HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

THE ARAL SEA ENVIRONMENT: ECOLOGICAL CONSEQUENCES AND ASSISTANCE EFFORTS

Samira Jasur qizi Gapurdjanova

an 11th-grade student at Ellipse International School

gafurzhansamira@gmail.com

Doi: https://doi.org/10.5281/zenodo.22172969

Abstract: This article provides a comprehensive analysis of the ecological crisis caused by the desiccation of the Aral Sea, examining both its historical causes and its present-day negative consequences. The study separately addresses climate change, the loss of biological diversity, the salinization of soil and water resources, the damage inflicted on the health of the region's population, and the broader socio-economic consequences. The article also reviews the international and national measures being taken to mitigate the effects of the crisis, including the activities of the International Fund for Saving the Aral Sea (IFAS), the involvement of international organizations such as the United Nations and the World Bank, as well as the afforestation and social-support programs being implemented in Uzbekistan. The findings of the study may serve as a basis for developing scientific and practical recommendations aimed at ensuring ecological security and achieving sustainable development in the Aral Sea region.

Keywords: Aral Sea, ecological crisis, Aral Sea region, desertification, biological diversity, climate change, International Fund for Saving the Aral Sea, ecological migration, sustainable development, afforestation-reclamation.

Introduction. Located at the very heart of Central Asia, the Aral Sea was, until the 1960s, one of the largest inland bodies of water on Earth and the world's fourth-largest lake. Covering an area of approximately 68,000 square kilometers, it served as a vital natural factor moderating the region's climate and supporting fisheries and irrigated agriculture. However, under the irrigation policy pursued during the Soviet era, the bulk of the flow of the Amu Darya and Syr Darya rivers was diverted to irrigate cotton and other agricultural crops, causing a sharp decline in the volume of water reaching the sea.

As a result, over the course of several decades the Aral Sea lost more than 90 percent of its original volume, and in its place emerged the Aralkum — a desert of exposed seabed that has become a source of salt and dust. This process gave rise to ecological, economic, and social consequences not only at the regional but even at the global scale. The purpose of this article is to provide a scientific analysis of the principal causes of the Aral Sea ecosystem crisis and its impact across various spheres, and to highlight the measures being undertaken by the international community and Uzbekistan to mitigate the consequences of the crisis.

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

Historical roots of the aral sea crisis. The onset of the Aral Sea crisis dates back to the 1960s. During this period, the policy of cotton monoculture in Central Asia was intensified, and in order to expand irrigated land, more than 50 large reservoirs and thousands of kilometers of canals were built across the Amu Darya and Syr Darya basins. Excessive and inefficient use of water resources, combined with a failure to account for ecological consequences in the construction of hydraulic engineering structures, led to a steady decline in the volume of water flowing into the sea.

Whereas the sea level fell by only a few centimeters per year in the 1960s, this rate increased sharply by the 1980s. By 1989 the Aral Sea had split into two separate basins — the Small (Northern) Aral Sea and the Large (Southern) Aral Sea. In the early 2000s the Southern Aral Sea split further into two parts, and by 2014 its eastern portion had almost completely dried up. Today, international experts, hydrologists, and ecologists acknowledge that fully restoring the Aral Sea to its former state is scientifically and technically impossible; consequently, the primary strategic direction has shifted toward mitigating the consequences of the crisis and creating sustainable living conditions in the region.

Climate change and desertification. The desiccation of the Aral Sea has had a significant impact on the region's climate. The sea's waters once acted as a natural regulator, warming the air in winter and cooling it in summer. With its disappearance, the climate of the Aral Sea region has become sharply more continental: summers are becoming hotter and drier, while winters are becoming colder. According to a report prepared by the United Nations Environment Programme (UNEP), the average annual temperature in Uzbekistan has risen by 1.6°C over the past 60 years, while in the Aral Sea region this figure has reached 1.8–2.5°C — significantly higher than the global average.

Tens of millions of tons of salt and dust are lifted into the air each year from the dry seabed — the Aralkum — and carried by wind across hundreds, even thousands, of kilometers. Salt-and-dust storms are degrading air quality not only locally but at the regional level, accelerating the melting of mountain glaciers, and adversely affecting the yields of agricultural crops. As precipitation declines and soil moisture drops, the risk of drought is increasing and the process of desertification is accelerating.

Loss of biological diversity. The Aral Sea and its surrounding delta once supported a rich flora and fauna. Dozens of fish species inhabited the sea, and fishing was one of the principal sources of livelihood for the region's population. As the sea level fell and salinity rose, fish species declined sharply from the second half of the twentieth century onward, with some disappearing entirely. Today, commercial fishing in the former sea basin has essentially ceased.

