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Exploring social vulnerability and environmental migration in Urmia Lake of Iran: Comparative insights from the Aral Sea

Environmental migration has attracted more attention over the recent years. This increasing interest emanates from the global crisis caused by 'climate change and other human-induced environmental changes' (Sachs, 2014) and their impacts on the wellbeing of populations. As unfortunate as it may be, environmental disasters have been occurring with higher frequency and magnitude in recent years, e.g., Solomon Islands tsunami in 2013; Mozambique flooding in 2013; and the drastic depletion of the Aral Sea in 2010 (see World Disasters Report 2010, OCHA). According to OCHA-IDMC (2009)- (United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and the International Displacement Monitoring Centre (IDMC)- more than 20 million people have already been displaced within and outside national borders of countries struck by environmental disasters; and an estimated 25 million to 1 billion people could be displaced within the next 40 years (International Organization for Migration, IOM, 2009).

Environmental migration cannot only be induced by sudden onset disasters but is also caused by slow onset of environmental changes. In fact, the number of people displaced due to gradual changes in environment may actually be higher than those displaced due to sudden disasters. As explained in EM-DAT report (2009)_(see International Emergencies Disaster Database: http://www.emdat.be/index.html)_ 1.6 billion people were displaced due to droughts compared to 718 million displaced as a result of sudden on-set of disasters from 1979 to 2008. The underlying reason for such escalated migration patterns is that gradual environmental change creates an increasingly difficult socio-economic context in which people either volunteer or are forced to migrate. That is, as populations' livelihood and their economic and social wellbeing are gradually undermined by changes in their immediate environment, those who can afford may choose to migrate either temporarily or permanently.

Whether and when families decide to migrate is directly correlated with the stages of the actual environmental change. At the early stages of environmental change families may choose to voluntarily leave in search of more suitable places. As the environmental change gradually develops so does its impact on the social wellbeing of populations who would eventually be forced to leave to more suitable places further away. The final episode of the environmental change, however, may have a negative correlation with families' migration pattern as those who have been left behind may be entrapped and be unable to leave.

Although there is much debate over drivers of migration and whether it has a voluntary or a forced nature, it is evident that environmental change can be counted among pull or push factors for migration, as they have since ancient times. Some of the instances of gradual environmental change that may lead to migration include: desertification, rising sea levels, soil erosion, degradation of natural resources, and lack of access to safe drinking or irrigation water- many of which are human-induced. This paper is an attempt to examine social impacts and patterns of environmental migration caused by the gradual depletion of a certain natural resource: Lake Urmia in Iran. To this end, this article questions i) the social vulnerabilities that may arise from the depletion of Urmia Lake: This will allow an exploration of the types and intensity of socio-economic impacts in the lake's region, drawing specifically on social vulnerabilities that have already occurred in the case of the Aral Sea; and ii) if and how the gradual disappearance of the Urmia Lake may lead to environmental migration. This will allow understanding the possibility, patterns, and kinds of migration evoked at different stages of the Lake's depletion.

This paper is divided into three main parts. In the first section, an analysis of the current situation, causes and challenges of the degradation of Urmia Lake will be outlined by drawing on relevant literature. This section will also include an analysis of the Aral Sea depletion and its social impacts. In the second section, social impacts of Urmia Lake depletion will be examined considering the basin countries' contextual and socio-economic specifications. The geographical coverage of this analysis will be limited to an immediate basin impact region (IBIR) of 100 Kilometers circle around Urmia Lake and a further basin impact region (FBIR) within a 500 Kilometers distance from the Lake including: Armenia, Azerbaijan, Iran, Iraq, Syria, and Turkey (See Map 1 below). This section will end by replying to the first research question and will highlight Urmia basin countries' social vulnerabilities. Some of the data used to answer the first question are: Environmental Vulnerability Index (EVI), Human development Index (HDI), urban population density and annual growth rate as well as data on health and global governance Index. Before presenting final remarks and conclusion, the third section of the paper will explore the possibility of environmental migration as well as its patterns and consequences for Iran and the region.

Map 1. Immediate basin impact region (IBIR) and further basin impact region (FBIR)

Originally created by Torabian, Elham(2014): The inner red circle is a region within 100 km range from the center of the Lake Urmia; the Outer red circle has a 500 km radius and includes all 6 countries of the Urmia Basin: Armenia, Azerbaijan, Iran, Iraq, Syria, and Turkey.

1. EXPLORING LAKE URMIA AND ITS DESICCATION

To understand the social impacts of the receding Urmia Lake in Iran, it is worthwhile to scrutinize previous similar cases. In fact, as the 'complex nexus' of migration and social vulnerability in past cases unfolds it may serve as a model to understand the new case at hand. Indeed, the aim of such analysis will not be to generalize the trends and challenges of the past experience to those of the current case; such delineation will simply serve as a frame of reference to which contextual factors of the new case will be added in order to arrive at a context-specific understanding of migration and environmental change. Although there is a long list of depleting lakes and seas around the world, I have chosen to take after many studies that have compared Urmia Lake with the Aral Sea (Garousi et al. 2013; Charandabi, 2013; Pengra, 2012; Hassanzadeh, 2011; Micklin, 2007). The case of the Aral Sea will serve as a model for projecting the social vulnerabilities and migration patterns caused by the desiccation of the Urmia Lake.

