Lake Urmia: Signs of recovery

Background

The UN Environment Foresight Briefs are published by UN Environment to, among others, highlight a hotspot of environmental change, feature an emerging science topic, or discuss a contemporary environmental issue. The public is thus provided with the opportunity to find out what is happening to their changing environment and the consequences of everyday choices, and to think about future directions for policy.

Introduction

Lake Urmia, located in a mountainous region between the provinces of East and West Azerbaijan in northwestern Iran is one of the country's most important ecosystems. The lake is fed by rainfall, runoff from the wider catchment area and groundwater.

There are 13 rivers that feed Lake Urmia, the largest of them being River Zarrineh Rood. In February 2012, a UN Environment feature on *'The Drying of Iran's Lake Urmia and its Environmental Consequences'* highlighted that during high water periods, it's dimensions were 140 by 85 km with a surface area of 6,100 km² (UNEP, 2012) with its water level varying between 1270-1280 meters above sea level (UNDP, 2014). The lake has been in decline since 1995. By August 2011, its surface area was only 2,366 km² (UNEP, 2012), it further declined to 700km² in 2013.

Recent indications are that the lake is recovering. The lake surface area is now at 2,300 km² (UNDP, 2017). The focus of this brief is on the extent of this recovery and measures that are being put in place to ensure this is sustained.

Changes in the surface area of Lake Urmia (1963-2017)

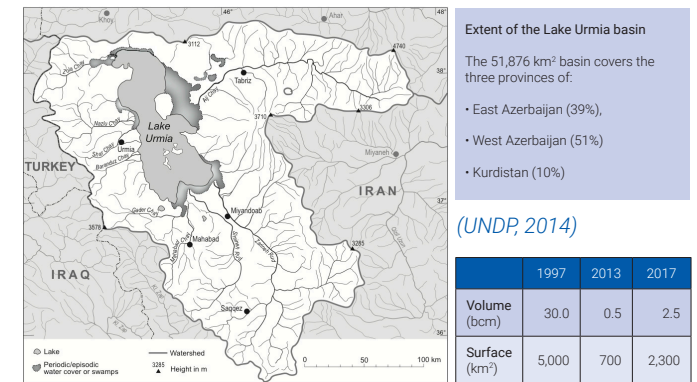

1963 · 1982 · 1998 · 2013 · 2016 · 2017
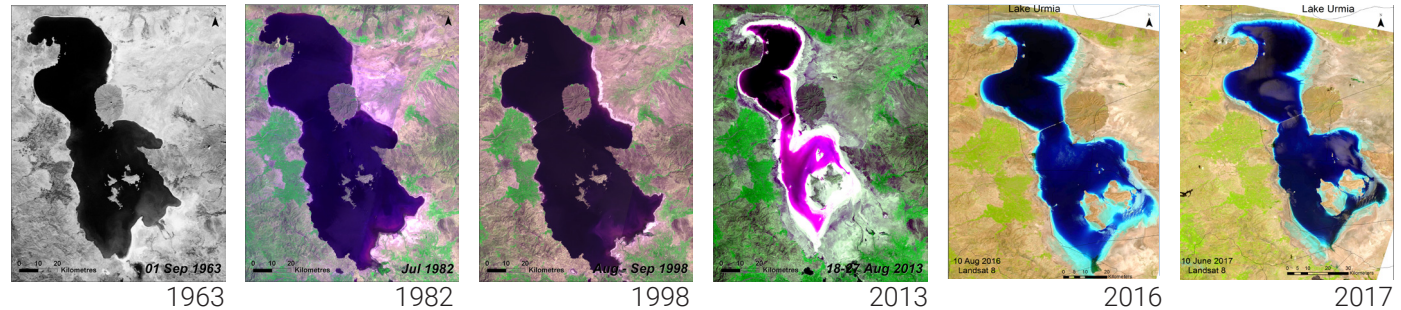
Source: UNEP

Why is this issue important?

