

# Environmental economy as the basis for sustainable development of the Arctic regions of Russia

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**Abstract**—The problems of ensuring an environmental economy with the sustainable development of the Arctic regions of Russia are considered. Studies of the impact of environmental economy on the sustainable development of the Arctic regions showed a negative impact of industrial activity. In the Arctic regions air pollutant emissions in average increased by 2.7%. The changes in the sphere of environmental economy are achieved within the framework of close attention to the environment and the adoption of a large number of regulatory and strategic documents aimed at environmental planning and management of business technologies for the sustainable development of territories. It is shown that despite the full implementation of environmental protection activities the main environmental indicators have been changed slightly. The proposals to improve the environmental economy and the sustainable development of the Arctic regions of Russia have been developed.

**Keywords**—sustainable development, efficiency, environmental economy, Arctic, region, enterprise.

## I. INTRODUCTION

Industrial activities related to the mineral resources exploitation influences directly sustainable development, including environmental safety. Industrial activities are influenced by environmental economy, which also provides for efficient management of the economic and ecological system. Unsustainable consumption of non-renewable natural resources results in the negative environmental impact, and additional environmental costs.

The relevance of environmental economy of the Russian Arctic regions is caused by a number of aspects including increased production costs and life support, uncertainty of the economy and the need to minimize man-made impact on the vulnerable Arctic environment.

It should be noted that the leading countries implement the concept of transition to environmentally efficient economic development, which is considered as socio-economic growth with meeting the needs of the current generation provided the environmental restrictions to ensure the livelihood of future generations [1].

## II. MATERIALS AND METHODS

Global environmental and economic challenges associated with climate change, pollution of air, surface and

groundwater as well as the marine environment, damage from natural and man-made disasters recently have been significantly increased. These and other factors determine the need to ensure environmental economy under sustainable development of the Arctic and the Russian Federation.

Environmental activities in the Arctic are carried out in accordance with the Constitution, federal and regional laws and other governmental documents. The Russian Federation is a party to the main international conventions and agreements on environmental protection, which take precedence over the Russian legislation that is guaranteed by the country's Constitution and federal legal acts [2, 3].

Efficient environmental economy is the basis for sustainable development of the Arctic territories to meet the needs of the present and future generations and to ensure environmental safety [4].

Environmental economy of the Arctic regions of Russia is characterized by a high level of man-made impact on the environment and significant negative consequences of economic activities [5, 6]. In this regard development of objective indicators and methods of environmental economy for making science-based management decisions and ensuring sustainable development in the long term becomes relevant.

Currently in Russia the scientific community pays much attention to environmental issues [7-13]. However, scientists and specialists pay insufficient attention to the objective assessment of the environmental economy as a factor of sustainable development of the Arctic regions of Russia.

## III. RESULTS

### A. Analysis of the environmental economic indicators of the Arctic regions of Russia

In order to determine the impact of economic and industrial activities on the state of the environmental economy of the regions completely related to the Arctic zone of the Russian Federation [14] a comparative analysis of the impact of industrial development on the environmental economy of the Arctic regions using a correlation coefficient was carried out (Table 1).

TABLE I. CORRELATION COEFFICIENT OF THE GROSS REGIONAL PRODUCT AND THE POLLUTANT EMISSIONS VOLUME

	2013	2014	2015	2016	2017
Correlation coefficient of the gross regional product and the pollutant emissions volume	0.99	0.95	0.97	0.99	0.99

Correlation coefficient for Arctic regions ranges from 0.95 to 0.99 that characterizes the presence of the close relationship between industrial development and negative impact on environmental economy.

Another important indicator of the sustainable development is the environmental friendliness of production, which determines the ratio of the gross regional product to pollutant emissions (Fig. 1).

It should be noted that environmental friendliness of production of the Arctic regions is lower than in the Russian Federation that also determines the increased negative impact of economic activities on environmental economy and, consequently, it is a limitation for sustainable development.

The analysis showed that the industrial development of the Arctic regions has a negative impact on the environmental economy. In the Arctic regions air pollutant emissions in average increased by 2.7%. These changes in environmental economy sphere are achieved within the framework of the close attention to the environment and the adoption of a large number of regulatory and strategic documents aimed at environmental planning and management of business technologies for sustainable development of territories.

### B. Analysis of the environmental economy indicators of the Arctic corporations

Given the financial restrictions and impact of the western sanctions industrial Arctic enterprises can use mainly their own funds to implement innovative projects. An assessment of the financial capabilities of Arctic enterprises on the basis of the methodology of N.L. Gracheva and A.Yu. Anisimov was carried out [15]. As a result of the research it was shown that out of the thirteen large mining enterprises in the Arctic only JSC Kola MMC has the necessary financial support and appropriate basis for planning, managing and implementing innovative projects in the environmental sphere including sufficient solvency, stable profit and a positive net working capital. For the rest 13 enterprises the transition to innovative development is impossible without additional investments. [16].

Analysis of the costs for the developed and implemented environmental protection activities as well as their effectiveness on the example of PJSC “NOVATEK”, PJSC “Nornickel” and PJSC “ALROSA” who publicly provided relevant reports for the last five years was carried out.