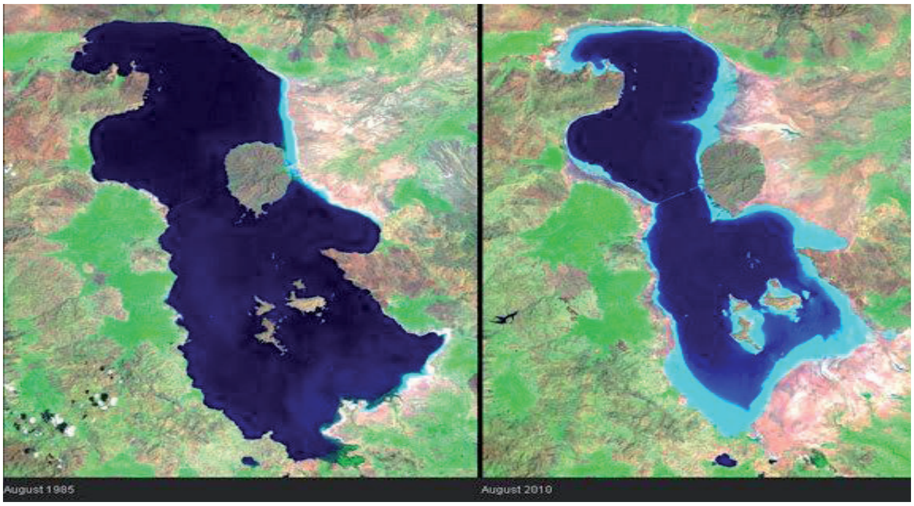
1.1. Introducing Lake Urmia: An analysis of its importance and current situation

Lake Urmia is an endorheic (closed or terminal basin with no outflow) and hypersaline (A landlocked body of water with significant concentration of salts more than 35 g/l) basin situated in the northwest Iran extending as long as 140 kilometres from north to south and as wide as 85 kilometres from east to west. Registered as a UNESCO (United Nations Educational, Scientific, Cultural Organization) biosphere reserve and an internationally significant wetland in the1971 Ramsar Convention (Nazaridoust, 2011) the lake is the third largest hypersaline basin in the world and the first largest in the Middle East; accommodating more than 210 species of birds, reptiles, amphibians and mammals, a unique salt-water shrimp species called Artemia urumiana and a significant variety of salt tolerant plants (UNEP report, 2012). The basin's surrounding villages and cities are home to 6.4 million people and an estimated 76 million people live within a radius of 500 kilometers (Food and Agriculture Organization of the United Nations, FAO 2010).

The surface area and water level of the lake have decreased significantly during the last four decades, with its depletion rate rapidly accelerating in recent years. According to Hassanzadeh et al. (2011) the estimated water level of the lake has decreased 7 meters from its highest level of 1,278 in 1995. Although the decline in water level does not seem impressive at first glance, it has had a significant impact on the surface area of the lake due to its original shallowness. That is, in 1995 the surface area of the lake was estimated at almost 6,100 KM^2 remaining stable from 1969, which has now declined to almost one third, 2,366 KM^2 in 2011.

The decline in water and surface levels has in turn had two immediate impacts. One is the unprecedented salinity increase in the water, i.e., 300 g/L- more than 8 times salt in any typical saline basin, which has proved fatal for the lake's brine shrimp and has consequently led to a disruption in the lake's food cycle. In addition, the dried surfaces of the lakebed has turned into a wide salty desert of more than 400 square kilometers that not only threatens agriculture and natural vegetation growth around the lake but is also predicted to endanger cities and villages within close approximation to the lake due to high probability of future salt and sand storms (Hassanzadeh et al., 2011). Several environmental studies have predicted similar fatalities associated with the lake's biodiversity and population caused by the drying of the Aral lake drying (Micklin, 2007 and Pengra, 2012). The below satellite picture is adapted from the UNEP report 2012 showing the decrease of water surface and level from 1995 to 2011.

Map 2. Adapted from 'The drying of Iran's Lake Urmia and its environmental consequences'



Source: UNEP 2012 Report

1.2. Trend and Causes of Urmia Lake's depletion

Several direct and indirect human-induced factors are recognized as causes of the lake's rapid drying in the last three decades.

Among the indirect causes, climate change impacts such as drought and low precipitation levels are considered as the two major contributing factors to the lake's desiccation. The annual rainfall over the Lake has decreased by 40 per cent from its average 235 mm from 1967 to 2006 (Hassanzadeh et al., 2011), leading also to a decline in the level of groundwater in the area (Zarghami, 2011). The impacts of such indirect environmental factors on Urmia Lake have been quite significant. For instance, a comparison of the surface level of the Sevan Lake in Armenia and the Van Lake in Turkey, both of which are located less than 200 km away from Urmia Lake and reveals that despite similarities in their geographical situations, none of the two lakes have declined as has Urmia Lake (UNEP, 2012). The report highlights the fact that being the shallowest among the three, Urmia Lake has been more vulnerable to climate change issues such as low precipitation rates. The 4 degrees rise of temperature in the lake's region also bears a negative impact on the Lake's sustainability.

