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Sanctions and scenarios of economic development of the Russian Arctic territories (the case of the Yamalo-Nenets Autonomous District)

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Institute of Economics, Ural Branch of the Russian Academy of Sciences; ✉ zakharchuk.ea@uiiec.ru**ABSTRACT**

Relevance. The sanctions against Russia in 2022 affected almost all areas of the country's economic activity. The sanctions may have varying effects on different territories of Russia. Mono-sectoral regions specializing in the production of primary raw materials are faced with the highest uncertainty.

Research objective. The main purpose of the study is to develop and describe scenarios for the economic development of the Yamalo-Nenets Autonomous District under the pressure of sanctions. As part of this task, the impact of restrictions on the development of municipalities in Yamal is assessed, with a special focus on the areas with new hydrocarbon deposits in the Arctic zone.

Data and methods. The study relies on the scenario method and the System of National Accounts to calculate the key indicators of economic development, which are defined as aggregated parameters (gross regional product, investment, tax revenues of the consolidated budget, and employment).

Results. The impact of sanctions on the development of the Yamalo-Nenets Autonomous District is considered through the three scenarios: inertial, negative, and catastrophic. Under the inertial scenario, the key indicators will not change, and the pace of economic development will decrease. Under the negative scenario, investment projects will be put on hold and a limited deterioration in economic indicators will be observed. Under the worst-case scenario, there will be a serious drop in the key indicators, especially investment and employment.

Conclusions. The imposed sanctions prohibiting the supply of high-tech equipment and limiting the supply of natural gas and oil to world markets will not be destructive for Yamal even in the catastrophic scenario. However, these restrictions will seriously limit economic development, gradually worsening the prospects for the development of the Arctic territories and the region's ability to maintain the current standards of living.

KEYWORDS

sanctions, economic development, Yamalo-Nenets Autonomous District, development scenarios, System of National Accounts, gross regional product, investment, tax revenues

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Сценарии экономического развития арктических территорий России (на примере Ямало-Ненецкого автономного округа)

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Актуальность. Санкции против России в 2022 г. затронули практически все сферы экономической деятельности страны. Санкции могут иметь различный эффект на разных территориях России. С наибольшей неопределенностью сталкиваются моноспециализированные территории, основу экономического развития которых составляет производство первичного сырья.

Цель исследования. Основной целью исследования является разработка и описание сценариев экономического развития Ямало-Ненецкого автономного округа в условиях санкционного давления. В рамках этой задачи оценивается влияние ограничений на развитие муниципальных образований Ямала с особым акцентом на территории с новыми месторождениями углеводородов в арктической зоне.

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КЛЮЧЕВЫЕ СЛОВА

санкции, экономическое развитие, Ямало-Ненецкий автономный округ, сценарии развития, система национальных счетов, валовой региональный продукт, инвестиции, налоговые поступления

Данные и методы. В исследовании на основе метода написания сценариев и Системы национальных счетов рассчитаны основные показатели экономического развития, которые определяются как укрупненные параметры (валовой региональный продукт, инвестиции, налоговые поступления в консолидированный бюджет, занятость).

Результаты. Влияние санкций на развитие Ямало-Ненецкого автономного округа рассматривается через три сценария: инерционный, негативный и катастрофический. При инерционном сценарии основные показатели не изменятся, а темпы экономического развития снизятся. При негативном сценарии инвестиционные проекты будут приостановлены, и будет наблюдаться ограниченное ухудшение экономических показателей. При наихудшем сценарии произойдет серьезное падение ключевых показателей, особенно инвестиций и занятости.

Выводы. Введенные санкции, запрещающие поставку высокотехнологичного оборудования и ограничивающие поставки природного газа и нефти на мировые рынки, не будут разрушительными для Ямала даже в катастрофическом сценарии. Однако эти ограничения будут серьезно ограничивать экономическое развитие, постепенно ухудшая перспективы освоения арктических территорий и возможности региона поддерживать текущий уровень жизни.

БЛАГОДАРНОСТИ

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俄罗斯北极地区经济发展方案 (以亚马尔涅涅茨自治区为例)

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摘要

现实性：2022年对俄制裁几乎影响到俄罗斯经济活动的各个领域。制裁在俄罗斯的不同地区可能会产生不同的影响。对以初级原材料生产为基础的单一专业地区，它们面临的不确定性最大。

研究目标：该研究的主要目标是制定和描述制裁压力下亚马尔-涅涅茨自治区经济发展的方案。文章评估了制裁对亚马尔市发展的影响，特别是对北极新油气矿藏地区。

数据与方法：该研究使用脚本法和国民账户体系来计算经济发展的主要指标，这些指标被定义为综合参数（地区生产总值、投资、综合预算的税收收入、就业）。

研究结果：制裁对亚马尔-涅涅茨自治区的影响通过三种情况分析：惯性、负面性和灾难性。在惯性情况下，主要指标不会改变，经济发展速度会下降。在负面情况下，投资项目将被暂停，经济指标将出现有限恶化。在灾难性情况下，关键指标，特别是投资和就业，将严重下降。

结论：即使在灾难性情况下，禁止向该区域供应高科技设备并限制其向世界市场供应天然气和石油，这样的制裁也不会对亚马尔造成毁灭性的打击。

关键词

制裁、经济发展、亚马尔-涅涅茨自治区、情景规划、国民账户体系、地区生产总值、投资、税收收入

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Introduction

The expansion of international sanctions against the Russian Federation will have serious consequences for the socio-economic development of the entire country. The blocking of foreign exchange reserves of the Russian government, disruption of international supply chains of goods and services, bans on the supply of high-

tech equipment, partial embargo on the supply of energy products (oil, natural gas, coal) from Russia are sensitive measures that limit the economic development of the country. Despite the efforts made in recent years by the Russian government to replace imported components and equipment with their domestically produced equivalents, Russia's economic development was based on the

scheme of “low-value raw materials in exchange for high-tech”. In this regard, a sharp change in this model, both in exports and imports, will cause an inevitable transformation of the existing economic ties, which is a lengthy process and is likely to lead to a loss of efficiency of the Russian economy as a whole.