Lake Urmia supports agriculture, energy, industry, food, water and housing needs of the people that live around the lake and within the wider catchment basin. In 2011, about 6 million people lived within the basin (ULRP, 2017). From 2015 estimates, about 10.33 million people live in the area within a 200m radius from the centre of the lake, an area of 121,304 km² (SEDAC, 2017). The population and their needs are growing and decline of the lake will have negative ramifications throughout the region in areas such as access to water, food security, public health, biodiversity and ecosystem health and possibly the local climate.

The restoration of Lake Urmia is possible, as the government of Iran acts together with development partners and local communities. There have so far been positive indications that this is possible –the lake increased by 1600 km² between 2013 and 2017 (UNDP, 2017). There have been efforts at engineering works to help unblock and un-silt the feeder rivers, deliberate release of water from the dams in the surrounding hills, and water management in the basin. This presents an opportunity to support the continued restoration the degraded environment. In fact, as has been shown in the case of the *'The changing Aral Sea'* it is possible to restore a degraded environment through concerted interventions and action.

Location of Lake Urmia and the catchment basin

Extent of the Lake Urmia basin

The 51,876 km² basin covers the three provinces of:

· East Azerbaijan (39%),

· West Azerbaijan (51%)

· Kurdistan (10%)

(UNDP, 2014)

	1997	2013	2017
Volume (bcm)	30.0	0.5	2.5
Surface (km²)	5,000	700	2,300

http://www.iranicaonline.org/uploads/files/Urmia_Lake/urmia-lake-fig1.jpg

(UNDP, 2014)

ISNA PHOTO
Sara Ahmadi

Tourists visiting revived Lake Urmia in Iran

What are the findings?

Agricultural water use

Agriculture is important to the economy around lake Urmia. Employment in agriculture as a percentage of total employment stands at 19.2 per cent and the value-added contribution to GDP stood at 10.8 per cent in 2015 (World Bank, 2017). This signifies the importance of the agricultural sector to the economy and highlights the influence it carries in the competition for water resources.

Iran aims to be food self-sufficient and currently supplies about 90 per cent of her domestic food demands (Mesgaran, Madani, Hashemi, & Azadi, 2017). But the demand for food continues to rise.

A study between 2002-2011 in the eastern sub-basin of Lake Urmia showed that agricultural activities, the expansion of farm land, and increase in population over the last three decades led to over exploitation of resources, thus, causing land degradation (Fathian, Dehghan, & Eslamian, 2015). In 2014, irrigated land as a percentage of agricultural land was 16.6 per cent (World Bank, 2017).

Due to the local semi-arid climate, water demand in the agricultural sector is high - estimated at 92.18 per cent of total water withdrawal between

2003 and 2007 (Keshavarz, Ashraft, Hydari, Pouran, & Farzaneh, 2003) (FAO, 2017). Furthermore, irrigation practices are inefficient. For example, in West Azerbaijan, irrigation efficiency ranges between 28-41 per cent (Keshavarz, Ashraft, Hydari, Pouran, & Farzaneh, 2003).
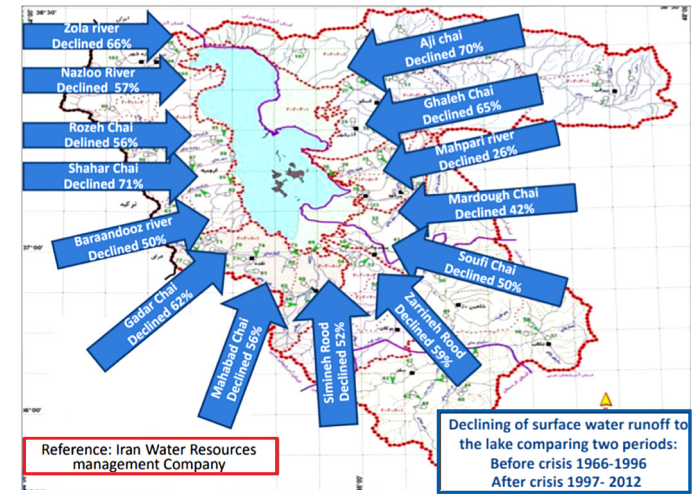
Agriculture (value added % of GDP),
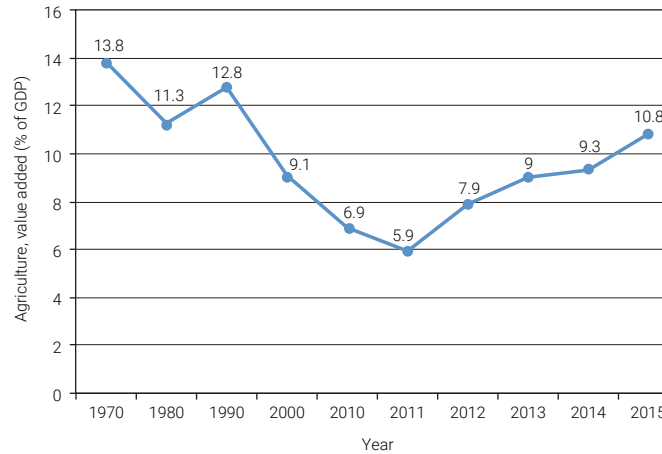
(World Bank, 2017)