However, direct human-induced impacts have played a greater role in the rapid desiccation of the Lake. Based on a systematic literature review of 25 academic articles conducted by Garousi et al. (2012) common causes of the Lake's decline are recognized to be: a) construction of dams; b) poor water management policies; and c) construction of a primitive-type causeway (An elevated road/railway over a wetland) dividing the lake into two north and south lakes with almost no connectivity. In addition, a rapid increase in population size and aggressive use of the lake's water and nearby underground water reserves for irrigation purposes and diversion of in-flow rivers have worsened the situation (Golabian, 2010).

Construction of dams is one of the most contested policies of the central government in Iran with undeniable environmental impacts on the lake. Urmia is a terminal lake, therefore in addition to evaporation the only other explanation for the lake's decreasing water level is a drastic reduction in incoming water. According to Mohebbi et al. (2007) almost 25% of the decline of Urmia Lake is in fact due to dam construction compared to 10% impact of low precipitation. In the last three decades, a number of 48 dams have been constructed over the 13 rivers that flow into the Lake - mainly for irrigation purposes but also for electricity, household water and economic development of the region and its increasing population (ibid.). The amount of water kept behind the dams accounts for up to 13% of the Lake's health capacity; this combined with low rates of rainfall can partially explain the current situation of the Lake (Alipour, 2006). In addition, availability of irrigation water accumulated behind the dams has led to a change in farmers' cultivation attitudes from subsistence to intensive agriculture (Ilhan et al., 2012).

Furthermore, the increase in water consumption for irrigation and the rise in population have not only resulted in the rapid decrease of Lake's surface water but also an aggressive use of underground waters. Local farmers interviewed in Ilhan et al.'s (2012) study have explained that only a decade ago they could reach underground water digging wells of 30 to 40 meters while currently they have difficulty accessing water even with 70 meters deep wells. Thus, construction of dams and diversion of water could be considered as the two important causes of reduced inflow into the lake leading to drastic decline of its surface and water level.

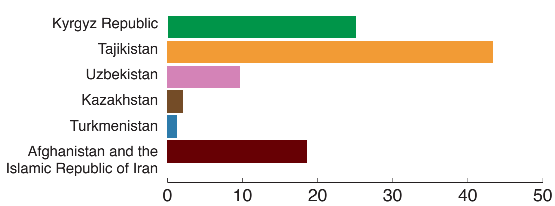
In addition, other unsustainable management practices threaten the future of the Lake. Intensive and industrial agriculture in the lake's region and rapid urbanization have resulted in a high discharge of agro-chemical and residential sewage into the lake and thus are causing water contamination. Dividing the Lake into two dissimilar bodies of south and north bodies of water-, the causeway constructed across the Lake has 'disturbed salinity levels, density and distribution of brine shrimp and the equal distribution of inflow waters' (Mohebbi et al., 2007) thereby a further drying out of the lake. Some of the other direct human impacts on the lake include: increased sediment inflow through agricultural development and conversion or damage to natural pasturelands; increased fish-culturing activities that are not compatible with the lake's water quality; and explosions from mine excavation.

1.3. Exploring similarities with the Aral Sea

The Aral Sea used to be the fourth largest landlocked saline and enderheic lake with an area of 68,000 square kilometers situated in the semi-arid and desert areas between Kazakhstan in the north and Uzbekistan in the south. This entails a similar situation to that of Urmia Lake where the main contributing factors of depletion of the water resource are limited to evaporation and diversion of rivers.

In addition to Kazakhstan and Uzbekistan, the basin area of Aral Sea is shared among five more countries including Kyrgyzstan, Tajikistan and Turkmenistan, Afghanistan and Iran. The basin encompasses a total area of 1,549,000 km2. Seven countries share the inflow water of the Aral Sea Basin, as shown in the pie chart below:

Figure 1. Diagnostic report on water resources in Central Asia



Based on SPECA project 2002: 73.

Similar to Urmia Lake, climate change and decreasing annual precipitation rates have borne negative impact on the Aral Sea. However, the depletion of the Sea is more a result of human interventions to divert rivers. According to UNEP (2005), annual precipitation levels range between 2000-1500 mm in eastern parts of the Sea and 200-80 mm in its western parts. The two main rivers that fed into the Sea; Amu Darya and Syr Darya were diverted during 1950s as part of 'Stalin's expansive irrigation plans' (Grigoryev, 1952). The goal was to cultivate the 'white gold' or cotton as a result of which Uzbekistan remains the world's largest cotton provider today (USDA-Foreign Service, 2008). Child labor in Uzbekistan in these very same cotton fields has been a human rights concern in recent years- See Human Rights Watch report in: http://www.hrw.org/news/2013/01/25/uzbekistan-forced-labor-widespread-cotton-harvest). Due to an increase in population size surrounding the Aral Sea region (14.1 million in 1960 to 47 million in 2008), the irrigation area has also increased to 8.5 million hectares which has meant a drastic reduction of water volume in the Aral Sea from 1,093 km^2 in 1960 to 0.27 km^2 in 1984 (Aralgenefund, 2012; Viktor, 2011).

These human-induced changes have significantly affected the Aral Sea. In 1987, the Sea was divided into two parts: the Large or Southern Aral Sea and the (Northern) Small Aral Sea; by 2009 the Southern Sea disappeared and the North Sea had a maximum depth of 42 meters. The drying of the Aral Sea has caused more extreme air temperatures, i.e., hotter summers and colder winters (Aralgenefund, 2012). Following the separation of the lake from 1986 to 2000 the precipitation of the Small Aral Sea has reached almost zero (CAWATER, 2012). However, a 2014 NASA report indicates that changes in the rainfall patterns have been misleading since 'lake-effect precipitation downwind of the Aral Sea has decreased, but precipitation over the sea itself has increased' (see http://www.jpl.nasa.gov/news/news.php?release=2014-050). The amount of the dry seabed has risen from 4.5 million hectares in 1960 to 8.7 million hectares in 2010 (Viktor, 2011).