The restrictions imposed by on Russia affect the development of individual industries and territories to varying degrees. The negative impact of the sanctions will be especially by the corporations engaged in export-import operations. To a lesser extent, the impact of the sanctions will be felt by those sectors whose products are sold on the domestic market (food production, defense industry, provision of services to government agencies, etc.). Therefore, the impact of sanctions on the socio-economic development of Russian regions and municipalities will be determined by the structure of this or that industry and the service sector of a particular territory.

Most Russian regions lack economic diversification, with a few exceptions. A significant part of the territories, especially in the Asian part of Russia, have mono-specialization, as a rule, based on the extraction of certain raw materials or the operation of large-scale industries. Taking into account the previous economic crises in Russia, abrupt changes in economic development can have dramatic consequences for such territories.

The Yamalo-Nenets Autonomous District (YNAD, Yamal) has been chosen for this study for a number of reasons. Firstly, this is one of the most prosperous regions of Russia in terms of socio-economic development, having survived previous crises with virtually no losses. Secondly, Yamal has large hydrocarbon investment projects, which make it one of the economic leaders in Russia. Thirdly, the region's economy is strongly connected to international trade, e.g. LNG exports and imports of high technologies for the development of the Arctic. The sanctions against Russia affected the imports of equipment for the oil and gas industry. Another important factor is the EU's intention to ban Russian oil imports, which will significantly impact the conditions of Yamal's socio-economic development. All of the above makes Yamal worthy of special scholarly attention in the light of the current sanctions episode.

Geographically, the Yamalo-Nenets Autonomous District, is situated in the extreme natural conditions of the Arctic, which makes traditional ways of economic development problematic. The

development of natural gas and oil fields began in Yamal in the 1960s of the last century, gradually moving from the south of the district to the Arctic zone. Yamal currently holds the leading position in natural gas production (more than 80%) in Russia and about 10% in oil and gas condensate production. At the same time, the deposits in Nadym-Pur-Taz developed in the last century are gradually being depleted, which means that new deposits located in remote areas will be developed.

The Yamal district (in the Yamal peninsula) and Tazovsky district (in the Gyda peninsula) became the new centers for hydrocarbon production in the Yamalo-Nenets Autonomous District. On the Yamal Peninsula, the Bovanenkovskoye natural gas field was put into operation in 2012, and since 2019, the Kharasaveyskoye field has been developed by Gazprom. The Yamal LNG project (Novatek) has also been implemented here, with exports reaching 16.5 million tons of liquefied natural gas via the Northern Sea Route. The development of the fields on the Gyda Peninsula is just beginning: in 2016, production was launched at the Vostochno-Messoyakhskoye oil and gas condensate field (a joint venture between Gazpromneft and Rosneft); work is underway at the Salmanovskoye natural gas field (Arktik LNG-2, Novatek). The development of these fields provides a significant part of the investment and high-paying jobs in Yamal.

Yamal natural gas fields (except for LNG projects) are part of Russia's unified gas supply system, from which gas is exported via pipelines. Unlike the oil transportation system, which has access to the sea in the European and Asian parts, a significant part of natural gas exports is “locked” in the European part, and has no connection with the gas transmission system of the Asian part of the country. Therefore, in the event that the purchase of natural gas by the main European consumers is limited, it is still technologically impossible to redirect the released volumes to other directions.

On the other hand, the mining industry of Yamal has a rather high dependence on imported (mainly from the EU and USA) high-tech equipment for the development and operation of oil and gas fields. A striking example is the implementation of the Arctic LNG 2 project by an international consortium led by Novatek. The success of the Yamal LNG project led the company to make plans for further development of LNG projects and to consider moving some of

the production stages to Russia. Initially, Novatek announced the introduction of the Russian patented technology “Arctic Cascade” in the implementation of the Arctic LNG 2. However, the test use of the line at the Yamal LNG site did not allow the company to achieve the desired efficiency¹. Therefore, Novatek decided to use tried and tested foreign gas liquefaction technologies, with the main production units being manufactured by foreign companies. In particular, orders for key equipment for the project are currently drawn: gas turbine generators and compressors (Baker Hughes, USA), heat exchangers (Linde, Germany), compressors (Siemens, Germany), logistics (TechnipFMC, France-USA)². So far, the equipment for the first of the three LNG lines has been 95% installed, the rest of the orders are suspended³. Gravity-based foundations (platforms) are mostly produced locally, e.g. at a new plant near the city of Murmansk. Thus, the key equipment for the project is produced in the sender countries. Another area that may be affected by the sanctions is the innovative solutions in drilling technology, since in this sphere the services are mostly provided by foreign companies. For other projects and companies involved in the development of the Arctic fields, the dependence on imports is perhaps less critical.

Therefore, the purpose of this study is to develop integrated scenarios for the economic development of territories with a pronounced specialization, such as Yamal, in the context of the 2022 sanctions. This goal determines the following tasks: first, to identify the main indicators of regional economic development based on the SNA (system of national accounts); to build scenarios of mid-term development of Yamal, depending on the intensity of the sanctions pressure and estimating the negative consequences of the sanctions on this region’s economic development.

¹ Tatyana Dyatel “Liquefy domestic”. *Kommersant* newspaper No. 91 dated May 26, 2022. <https://www.kommersant.ru/doc/5368501> (Accessed: 15.06.2022).

² Assessment of the impact on the environment, socio-economic environment and public health according to international standards for the Arctic LNG 2 Project. Ramboll CIS, July 2021. https://corporate.totalenergies.ru/ru/system/files/atoms/files/sep_rus_2021.pdf

³ Tatyana Dyatel “Gas was rendered a disservice” *News-paper “Kommersant”* No. 105 dated 16.06.2022. <https://www.kommersant.ru/doc/5412128> (Accessed: 22.06.2022).