Time series of annual Precipitation (mm) and Temperature (°C) for Urmia Lake basin between 1966 and 2015
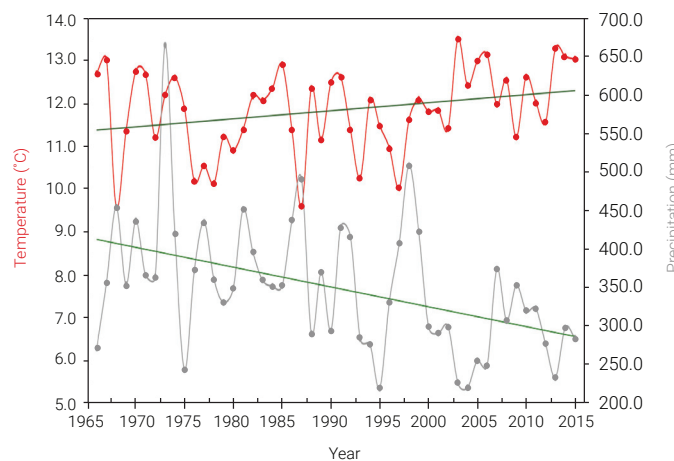
(Taravat, et al., 2016)

Rivers runoff declines (%) comparing two periods: before and after crisis,

(ULRP, 2017)

Water resources development projects

By 2012, there were over 200 new dams and irrigation projects in the design or construction phase in lake Urmia catchment basin (Agha Kouchaka, et al., 2015).

These projects have over time decreased the amount of water reaching Lake Urmia. The situation is compounded by decreasing precipitation, increasing evaporation and the recurrent droughts.

Declining precipitation levels

An assessment between 1965 and 2010 of meteorological and satellite data from four stations around lake Urmia shows that rainfall has decreased by 37 mm implying that the falling lake levels are also related to the decline in precipitation (Arkian, Nicholson, & Ziaie, 2016). Temperature within the region is also on the rise (Taravat, et al., 2016).

Social, environmental and economic impacts

Although not conclusive, the construction of Urmia Lake Bridge, that was built to facilitate regional transport, seems to have contributed to the current state of the lake. Since its completion in 2008, Lake Urmia has essentially been two water bodies.

Although a gap of 1,276 m was left, the embankment created for the causeway, this was inadequate to maintain the flow of water between the two sections of the lake (Ghadimia & Nezammahalle, 2016).

The receding waters have resulted in the drying of shoreline wetlands. Dust and salt from this area is carried during wind storms and causes harm to surrounding vegetation and fauna, affecting visibility and public health concerns for residents. Although more study is required, it is thought that these are caused by dust polluted with chemicals used in the irrigated farms.

Red waters of Lake Urmia draw tourists

The biodiversity in Lake Urmia include an almost endemic specie of brine shrimp Artemia urmiana, several species of algae, amphibians, bacteria, birds, mammals, reptiles, microfungi and plants (Asem, Eimanifar, Djamali, De los Rios, & Wink, 2014). Over 200 bird species are found including avocets, flamingos, gulls, ibises, pelicans, shelducks, spoonbills, stilts and storks (ULRP and SUT, 2015). Halophilic archaebacteria have been known to bloom in the northern section of the lake causing the water to turn red (Mohebbi, Ahmadi, Aza, Esmaili, & Asadpour, 2011), (Asem, Eimanifar, Djamali, De los Rios, & Wink, 2014). The wetlands support harvesting of the brine shrimp, salt, fisheries, reeds, fodder and medicinal herbs. They also provided habitat for water bird species and control saline underground waters.