In addition, the sea used to support a major fishery and functioned as a key regional transportation route. The extensive deltas of the two major inflowing rivers sustained diverse flora and fauna. They also supported irrigated agriculture, animal farming, hunting and trapping, fishing. It also allowed harvesting of reeds which served as fodder for livestock as well as building materials. Decrease of the Aral Sea water level has meant a major loss of fish resources (20 fish species in 1960, reduced from 11 fish species in 1970 to just 1 species in 1990) and local climate change impacts such a flooding in winter, initiation of salt and sand storms, desertification and loss of flora and fauna (Micklin, 2014; Dukhovny & Shuetter, 2011; Alikhanov, 2011; Micklin, 2007; Forkutsa, 2006). Of' course, the Aral Sea will not desiccate completely but both the Small and Large Sea may survive only to become too hypersaline to yield any economic or ecological value except for production of Artemia brine shrimp eggs; although the future survival of the Large Sea is both debatable and problematic (Mickline, 2014).

As it can be observed, both basins of the Aral Sea and Urmia Lake share similar desiccation causes and trends, particularly when it comes to the human-induced changes. Such resemblances has persuaded many environmentalists to believe that Lake Urmia and its surrounding population will soon be exposed to similar challenges that Aral Sea basin population have previously experienced (Boms and Arya 2012, Pengra 2012, Micklin 2007).

In the following section I will highlight the social impacts caused by desiccation of Lake Urmia. First, the Aral Sea impacts on the social wellbeing of surrounding populations will be examined. In order to differentiate the Urmia Lake and Aral Sea impacts I will then draw on the Environmental Vulnerability Index (EVI) of countries in the two basins. This will facilitate a comparison of vulnerability in the two basin areas and the intensity of the social impacts in countries of Urmia basin. The average EVI and other socio-economic and development indicators such as HDI, poverty rates, population growth rate, urbanization, unemployment and health issues will be used to better demonstrate the social vulnerability of Urmia Basin desiccation which will eventually lead to the entrapment, voluntary or forced migration of the basin's population.

Table 1. **Comparative data on Urmia Lake and the Aral Sea**

	Urmia Lake	The Aral Sea
Geographical position	Iran, Middle-East, Landlocked	Uzbekistan – Kazakhstan, Central Asia, Landlocked
Coordinates	370.42 N, 450.19 E	450 N, 600 E
Surface Area (km2)	3,500 (2013)	Small Aral: 3300 (in 2008); Large Aral: 27,750 (used total 68,000 in total)
Average depth (m)	16	10 (10%: 42) 2008
Water Volume (km3)	-74 %	Small Aral: 22km3/Large Aral: 70 km3
Lake level (m)	1273 m above sea level	Small Aral: 40.8 drop; Large Aral:40.1
Type of lake	Enderheic	Enderheic
Primary inflows	13 Aji Chay, Alamlou River, Barandouz River, Gadar River, Ghaie River, Leylan River, Mahabad River, Nazlou River, Rozeh River, Shahar River, Simineh River, Zarrineh River, Zola River	2 Syr Darya (North) Groundwater only (South) (previously Amu Darya)
Basin countries	(6) Armenia, Azerbaijan, Iraq, Iran, Syria, Turkey	(7) Afghanistan, Iran, Kazakhstan, Kirghizstan, Tajikistan, Turkmenistan, Uzbekistan
Causes and depletion	Climate change Dam construction Increased sediment flow Low precipitation Unsustainable water management of irrigation river diversion Lack of political and legal frameworks Population increase	Climate change Irrigation Increased sediment flow Low precipitation Unsustainable water management River diversion Decreased ice resources Lack of political and legal consensus Population increase
Salinity (g/l)	300g/l , Hypersaline	270 g/l , Hypersaline

Created by Torabian, Elham (2014)

2. PROJECTING THE SOCIAL IMPACTS OF URMIA LAKE DEPLETION BASED ON THE ARAL SEA EXPERIENCE

2.1. Health, water and food security

The social impacts caused by the Aral Sea desiccation are multiple. The primary issue has been health. According to Micklin (2014) the population around the Sea suffers from several acute health problems caused by depletion or contamination of the Sea. There had been incidences of water borne massive outbreaks such as typhoid fever, hepatitis A and diarrheal diseases (MSF (2001) Aral Sea Program, Medecins Sans Frontieres. http://www.msf.org/aralsea). Some of the direct health issues include Tuberculosis and respiratory diseases (Small et al., 2001). Furthermore, digestive afflictions and cancers, malnutrition and anaemia have increased drastically (Ferriman, 2000; Ataniyazova, 2001). These health issues are generally as a result of the Aral basin's population exposure to a) toxins and minerals in salt and dust storm, b) as they have used the contaminated water of the Sea; c) the discharged water from agricultural fields with high level of pesticides. Furthermore, the decline in water levels has caused poor health for the household's whose main food used to be fish or other agricultural/animal products. The already vulnerable populations with low access to health services, proper nutrition, hygiene and safe water have been struck more severely with health diseases and outbreaks.