The drying of the delta and floodplain (tugai) ecosystems has caused reed beds and riparian forests, along with the birds, mammals, and other wildlife dependent on them, to lose their habitat. Numerous species and populations have declined sharply in number or have vanished from the region altogether. This disruption of the ecosystem continues to exert a long-term negative effect on the region's ecological balance.

Contamination of soil and water resources. Residues of pesticides and mineral fertilizers used in agriculture accumulated on the seabed over decades. As the sea dried, these substances have been lifted into the air along with salt and dust particles and dispersed across vast territories, contaminating soil and water sources. The salinity of land in the lower reaches of the Amu Darya and Syr Darya continues to rise year by year, leading to a shrinking area of land suitable for irrigated agriculture. The mineralization and contamination of drinking-water sources has also become a serious problem. In

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

many areas the population faces difficulties in accessing quality drinking water, which in turn directly affects sanitary-hygienic conditions and public health.

Impact on public health. The Aral crisis has had a significant negative impact on the health of the population of the Aral Sea region. The presence of pesticide residues in airborne salt-and-dust particles is contributing to a rise in the incidence of respiratory diseases, cardiovascular disease, circulatory disorders, and digestive illnesses. Studies also indicate a high prevalence of anemia and kidney disease in the region, a heightened frequency of somatic and gynecological illnesses among women, and a relatively elevated rate of infant mortality.

The deterioration of the ecological situation has also affected the population's social and psychological well-being: the worsening of living conditions and the narrowing of economic opportunities are intensifying migration from the region to other areas. *Socio-economic consequences.* The near-total collapse of the fishing industry has resulted in the loss of thousands of jobs in Moynaq and other towns that were once thriving ports. Fish-canning plants and shipbuilding enterprises that once operated in the area have lost their significance. The salinization of agricultural land has reduced crop yields, leading to a decline in household incomes.

The narrowing of economic opportunities, combined with underdeveloped infrastructure and adverse ecological factors, has intensified the migration of the population from the Aral Sea region to other areas. This process has given rise to the problem of "ecological migrants," requiring a reassessment of socio-economic policy at both the regional and national levels.

Regional and global impact. The effects of the Aral crisis are not confined to the Aral Sea region alone. Clouds of salt and dust rising from the Aralkum are clearly visible in satellite imagery, and they settle onto the glaciers of the Pamir and Tian Shan mountain ranges, accelerating their melting. This, in turn, threatens to further reduce the mountain glaciers that constitute Central Asia's principal source of fresh water. In this way, the Aral problem is becoming a global ecological issue directly linked to the region's water security.

International experts regard the desiccation of the Aral Sea as one of the largest human-induced ecological disasters, and it is frequently cited in the scientific literature as an example of a "slow-onset ecological catastrophe." For this reason, the solution to the problem must be sought not within the framework of a single state, but through the joint efforts of the entire Central Asian region and the international community.

International and national assistance aimed at mitigating the consequences of the crisis. *The international fund for saving the aral sea (IFAS).* With the aim of addressing the consequences of the Aral crisis, the Central Asian states — Uzbekistan, Kazakhstan, Tajikistan, Kyrgyzstan, and Turkmenistan — established the International Fund for Saving the Aral Sea (IFAS) in 1993. The Fund has become the principal institutional mechanism coordinating regional cooperation among these states in the fields of water management, ecology, and socio-economic development. Over the course of its activities, the Fund has adopted a series of joint decisions and programs concerning the Aral Sea basin and has expanded cooperation with international organizations and financial institutions.

Under the "Comprehensive Programs of Measures to Mitigate the Consequences of the Aral Disaster and to Develop the Aral Sea Region" for 2013–2017 and 2017–2021, more than 500 national and international projects were implemented. The chairmanship of the Fund rotates among the founding states; for the period 2024–2026, the chairmanship passed to the Republic of Kazakhstan, ensuring the continuity of regional cooperation.

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

The united nations, the world bank, and other international organizations. The United Nations (UN), the World Bank, the European Union, and other international financial institutions are also actively engaged in addressing the Aral problem. Agencies within the UN system are financing and providing technical assistance for projects in the Aral Sea region relating to ecological monitoring, climate adaptation, and drinking-water supply. The adoption in 2018 of a special UN General Assembly resolution on transforming the Aral Sea region into a zone of ecological innovation and technology further underscored the international community's engagement with this problem.

The World Bank and other international financial institutions are implementing a number of loan and grant projects in the Aral Sea region aimed at managing water resources, modernizing irrigation systems, improving drinking-water infrastructure, and providing social support to the region's population. Such cooperation brings not only financial resources but also advanced technology and international experience to the region.