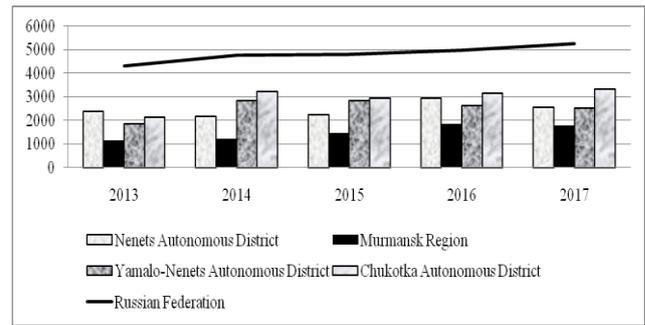


Fig. 1. Environmental friendliness of production of the Arctic regions compared to the Russian Federation

PJSC “NOVATEK” shows the growth of key indicators in the sphere of environmental protection and a corresponding increase in their costs (Fig. 2).

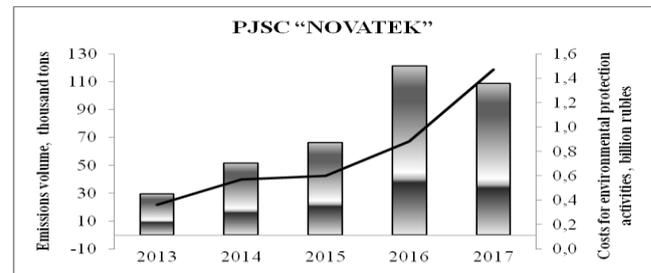


Fig. 2. Main environmental indicators and expenditures, PJSC “NOVATEK” [17]

According to the results of the analysis the costs for environmental protection activities grow more rapidly than environmental pollution indicators. The company explains this situation mainly by an increase in construction volumes, commissioning of new facilities and an increase in production volumes.

Environmental indicators of PJSC “Nornickel” are characterized by multidirectional dynamics (Fig. 3).

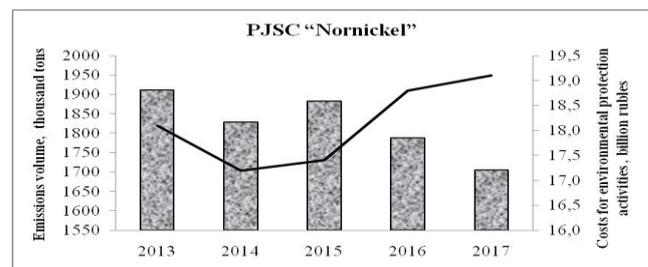


Fig. 3. Main environmental indicators and expenditures, PJSC “Nornickel” [18]

PJSC “Nornickel” shows the costs increase for environmental protection activities mainly due to the closure of the Nickel Plant, transition to the briquetting technology at JSC Kola MMC as the main reason for reducing emissions to the atmosphere and construction of wastewater treatment plants and waste disposal facilities.

Environmental indicators of PJSC “ALROSA” are also characterized by multidirectional dynamics (Fig. 4).

PJSC “ALROSA” shows the reduction of emissions into the atmosphere and the formation of waste what is explained by the introduction of new technologies for the construction

of quarries, the block cave-in of rocks by the underground method of ore mining and the carrying out of drilling and blasting operations. Costs for environmental protection activities have also been decreased.

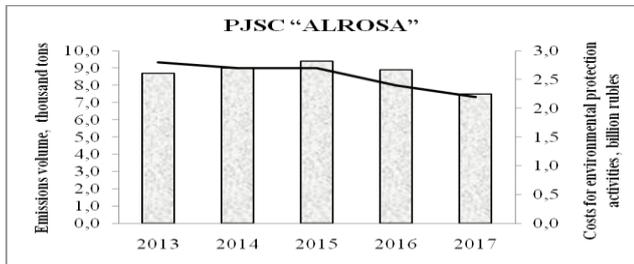


Fig. 4. Main environmental indicators and expenditures, PJSC "ALROSA" [19]

As a result of the analysis it was determined that despite the full implementation of environmental protection activities the main environmental indicators have been changed slightly.

#### IV. CONCLUSIONS

Studies of the impact of environmental economy on the sustainable development of the Arctic regions of Russia have showed a negative impact of industrial activity. Atmospheric pollutant emissions have been increased by an average of 2.7% in the Arctic regions. These changes in the sphere of environmental economy are achieved within the framework of close attention to the environment and the adoption of a large number of regulatory and strategic documents aimed at environmental planning and management of business technologies for the sustainable development of territories.

It is shown that despite the full implementation of environmental protection activities the main indicators of the Arctic enterprises in the sphere of environmental protection have been changed slightly.

Following proposals to improve the environmental economy and the sustainable development of the Arctic regions of Russia have been developed:

- improvement of the regulatory framework in the direction of ensuring the functioning of an effective system of rationing the negative impact on the environment;
- conducting research and development aimed at improving environment quality and ensuring environmental safety;
- development of economic incentives to reduce negative man-made impact;
- increase of the subsidies availability or other financial incentives aimed at implementing developed environmental innovations;
- increase of the competitiveness and reduce of the production cost;
- complex and deep processing of mineral raw materials and production waste.

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