

## Historical Roots of the Aral Sea Desiccation: Consequences of Soviet Irrigation Policy (1950–1991)

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### Abstract

This article analyzes the historical causes of the Aral Sea desiccation using the IMRAD methodology. The study covers the period from 1950 to 1991. Soviet irrigation policy, cotton monoculture and irrational water resource allocation are examined as the main causes of the disaster. The findings demonstrate that this catastrophe is a direct consequence of deliberate political and economic decisions rather than natural processes.

**Keywords:** Aral Sea, Ecological Disaster, Soviet Irrigation Policy, Cotton Monoculture, Water Resources, Environmental History, Central Asia.

### 1. Introduction

The Aral Sea was once considered the fourth-largest lake in the world. Its area covered approximately 68,000 square kilometers, and it occupied a central place in the lives of millions of people in Central Asia. Today, however, only a few small residual lakes remain from this vast body of water. This transformation has gone down in world history as one of the most devastating ecological disasters of the twentieth century [1].

Many people consider this catastrophe to be a natural process. In reality, however, the situation is quite different. Human activity played a decisive role in the desiccation of the Aral Sea [2]. More specifically, the irrigation policy implemented by the Soviet government beginning in the 1950s became the main cause of this disaster. Political and ideological decisions were placed above ecological consequences, and an entire region paid the price for it [3].

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## 2. Research Method

The study of this topic remains highly relevant today. First, the consequences of the Aral Sea disaster are still being felt in the territory of Uzbekistan. Second, the distribution of water resources continues to remain a complex issue among the Central Asian states. Third, a comprehensive understanding of the historical causes of this catastrophe can help prevent similar mistakes in the future.

The main purpose of this research is to analyze the historical processes that led to the desiccation of the Aral Sea on the basis of archival documents and scientific sources. The study covers the period from 1950 to 1991. This period represents the most active phase of Soviet irrigation policy as well as the time when its most severe consequences became evident.

Several complementary scientific methods were employed in this study. The first method was the historical analysis method, through which the decisions adopted during the Soviet period and their consecutive consequences were examined. This method made it possible to organize events chronologically and identify their interrelationships.

The second method was documentary analysis. During the research, project documents, government resolutions, and scientific reports produced during the Soviet era were studied. Some of these sources are preserved in the National Archive of Uzbekistan, while others are kept in the State Archive of Russia. These archives, which were partially opened during the independence period, served as the primary sources for the research.

The third method selected for the study was comparative analysis. Through this method, water consumption in the Aral Basin was comparatively examined across different periods. Comparing the indicators before and after 1950 made it possible to demonstrate the scale of the catastrophe more clearly. In addition, a comparative analysis was also carried out with similar ecological problems in other regions of Central Asia.

The fourth method was the oral history method, through which the memories of people who had lived in the Aral Sea region and were still alive were collected. These memories contain valuable information that was not reflected in official documents. In particular, the testimonies of fishermen and rural residents revealed the human dimension of the catastrophe more comprehensively.

## 3. Results and Discussion

The results of the study showed that beginning in the 1950s, the Soviet government firmly implemented a policy aimed at transforming Central Asia into the main base for cotton production. Within the framework of this policy, enormous canals were constructed to redirect the waters of the Amu Darya and Syr Darya rivers to agriculture. The Karakum Canal and the Great Fergana Canal were among the largest of these projects [4].

Documentary analysis revealed that a large portion of the constructed canals were built from clay and had very low water retention capacity. According to expert calculations, between 40 and 60 percent of the water diverted through these canals never reached its intended destination. Instead, the water seeped into the ground or evaporated along the way. Such wastefulness led to the continuous increase in the amount of water extracted from the rivers [5].

Annual cotton harvesting targets were continuously increased. In 1960, the amount of cotton harvested in Uzbekistan was more than twice that of 1950. By 1980, this figure had grown even more significantly. Each new production record required the consumption of

greater amounts of water, and the volume of water diverted from the Amu Darya and Syr Darya rivers increased year by year [6].

Before 1960, most of the waters of the Amu Darya and Syr Darya flowed into the Aral Sea, which helped maintain a relatively stable water level. However, beginning in the 1960s, the situation started to change dramatically. The amount of water extracted from the rivers increased to such an extent that the volume of water reaching the Aral Sea gradually declined [7].