In addition, the salt and sand storms have had a further negative impact on the food security of the Aral region by damaging animal and plant lives. Similarly, equal access to safe water and water for irrigation, as well as power generation has declined due to population growth, upstream countries' higher use of water than agreed and inefficient water management and lack of legal frameworks to regulate water management especially among the basin countries. For instance, in 2000, when overall water supply dramatically decreased, it is reported that the water abundance (the ratio of total water withdrawal to the total required amount of water) was 90% in the upstream region of Tajikistan but only 40% and 45% in the downstream regions – of Dashauz in Turkmenistan and Karakalpakstan in Uzbekistan, respectively (Dukhovny and Schutter 2011:277). Consequently, water shortage has also turned into a major social and health crisis (Whish-Wilson, 2002).

Unfortunately, similar social impacts have already started in the Urmia Lake immediate basin region. With more than half of the Lake already desiccated , the salt from the lake beds have been disposed and locals have reportedly witnessed salt storms that will potentially cause health and agricultural concerns (Garousi et al., 2013).The impact of Urmia Lake salt storms are significant. "It has been estimated that 6 to 8 cities will be totally destroyed, covered by layers and layers of salt. That's 4- 14 million people that have to be displaced to avoid the storm of salt within that region" (The World Radio News Magazine, Sept. 11, 2011 quoted in Garousi et al (2013). Without immediate and sustainable solutions, aggressive sand and salt storms will undermine the health and social wellbeing of the population living in immediate proximity to the Lake. Unfortunately, it is predicted that the Lake will dry out in 2035 with an ecological level unsuitable for economic or ecological benefits. 'If discharge of all rivers to the lake equals to zero (as happened in summer 2010), the precipitation on the lake will not be enough and the lake will be dried thoroughly in 6–9 years. Therefore, similar to Aral, health concerns and food security and access to safe water could affect the Urmia Lake population within 6-20 years from now' (Abbaspour et al., 2012:266). Extreme harsh symptoms as such have been observed in the already depleted Hamoon Lake area in Southeast of Iran; in fact, a diagonal line could be drawn from Hamoon Lake to Urmia Lake to designate a 'security hot zone' in the Middle East within the next decade or so.

To better understand the significance of Urmia Lake desiccation, further complementary data is required. Unfortunately, there are no aggregated statistics on diseases, water access, malnutrition and child stunting for the main cities affected by Urmia desiccation Table 2 below is an attempt to summarize relevant data on Urmia basin countries based on World Health Organization Report 2013.

However, the 2013 WHO statistics may prove helpful here. As shown in Table 3 below all six countries of Urmia basin suffer from a high prevalence of tuberculosis-Turkey has the most cases reported (15,054) and Armenia has the least- with only 1,261 cases reported. Between 5 to 20% of the population in the basin countries remains without access to safe water, except for the cases of Armenia and Turkey where less than 2% of the population remain without access to safe water. The percentage of population without access to improved sanitation remains high and between 9-18% in all Urmia basin countries; except in the case of Iran which ranks the lowest (2%). Child stunting in rural areas of all basin countries is higher than urban areas and could be reinforced with further depletion of Urmia.

Table 2. **Urmia Basin countries' population growth and health situation**

	% of population without access to improved drinking water resources	% of population without access to improved sanitation	Most prevalent diseases	Child stunting in rural and urban areas respectively	% Annual growth rate of population	% of population living in urban areas
Armenia	2	10	TB	22-17	0.1	64
Azerbaijan	20	18	TB	30-20	1.3	54
Iran	5	2	TB, Cholera, Malaria	-	1.2	69
Iraq	15	16	TB, Pertussis, Mumps	31-25	2.9	66
Syria	10	-	TB	29-28	2.3	56
Turkey	2	9	TB, Mumps, Rubella	-	1.3	72

Based on *WHO Report* 2013

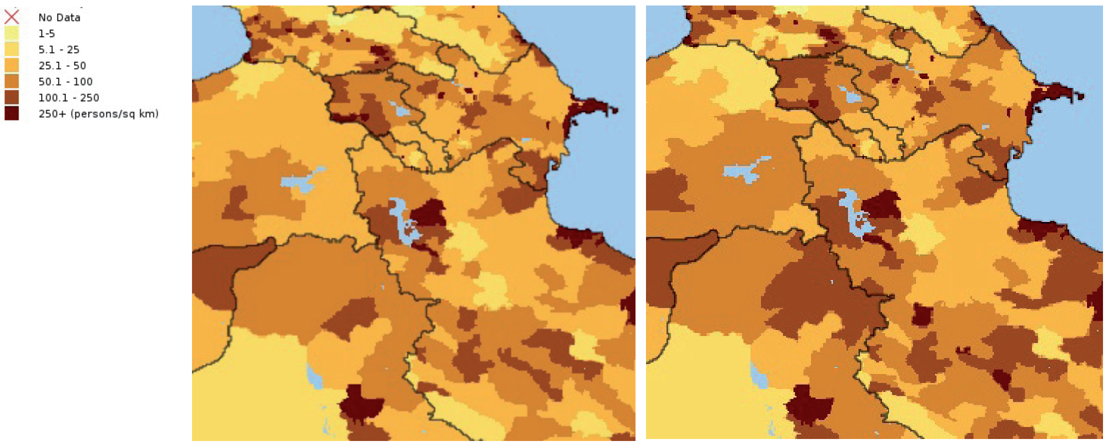
Table 3. **Summary of disease cases reported in Urmia basin countries in 2013 (WHO)**

