Environmental management and economics of the Arctic Region

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Abstract. In the paper, the goals, priorities and objectives of the environmental safety planning and management in the Arctic are formulated. Pollutant emission dynamics in the Arctic regions for the period 2013-2017 and implementation of target indicators stipulated by the state program "Environmental Protection" are considered. The analysis of influence of performance of the major Arctic companies mainly developing mineral resources on environmental pollution during the period under consideration is carried out. It is shown that despite environmental finances and fully implemented environmental activities, the main environmental indicators practically have not improved. The proposals to improve the management of the environmental and economic system of the Arctic for sustainable development of the region are presented.

1 Introduction

Industrial activities mainly related to development of mineral resources directly influence sustainable urban development, including environmental safety. Environmental economics, which provides for efficient management of the economic and ecological system, in turn, also influences industrial activities. Unsustainable consumption of non-renewable natural resources leads to their depletion, negative environmental impact, and additional environmental finances.

The relevance of environmental development of the Arctic is caused by a number of aspects including increased costs of production and life support of the population, uncertainty of the economic situation, and the need to minimize man-made impact on the particularly vulnerable environment of the North.

In accordance with the methodological recommendations of the Federal State Statistics Service of the Russian Federation (Rosstat) accounting of environmental costs in financial results of performance (green accounting) includes expenditures of companies (organizations, institutions), individual entrepreneurs, the state (budgets of the Russian Federation, its regions and municipalities) having a designated environmental purpose carried out at the expense of all sources of funding [1].

As part of environmental finances companies do not count:

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- costs of activities that have a positive environmental effect but implemented outside the framework and objectives of environmental protection and carried out mainly in order to reduce the cost of fuels, raw materials, overall reduction of production costs or to provide related services, improve product quality, obtain by-products, produce ecological products, health protection, improvement of working conditions and safety;
- natural resource use costs;
- depreciation charges and the cost of fixed capital;
- payments for negative impact, for exploitation of natural resources, fines for violation of environmental legislation, compensation for damage to the environment, compensation received from third parties since they are not directly related to environmental activities.

It should be noted that the leading world countries implement the concept of transition to environmentally sustainable economic development, which is understood as socio-economic growth in which needs of the current generation are met with the environmental restrictions necessary to ensure the livelihood of future generations [2].

2 Materials and Methods

Recently global environmental and economic challenges associated with climate change, damage from natural and man-made disasters, pollution of air, surface and groundwater as well as the marine environment increased significantly. These and other factors determine the need to ensure environmental safety during the modernization and innovative development of the economy 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. [3, 4].

The strategic goal of managing the environmental and economic system of the Arctic is to solve tasks that ensure preservation of a favorable environment and natural resources to meet needs of the present and future generations and ensure environmental safety [5].

The main priorities of the state policy of the Russian Federation in the field of environmental development in the Arctic are: implementation of national interests and research projects, creation of an infrastructure for environmental pollution monitoring system, taking into account the norms and principles of international law.

Implementation of environmental planning, management and safety in the Arctic is ensured by solving the following main tasks:

- formation of an efficient system involving interactions and coordination of the activities of public authorities;
- scientifically substantiated combination of environmental, economic and social interests of individuals, the society and the state for sustainable development of the macroregion;
- establishing scientifically based environmental norms and requirements;
- improvement of regulatory support;
- ensuring safe waste management;
- development of international cooperation.

It becomes relevant to consider the modern methodology of environmental economics in order to make science-based management decisions and ensure sustainable development of the Arctic in the long term [6, 7].

3 Results

3.1. Analysis of indicators of the Arctic regions' ecological sphere

An analysis of emissions of atmospheric pollutants from regions that are fully related to the Arctic for the period of 2013-2017 in comparison with 2007 and the target indicators stipulated by the state program "Environmental Protection for 2012-2020" (hereinafter the Program) was carried out [8] (fig. 1-4).

The results of the study showed that all regions except the Nenets Autonomous District demonstrate fulfilling the target indicators established by the Program. At the same time the actual emissions of air pollutants increased in the Nenets and Yamalo-Nenets Autonomous Districts. In the Murmansk region and Chukotka Autonomous District there was a slight decrease.

