THE ARAL SEA DISASTER, ECOLOGY, AND HUMAN HEALTH

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Annotation: *This article examines the causes, stages of development, and current consequences of the Aral Sea crisis, one of the largest environmental disasters in Central Asia. The main focus is placed on anthropogenic impacts resulting from human activities, the irrational use of water resources, and their negative effects on the region’s water ecology, climate, public health, and socio-economic conditions. In addition, the article analyzes ecological restoration efforts being implemented in the Aral Sea region, international cooperation projects, and modern approaches aimed at mitigating the consequences of the crisis.*

Keywords: *Aral Sea, agriculture, salinization, environmental crisis, anthropogenic factors, water resources, desertification, land degradation, phytomelioration, land reclamation.*

Annotatsiya: *Mazkur maqolada Markaziy Osiyodagi eng yirik ekologik fojialardan biri hisoblangan Orol dengizi muammosining kelib chiqish sabablari, rivojlanish bosqichlari va bugungi kundagi oqibatlari yoritilgan. Asosiy e’tibor inson faoliyati natijasida yuzaga kelgan antropogen ta’sirlar, xususan, suv resurslaridan noo‘rin foydalanish va uning mintaqa ekologiyasi, iqlimi, aholi sog‘lig‘i hamda ijtimoiy-iqtisodiy hayotiga ko‘rsatgan salbiy ta’sirlariga qaratilgan. Shuningdek, maqolada Orolbo‘yi hududida amalga oshirilayotgan ekologik tiklash ishlari, xalqaro hamkorlik loyihalari va muammoni yumshatishga qaratilgan zamonaviy yondashuvlar tahlil qilinadi.*

Kalit so‘zlar: *Orol dengizi, qishloq xo‘jaligi, sho‘rlanish, ekologik inqiroz, antropogen omil, suv resurslari, cho‘llanish, degradatsiya, fitomeliorativ, meliorativ ishlar.*

Аннотация: *В данной статье освещаются причины возникновения, этапы развития и современные последствия проблемы Аральского моря, считающейся одной из крупнейших экологических катастроф в Центральной Азии. Основное внимание уделяется антропогенному воздействию, возникшему в результате человеческой деятельности, в частности нерациональному использованию водных ресурсов и его негативному влиянию на экологию региона, климат, здоровье населения, а также социально-экономическую жизнь. Кроме того, в статье анализируются экологические восстановительные работы, реализуемые в Приаральском регионе, международные проекты сотрудничества и современные подходы, направленные на смягчение последствий данной проблемы.*

Ключевые слова: *Аральское море, сельское хозяйство, засоление, экологический кризис, антропогенный фактор, водные ресурсы, опустынивание, деградация, фитомелиорация, мелиоративные работы.*

The decline in the level of the Aral Sea is an ecological crisis associated with the loss of about 90% of the Aral Sea's water volume in the second half of the 20th century and the emergence of the Aralkum desert in its place. According to calculations by modern scientists, the impact of anthropogenic factors on the decline of the Aral Sea's level has exceeded 70%. By the 1960s, the waters of the Amudarya and Sirdarya rivers, which had fed the Aral Sea, began to be widely used for other purposes, particularly for expanding cotton fields. As a result, the amount of river water flowing into the Aral Sea significantly decreased. In 1985–1986, the sea level dropped from 53 m to 41 m (relative to the Baltic Sea level). The Berg Strait dried up, and the Aral Sea split into two separate reservoirs — the Large Aral Sea and the Small Aral Sea. By 2002, the level had decreased by another 10 m. From 1960 to 2009, the area of the Aral Sea shrank from 67,499 km² to 6,700 km² [1].

The drying of the Aral Sea has led to a sharp degradation of the soil layer in the Aral Sea region. As the sea waters retreated, sources of moisture decreased, and soils that initially had hydromorphic characteristics began to turn into

saline and solonchak soils within a short period of time. In some areas, this process occurred within 3–5 years. In particular, in the territory of Karakalpakstan, the level of salinization of irrigated lands increased significantly over the years. Between 1970 and 1990, the proportion of saline lands increased several times. Due to water shortages in river basins and improper meliorative measures (technical and engineering measures carried out in agriculture to improve soil fertility), thousands of hectares of land became unsuitable for agriculture. In addition, salts, pesticides, and residues of mineral fertilizers accumulated on the dried seabed are spread into the environment by wind, causing secondary soil pollution and negatively affecting the health of the population [2].

The dried seabed of the Aral Sea has an unstable landscape and is considered a major source of ecological danger. A large part of the territories where the sea has retreated belongs to highly hazardous zones. In these areas, sand and saline dust storms occur under the influence of strong winds. In the Aral Sea region, dust storms are observed on average for 30–50 days per year. These storms can extend for hundreds of kilometers; in some cases, dust particles spread up to 600 km and rise several kilometers into the atmosphere. Depending on the wind direction, mixtures of dust and salt can reach cities such as Kyzylorda, Nukus, and Baytqo‘rg‘on. Toxic chemical substances used in agriculture have remained in the salt layers of the dried seabed, and when they are lifted into the air as dust, they pose a serious threat to both humans and animals. Every year, tens of millions of tons of dust and salt are released into the atmosphere from the Aral Sea region. Scientists have found that these substances can even reach distant regions, including glaciers and forest zones. Dust storms accelerate the process of secondary desertification and further reduce soil fertility [1,3].