National programs of Uzbekistan and the creation of green cover in the aral sea region. In recent years, the Government of Uzbekistan has been implementing wide-ranging national programs to mitigate the consequences of the Aral crisis. One of the principal directions of this work is the creation of protective green cover on the dried seabed by planting saxaul and other salt-tolerant vegetation. According to official data, afforestation-reclamation work has so far been carried out on more than 1.7 million hectares of the former seabed, making it one of the largest artificial forest areas created by human effort in the world.

Under the project to expand green cover, the planting of forests across millions of hectares in the Aral Sea region is planned, and this initiative has received wide coverage in the international press. The creation of green zones plays an important role in reducing salt-and-dust storms, mitigating the adverse effects of climate change, and restoring degraded land. At the same time, Uzbekistan is actively exchanging experience in restoring forests in arid regions with Kazakhstan and other neighboring states.

In addition, targeted funds are being allocated from the state budget to modernize drinking-water supply systems, provide social support to the population, improve medical services, and create new jobs in the Aral Sea region. This package of measures is aimed at improving the living conditions of the region's population and achieving sustainable socio-economic development.

Furthermore, a number of projects are being implemented to introduce modern water-saving technologies — such as drip and sprinkler irrigation — to expand the use of renewable energy sources (solar and wind power), and to raise ecological education and public awareness. Within the framework of a special economic and ecological innovation zone established in the Aral Sea region, favorable conditions are being created for foreign investors, with new production capacities and jobs planned to be created in the region. This integrated approach serves to restore the Aral Sea region not only ecologically but also socio-economically.

Conclusion

The Aral Sea crisis is one of the largest anthropogenic disasters, one brought about by human activity and affecting ecological balance not only at the regional but also at the global level. The analysis presented in this article shows that the desiccation of the Aral Sea has given rise to a complex set of closely interrelated consequences — climate change, the loss of biological diversity, the

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

contamination of soil and water resources, the deterioration of public health, and socio-economic decline.

From today's scientific standpoint, it is considered impossible to restore the Aral Sea to its former state; the primary strategic direction must therefore be to mitigate the consequences of the crisis, ensure ecological security in the region, and improve the living conditions of the population. The activities of the International Fund for Saving the Aral Sea, the support of international organizations such as the UN and the World Bank, and Uzbekistan's national afforestation and social-support programs are all serving to achieve meaningful results in this direction.

At the same time, given the regional and global nature of the problem, it will be necessary going forward to further strengthen water-and-energy cooperation among the Central Asian states, to develop scientific research and monitoring systems, to widely introduce modern water-saving technologies, and to expand cooperation with the international community. Only through a comprehensive and sustained approach can ecological stability and the well-being of the population be achieved in the Aral Sea region.

In sum, the Aral problem should be viewed simultaneously as a cautionary historical lesson and as a factor calling for practical action. The results achieved to date — the expansion of green cover, the strengthening of international cooperation, and the consistent implementation of national programs — testify to the possibility of achieving ecological and social stability in the region in the future. Continuing scientific research in this field, engaging young specialists, and intensifying efforts to raise the population's ecological awareness remain among the key conditions for the gradual resolution of the Aral Sea region's problems.

References

1. The Aral Sea Crisis and Its Ecological Impact // Bulletin of Students of New Uzbekistan. — 2025.
2. Priority Directions for Establishing a Zone of Ecological Innovations and Technologies in the Aral Sea Region // Modern Science and Research. — 2025.
3. Historical Lessons of the Aral Sea Region Crisis and Prospects for International Cooperation // CyberLeninka Scientific Electronic Library.
4. The Aral Sea and the Ecological and Socio-Economic Problems Associated with It // Worldly Journals.
5. A'zamova, M.G., Jahongirov, B.B. Global Ecological Problems and Their Solutions // Modern Science and Research. — 2025.
6. Global Problems and Solutions Arising from the Desiccation of the Aral Sea // Science and Education Scientific Journal. — Tashkent.
7. Studying the Impact of Climate Change on the Health of the Aral Sea Region's Population // Theoretical Aspects of the Development of Pedagogical Sciences. — 2025.
8. State Program for the Development of the Aral Sea Region (2017–2021), Decree of the President of the Republic of Uzbekistan // National Database of Legislation of the Republic of Uzbekistan.
9. United Nations Environment Programme (UNEP). Atlas of Environmental Change in Uzbekistan.

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

10. Proceedings of the Meeting of the Council of Heads of Founding States of the International Fund for Saving the Aral Sea // Official website of the President of Uzbekistan (President.uz).
11. Materials of the Summit of the International Fund for Saving the Aral Sea // Gazeta.uz.
12. Turaeva, G'.G'. The Impact of the Desiccation of the Aral Sea on the Countries of Central Asia // Ijodkor O'qituvchi (Creative Teacher). — 2023. — No. 3(30). — Pp. 105–109.