Theoretical framework

Restrictive measures of various nature (sanctions) as a tool have been known for a long time. They have become especially popular in the 20th century, due to the increased specialization in the international division of labor. In research literature, sanctions are understood as some kind of collective action against a state that violates international laws and regulations (Daoudi and Dajani, 1983).

Flichy de La Neuville (2021) analyzes the history of sanctions and blockades since the nineteenth century, noting that such measures often involve military action and are detrimental to both sides. An in-depth analysis of the types of sanctions introduced in the 20th century is described by Lance and Engerman (2003). It is noted that this tool is becoming an increasingly popular form of pressure on the economic development of countries, as the role of trade in international relations and access to high technologies has increased.

The effectiveness of sanctions is a subject of much scholarly discussion. Simon (1995) argues that if a sanctioning state has a strategy to respond to non-compliance, sanctions can be successful even if they are costly. Major (2012) hypothesizes that sanctions lead to internal instability in countries, and after a while the restrictions achieve their goal. Allen (2005) analyzes the reasons for successful and failed sanctions using a competing risks event history model and concludes that in any case, the introduction of restrictive measures worsens the development of countries. Smith (1995), using a one sided incomplete information game, argues that the effectiveness of sanctions depends significantly on the decisions of the country threatened with sanctions and the adoption of the sanctions policy by that nation. Peksen (2019) notes that there is some consensus that economic sanctions against authoritarian regimes are less effective than sanctions against democratic ones. The author concludes that sanctions against military or one-party regimes are less likely to lead to concessions compared to democratic targeted regimes, but the economic effect of sanctions is equally pronounced. Similar results are shown by Kim (2013), based on the social-network conception of national power, who concludes that social networks are playing an increasing role in promoting sanctions.

In general, there is consensus among experts that sanctions cannot radically change the

behavior of the target state, which, nevertheless, may face severe economic consequences. Over the past century, various countries by territory, population, economic power, including the Soviet Union, were subjected to sanctions. The degree of sanctions pressure also varies: from insignificant (e.g., small restrictions in trade and in the humanitarian sphere) to a complete rupture of trade and financial relations. Regarding the current sanctions against Russia, it makes sense to compare their effects with the economic effects of the sanctions imposed on such states as Iran, Iraq and Venezuela. Such comparisons may prove particularly insightful since there is already a large body of research focused on these sanctions cases.

The Islamic Republic of Iran has the longest experience of being under sanctions (since 1979). It is an industrialized country and most of the foreign exchange earnings come from the export of hydrocarbon raw materials. In this aspect, the structure of Iran's economy is very similar to Russia's, which makes the case of Iran particularly relevant to understanding the current Russia sanctions episode. Dastgerdi et al. (2018) explores the relationship between the phases of sanctions (i.e. sanctions-free, hard and light sanctions) and the inflation rate in Iran. The study showed a direct dependence of the inflation rate on the severity of sanctions, due to a decrease in investment and trade. The impact of sanctions on industrial employment is identified by Moghaddasi Kelishomi and Nisticò (2022), showing that sanctions against Iran resulted in an overall decline in the growth rate of manufacturing employment by 16.4%. Using a nonlinear autoregressive distributed lag (NARDL) model, Ghodsi and Karameikli (2022) investigate the impact of EU sanctions against Iran on bilateral trade performance among 19 euro area members. As a result, it was concluded that the sanctions made mutual trade difficult in almost all the sectors, with the exception of raw materials. Larch et al. (2022) used the gravity equation to model trading costs in the mining industry and found that, on average, trade in this industry is reduced by 44% due to sanctions against Iran. Bastani et al. (2022) study the impact of sanctions on the supply of pharmaceutical products (PSC) to Iran. This study showed that pharmaceuticals are not protected from political and economic sanctions, although they are not directly subject to them. At the same time, sanctions affect healthcare and have an indirect impact on the availability of pharmacology.

In general, the history of Iran shows that the economic development of the country depends quite strongly on the severity of the restrictions imposed, but does not have a critical impact on the stability of the economy.

Another, more dramatic example of the impact of sanctions on the target's economic development is the Bolivarian Republic of Venezuela. This country's experience of living under sanctions imposed against the oil and gas sector is widely discussed in research literature (Seelke, Nelson, Brown & Margesson, 2021; Watkins, 2010; Brady, 2015; Nelson, 2021; Akande, Akhavan & Bjorge, 2021; Seelke, 2021). In particular, most studies show that the introduction of unilateral sanctions cannot completely paralyze the activities of certain branches of the state in the presence of friendly relations with other countries.

In the official report⁴ of the United States Government Accountability Office, the consequences of the imposed sanctions against the target country are estimated to reduce GDP by up to 35% in 2019 and 25% in 2020, due to the ban on oil supplies for the state oil company, and, accordingly, the restriction of production revenues oil. Monaldi et al. (2021) argue that the collapse of the Venezuelan oil industry was predetermined even before the imposition of sanctions, because due to the high risks of working in the country, foreign direct investment in the oil industry declined significantly. And Venezuela does not have its own production technologies. Lvova (2022) describes some of the effects of sanctions: Venezuela recorded an 80% decline in GDP in almost a decade, from \$352 billion at its peak in 2011–2012 to less than \$50 billion in 2020–2021, inflation rose 180.9% in 2015 to 959.8% in 2020. According to the author, the minimum wage has dropped from \$480 a month in 2012 to \$2.4 in 2021. Semenov (2022) notes that the main factor behind the economic collapse of Venezuela was the populist government policy, which led to a decrease in investment in the oil industry, the main one for the country's economic development. And the sanctions imposed by the United States only exacerbated the situation in the economy.

Thus, the experience of Venezuela shows that the sanctions pressure on the region, which is dependent on the export of natural resources, can

⁴ United States Government Accountability Office Venezuela: Additional tracking could aid treasury's efforts to mitigate any adverse impacts U.S. sanctions might have on humanitarian assistance (2021) Venezuela: Political, Economic and Humanitarian Issues, 255-307.

have disastrous consequences for its economic development. Taking into account that approximately half of Russia's foreign exchange earnings come from energy exports, this experience can be very important for building critical economic scenarios for the development of the country and its individual regions.

