Production and logistics of goods in the Arctic zone of Russia

R V Fattakhov¹, P V Stroev¹, D E Morkovkin¹, A A Gibadullin² and N I Isaichykova³

¹Financial University under the Government of the Russian Federation, 49, Leningradsky avenue, Moscow, 125993, Russia
²State University of Management, 99, Ryazan Avenue, Moscow, 109542, Russia
³Gomel State Technical University named after P.O. Sukhoi, 48, Prospect Octiabria, Gomel, 246746, Republic of Belarus

E-mail: 11117899@mail.ru

Abstract. The study focuses on the extraction, production, transfer, transportation and storage of goods in the Arctic zone. The issues of ensuring the transportation of goods to the Arctic zone and the movement of extracted goods and services from the Arctic are relevant and necessary for study. The study revealed the main problems that arise in the Arctic after the extraction and transportation of natural resources. Achieving the efficiency of production and transportation of goods and reducing the burden on the environment should be decided at the state level. At the same time, in order to increase the efficiency of production, production, transfer and transportation of goods, a model has been developed that will improve the efficiency of production and transport enterprises in the Arctic zone.

1. Introduction

The problems of preserving biological diversity and the environment in an unchanged state for future generations began to become actual in the last century, under the auspices of which whole countries united and international conferences on sustainable development were held. The Soviet Union tried to adhere to the environmental protection requirements established worldwide and sought to improve national production units to meet environmental requirements [1]. But at the same time, it should be noted that this period of the USSR was marked by the emergence of new industrial enterprises, the creation of innovative technologies and equipment of that time, which, in fact, was the fulfillment of the tasks set at the world level to ensure sustainable development. In this regard, the Soviet Union could be considered a leader in the transition to innovative technologies and the creation of conditions to increase the efficiency of the use of natural resources in industry and everyday life [2–4].

However, with the transition to market relations in of Russia, there have been no processes to switch to innovative and modernized technologies, which lead to the use of equipment that has been commissioned for 40-50 years and has already exhausted its park resource. At the same time, if we compare the volumes of emissions of polluting substances into the atmosphere and the volumes of allocated budgetary allocations, we can state that today there are no positive trends in increasing the volumes of commissioning capacities to protect natural resources and atmospheric air from pollution [5–6]. All this actualizes the issues of improving environmental safety and preserving biological diversity for future generations.
2. Materials and methods
The study examined factors affecting the state of natural resources, biological diversity and atmospheric air, thanks to which it was possible to build a chain of causal relationships that negatively affect the sustainable development of the Arctic.

The goal was set in the study, which is to develop mechanisms for the conservation of biological diversity and the environment in the Arctic zone of Russia. To achieve this goal, the following tasks were formulated:

- Conduct a statistical analysis of the environmental performance of the Arctic;
- Form a factor model for ensuring Arctic security.

The analyzed indicators made it possible to establish an objective picture of maintaining the current state of the natural environment after a temporary anthropogenic interference with the environment. As a result of the study, it was possible to form factors that affect the environmental safety of the Arctic zone of Russia, which, in the opinion of the authors of the study, are manageable and may be subject to further regulation and adjustment at the national and industry levels. The developed mechanisms aimed at preserving the biological diversity of the Arctic zone of Russia made it possible to present organizational and managerial designs for ensuring the ecological safety of the territory.

3. Results
Humankind began to explore new territories in ancient times, when the human population began to form and the process of developing territories was started for a favorable living and existence of a primitive society. During this period, humanity did not even think about the foundation of extreme and inaccessible territories [7-8]. At the end of time, man began to conduct research on the surface of various territories and determine the possibility of their use for humanity. To date humankind together with its state institutions has launched a struggle for the study and development of new territories, which until recently were not even studied, and the use of these territories was not even planned [9].

The Arctic zone of Russia occupies almost 18% of the Earth’s land in Russia, or about 3.1 millions of square kilometers, and shelf and inland seas exceed an area of 4 millions of square kilometers. The Arctic zone has its own characteristics, among which one can distinguish the climatic conditions of the area, remoteness from industrial centers, high dependence on other regions of Russia and a high risk of destruction of nature from emergencies.

The Arctic is most attractive for mining, for example, up to 80% of gas is extracted here, up to 60% of oil and about 97% of diamonds, while about 90% of nickel and cobalt and 60% of copper are produced, and in the Arctic zone about 22% of all Russian exports [10].

