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The Aral Sea Tragedy: A Current Problem of Today's World

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ABSTRACT

The article discusses the factors that led to the drying up of the Aral Sea, which is the fourth largest in the world (after the Caspian Sea, Lake Superior in America, and Lake Victoria in Africa) and the second largest on the Eurasian continent (after the Caspian), the changes that have occurred in the lives of the population living along the seashore, and the fact that this ecological disaster has become an urgent problem not only for the peoples of Central Asia, but also for the whole world, and provides recommendations for improving the current state of the sea and preventing salt and sand migration.

Keywords: Lake; Water; Shoreline; Soil Salinization; Ecological Disaster; Climate; Dust Storms; Pastures.

1. Introduction

The Aral Sea (Kazakh: Арал Теңізі, Aral Tengizi, Arakalpak: Арал тен'изи) is the largest closed lake in Central Asia. Administratively, more than half of the Aral Sea is located in the southwestern part of Uzbekistan (Karakalpakstan), and the northeastern part is located in Kazakhstan.

Until the 1960s, the Aral Sea had an average extent of 68,000 km², including its islands. It was the world's fourth largest lake (after the Caspian Sea, Lake Superior in America, and Lake Victoria in Africa), and the Eurasian continent's second largest (after the Caspian Sea).

The sea spans from northeast to southwest, measuring 428 kilometers long and 235 kilometers wide at its widest point. The basin area is 690 thousand km², the water volume is 1000 km³, and the average depth is roughly 16.5 m. It is known as a sea due to the magnitude of its basin [2].

1.1. Study Objectives

The objectives of this study are outlined as follows:

➢ to explore the historical and geographical importance of the Aral Sea, once ranked among the world's largest inland water bodies, and to understand the factors that shaped its prominence before ecological decline set in.

➢ to trace the root causes of the sea's desiccation, with special attention to anthropogenic factors, including large-scale diversion of water for irrigation, particularly during the Soviet era.

➢ to assess the broader socio-economic and environmental consequences experienced by communities in the Aral region, focusing on public health, livelihoods, and migration patterns.

➢ to emphasize the urgency of the Aral Sea crisis as a global concern, advocating for greater international cooperation and regional commitment to environmental preservation in Central Asia.

2. Discussion

The water level in the Aral Sea has long been rising and falling. In later geological times, the Aral Sea water periodically flowed into the Caspian Sea through Sarikamish and Uzboy, the water level was much higher, and several thousand km² of the coast in the south and southeast was under water. The Aral Sea is not very deep. The deepest places are in the western part. Near Ustyurt in Karakalpakstan, its depth reached 69 m. The shallow areas of the lake were in its southern, southeastern, and eastern parts. There were more than 300 islands in the Aral Sea. 80% of them were in the southeastern part of the sea. The largest were Kokorol (273 km²), Vozrozhdeniye (216 km²), and Borsakelmas (133 km²). The Amu Darya and Syr Darya rivers flow into the sea.

Until the 1960s, the Amu Darya brought 38.6 km3 of water to the Aral Sea per year, while the Syr Darya carried 14.53. In 2001, the Aral Sea was separated into two parts: western (southern) and eastern. In 2003, the Aral Sea covered a fifth of the original area, with seawater covering the remaining 10%. Today, instead of the previous deep sea, there are new sand and salt deserts covering 38,000 km^2. Climate change has caused the water level of the Aral Sea to fluctuate throughout time.

For example, the sea level began to increase in 1785, then fell in 1825, then rose again between 1835 and 1850, and finally fell in 1862. Kokorol became a peninsula in 1880. In 1881, the water level dropped again. Since 1885, the water level in the Aral Sea has been rising again. By 1899, the Kokorol peninsula had become an island. In 1919, the sea area was 67,300 km² and the water volume was 1,087 km³. However, by 1935, the area was 69,670 km² and the water volume had increased by 1,153 km³. Over the next century and a half, the sea level shifted dramatically.

Until the 1990s, carp, roach, pike perch, bream, and roach were caught in the Aral Sea. A vast number of fishing farms existed in and around the cities of Aralsk and Muynak. The water level of the Aral Sea is tied to the water regime of the Amu Darya and Syr Darya, therefore the more these two rivers were used for irrigation, the less water was in the sea. In particular, as irrigated regions have expanded since the 1960s, the volume of water flowing into the sea from the Amu Darya and Syr Darya has decreased year after year.

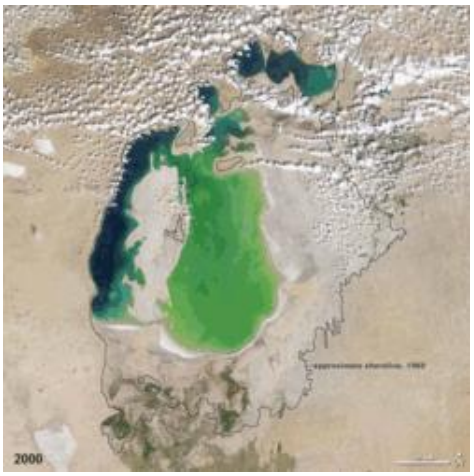

Figure 1. The look of the Aral Sea from 2000-2010

In ancient times, the Amu Darya flowed into the Caspian Sea via the Uzboy, and the Turgay River into the Aral Sea. In 1573, the Aral Sea was connected to the Caspian Sea. Paleontologists discovered remnants of whales, sharks,

and red sea fish on the Aral Sea's shoreline. In 1850, a steamer built in Sweden for the Russian Empire was launched into the Aral Sea. Until 1965, passenger and cargo steamships traveled between Aralsk, Muynak, Khojaly, and Chorjoy.