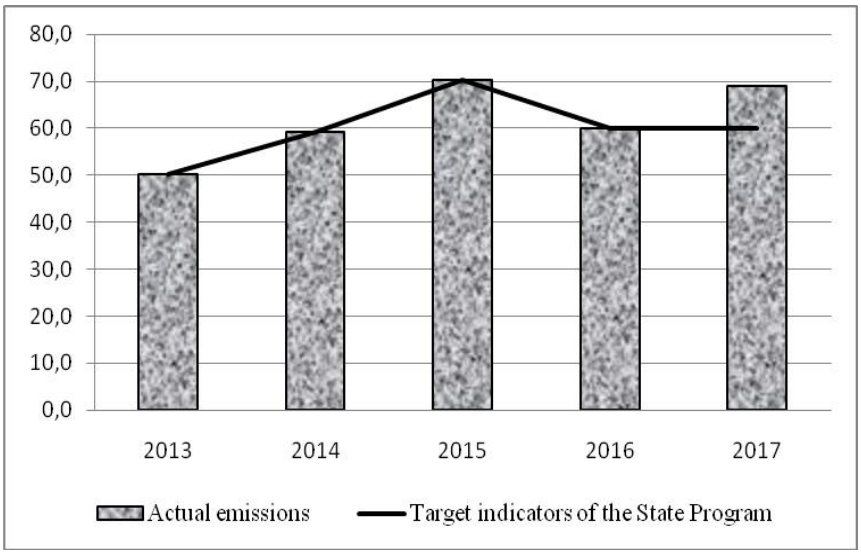

Fig. 1. Air emissions in relation to 2007 in the Nenets Autonomous District [9, 8].

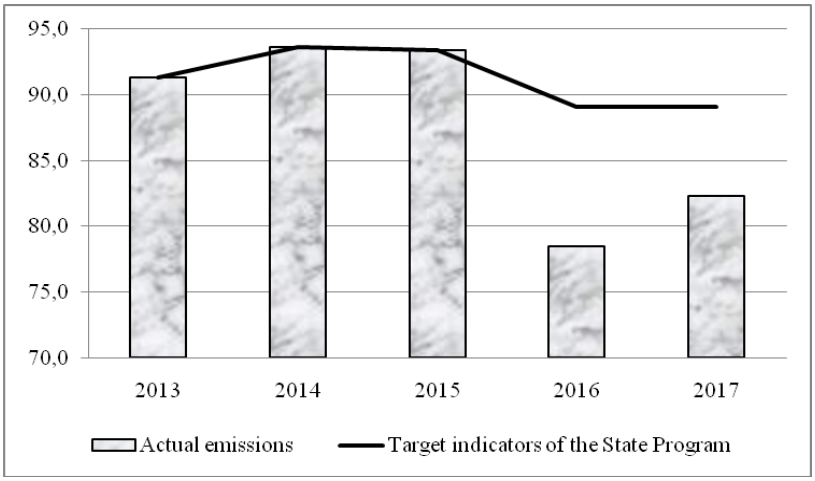

Fig. 2. Air emissions in relation to 2007 in the Murmansk region [9, 8].

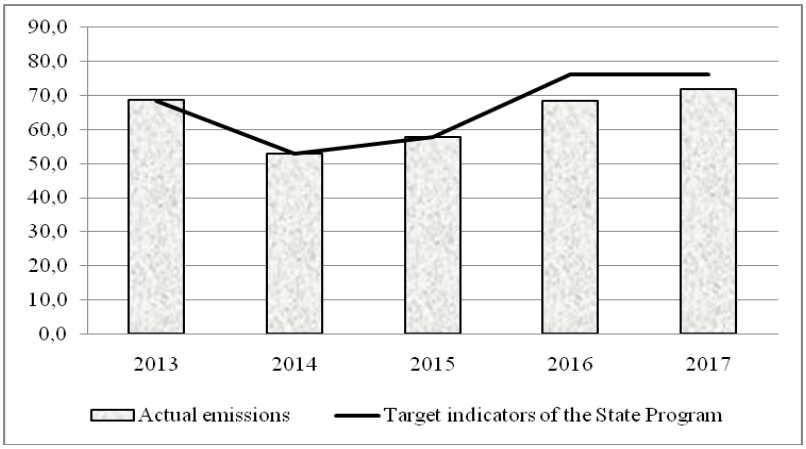

Fig. 3. Air emissions in relation to 2007 in the Yamalo-Nenets Autonomous District [9, 8].

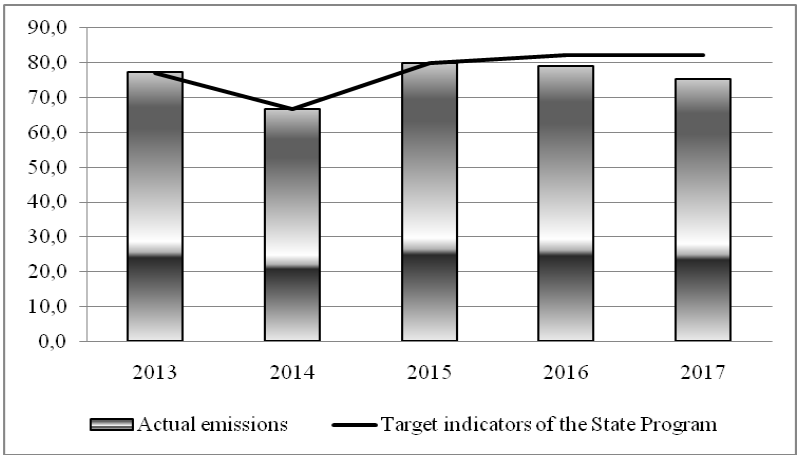

Fig. 4. Air emissions in relation to 2007 in the Chukotka Autonomous District [9, 8].

