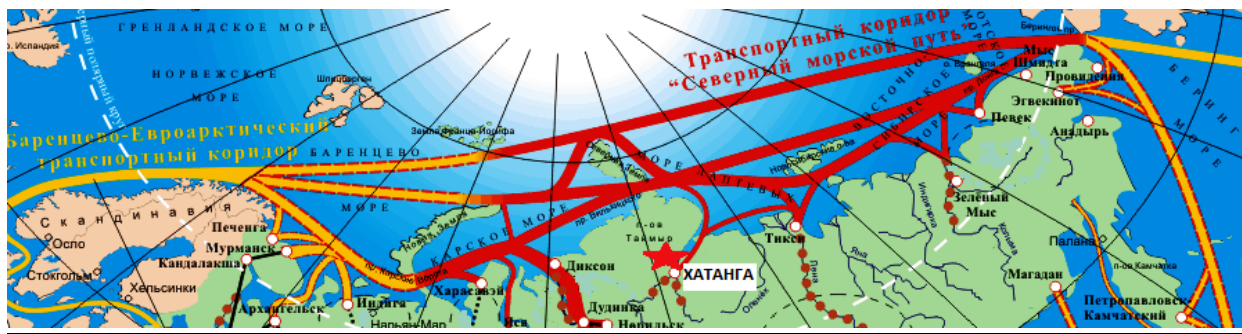


Figure 2. Khatanga port in the system of the Russian transport routes in the Arctic ocean [9, Peresykin V., Yakovlev A.]

The development of oil and gas deposits at the territory of rural settlement Khatanga and the Laptev Sea shelf will be accompanied by increase in the volume and intensity of cargo deliveries and passenger traffic, will require substantial renovation and increase of the port capacity and creation of large transportation and logistics hub on its basis (Fig. 3). The prospects of the transport and logistics hub on the basis of Khatanga sea port provide the following²²:

- 1) reconstruction of the port complex with taking into account the requirements of the Maritime Doctrine for the Unification of the infrastructure for military and economic needs, modernization and increase of the port capacities;
- 2) the expansion of navigation along small rivers;
- 3) development of warning and communication systems on the Northern Sea Route and all water routes in the zone of its influence:
 - a) the construction of digital radio stations;
 - b) the modernization, reconstruction and technical equipping of the air navigation infrastructure, the introduction of "GLONASS/GPS" system;
 - c) expanding of the network of aerologic stations;
 - d) update of the hydrographic maps of the Khatanga Bay and approaches to the Khatanga seaport, reconstruction of buildings and facilities of the hydrographic base;
- 4) reconstruction and inclusion of Khatanga airport in the list of alternate aerodromes to ensure safety flights on cross-polar routes and regional air line.

²¹ Morskoy port Khatanga URL: <http://polartrans.ru/information/morskoj-port-xatanga.html> (Accessed: 16 August 2016).

²² Skhema territorial'nogo planirovaniia Taimyrskogo Dolgano-Nenetskogo munitsipal'nogo raiona (Tom 3) (proektnye predlozheniia Vodnyi, vozdukhnyi i avtomobil'nyi transport) //FGUP Rossiiskii gosudarstvennyi nauchno-issledovatel'skii i proektnyi institut «Urbanistika». - Sankt-Peterburg, 2012 URL: <http://fgis.economy.gov.ru/fgis/> (Accessed: 16 August 2016).



Figure 3. The development of transportations and service in the Khatanga rural settlement during the development of offshore hydrocarbon fields

The pace of development of the Khatanga transport and logistics center will be determined by the timing and scale of the development of oil fields. Bearing in mind that the practical implementation of the oil project is expected not earlier than 2020-2025, the creation of transport and logistics center Khatanga should be divided into two phases: the first (till 2020-2025) to ensure the reconstruction and modernization of existing infrastructure, the second (after 2025) to proceed to increase its capacity and expand the composition — to form the repair and maintenance base of commercial and specialized fleet; to arrange the base of creation and maintenance of high-latitude expeditions; to organize tourist routes with the development of an appropriate infrastructure.