In the post-Soviet period, Russia first faced sanctions in 2014. The set of restrictions adopted at that time can be called soft, and they mainly concerned the transfer of high technologies. Arkhipova (2019) identifies the stages of the sanctions regime against Russia in 2014–2018: initial, intermediate, and accelerated. The paradox of sanctions is also highlighted: a further increase in restrictive measures does not lead to proportional economic effects in Russia. Shida (2020), looking at the impact of sanctions on regional companies, notes that according to management surveys, even Asia-Pacific-focused businesses are affected by post-2014 sanctions. Radzhabova et al. (2016) confirm this conclusion, predicting the loss of competitiveness of large industrial corporations and banks.

The above-described sanctions episodes had different effects on the economic development of countries. However, international research is mainly devoted to the impact of sanctions either on the economic system of the target state or on individual areas of management. For the Russian context, where the specialization of territories and regional disparities are highly pronounced, it is important to conduct a study of the impact of sanctions for individual regions, and highlight the possible effects on economic development. In our opinion, the greatest challenges from the sanctions in 2022 may be faced by regions specializing in the extraction of hydrocarbon raw materials, since one of the main goals of restrictive measures is to reduce revenues from oil and natural gas exports.

Method and Data

This study relies on the methodology developed for studying scenarios of socio-economic development of the Arctic territories and based on the System of Territorial Accounts (STS) (Zakharchuk & Pasynkov, 2017; Zakharchuk, 2019). The System of National Accounts (SNA) is used to trace the movement of financial resources between sectors of economy at the regional and municipal levels. The “Corporations” sector, which includes all organizations producing goods and services, including financial ones, is the starting

point for the formation of added value for a territory. The “General Government” sector performs a redistributive function, withdrawing some part of the value added in the form of taxes and other payments, and distributing financial resources among other economic agents. The public sector is considered as a broad concept, including all levels of the budget system and state-owned organizations. The “Households” sector is the final consumer of goods and services produced, thus ensuring the circulation of resources in the economy.

Based on this, we have formed an interconnected set of accounts for the Yamal region and its municipalities by institutional sectors. According to these accounts, it is possible to determine the mutual influence of changes in economic indicators. For example, when changing the volume of value added in a municipality, it is possible to calculate the change in tax revenues, payroll and final consumption.

However, for the purposes of this study, we are going to limit the calculations to the set of key parameters that would be considered on two levels: regional and municipal.

The key parameters include the following:

1) The volume of gross regional and municipal product, as an analogue of GDP. Even though the limitations of this indicator are widely discussed, it is a recognized tool for measuring economic performance. The source of data for calculating regional product is the income generation account by type of economic activity, provided by the regional divisions of Rosstat upon request. To calculate gross municipal product, we use the approach based on the distribution of regional data of the income generation account in relation to the data on the accrued wages of municipalities (database “Indicators of municipalities” of Rosstat) (Zakharchuk, 2019).

2) Investment in fixed capital, which can be used to measure the attractiveness of a given territory. This indicator reflects the prospects for increasing the added value of territories and the production volumes of the “Corporation” sector. Traditionally, investments are divided into those spent on maintaining the current projects and those devoted on new projects (the so-called “greenfield projects”). For Yamal, such classification is especially relevant due to its mono-sectoral specialization and remote geographical location of the new deposits. The data sources here are the database “Indicators of Municipalities” of Rosstat, section “Investments in Fixed Capital”.

3) Revenues of the consolidated budget of the region, based on its own tax base. As noted, the budget is a redistributive link in the use of value added. In the Russian context, the sustainability of budget revenues means, first of all, the quality of the region's social sphere (health care, education, infrastructure support, construction of transport facilities, etc.). The Russian system of distribution of tax and non-tax revenues between the levels of the budget system (federal, regional and municipal governments) is set up in such a way that the main revenues to the budgets depend on three main taxes: the corporate income tax (most of it goes to the regional budget), personal income tax (the municipal budget), and corporate property tax (regional tax). Changes in the volume of revenues from these sources are crucial for regional and municipal governments' budgets. Data sources are the database of the Federal Tax Service of Russia, section "Statistics and Analytics", forms of statistical tax reporting in the context of regions and municipalities, and data from the Ministry of Finance of the Russian Federation, section "Budgets of the Regions of the Russian Federation".

4) Structure and volume of income. This indicator, on the one hand, is an indicator of the economic well-being of people living in the given territory. On the other hand, the incomes of the population are directly dependent on the performance of other institutional sectors. The specifics of the Yamalo-Nenets Autonomous District in this indicator is that, unlike other regions, the basis of the population's income is payments from large enterprises and state institutions. And to a lesser extent, their income depends on social benefits and various entrepreneurial income (small business, capital payments, etc.). Therefore, the structure and volume of income is evaluated by balancing the income received from the corporate sector and public administration. The source of data here is the same Rosstat database "Indicators of Municipalities", section "Employment and Wages", the indicator is the wage fund of all employees of organizations (by type of economic activity).

Accordingly, to find the relationship between these indicators, the following steps were taken:

1) The value-added matrix for the municipalities of Yamal by type of economic activity for 2019 is calculated. It is then used to determine the changes in the structure of economic activity. To calculate the scenarios, various coefficients are used for basic industries (mining, construction) and for service activities.

2) A database on investments in the real sector and public administration is built. The main production facilities that ensure the growth of investment activity are highlighted. The investment reduction coefficients for the municipalities of Yamal, depending on the selected development scenarios, are calculated.

3) The region's own tax revenue sources are analyzed to show the dependence of the tax base on the volume of revenues. For these purposes, it is possible to use correlation analysis in order to highlight such dependencies.

4) The scenarios are aligned with the key parameters such as natural gas production, value added, household income, income tax payments, etc.

5) Calculations are made according to selected scenarios, determining the likely consequences depending on the intensity of sanctions, determining the main parameters of economic development.