Indicators of the specific weight of captured and neutralized air pollutants in the total amount of pollutants in the regions are considered.

In the Murmansk region and the Chukotka Autonomous District there is a slight decrease of the specific weight of captured and neutralized air pollutants and accordingly the failure to fulfill target indicators (table 1).

Table 1. Share of captured and neutralized air pollutants in the total amount of outgoing pollutants, percent [9].

	2013	**2014**	**2015**	**2016**	**2017**
Nenets Autonomous District	6.8	8.7	10.6	9.4	11.0
Murmansk region	85.8	86.7	86.6	88.8	84.8
Yamalo-Nenets Autonomous District	0.0	0.1	0.1	0.0	0.0
Chukotka Autonomous District	59.5	60.2	58.8	55.1	56.3

Indicator of the Arctic regions' ecological sphere on discharge of polluted wastewater into surface water bodies for the period under consideration was investigated (table 2).

Table 2. Discharge of polluted wastewater to surface water bodies, million cubic meters [9].

	2013	**2014**	**2015**	**2016**	**2017**

Nenets Autonomous District	0.1	0.0	0.0	0.4	0.3
Murmansk region	334.0	331.0	328.0	312.0	318.0
Yamalo-Nenets Autonomous District	25.0	22.0	23.0	32.0	31.0
Chukotka Autonomous District	5.0	5.0	4.0	3.0	3.0

In the Nenets Autonomous District volume of wastewater discharges increased 2 times, in the Yamalo-Nenetsky District - by 24%, in the Murmansk Region and the Chukotka Autonomous Region wastewater discharge decreased by 5% and 40%, respectively.

Despite serious environmental expenditures from the budgets of various levels and adopted regulatory acts, the main indicators of the ecological sphere in the Arctic regions have not improved. Thus emissions of pollutants into the atmosphere increased by 2.7%, share of captured and neutralized air pollutants remained practically unchanged, and wastewater discharge decreased by 3%.

3.2. Analysis of the environmental economy indicators of the Arctic corporations

Since 2014 sanctions have been imposed on the transfer of technologies for exploration and production of Russian oil on the Arctic shelf that, consequently, leads to restriction in debt financing, reduction of production cooperation and foreign investments levels, an embargo on access to high technologies [10].

Research has shown [11] that under such conditions Arctic industrial companies when developing and implementing projects can rely primarily on their own funds. For example out of thirteen large companies in the Arctic only JSC “Kola MMC” has the necessary financial support and appropriate base for planning, managing and implementing innovative projects in the ecological sphere, including sufficient solvency, stable profits, and positive value of net working capital.

Analysis of the expenditures for developed and implemented environmental protection measures as well as their efficiency for the period 2013-2017 on the example of large Arctic companies that publicly provide relevant reports was performed.

Expenditures of PJSC NOVATEK for environmental protection and its efficiency are presented in Table 3.

Table 3. Main environmental indicators and expenditures, PJSC NOVATEK [12].

	2013	**2014**	**2015**	**2016**	**2017**
Air emissions, thousand tons	29.4	51.5	66.2	121.2	108.9
Wastewater discharge, million cubic meters	0.82	0.88	1.27	2.01	2.54
Waste generation, million tons	0.018	0.041	0.042	0.050	0.047
Environmental expenditures, billion rubles (in comparable prices)	0.36	0.57	0.60	0.88	1.47

According to the results of the analysis expenditures on environmental protection measures are growing at a higher rate than environmental pollution indicators. Thus the expenditures of PJSC “NOVATEK” have increased by 4 times. Air emissions have increased by 3 times, wastewater discharge - by 2 times, waste generation - by 2.7 times.

Expenditures of PJSC “Severstal” Resources for environmental protection and its effectiveness are presented in Table 4.

Table 4. Main environmental indicators and expenditures, PJSC “Severstal Resources” [13].

