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THE CURRENT STATE OF THE ARAL SEA, THE PERSISTENCE OF ENVIRONMENTAL PROBLEMS AND THE POSSIBILITIES FOR THEIR ELIMINATION

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Annotation: This scientific article evaluates the current state of the Aral Sea, the analysis of the negative ecological crises that it poses to the environment and human activities. It also shows the effectiveness of the positive work being carried out by the Republic of Uzbekistan, foreign countries and relevant international financial institutions to prevent this ecological crisis. The effectiveness of scientific research by scientists of international scientific organizations in order to stabilize the ecological state of the Aral Sea, as well as the introduction of modern innovative technologies in this area and the implementation of advanced Startup projects in practice are presented.

Keywords: Aral Sea, ecological and social consequences, economic consequences, modern technologies, start-up projects, initiatives, targeted plans.

The Aral Sea, once the world's fourth largest inland body of water, is now an ecological disaster. The shrinking and drying up of this sea poses serious environmental and economic challenges not only for the countries of the Central Asian region, but also for the entire world. In particular, the problems related to health, agriculture, climate change and biodiversity conservation have significantly increased in this region.

The rapid drying of the Aral Sea in recent decades has been caused mainly by the cessation of water flow and the artificial misallocation of water resources. As a result of this process, the sea surface has shrunk by 85% and turned into a real desert. The drying of the Aral Sea and the harmful chemicals released from it into the regions have not only resulted in a decrease in natural resources, but also in a deterioration of the health of the population and an increase in diseases.

This article analyzes the current ecological state of the Aral Sea and the main problems that have arisen in the region. It also examines the efforts being made to solve these problems and future opportunities. The role of the international community and the cooperation of Central Asian countries in combating the ecological crisis of the Aral Sea should be given special attention. The natural state of the Aral Sea and its shrinkage have historically caused profound ecological changes. In the 1960s, the area of the Aral Sea was approximately 68,000 square kilometers, but today 85% of its surface is dry. The largest rivers of the Aral Sea, the Amu Darya and the Syr Darya, served as sources of water for the sea. However, since the 1960, the waters of these rivers have been intensively diverted for agricultural needs, which has led to a disruption of the water balance of the Aral Sea.

The drying of the Aral Sea has not only caused an ecological crisis, but also serious economic and social problems for the population of the region. Along with the drying up of the sea, the main

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water source for the population of the coastal countries of Uzbekistan, Kazakhstan and Turkmenistan has decreased and irrigated lands have dried up, which has caused major problems in agriculture. This, in turn, has made food security, job security and economic development a serious problem. Health issues have also become acute for the population of the region, as dust storms, saline soil and chemical pollution from the land have led to a wide spread of respiratory diseases, allergic reactions and other health problems. The health of the population has suffered seriously, and many diseases, including cancer, gastrointestinal diseases and respiratory tract diseases, have become widespread.

The shrinking of the Aral Sea has also had a significant impact on the agricultural sector and economic development in the region. The reduction in water allocated for irrigation, especially in the upper reaches of the Amu Darya and Syr Darya rivers, has led to a shortage of resources in agriculture. In the 1980, agriculture around the Aral Sea was carried out on an area of 3 million hectares. By 2020, this figure had fallen to 1.2 million hectares, which significantly reduced agricultural production. According to 2022 data, about 5 million people in Uzbekistan lost their income due to the weakening of agricultural activities and soil salinization around the Aral Sea and its drying.

Practical work underway to stabilize the ecological state of the Aral Sea

Today, a number of initiatives are being implemented at the international and national levels to restore the ecological status of the Aral Sea. Programs aimed at improving the ecological status of the Aral Sea are being implemented through the cooperation of many countries and international organizations. For example, several large water transport projects are being carried out between Uzbekistan and Kazakhstan to restore part of the Aral Sea, as well as measures to restore water in some parts of the sea.

Comprehensive measures have been taken to introduce advanced foreign experiences to develop 3.5 million hectares of land on the dried-up bottom of the Aral Sea. In particular, in 2020-2024, 56 species and 228 varieties of plants were planted on an experimental basis on 100 hectares in the Muynak district and 24 hectares in the Nukus district.

Also, in order to provide a scientific solution to the problems of water conservation and salt reduction in the dried-up Aral Sea, a national competition was announced, and a total of 17 practical and innovative projects worth 15.7 billion soums were implemented. Within the framework of these 17 projects, research was carried out on more than 67 types of salt-tolerant plants on 10 hectares, and according to the test results, 31 types of halophyte plants sprouted. Also, 5 varieties of wheat and 9 varieties of pasture fodder plants gave positive results in the dried-up Aral Sea.

55 kg of seeds were prepared to test 31 types of drought- and salinity-tolerant halophyte plants on 68 hectares of the dried-up Aral Sea bed. Among the halophyte plants, African millet is adapted to saline soils and is used as livestock feed.

Initiatives aimed at restoring the Aral Sea

The measures and initiatives taken to restore the ecological status of the Aral Sea have led to a number of positive developments. Since the beginning of 2000, the governments of Uzbekistan and Kazakhstan, as well as international organizations such as the UN and the World Bank, have implemented a number of projects aimed at restoring the ecological status of the Aral Sea. For example, in 2005, new water storage systems and irrigation methods were introduced in the coastal areas of Kazakhstan, especially in Kyzylkum and Muynak. As a result, by 2010, about 3 billion cubic

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meters of water had been collected in the monitoring areas of the Aral Sea, which somewhat slowed down the shrinkage of the sea.

Important directions for the environmentally sustainable development of the Aral Sea

There are a number of important areas to ensure the ecological restoration of the Aral Sea:

First, it is necessary to effectively manage water resources in rivers, introduce new technologies for the development of agriculture in water-scarce regions. New irrigation technologies and innovative methods aimed at saving water will help reduce the demand for water.

Secondly, it is necessary to develop scientific research and monitoring systems aimed at restoring the ecological state of the Aral Sea. Large-scale scientific research should be carried out to restore the biodiversity of the Aral Sea, monitor the state of water resources, and protect the environment.

Thirdly, it is important to introduce environmental education and training programs for the population in the region, raise awareness of environmental issues, and guide them towards sustainable development.

The main scientific approaches put forward to fully restore the ecological state of the Aral Sea and ensure sustainable development are as follows:

1. **Effective management of water resources:** Effective management of rivers and reservoirs, optimization of plants and irrigation technologies. Water-saving technologies and modern irrigation systems should be introduced in the regions around the Aral Sea.
2. **Scientific research and monitoring:** Conduct scientific research to monitor the ecological state of the Aral Sea, develop monitoring systems aimed at restoring biodiversity and identifying new problems.
3. **Soil restoration:** Use environmentally sustainable methods for reclamation and land reclamation of highly saline lands.
4. **Environmental education and public awareness:** Increasing the population's awareness and knowledge of environmental issues, and achieving active public participation in environmental protection.

Although the process of restoring the ecological status of the Aral Sea is ongoing, the implementation of effective measures in the future will help restore the ecological stability of the area and improve economic and social well-being in the region. Therefore, international cooperation, advanced technologies and continued scientific research are necessary for the full restoration of the Aral Sea and the sustainable development of the Central Asian region.

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