The economic development of any territory can be described on the basis of a wide range of indicators. In our opinion, the proposed macro-indicators reflect the functional shifts in the regional and municipal economy, showing the direction and depth of economic entities' reaction to sanctions.

Results

The development strategy of the Yamalo-Nenets Autonomous District until 2035⁵ describes two scenarios of socio-economic development. The inertial scenario is based on the current trends in the development of the region; it assumes a moderate increase in value added in 2035 (112% by 2020). Gas production in this scenario will increase significantly by slightly more than 30%, while at the same time, a decrease in the number of people employed in the economy from 418 to 377.7 thousand people is predicted. The target scenario, adopted as the main one, assumes a 130% increase in GRP, an increase in gas production from 535 to 697.8 billion cubic meters and maintaining employment at the 2020 level by 2035.

If we look at the key infrastructure projects described in the Strategy until 2035, it will be seen that in various scenarios the list does not change, only the implementation dates are shifted. Significant delays in the implementation of projects are observed only in 5 out of 31 objects (mainly,

⁵ Strategy for socio-economic development of the Yamalo-Nenets Autonomous District for the period up to 2035. Approved by the Decree of the Legislative Assembly of the Yamalo-Nenets Autonomous District dated June 24, 2021 No. 478. <https://docs.cntd.ru/document/574785875/titles/3HJAKIN>

these are the most promising areas such as the development of complex hydrocarbon deposits, the construction of the Northern Latitudinal Railway, planning of new roads); for the rest, the delays are fairly insignificant – only 2–3 years.

Taking into account the possible effects of the sanctions on Yamal’s key projects and exports, we formulated three main scenarios:

1. The “inertial” scenario of the economic development of Yamal included in the official strategy. The scenario is based on the assumption that the sanctions will be lifted in the foreseeable future or that the suppliers of equipment will be gradually replaced and companies will find new markets for their products. In this scenario, the key projects will be implemented with a delay while new project will be postponed for an indefinite period.

2. The “negative” scenario of economic development assumes long-term sanctions that will hamper the realization of the current projects to develop Arctic deposits. However, the sender

states do not impose restrictions on the sale of natural gas and oil, allowing the region to maintain the current level of production through supporting investments.

3. A “catastrophic” option for the economic development of the region, which implies a total ban on both the supply and maintenance of equipment for the oil and gas sector, and the refusal of a significant number of consumers to purchase products from the Yamal oil and gas manufacturers. This scenario appears to be less likely due to a large number of restrictions, but it represents the worst case scenario for the economy of Yamal.

The structure of Yamal’s GRP is characterized by a high share of mining (2.2 out of 3.1 trillion rubles in 2019). Other important sectors also include construction (8.5% of GRP), manufacturing and transport (less than 5%), however, these industries, for the most part, are complementary to the mining industry. As can be seen from Figure 1, the main added value is in Purovsky district,