At the same time, in recent years, issues of conservation of biological diversity and the natural environment of the Arctic zone have been included in state and regional programs. For example, in 2012, the State Program “Environmental Protection” was adopted, which highlighted the subprogram “Organization and Support of Work and Scientific Research in the Arctic and Antarctic”, which contains directions for maintaining an extensive environmental monitoring system in the Arctic [11-12]. The subprograms provides for budgetary allocations in the amount of 12.4 billion rubles for the period from 2012 to 2020, aimed at eliminating the accumulated damage to the environment of the Arctic zone of Russia [10].

However, it is worth noting that any anthropogenic impact on the environment negatively affects biological diversity and atmospheric air, which, ultimately, leads to a reduction in the population of animals, birds, a decrease in the proportion of greenery, etc. In this regard, we analyze the environmental indicators of the Arctic zone of Russia after human intervention in the natural environment [13-16].

Consider the volume of production in the Arctic zone of Russia (figure 1) [10].

It can be seen from the figure that in the Arctic zone of Russia about 7% of all Russian production is produced, while over the past three years there has been an increase in production. Of course, such a
picture indicates an increase in production capacity in the Arctic and anthropogenic impact on the environment [17-20].

An analysis of indicators directly related to the environment indicates that in 2017 the atmospheric emissions of pollutants emanating from stationary sources in the Arctic zone of Russia amounted to 3 356 thousand tons, in Russia as a whole this indicator amounted to 17 500 thousand tons. In 2016, wastewater discharged without treatment or insufficiently treated in the amount of 662 million cubic meters and in 2017 - 638 million cubic meters, while the volume of generated production and consumption waste amounted to 32 564 thousand tons, of which 18 895 thousand tons were disposed of [10].

**Figure 1.** Shipment of goods of own production, work (services), performed on their own, billion rubles.

Next, we will consider the volumes of disturbed and reclaimed land, since it is precisely during oil and gas production that the land cover is most severely damaged due to well drilling, storage of fuel and lubricants and spare parts, construction of separator stations and tanks, placement of warehouse and administrative buildings (figure 2) [10].

**Figure 2.** Area of disturbed and reclaimed land in 2017, hectares.
It can be seen from the figure that only a third of the land undergoes reclamation after mining and various construction works. Such a situation negatively affects the natural environment and upsets the ecological balance of the Arctic zone of Russia.

Imagine the amount of investment in fixed assets to protect the environment (figure 3) [10].

![Figure 3](image)

**Figure 3.** Imagine the amount of investment in fixed assets to protect the environment of the Arctic zone of Russia, in percent.

Total investment in fixed assets in 2017 and 2018 amounted to 25.9 billion rubles and 26.1 billion rubles respectively. Most of the investments were aimed at protecting and protecting the air, but only about a tenth of them were directed at protecting and rational use of water resources, and only 3% and 1.5% at protecting the soil of the earth.

Consider the volume of costs aimed at preserving natural diversity in the Arctic zone (figure 4) [10].

![Figure 4](image)

**Figure 4.** Costs of protecting the natural environment of the Arctic, billion rubles
However, despite the fact that there is a need to protect nature, including in the Arctic, but its costs differ insignificantly.

4. Discussion
In recent years, capacities and facilities for the protection and rational use of water resources, atmospheric air protection, facilities for the protection and rational use of land, reproduction of fish stocks, utilization and processing of consumption and production waste have been commissioned in the Arctic zone of Russia [21-23].

Thus, in our opinion, it is advisable to create a model that ensures the environmental safety of the Arctic zone of Russia (figure 5) [24-28].

**Figure 5.** Factor model ensuring the conservation of biological diversity and the natural environment of the Arctic.

The presented model will ensure the efficient functioning of energy facilities in the Arctic and preserve the natural environment for future generations.

5. Conclusion
The work is devoted to the analysis of the environmental situation in the Arctic zone of Russia and the development of mechanisms for the conservation of the natural environment of the area. As part of the study, an analysis of the economic activity of the Arctic territories was carried out, which showed that most of the oil and gas of Russia is produced in the Arctic latitudes and various goods are produced on its territory. The analysis of the ecological situation in the Arctic showed that most of the land was not restored after mining, and the recycling of consumption and production waste occurs only in half. The paper proposed a factor model to ensure the environmental safety of the Arctic zone of Russia, based on which mechanisms were developed to preserve the natural environment of this territory.
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