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Saving Lake Urmia: The Impact of Water Heritage on People's Lives

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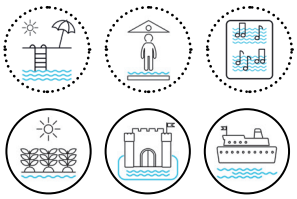
Lake Urmia is one of the largest saltwater lakes on Earth and a highly endangered ecosystem. It is on the brink of a significant environmental disaster, similar to the drying up of the Aral Sea. UNESCO has inscribed Lake Urmia on its list of Iranian biosphere reserves. The existing situation is due to a lack of water heritage management and the absence of an integrated, straightforward method that includes support for the ecological and social aspects of the lake. Recognizing the significant factors behind Lake Urmia's drying up and the impact on people's lives can significantly raise awareness about this catastrophic phenomenon. Reviving Lake Urmia and protecting it can decrease pollution, maintain species diversity and increase tourism. It will ultimately lead to sustainable development by improving health, contributing to the economy and preserving culture and identity.

KEY THEMES



CLIMATE

Dsa
Hot, dry-summer continental

< Fig.1 Lake Urmia in northwestern Iran, taken from the International Space Station on 12 september 2016 (Source: NASA, Public domain, via Wikimedia Commons).

Introduction

Lake Urmia, also known as Rezaiyeh Lake, is located northwest of Iran and in the Azerbaijan region. Based on the latest country divisions, this lake is divided between the two provinces of East Azerbaijan and West Azerbaijan. Lake Urmia is the largest inland lake in Iran and the second-largest saltwater lake in the world. The water of this lake is very salty, and it is mainly fed by the rivers Zarinee Rood and Simine Rood (Dastranj, Tavakoli and Soltanpour 2018, 151).

While historical documents concerning the decay of the Aral Sea have been included in the UNESCO Memory of the World Register, UNESCO has inscribed Lake Urmia on its list of Iranian biosphere reserves (UNESCO 2021). A unique feature of this Biosphere Reserve and National Park is its hypersaline environment, with salinity ranging from 217 to more than 300 g/l, approximately eight times higher than seawater (UNEP 2012; Ghaheri et al. 1999; Ahmadzadeh Kokya et al. 2011). Unique types of diatoms, phytoplankton and bacteria can survive in this kind of hypersaline environment. The Lake Urmia water basin, with a population of 6 million people, has been an essential source of life and fertility for a long time, from farmers who irrigate their fields with water from rivers and groundwater to the unique shrimp species called Artemia that live in the lake and provide food for a wide range of migrating birds, including flamingos (Zagharmi et al. 2015). The lake is surrounded by several freshwater wetlands, forming a critical ecological zone around the lake.

Current Situation of Lake Urmia

Water has always been a key social issue and the drying up of Lake Urmia has become a national concern. The gradual destruction of Lake Urmia would mean the disappearance of a part of the natural history of several thousand years and a loss of social history due to increased migration to cities.

Climate change is one factor behind Lake Urmia's decreasing water level. When comparing the situation of Lake Urmia with other nearby lakes – such as Swan in Armenia and Van in Turkey (Hesari and Naskili, 40) as well as lakes in Iraq and Beyşehir in Turkey (Birkett et al. 2009) – the role of climate in the drying up of Lake Urmia is not convincing as a primary cause. Recent increases in rainfall have not stopped the drying of the lake (Abbaspour et al. 2012).

Economic, social, cultural and political factors lead to a specific level of demand for water. The population growth in the catchment area of Lake Urmia and the excessive use of water in agriculture in this area are among the factors that have decreased the water level of Lake Urmia. The production culture of the farmers in this area relies on traditional methods: basin irrigation leads to evaporation and the infiltration of water in non-cultivable areas and its absorption by weeds. This has resulted in the overexploitation of the area of this lake (Alamohammad et al. 2014, 646).

The construction of the Shahid Kalantari highway to connect the two cities of Tabriz and Urmia, a project based on a railroad that crosses Great Salt Lake in the US state of Utah, inspired much criticism pertaining to the drying up of Lake Urmia. The construction of Shahid Kalantari highway has caused changes in the process of natural sedimentation, which, in addition to disrupting the natural order of the water cycle and the distribution of sedimentation of suspended matter, has changed the natural process and ecological state of the lake (Alavipanah et al. 2005, 58). The unbalanced distribution

^ Figs. 2 & 3 Lake Urmia in 1998 (left) and 2011 (right) (Source: Landsat imagery, courtesy of NASA Goddard Space Flight Center and U.S. Geological Survey).

of salt in the north and south and changes to the normal process of sedimentation resulting from the construction of the highway are factors behind Lake Urmia drying up (Ahmadi and Akbarzadeh 2018, 115).