In the mid-twentieth century, the Aral Sea had ten fish factories and a canning facility, and up to 450,000 quintals of fish were caught there each year. The Amu Darya had a suspension of ship and ferry activity in 1981. The Aral Sea receded more than 100 kilometers inland, leaving ships stranded on barren sand.

Figure 2. Current status of the Aral Sea (October 2024)

In the middle of the twentieth century, 178 animal species and 1,200 plant species were discovered along the Aral Sea's shoreline. Every year, around 1 million muskrat furs are gathered from the Amu Darya River's banks. By the 1990s, fur manufacture had virtually stopped. Agricultural production has dropped multiple times as a result of severe soil salinization. Soil salinization causes extensive harm to residential areas, administrative buildings, and paved roadways.

In 1986, 78% of towns were declared uninhabitable. This calamity damaged drinking water and caused a rise in sickness rates in the community. Mistakes in the utilization of the Amu and Syr Darya rivers resulted in an ecological disaster along the Aral Sea coast.

The Aral Sea's waters dried up due to faulty irrigation, leaving salts and other minerals in the land. They not only poisoned the soil, but they also grew with the wind and storms and spread to other regions, including agricultural fields. This resulted in a rise in respiratory illnesses and cancers. The changing size of the Aral Sea also had an impact on the local climate, increasing the frequency and intensity of storms [2].

The diminishing of the Aral Sea has surely caused health issues for the locals. One of the main reasons why much of the Aral Sea area has been damaged is "improper water use." Examples of environmental impacts that potentially influence human health as a result of changes in the Aral Sea region include "declining water levels, pesticides in the environment and food chain, dust storms, and changes in the weather" [3]. During the Soviet era, water from the Amu Darya and Syr Darya rivers that flowed into the Aral Sea was utilized to irrigate cotton plantations in Uzbekistan [4].

More than 100,000 people were employed in poultry and cattle production around the Amu Darya and Syrdarya rivers' pastures and fertile areas. The natural mineral and nutritional content of the soil reduced over time due to

monoculture cotton planting in the region. This resulted in an increase in the usage of herbicides and fertilizers to improve soil quality. However, the massive volumes of chemicals utilized had an impact on the land, water, and, ultimately, the Aral Sea. These changes in agriculture "led to changes in soil composition and deterioration of water quality and quantity"[5]. As the sea dries up, toxins rise to the surface, settle in the soil, and become airborne. These environmental consequences have had a far-reaching impact on the health of local inhabitants. The increase in many diseases is associated with the shrinking area of the Aral Sea. Those most affected by pollutants: infants and children. Changes in the ecological environment in the region contribute to an increase in infant mortality [6].

Infant mortality rates have been increasing in this region since the 1970s [7]. These hazardous compounds, which are responsible for an increase in newborn death rates, have been documented in Kazakhstan since 1993, totaling 70. Toxins can enter our bodies through a variety of sources, including the air we breathe, drinking water, and food. However, a young baby has limited options for what to eat and drink. It is known that these poisons can also be transmitted through nursing. "In a number of regions, doctors do not recommend breastfeeding babies because breast milk is considered toxic." In Turkmenistan alone, respiratory disorders account for 50% of all diseases recorded in children. This syndrome has far-reaching consequences for those suffering from a variety of ailments.

3. Results

The following is a list of health issues that can cause infant mortality and lower living standards in the Aral Sea region: -diarrheal disorders, dietary deficits, upper respiratory infections, teratogenesis, endocrine disruption, neurodevelopmental consequences, and behavioral alterations; -Gastroenteritis; -Typhoid fever; -Hepatitis; -Esophageal malignancy; -Various forms of cancer; - Hypertension; - Heart disease; - Anemia; - Kidney disease; - Eye illness.

Solutions: The primary problem in recovering the environment is removing salt and other toxic materials from the seafloor. Some alternatives include creating reservoirs to manage water flow and restricting the amount of water used for cultivation. "We want to save the Aral Sea, but it is impossible to completely abandon irrigated agriculture in the entire region," says Medad Aspanov, executive director of the International Fund for Saving the Aral Sea.

Some international experts believe that the Uzbek government has not taken serious steps to conserve the Aral Sea. However, Uzbekistan is making every effort to resolve this issue. Uzbekistan is currently focusing on conserving the people who live around the Aral Sea and the existing ecosystems rather than the sea itself. Because the only way out is to lessen the environmental effect rather than restore it. Otherwise, this will result in even worse difficulties. The Aral Sea is in deteriorating condition at a time when the climate is rapidly changing.

As a result, Uzbekistan is offering aid through every means possible. This is no longer just a national issue, but rather a regional one. As a result, Central Asian countries should reach an agreement to resolve this issue and eradicate the current crisis.

4. Conclusion

The drying of the Aral Sea was caused, first and foremost, by the usage of water from the rivers that flow into it for other reasons, and second, by the knowledge that it was drying up, which was willfully ignored. In the end, this

became a major problem. According to analysts from Uzbekistan and Kazakhstan, neither the Soviet Union nor the world community paid enough attention to the "Aral tragedy".

The increase in salinity caused the extinction of the surrounding flora and wildlife. This condition resulted in not only flora and wildlife, but also climate change. Summers became hotter, and winters colder. Academician A.S. Berg cautions in his early-century essay "The Aral Sea" that if the sea water dries out, a salt layer will build on its bottom. Every year, 25,000 hectares of black saxaul, kandim, yulgun, and other shrub seedlings are planted in Uzbekistan's parched seabed. The same procedure, when taking into account the local relief features, will produce satisfactory results.

Declarations

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The author has not declared any conflict of interest.

Consent for publication

The author declares that he/she consented to the publication of this study.

Authors' contributions

Author’s independent contribution.

Informed Consent

Not applicable.

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