	TB	Mumps	Malaria	Pertussis	Others	Measles
Armenia	1261	15	-	-	-	-
Azerbaijan	6527	101	-	-	-	-
Iran	10,980	-	3,239	650	Diphtheria 132	73
Iraq	8837	1,944	-	2,019	Total Tetanus 39	15
Syria	3395	95	-	90	-	13
Turkey	15,054	1,609	128	-	Total tetanus 24/ Rubella 1734	111
Total region	46,054	3,764	3,367	2,759	1,929	212

Note: As observed, TB has the highest frequency and occurrence in all Urmia Lake countries.

Putting together current lack of safe water for drinking, sanitation and irrigation, and the increasing probability of sand and salt storms, it is only logical to conclude that further degradation of Urmia Lake could result in a TB epidemic starting from urban areas that accommodate higher population densities (as shown in map 3 below adapted from SEDAC 2011) as well as and increased child stunting and malnutrition in rural areas. At this stage of Urmia Lake depletion, the inhaled toxins and minerals from salt storms are already believed to have led to throat and lung cancer, infant mortality, decreasing life expectancy and increasing child defects in Iran and the adjacent regions (Zarrineh & Azari, 2013).

Map 3. Population density change in basin countries (2000-2015)



2000 **2015**

Adapted from Socio-Economic Data and Applications Center (SEDAC, 2011)

3. UNEMPLOYMENT

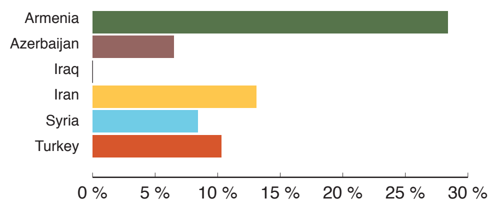
Environmental degradation decreases economic development and productivity. This is specifically true in developing countries where more than half of the population directly rely on –in part or whole- the environment through agriculture, animal farming, hunting, fishing, forestry and foraging (Todaro & Smith, 2012). The impacts of environmental degradation could become significantly severe with population growth and their increased pressure on natural resources especially in rural places (Maureen et al., 1994). Loss of environmental capital then could translate into a vicious circle of unemployment, poverty, a decrease in food security and eventually lead to local/regional conflicts.

The Aral Sea desiccation has indeed increased unemployment. According to a FAO (2007) report, the fishing industry, shipping and all related activities as well as paper industry have drastically decreased. Likewise, jobs in the agriculture section and animal farming have also decreased (See Oblast, 2002 at: http://nailaokda.8m.com/aral.html). The total unemployed population amounts to 19.5-17.2% and is growing particularly in small towns, settlements and rural areas especially among the youth (See Myagkov, 2006 at: http://www.sidym2006.com/imagenes/pdf/presentaciones/9_s2.pdf). Women are affected by unemployment issues, in specific, as their gendered roles increases their exposure to social vulnerabilities (Cutter et al. 2009). The desiccation of Aral Sea has indeed deprived the basin population from their functioning, capabilities and as such has caused violation of basic human rights.

Unfortunately, similar impacts on the economic wellbeing of the population living close to Urmia Lake can be observed. According to Zarrineh & Azari (2013) fishing industry and shipping has drastically decreased. Mud bathing which used to attract health tourists has declined due to severe environmental conditions and droughts. As Jafarli (2013) explains 34% of factories related to agricultural industry have closed down leading to the displacement of three million people (For further information refer to: http://en.apa.az/xeber_drying_of_lake_urmia_leads_to_unemployme_196025.html).

Further depletion of the Lake will also inevitably increase the existing high unemployment rates already prevalent in its basin countries, see Figure 2 and Table 4 below.

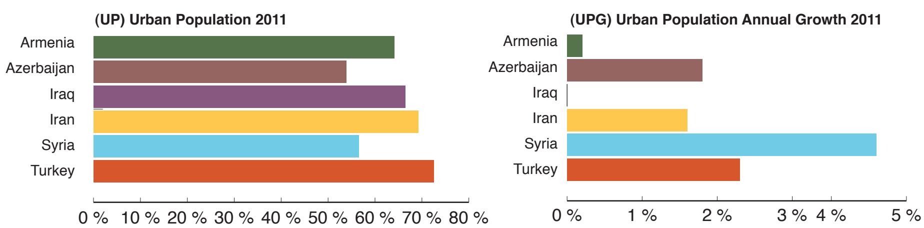
Figure 2. Unemployment rate and percentage in basin countries



Source: Human Development Index Report, UNDP 2013.

Considering the high unemployment rates and the urban population density and growth, shown in Figure 3 below, it is again only logical to deduct that desiccation of the Lake would only worsen the situation if no immediate response mechanism is foreseen. Subsequently, further unemployment in Urmia basin countries will bear significant impacts on the security and sustainable development of the region.