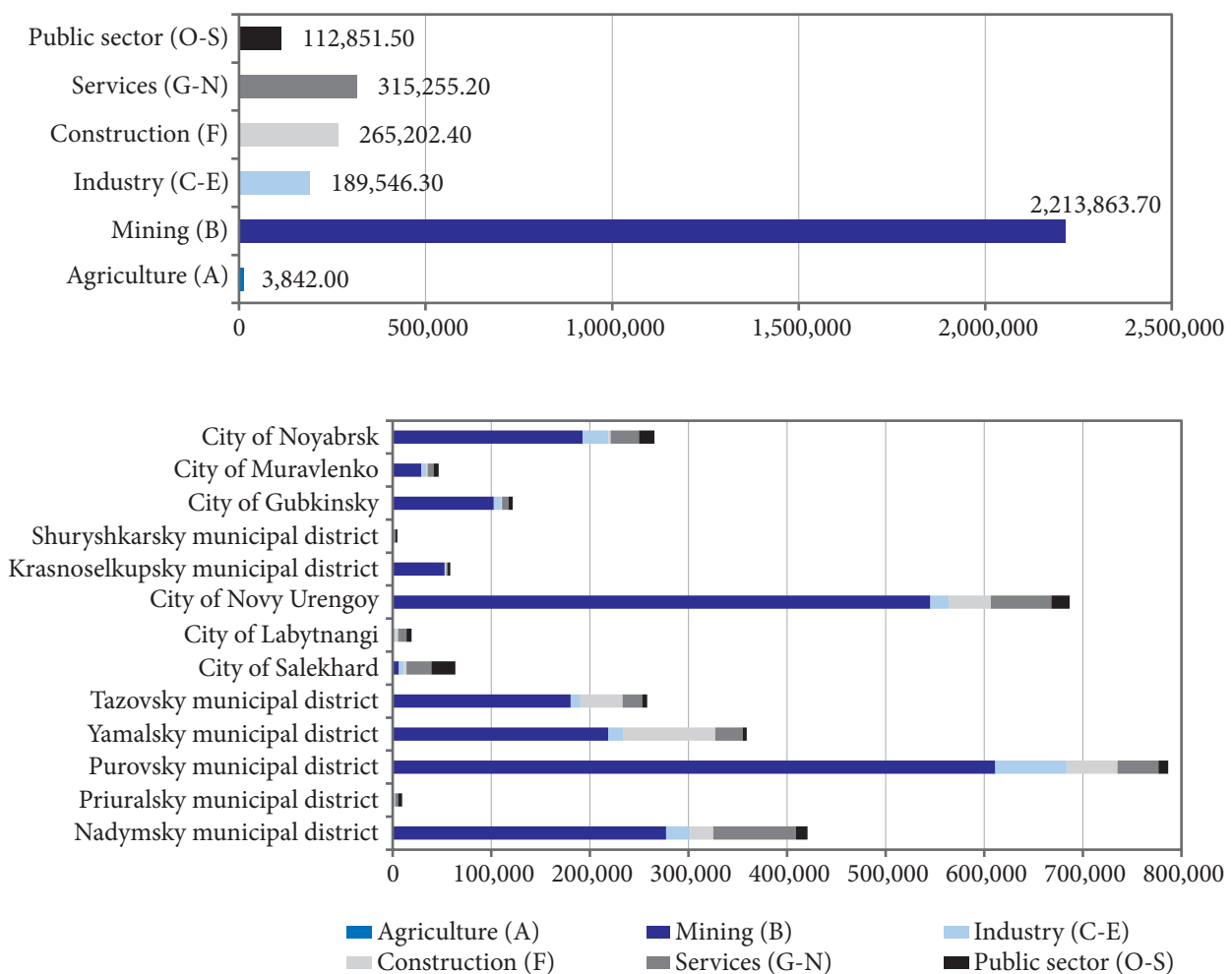


Figure 1. Structure of value added in the YNAD and its municipalities, 2019, million rubles
 Source: the author’s calculations are based on Rosstat data

Novy Urengoy and Nadymsky district, where old mining areas are located. The share of the gross product of new development areas (Yamalsky and Tazovsky districts) in 2019 was about 13%.

To predict the change in value added under the proposed scenarios, 2020 is used as the base year, and 2025 is used as the forecast year (based on the data provided in the YNAD 2035 Strategy) (see Fig. 2). The inertial scenario assumes a slight increase due to the delayed implementation of new projects, the negative one is based on the planned decline in oil production (no more than 20 billion cubic meters). The catastrophic scenario takes into account a proportional decrease in production by the value of exports to foreign countries (based on Reuter's⁶ data, according to our estimates, about 150 out of 535 bcm). The value added of complementary industries was calculated based on the investment forecast.

According to our calculations, the high investment activity of the YNAD's enterprises is based on the implementation of large projects in Yamal and Taz districts (see Fig. 3). On average, these districts accounted for more than half of all investments in the YNAD in 2013–2019, ranging from 70% in 2016 to 24% in 2013. Based on this, we conclude that "supporting" investment to maintain the current level of production in Yamal should be about RUB 400 billion (the basis for a negative scenario). In a catastrophic scenario,

⁶ Reuters TABLE-Gazprom Export by Country. May 17, 2021. <https://www.reuters.com/article/russia-gas-export-europe-idRUL5N2N41X5> (Accessed: 15.06.2022).

we estimate that enterprises will invest about RUB 200 billion to replace only essential equipment.

The consolidated budget of Yamal is based on three major sources of revenue: the corporate income tax, corporate property tax, and personal income tax (Fig. 4). We do not expect any significant changes in the property tax dynamics under the negative scenarios, since the tax base is rather conservative. As can be seen from Fig. 4, the most volatile source of income for the regional government is the corporate income tax, which has changed almost three times over five years. In order to predict the dynamics of revenues from this tax, we correlated it with three main financial parameters of the gas complex: the volume of natural gas production, the average annual selling price in foreign markets, and the net profit for Gazprom group (a key company in Yamal) (Fig. 1). The highest correlation is found between the income tax receipts and the volume of natural gas production (correlation coefficient of more than 0.9). The weaker dependence on other parameters of Gazprom's activity can be explained by the specifics of corporate financial flows where most of the profit is consolidated at the company's head office in St. Petersburg (Table 1).

With this in mind, the implementation of scenarios which imply reduced natural gas production will lead to a proportional reduction in income tax deductions to the YNAD's regional budget, and a sharper reduction in the tax base from sales in foreign markets will be at the place of the parent company's registration.