Thousands of Flamingos delay migration from Lake Urmia

What has/is being done?

Lake Urmia has attracted a lot of attention and action from stakeholders at the local, national and international level. A number of activities including better water management throughout the basin, release of water from dams and desilting of feeder rivers have resulted in the slow but sure restoration that is evident. Some of the initiatives are highlighted below.

Government national development plans

Iran's fifth 5-year development plan (2010-2015) adopted an environmental assessment of strategic policies and plans as well as an ecosystem-based approach to the management of wetlands and biodiversity. It also incorporated climate change considerations. In 2013, a working group was established to address the issue of Lake Urmia. Its mandate was to use available literature to inform proposed solutions to the environmental degradation besetting the lake and present proposals to the government. The sixth 5-year development Ghent plan (2016 – 2021) launched in 2017 continues to focus on water aiming to reduce consumption of potable water by 30 per cent by 2021 and to produce 30 per cent of the required water needs for South Iran from desalination.

Conservation of Iranian Wetlands Project (CIWP)

Since 2005, the United Nations Development Programme (UNDP), the Global Environment Facility (GEF) and the Iranian Department of Environment have been working together to improve the management of Iran's wetlands. The Lake Urmia Basin Integrated Management Plan adopted by cabinet in 2010 uses an ecosystems approach to integrate community livelihoods, development and conservation needs.

In 2014, the government of Japan supported a further project on 'Contribution to restoration of Lake Urmia via local community participation in sustainable agriculture and biodiversity conservation'. Pilot projects to demonstrate sustainable agriculture or Integrated Participatory Crop management (IPCM) indicated that water efficiency was increased by 35 per cent (CIWP, 2014). The third phase of the project commenced in 2016 with further support from the government of Japan.

Urmia Lake Restoration Program (ULRP)

FAO has since September 2016 been collaborating with the government of Iran in a project on "Urmia Lake Restoration Programme" (ULRP) to ensure sustainable management of the water resources of the lake basin area.

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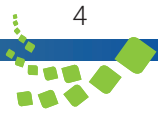
What are the implications for policy?

Build consensus amongst stakeholders

Collaboration between the national and local government stakeholders and other organisations on how to manage the lake could be improved (Zagharmi, Ku, Ying, Shaba, & Islam, 2015). It is imperative that the various stakeholders be actively involved in developing and implementing an agreed governance model.

Employ an Integrated Water Resources Management approach

There is an urgent need to fully implement the 2010 Integrated Management Plan for the Lake Urmia Basin prepared in cooperation with the Iranian government, NGOs and communities; and the 2012 Drought Risk Management Plan for Lake Urmia Basin prepared by the Working Group on Sustainable Management of Water Resources and Agriculture, Regional Council of Lake Urmia Basin Management.

Address water governance issues

It will be necessary to improve irrigation efficiency while at the same time increase the yield per unit of water consumed (Keshavarz, Ashraft, Hydari, Pouran, & Farzaneh, 2003). Water conservation strategies such as those used in sustainable agriculture approaches should be employed.

In order to encourage water conservation, the government should consider economic instruments, legislation and water storage solutions such as increased rainwater harvesting (for domestic use), recycling of waste water (especially for agriculture), cloud seed research and inter-basin transfers (Zagharmi, Ku, Ying, Shaba, & Islam, 2015). However, more research on the latter two is required.

Improving the legal framework would also address some of the water governance issues, such as water rights. There has been a prohibition on the approval of new water development plans within the basin, apart from Kordestan province which is exempt on account of its low development status.

Illegal water uptakes from the basin are one of the issues with significant negative impact on securing water rights. Consequently, the National Implementation Committee has to intensify supervision on illegal water exploitation.

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A small part of Lake Urmia

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