Figure 3. Urban population & growth in basin countries

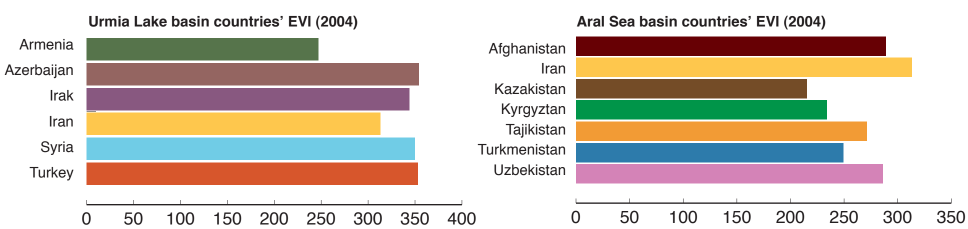


Source: The World Bank 2011.

3.1. Further reflections on Urmia desiccation social impacts:

At a glance, the social impacts of Urmia Lake depletion resemble those of the Aral Sea desiccation. However, a case-specific analysis of the social vulnerabilities in Urmia basin countries calls for further scrutiny of relevant data and statistics.

Figure 4. Environmental Vulnerability Index:

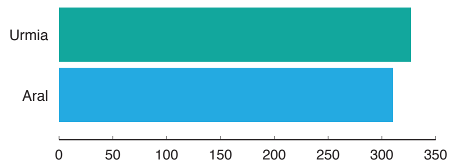


Urmia Lake basin countries' EVI (2004)Aral Sea basin countries' EVI, (2004).

One such significant data is the Environmental Vulnerability Index. In the event of a total depletion of Urmia Lake, the basin countries with higher environmental vulnerability will be more severely affected, facing challenges in health, water and food security, economic and social issues. In the EVI estimates for each country, three aspects of environmental, economic and social vulnerabilities are incorporated (for further information see: http://www.sopac.org/index.php/

environmental-vulnerability-index. As observed in Figure 4, Azerbaijan, Turkey and Syria are more vulnerable compared to Iran and Armenia. However, the average EVI of Urmia Lake basin countries is significantly higher than the average EVI of Aral Sea basin countries (Figure 5). This entails that Urmia basin countries are more vulnerable to environmental degradations which may translate into higher economic and social vulnerabilities.

Figure 5. A comparison of Aral Sea and Urmia Lake Average EVI



Average EVI of Urmia Lake and Aral Sea basin countries

Of course, the significance of the Lake's desiccation impact depends on each of the basin countries' population density and other factors such as their human development Index and poverty rates. According to UNDP 2013 report, the HDI of Iran is the lowest among the basin countries (76) and the highest is that of Iraq (131) followed by Syria (116)- note that these data may have drastically changed due to the recent unrest in the two countries. Nonetheless, basin countries with lower HDI like Iran and Azerbaijan (82) and Armenia (87) will be affected more severely than others with higher HDI like Turkey (90). Similarly, higher poverty rates would translate into more significant impacts on the wellbeing of populations living in Urmia basin, higher security and health risks, as well as further violation of human rights. Based on the UNDP 2014 human development report (Human Development Report 2014, Sustaining human progress: reducing vulnerabilities and building resilience), 35.8% of the Armenian population live under the national poverty line, while in Azerbaijan 6% and in Iraq 22.9% live under poverty. Therefore Armenian poor population- and the poorest of the poor- may be affected more significantly compared to those living in Azerbaijan. Iran may be among the most affected countries as it has a higher share of immediate and further basin lands and as it has the highest rate of poverty -more than 50% among the basin countries. (FIDH, 2013; Iran: Rising poverty and declining labor rights (FIDH,2013: http://www.fidh.org/IMG/pdf/iran_report_en.pdf). Furthermore, the rapid increase of the population in the region will only magnify the impacts of Urmia depletion. According to SEDAC (2010) future population estimates in 2015, Urmia IBIR population will be 6.4 million and FBIR population will be more than 76 million, (see: SEDAC (2010), Gridded Population of the World: Future Estimates. Socioeconomic Data and Applications Center (SEDAC); collaboration with CIESIN, UN-FAO, CIAT: http://sedac.ciesin.columbia.edu/gpw.)

To respond to the first research question on social vulnerabilities caused by Urmia depletion therefore, it is evident that these are: decreased access to safe water and food, increased probability of health outbreaks, epidemics, malnutrition, and further child stunting. These negative impacts can be amplified among poor households- especially poorest of the poor – who strive to survive the environmental impacts of the Lake's degradation. In a similar vein, increasing unemployment rates, loss of live stock and farm land will intensify poverty traps leading to further decline in the household's wellbeing and the violation of their basic human rights. Considering the high EVI and the diversity of ethnic and religious minorities in the basin countries, the households living in an immediate distance from the Lake will experience severe social vulnerabilities (Cutter et al., 2009). However, as shown in Table 5 below, public service corruption perception index 2013 (see http://www.transparency.org/cpi2013/results) in Urmia basin countries is slightly lower compared to the Aral Sea basin countries and this could mean that Urmia Lake countries may be better able to address and mitigate social impacts.