The results of a variety of research on Lake Urmia reveal that if this process continues without optimal environmental management, we will soon witness the destruction of the ecological, economic, touristic, social and aesthetic values of the lake, where the problems are currently being exacerbated by drought and human interference in the natural environment of the lake.

Current and Future Challenges to this Water System

Any discussion of Lake Urmia as heritage must pay special attention to the impact of the lake drying up and how its drying has been changing society and people's lives. The impacts summarized in this section illustrate the current challenges of water heritage management and the impact of decisions on the future.

Destructive effects on wildlife

In Lake Urmia National Park, 23 species of water birds have been identified in wet years, but

^ Fig 4. The ferry used to lie in a dried up area of Lake Urmia. This part of the lake has slightly recovered, causing the ship to be surrounded by water again. (Source: Solmaz Daryani, 2016, CC BY-SA 4.0, via Wikimedia Commons).

this number has decreased to less than ten in dry years. The disappearance of key species shows that Lake Urmia has undergone drastic ecological changes and has lost its habitat value for water birds (Behroozirad 2011, 2).

Immigration

The drying up of Lake Urmia is causing the destruction of thousands of hectares of agricultural land near the lake. One of the consequences is the unemployment and migration of an estimated 3 million people in the provinces of East and West Azerbaijan (Soleimani Ziveh 2010). Also, according to studies of the Lake Urmia Restoration Headquarters, the dryness of the lake causes the deposition of salt sediments and a bed is emerging that produces dangerous fine dust during intense storms. The salt storm phenomenon will cause even more destruction of agricultural fields and will increase the occurrence of diseases such as asthma and cancer, which in turn will lead to an increase in migration away from the region.

Destructive impact on the tourism industry

Research indicates that the complete drying up of Lake Urmia would be detrimental to tourism. Many people around Lake Urmia have left their villages in response to the ongoing environmental disaster. The village of Golmankhane, for example, was home to 550 people, most of whom worked in tourism. When the lake dried up, they migrated to other cities and can be considered the first victims of this catastrophe (Daryani 2021). Continued reduction of the lake water has damaged recreational opportunities, residential communities and coastal infrastructure.

The issues and problems have led to the creation of the Urmia Lake Restoration Program, which works on supplying lake water from oth-

^ Fig. 5 On weekends, locals and tourists come to see the parts of Lake Urmia around the Shahid Kalantari highway that still have water (Source: Solmaz Daryani, CC BY-SA 4.0, via Wikimedia Commons).

er sources, efficient water management, especially in the agricultural sector, and cooperation among experts. Despite appropriate funds from the government, various specialists' requests, and university invitations, so far the Urmia revitalization project has failed. Annual rainfall partly fills the lake, but a lack of strategies (conserving water, changing the agricultural system, etc.) leads to the lake completely drying up again. Pouladi and colleagues (2021) have analyzed interviews with farmers in the lake basin and specialist staff at the Urmia Lake Restoration Program. Their research indicates that so far, there have been several socio-economic barriers to the restoration of Lake Urmia: a lack of awareness among farmers of advanced irrigation and cultivation techniques, high dependency of rural households on agricultural incomes from small farmlands, water allocation and distribution conflicts between different users and low involvement of local stakeholders in critical policies and management decisions.

Conclusion and Future Approaches

The current condition of Lake Urmia requires immediate action to prevent or reverse the drying process. The Urmia Lake Restoration Program has so far failed due to a lack of participation and a failure to consider the opinions and concerns of local people in the planning phase and when implementing management strategies. Yet ignoring them can affect livelihoods and lead to severe social, environmental, economic and governmental crises. Without the participation of local people and attempting to meet their needs, it will be impossible to revive

Lake Urmia. This will mean the loss of natural heritage and the habitat of species and a loss in the cultural, spatial and historical value of the region, not only because of the reduced water supply but also because of changes in the lives of the residents. Without appropriate action, not only the ecosystem of the lake is at risk, but also the health and well-being of the residents of the basin. Dealing with the challenges and creating a suitable and inclusive process is crucial for the environmental, social and economic sustainability of this region.

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