Along with Khatanga port, external transport links will also be provided through another sea port in the region — Yuryung-Khaya, which will receive the appropriate development as transshipment base for the development of alluvial diamond deposit Ebelyakh, Tomtor deposit of the rare earth metals, Popigai field of impact diamonds and local enterprises of the agroindustrial complex²³.

²³ Skhema territorial'nogo planirovaniia munitsipal'nogo raiona MO «Anabarskii natsional'nyi (Dolgano-Evenkiiskii) ulus (raion) Respubliki Sakha (Iakutiia)», tom II. Materialy po obosnovaniuu skhemy (razdel Transport) // Otkrytoe obshchestvo Sakhaproekt – Iakutsk, 2012 //FGIS TP URL: <http://fgis.economy.gov.ru/fgis/> (Accessed: 16 August 2016).

Inter-municipal transport links will be developed during winter period along the main winter roads Dudinka — Norilsk — Khatanga (750 km), Hatanga — Popigaj — Syskylah (400 km) and Olenek — Syskylah — Yuryung-Khaya (730 km), as well as along the adjoining winter roads of local significance, during short period of summer navigation — on the rivers Khatanga and Anabar and their tributaries. *Air transport* will require reconstruction and construction of airfields, runways and other facilities of airfield infrastructure, formation of modern aircraft fleet, expansion of use of new types of aircrafts (seaplanes, amphibians, aircrafts with air cushion landing system, aerostatic devices).

Energy infrastructure. In connection with the construction and commissioning of large mining companies in the region, significant increase of the consumption of electricity and heat is expected [10, Melnikov N.N, Konuhin V.P., Naumov V.A., Gusak S.A., pp. 198-208]. The total load of current and new customers in the region is estimated to be 70-80 MW (excluding offshore oil needs, provided by its own autonomous power plant), including Khatanga node in 10-15 MW, Popigaj-Anabar-Zhilinda — 60-70 MW. To ensure reliable and efficient supply of new enterprises in the region, it is necessary to reconstruct the existing and to build new generating and grid facilities²⁴. First of all, the issue of choosing a rational scheme of power supply should be resolved. Among the main factors influencing the choice, on the one hand, the remoteness from the points of possible connection and restrictions to access to power center is important, on the other — the existence of transportation infrastructure, the possibility and the cost of fuel delivery [11, Ivanova I.Yu., Tuguzova T.F., Izhbuldin A.K., Simonenko A.N., pp. 187-199]. In the first case, as a rule, the reconstruction of existing or construction of new generating facilities and power grid is required, in the second - the construction of new roads (Figure 4.).

²⁴ See URL: <https://www.sakha.gov.ru/files/front/download/id/1186981> (дата обращения: 16.08.2016)