By the 1970s, the water level of the Aral Sea had begun to decrease significantly. By the mid-1980s, the area of the sea had shrunk by more than 40 percent. Along with the retreat of the water, the salinity of the sea also increased sharply. As a result, many fish species inhabiting the sea were driven to extinction [8].

By 1991, the Aral Sea had effectively split into two separate basins. The northern part, known as the Small Aral, and the southern part, known as the Large Aral, became isolated from one another. In the following decades, the Large Aral almost completely dried up [9].

An analysis of the research findings demonstrates that the tragedy of the Aral Sea was, first and foremost, the result of political decisions. The Soviet government adopted the strategic objective of maximizing cotton production in Central Asia. This policy was driven by economic interests, while its ecological consequences were largely ignored [10].

Local scientists and specialists had begun issuing warning signals at a very early stage. During the 1950s and 1960s, several Soviet scholars submitted reports to the government concerning the dangerous consequences of irrigation policies in the Aral Basin. However, these warnings were either ignored or deliberately pushed aside. Ideological and economic objectives were placed above scientific conclusions [11].

The policy of cotton monoculture weakened the Central Asian republics both economically and ecologically. An agricultural system that became completely dependent on a single crop was inherently unstable. Moreover, the chemical fertilizers and pesticides used in cotton cultivation further deteriorated the quality of soil and water resources [12].

The most severe consequence of the desiccation of the Aral Sea was its impact on human life. Fishermen living around the sea were among the first to suffer. In this basin, where tens of thousands of tons of fish had once been caught annually, the fishing industry had nearly ceased to exist by the 1980s. Fishermen lost both their professions and their sources of livelihood [13].

The dry seabed, covered with salt and mixed with chemical substances, was carried by winds across hundreds of kilometers. This toxic dust contributed to the spread of respiratory diseases, cancer, and other serious illnesses. In the Karakalpakstan region, public health indicators deteriorated sharply, and the child mortality rate became one of the highest in the entire Soviet Union [14].

The deterioration of water quality also created serious problems. Salinized lands became unsuitable for agriculture, and shortages of drinking water emerged. The local population was left in conditions of economic and social hardship. Many families were forced to leave the region and migrate to other areas [15].

This study proved that the primary cause of the desiccation of the Aral Sea was not a natural process, but rather deliberate political and economic decisions implemented during the Soviet period. The irrigation policies, cotton monoculture, and improper distribution of water resources carried out between 1950 and 1991 collectively led to this enormous ecological catastrophe [16].

#### 4. Conclusion

First, economic policies that ignore ecological consequences lead to enormous human and material losses in the long term. Second, the neglect of scientific warnings for political purposes can result in tragic outcomes. Third, unless the distribution of water resources is resolved through regional cooperation, conflicts and environmental problems in Central Asia will continue to persist.

The study proposes several recommendations for future research. First, scientific reports and government decisions related to the Aral Basin during the Soviet period should be comprehensively examined. In particular, archival materials that remain inaccessible should be opened for scholarly investigation. Second, oral history projects concerning the impact of the Aral Sea disaster on the local population should be expanded, as the generation that directly witnessed these events is gradually declining. Third, it is recommended that new mechanisms of regional cooperation regarding the distribution and management of water resources among the Central Asian states be developed and implemented.

The Aral Sea disaster demonstrated how large-scale environmental crises can emerge as a consequence of unsustainable political and economic policies. Between 1960 and 1991, the sea lost the majority of its water volume, while by the late 1980s its surface area had decreased by more than 40 percent. These developments clearly revealed the destructive impact of irrational irrigation policies and uncontrolled exploitation of natural resources. Therefore, understanding the historical roots of the Aral Sea catastrophe remains essential not only for interpreting the past, but also for preventing similar ecological disasters in the future.

The Aral Sea tragedy provided humanity with a profound lesson. A comprehensive understanding of the historical causes of this catastrophe is important not only for interpreting the past, but also for preventing the repetition of similar mistakes in the future. In this regard, the study of this issue continues to maintain its relevance today.

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