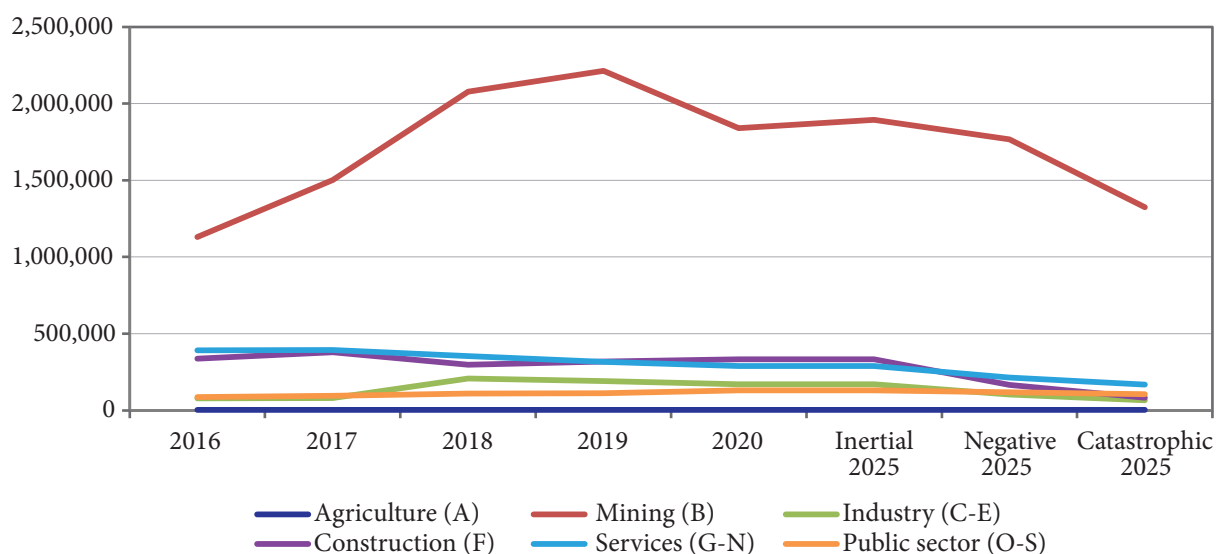


Figure 2. Value added by type of economic activity in the YNAD, million rubles

Source: the author's calculations are based on Rosstat data

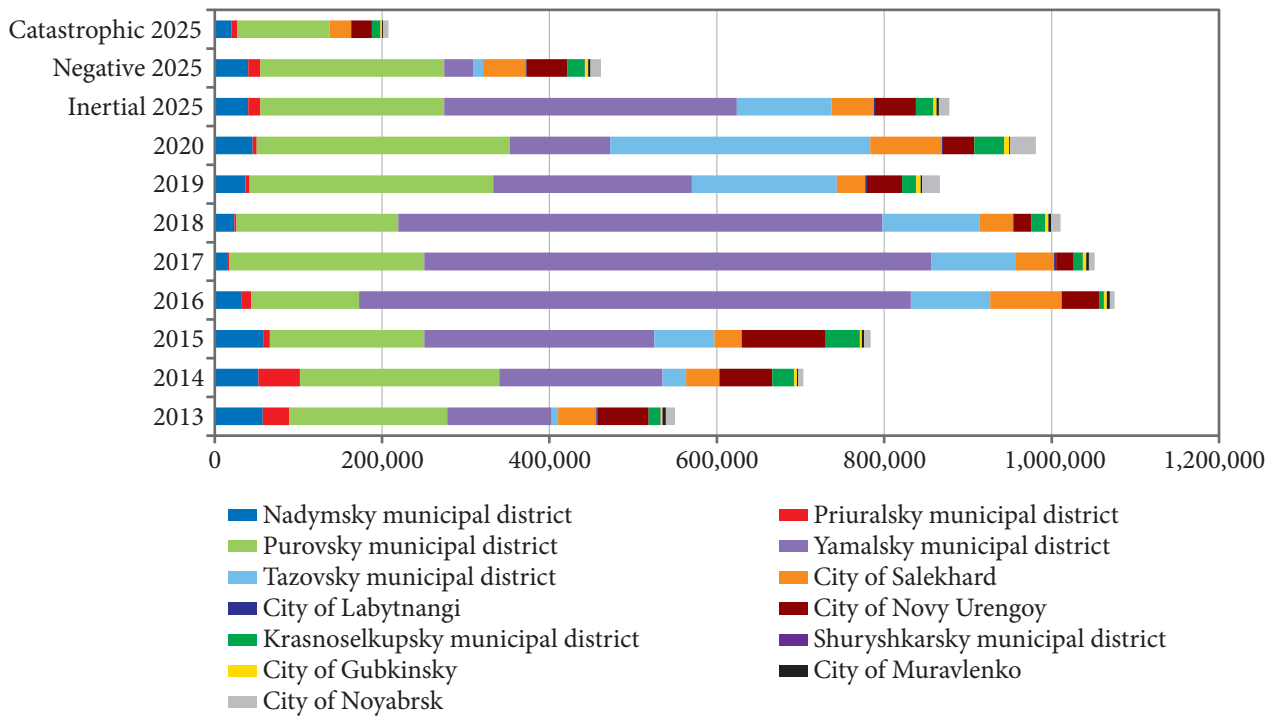


Figure 3. Investment by municipalities of the YNAD, mln rub
 Source: the author’s calculations are based on Rosstat data

Table 1

Correlation matrix

	Average annual price of Gazprom natural gas in foreign markets, \$	Annual net profit of Gazprom Group, RUB mln	Volume of natural gas production of Gazprom group, bcm	YNAD corporate income tax, RUB mln
Average annual price of Gazprom natural gas in foreign markets, \$	1			
Annual net profit of Gazprom Group, RUB mln	0.913682527	1		
Volume of natural gas production of Gazprom group, bcm	0.716308398	0.512333993	1	
YNAD corporate income tax, RUB mln	0.579597557	0.533327556	0.903786565	1

Source: the author’s calculations

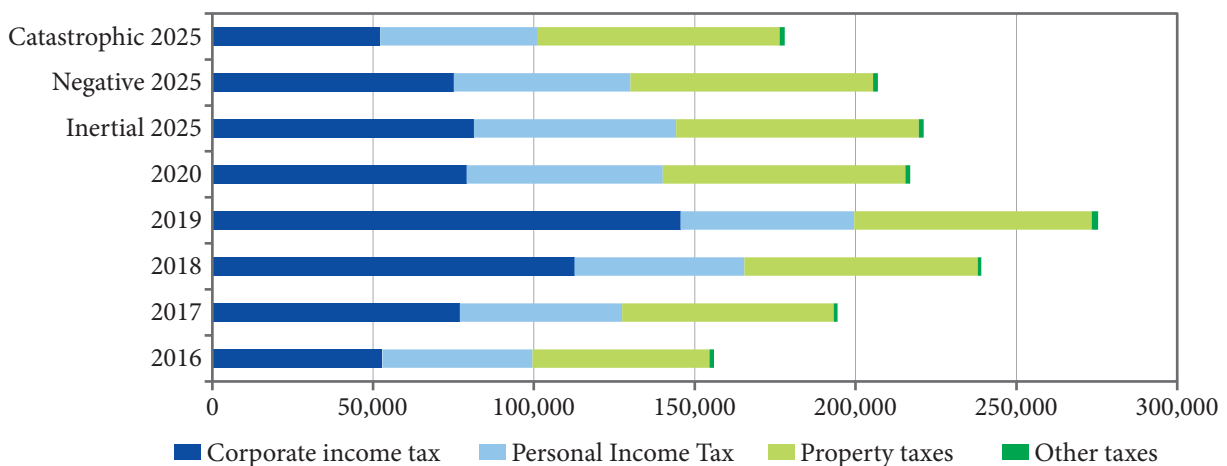


Figure 4. Tax revenues of the YNAD budget, RUB mln

Source: the author’s calculations are based on the data of the Ministry of Finance and Federal Tax Service

The dynamics of receipts from the personal income tax of the region’s consolidated budget depends on the forecast data of another key indicator – employment-related income. Figure 5 shows the results of calculating the structure of wages by municipalities and types of activity in Yamal, based on Rosstat data. It can be seen that three municipalities (Purovsky and Nadymsky districts, the city of Novy Urengoy) account for the largest proportion of accrued wages while the areas of new development (Tazovsky and Yamal districts) for a little more than 10%. Mining accounts for a third of employment-related income; 20% of wages are earned in construction and transport. At the same time, wages in the construction sector in the Yamal district account for about a third of the entire YNAD.