	2013	**2014**	**2015**	**2016**	**2017**
Air emissions, thousand tons	198	195	215	221	205

Wastewater discharge, million cubic meters	0.038	0.036	0.040	0.055	0.063
Waste generation, million tons	220	185	178	185	190
Environmental expenditures, billion rubles (in comparable prices)	1.41	1.29	1.20	1.07	1.11

PJSC "Severstal Resources" air emissions have increased by 3.5%, wastewater discharge - by 66%. There was a reduction in waste generation by 13%. Expenditures on environmental measures have decreased by 21.3%.

Expenditures of PJSC "Norilskiy Nickel for environmental protection and its efficiency are presented in Table 5.

Table 5. Main environmental indicators and expenditures, PJSC "Norilskiy Nickel" [14].

	2013	**2014**	**2015**	**2016**	**2017**
Air emissions, thousand tons	2097	2008	2064	1937	1847
Wastewater discharge, million cubic meters	146	146	140	144	148
Waste generation, million tons	40	35	34	33	32
Environmental expenditures, billion rubles (in comparable prices)	18.1	17.2	17.4	18.8	19.1

PJSC "Norilskiy Nickel" shows an increase in expenditures on environmental protection by 5.5%. Air emissions and waste generation have decreased by 11.9% and 20%, respectively, while wastewater discharge has increased by 1.4%.

Expenditures of JSC "Apatit" for environmental protection and its efficiency are presented in Table 6.

Table 6. Main environmental indicators and expenditures, JSC "Apatit" [15].

	2013	**2014**	**2015**	**2016**	**2017**
Air emissions , thousand tons	12.4	12.3	11.2	9.9	11.1
Wastewater discharge, million cubic meters	165.0	175.1	178.6	189.0	199.7
Waste generation, million tons	86.6	70.0	77.8	84.5	79.6
Environmental expenditures, billion rubles (in comparable prices)	0.18	0.54	0.69	0.71	1.00

At JSC "Apatit" (PJSC" PhosAgro") there was a reduction in air emissions by 10% and waste generation by 8%. Wastewater discharge has increased by 21%. Expenditures on environmental protection showed an increase of 5.5 times.

Expenditures of PJSC "ALROSA" for environmental protection and its effectiveness are presented in Table 7.

Table 7. Main environmental indicators and expenditures, PJSC "ALROSA" [16].

	2013	**2014**	**2015**	**2016**	**2017**
Air emissions , thousand tons	8.7	9.0	9.4	8.9	7.5
Wastewater discharge, million cubic meters	15.4	14.5	12.7	11.8	0.6
Waste generation, million tons	82.8	90.7	82.6	65.2	67.7
Environmental expenditures, billion rubles (in comparable prices)	2.8	2.7	2.7	2.4	2.2

PJSC "ALROSA" showed a decline in all indicators. Thus emissions into the atmosphere decreased by 13.8%, wastewater discharge — by 96%, waste generation — by 18.2%. Expenditures on environmental measures decreased by 20.6%.

As an analysis result of the impact of the main Arctic mineral-based companies' activities on environmental pollution during the period under consideration it can be stated that despite the significant environmental finances of companies and fully implemented

environmental protection measures the main indicators of environmental protection have hardly improved.

4 Discussion

Environmental protection is a complex problem that can only be solved by joint efforts of specialists from various industries and authorities. Justification of the cost of environmental protection measures is one of the most important tasks for solving which a quantitative assessment of economic damage is needed.

It is necessary to revise the system of rationing negative influence on the environment. Currently economic stimulation for companies is insufficient since fines for violating the environmental legislation are an order of magnitude lower than the required costs for developing environmental innovation projects.

Integrated basic and applied research is needed to develop environmental innovations aimed at improving the quality of the environment and ensuring that the negative influence on the ecosystem is reduced. It is needed to strengthen planning and management of environmental protection and ensuring environmental safety in the Arctic, continuously improving environmental policies at the macro, meso and micro levels as well as organizing accounting of environmental costs in the financial results of the company.

Managing the Arctic environmental and economic system for sustainable development and meeting the needs of the current and future generations requires implementation of a set of measures, the main of which are:

– improvement of the regulatory framework towards ensuring the functioning of an efficient system of rationing the negative influence on the environment;
– development of measures of economic stimulating to reduce the negative man-made influence;
– conducting research and development aimed at improving quality of the environment and ensuring environmental safety;
– increasing the availability of subsidies or other financial incentives aimed at implementing developed environmental innovations;
– increasing competitiveness and reducing production costs;
– complex and deep processing of mineral raw materials, maximum use of recycled water and production waste.

5 Conclusions

It is determined that despite the significant expenditures of companies and budgets of various levels as well as environmental protection measures being carried out, the main environmental indicators practically have not improved. Managing the environmental and economic system for sustainable development of the Arctic is inefficient. Proposals to improve management of the environmental and economic system of the Arctic for sustainable development and to meet needs of the current and future generations were developed.

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