Dust storms and the spread of salt in the Aral Sea region have a direct negative impact on the health of the local population. Depending on the size and composition of the particles, their duration in the air varies: heavy, coarse particles settle on the ground within a few days, while fine particles can remain suspended in the air for several months. As a result, the incidence of eye and respiratory diseases,

anemia, diabetes mellitus, and oncological diseases has sharply increased among the local population. Since the 1960s, cases of ischemic heart disease have increased 18 times, pneumonia 19 times, and chronic bronchitis 30 times [4]. The poor quality of drinking water has also led to an increase in kidney stone disease. It has been recorded that the disease rate among the rural population of Karakalpakstan has increased by 4.2 times. Among children, at least 46.4% of respiratory diseases are associated with dust storms and air pollution with sulfates, while among adults this figure is 38.9%. At the same time, some parts of the Aral Sea region are at risk of turning into semi-desert areas, making this environmental problem a long-term threat to human health [5].

According to the results of scientific research, as of 2021 it is considered practically impossible to restore the Aral Sea to its former water volume. Even if water withdrawal were completely stopped and the annual flow of the rivers were restored to 56 km³, it would still take approximately 100–200 years to fully refill the sea. Between 1992 and 2011, the average annual inflow of water into the Aral basin was only 5.9 km³. This flow increased mainly due to the melting of the Tien Shan glaciers; however, in the future, the reduction of these glaciers is expected to lead to a decrease in water flow. For this reason, the future of the Large and Small Aral Seas must be considered separately. According to estimates, if the annual inflow remains at about 5.4 km³, the water level of the Western Large Aral Sea may stabilize at around 21 meters, covering an area of approximately 2,560 km². At the same time, the mineralization of the water may reach about 200 g/l, which could transform the Large Aral Sea into a highly saline water body similar to the Dead Sea or Lake Urmia. Meanwhile, the Small Aral Sea is expected to gradually continue its transition toward becoming a freshwater reservoir [6].

As a result of joint initiatives by the countries of Central Asia, the International Fund for Saving the Aral Sea was established in Tashkent on January 4, 1993. The main objective of this fund is to mitigate the environmental problems that have arisen in the Aral Sea basin and to improve the socio-economic conditions in the region. In 1994, in an interstate concept adopted by the leaders of the Central

Asian countries, it was stated that restoring the Aral Sea to its former state was almost impossible, taking into account the existing natural and social conditions. Therefore, it was emphasized that the main focus should not be on restoring the Aral Sea itself, but rather on the ecological rehabilitation of the Aral Sea region. The primary environmental protection measures in the Aral Sea region are aimed at creating artificial ecosystems in the sea delta and on the dried seabed areas. These measures include the following directions:

- establishing controlled water reservoirs in dried territories through the efficient use of water from the Amudarya and replenishing certain parts of the Small Aral Sea with the waters of the Sirdarya;
- implementing phytomeliorative measures by planting vegetation to prevent the movement of sands caused by wind;
- creating polder systems on the dried seabed of the sea;
- directing collector-drainage waters into the sea's water area through special channels [8].

The Cabinet of Ministers of the Republic of Uzbekistan approved the Environmental Protection Action Program for 2013–2017, which was mainly aimed at improving the ecological condition of the Aral Sea region. Within the framework of this program, extensive measures were implemented to limit desertification processes and to carry out forest-melioration activities on the dried seabed of the Aral Sea. For the implementation of the program, a total of 89.39 billion Uzbek soums, 1,635.55 million US dollars, and 57.63 million euros were allocated. In 2014, the Nukus branch of the International Fund for Saving the Aral Sea established saxaul forests on an area of 1,500 hectares in the Muynak district. As part of these activities, 34 hectares of the "Uxantay" and "Oqqum" sites were drained on the dried seabed of the Aral Sea [9].

In conclusion, the Aral Sea disaster is one of the most serious environmental crises in the Central Asian region, and its consequences directly affect not only the natural environment but also the health and socio-economic life of the

population. Over the past half century, the mismanagement of water resources, the sharp decline in river and sea levels, the expansion of salinization, and the acceleration of desertification have disrupted the stability of the ecological system. As a result, not only environmental problems but also significant changes in public health have been observed. Therefore, in order to reduce environmental and health threats in the Aral Sea region, regional and international cooperation, rational management of water resources, the implementation of phytomeliorative measures, as well as the enhancement of biodiversity are of great importance. Indeed, the future is the result of the steps we take today.

REFERENCES:

1. Wikipedia. Aral Sea.
2. «Аральское море и Приаралье», 2017, pp. (45–47).
3. Glantz, M. H., Sonn, I. S. Aral Seas: Consequences of Environmental Degradation in Central Asia. Problems of the Post-Soviet Space, 2014, pp. (141–156).
4. Kudaybergenova, U. K. Geographical, Ecological, and Structural Features of the Regions and Related Population Diseases of Southern Aral Sea Region, 2020, pp. (12–13).
5. Khanturina, G. R., Seitkasymova, G. Zh., Fyodorova, I. A. Hygiene and Sanitation, 2017, Vol. 96, No. 3.
6. Novikova, N. M. Ecological-Geographical Aspect of the Aral Crisis, 2019, pp. (49–54).
7. https://ekolog.uz
8. https://ecifas.kz/en/ob-mfsa
9. Alfraganus University, The Recent History of Uzbekistan (Textbook for Non-Specialist University Students), Tashkent, 2023, pp. (169–172).