In Yamal’s oil and gas industry, a considerable part of work is organized on a rotational basis. In 2018–2020, there was on average 100 thousand people of rotation staff or almost 25% of the to-

tal number of people employed in the economy (Loginov et al., 2020). Our calculations show that in the Yamal district, the wage fund attributable to rotation workers accounts for about 78% of all receipts, in Tazovsky district – 44%, Novy Urengoy – 39%, Noyabrsk – 12.8%.

Thus, in the negative scenario, companies’ primary reaction will be to stop attracting labor from other regions. In the negative scenario that there will be a loss of approximately 40,000 jobs, and, accordingly, a 10% decrease in budget revenues from the personal income tax. In a catastrophic scenario, taking into account the decline in employment in the investment and service industries and the inevitable loss of jobs in the southern regions of Yamal, we can cautiously assume a reduction of about 80 thousand jobs.

Table 2 shows the data calculated for the main economic indicators of Yamal under various scenarios.

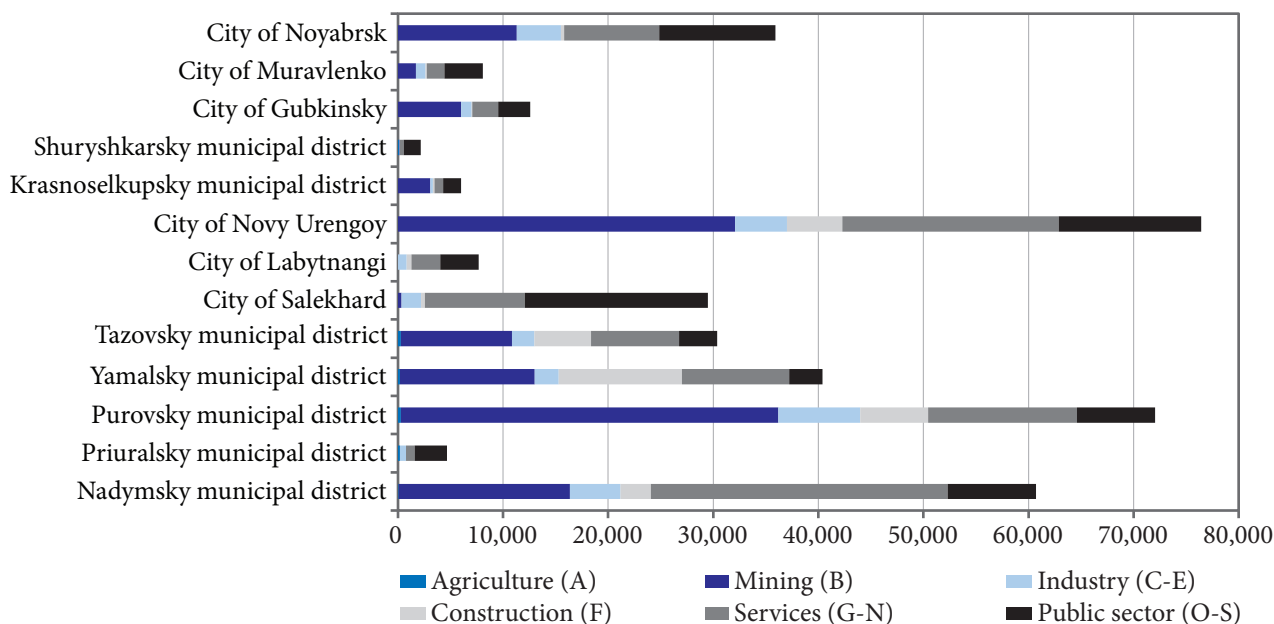


Figure 5. The structure of the accrued wages of the municipalities in the YNAO by type of activity, 2019, RUB mln

Source: the author’s calculations are based on Rosstat data

Table 2

The main indicators of the YNAD’s economic development under various scenarios

Scenarios	GRP, RUB mln.	Investments, RUB mln.	Own income cons. budget, RUB mln.	Number of employees, ths people
Actual data, 2020	2,768.2	980.9	217.0	418
Inertial, 2025	2,823.4	877.7	221.2	425.6
Negative, 2025	2,372.3	461.6	206.9	378
Catastrophic, 2025	1,751.9	207.7	177.9	338

Source: the author’s calculations are based on the data of Rosstat and the Ministry of Finance

Conclusions

The proposed approach to building scenarios of regional economic development showed that we can identify structural shifts and the main characteristics of economic development of individual regions and their municipalities by changing the key parameters. As a result, the study of the impact of the sanctions regime on the YNAD's economic development has led us to the following conclusions:

1. The most painful restrictions for the YNAD's economy were the restrictions on the supply of high-tech equipment, which is necessary for the development of new fields in the Arctic. This can severely limit the ability of corporations to replace and increase declining production at old fields, which in the medium term will lead to a slowdown in development.

2. Since a significant part of the produced natural gas (operator – Gazprom) is used for domestic consumption, restrictions on supplies to foreign markets will not lead to a landslide decline in the economy of Yamal, but will seriously affect the formation of added value, and as a result, have

a negative impact on budget indicators and reduce the number of workplaces.

3. The deterioration in the investment activity of corporations will hit the labor market most severely, primarily rotation workers. Regional and local governments, as in previous crises, will be forced to limit the use of the rotational method to protect the resident population. In any case, the decrease in the number of jobs and the resulting competition of labor resources will be detrimental to the local standards of living.

4. Due to the existing system of redistribution of tax payments, the consolidated budget of the region will suffer the least. However, a decrease in revenues will limit the budget's ability to implement infrastructure projects, which in turn will lead to a slowdown in economic development.

In general, the sanctions will not have a dramatic impact on the medium-term development of Yamal. However, in the long term, we expect a steady decline in the economic indicators, especially in the Arctic territories.

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