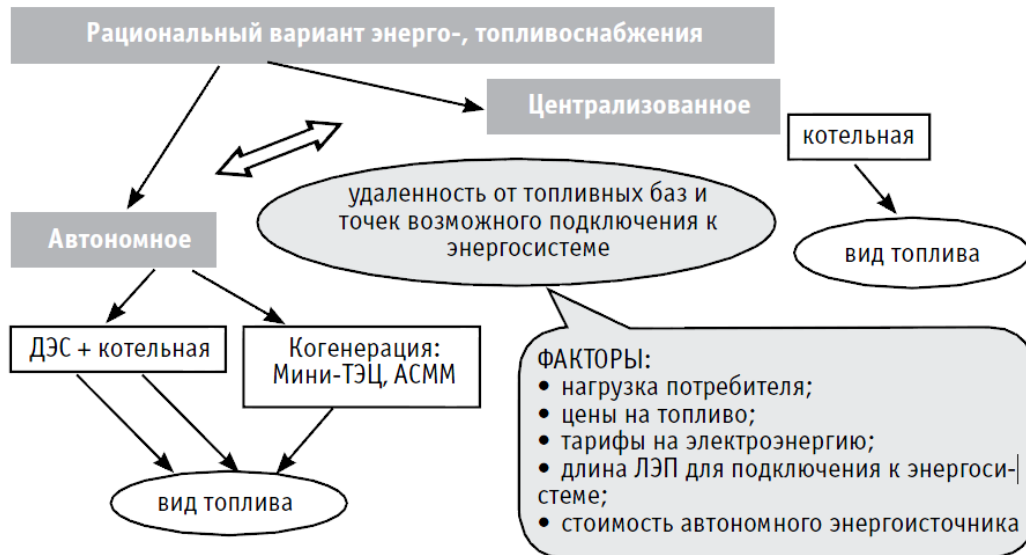


Figure 4. Alternative options of energy supply [11]

Preliminary estimates show the feasibility of the formation of two autonomous power units based on Khatanga coal power generation and Anabar small nuclear power station (SNPP). In the first case the construction of co-generation plant with the capacity of 10-15 MW in Khatanga will be required, in the second — the placing of SNPP on the base of floating power unit (FPU) with reactor unit equipment KLT-40C (Figure 5.).



Figure 5. Floating nuclear thermoelectric plant (FNTF) in Yuryung-Khaya port

Along with this, the staged decommissioning of existing boilers and construction of cogeneration sources in other settlement areas will be arranged.

***Organizational and economic measures aimed at effective
use of strategic potential of the region***

The immensity, comprehensiveness and complexity of the realization of project package, forming the core of the Khatanga-Anabar ATIC, require adequate scientific support as well as long-term and coordinated organizational decisions and measures permitting to effectively use the multiplicative effects of the discussed projects. To create Khatanga-Anabar ATIC it is necessary to find effective institutional solutions providing multi-level, multi-faceted cooperation, including a large number of participants.

That is why one of the important tasks is to seek mechanisms of such interactions. The Khatanga-Anabar ATIC is located at the territory of two constituent entities of the Russian Federation (the Krasnoyarsk Territory and the Republic of Sakha (Yakutia), on the one hand, with their own vision of the future, on the other hand, limited in the ability of investment support of the creating economic complex. Prospective investment projects, forming the Khatanga-Anabar ATIC will be implemented by various economic entities, which complicates the process of creating the integrated transport and logistics, energy and social infrastructure.

To overcome the potential contradictions, to organize integrated development of the territory and to reduce unproductive costs, it is necessary to consider the possibility of including the Khatanga-Anabar ATIC in the Program of development of the northern and Arctic areas of the Russian Federation (new edition of the State Program on social and economic development of the AZRF for the period till 2020 and later on). It is advisable to determine the federal structure as responsible for the further study of the project, at the level of the State Commission on the Development of the Arctic (created by the order №228, dated 14 March 2015, by the decree №431-p dated 14 March, 2015 for interaction of federal and regional executive authorities and local governments, other government agencies and organizations in solving social and economic problems of the development of the AZRF and providing of the national security).

To form scientifically based, organizational and administrative, social and economic, engineering and manufacturing solutions, it is necessary: 1) to develop and begin implementation of research programs, including geological surveys, economic and social and economic research, the elaboration of the strategy of the integrated development of the Khatanga-Anabar ATIC, evaluation of possible environmental and social and cultural consequences; 2) to begin the development of technological schemes, rules and strategies for implementation of investment projects on the territory of Khatanga-Anabar ATIC; 3) to develop and start the implementation of the federal program for the use of extracted natural resources program (REM, impact diamonds,

etc.) to create new high-tech innovative industries.; 4) to establish effective administrative and economic mechanism for raising of the effects and increasing the capabilities from the use of new materials in the economy of the country.

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