Table 5. Global Corruption Perception Index (2013)

Urmia Lake Basin Countries			The Aral Sea Basin Countries		
Country	Rank	Score	Country	Rank	Score
Armenia	94/177	36	Afghanistan	175/177	8
Azerbaijan	127/177	28	Iran	144/177	25
Iran	144/177	25	Kazakhstan	140/177	26
Iraq	171/177	16	Kyrgyzstan	150/177	24
Syria	168/177	18	Tajikistan	154/177	22
Turkey	53/177	50	Turkmenistan	168/177	17
			Uzbekistan	168/177	17

The above Table is based on the 2013 corruption perception index that included 177 countries and territories ranking them based on how corrupt their public sector is perceived to be. 'A country or territory's score indicates the perceived level of public sector corruption on a scale of 0 - 100, where 0 means that a country is perceived as highly corrupt and 100 means it is perceived as very clean' (2014, transparency international webpage). A country's rank indicates its position relative to the other countries and territories included in the index- (for further information refer to: http://www.transparency.org/cpi2013/results). As it is observed, although slightly lower, bad governance and perceived corruption remain high and an issue in Urmia basin countries.

4. EXPLORING THE POSSIBILITY AND TRENDS OF ENVIRONMENTAL MIGRATION

Whether the increasing level of socio-economic vulnerabilities in Urmia basin countries would lead to migration cannot be easily deducted from the above data. Migration patterns are usually complex and take place in rural-urban, urban-rural, urban-urban, and rural-rural patterns (IOM, 2009).

The primary causes for migration are multiple and may include a mix of reasons including wage differences, age, education, distance and costs of displacement, socio-cultural ties, disease, occurrence of environmental changes, prior migration of a family member, etc. (Todaro & Smith, 2012). These are among the push/pull factors that could lead the affected population to either migrate or stay. What is obvious, however, is that there is a positive correlation between environmental change and migration. For instance in the case of the Aral Sea, up to 90% of migration has been outbound from the area since 1989; with almost a quarter of a million of migrants displaced due to the quality of environment (Aman, 1999).

Generally and at the early stages of droughts, desertification, salt and sand storms, households may choose to stay due to different reasons including their age, health state and disability, (emotional) attachment to their lands, or simply due to their financial incapability to relocate or simply due to not having relatives in safer areas who could accommodate them in their early stages of resettlement. In later stages of environmental degradation, some choose to send one family member who can ensure the economic livelihood of the household by sending back remittances.

Further escalation of environmental degradation may eventually force all who can afford to, men and women alike, to migrate (Henry et al., 2004). However, the most vulnerable including women, elderly, sick, orphans, the poorest of the poor and domestic animals may be trapped and exposed to the harshest environmental, health, and socio-economic challenges.

Environmental migration patterns from Urmia basin could be explained in light of the migrant categories proposed by IOM-UNFPA (For further information: 2008: http:// publications.iom.int/bookstore/free/IDM_10_EN.pdf). The three categories of migrants include, a) environmentally motivated migrants who 'pre-empt the worst' and leave before the environmental degradation; b) environmentally forced migrants whose attempt is to 'avoid the worst'; and c) environmental refugees who are 'fleeing the worst' and may be displaced temporarily or permanently.

Accordingly, the first group includes economic migrants who have anticipated the worst and have chosen choose to migrate either temporarily or permanently. As Nodoushan (2012) indicate the Iranian provinces within immediate distance from the Lake are already showing a high level of unemployment and migration (for further information refer to: epc2014.princton.edu/papers/141050). For instance the two immediately adjacent provinces of East and West Azerbaijan in Iran show a 9.6 and 8.9 percent unemployment and a 4 and 0.9 outward migration pattern, respectively. Of course, environmental degradation of Urmia may not account as the unique cause of unemployment and migration, as Iran- like many other developing countries- suffers from rapid urbanization and urban bias. According to Todaro & Smith (2012: 315) the notion of urban bias entails that 'most governments in developing countries favor the urban sector in their development policies' which will lead to economic gaps between rural and urban spaces, increasing unemployment and migration from rural to urban areas.

The second category of migrants includes those who would leave permanently as their livelihood is reduced and as they try to avoid the worst. Recent drought and unpleasant environmental conditions in Urmia region has led to a substantial decrease in the number of tourists who used to benefit from the national park and medicinal mud bathing in the Lake (Zarrineh & Azari Najaf Abad, 2014). This tangible decrease in the economic services of the Lake has resulted in migration. Many of the households who directly relied on the Lake for their income, for instance fishers, tourist shops and boat rentals have already left their old business and have either shifted to agriculture or farming - in case they owned lands in the surrounding region - or have moved to adjacent cities and other professions. In addition, although the basin is an important agricultural region, farmers are increasingly finding it difficult to find water in wells with 70 meters depth (Ilhan et al. 2012) and are thus inevitably among this second category of environmentally forced migrants. Likewise, households whose health and basic sanitation needs are undermined due to lack of access to water and inhalation of toxics, specifically in rural areas, may migrate to urban areas in bigger numbers.

These environmentally motivated or forced migrants will have negative encroaching impacts on urban infrastructures. As it was observed above, urban areas of Urmia basin countries are already enduring a high population density. Arrival of environmental migrants could lead to expansion or creation of city slums putting further pressure on the urban infrastructure which are not necessarily capable of accommodating the needs and requirements of these migrants. Already suffering from economic and psychological impacts of Urmia degradation, migrants may then be forced to live the vicious circle of poverty, causing further damage to the environment; experiencing higher rates of unemployment, lack of access to safe water, food, health and education (Todaro & Smith, 2012). Urban population and density in the Urmia Lake basin countries is already increasing rapidly which denotes fewer socio-economic opportunities for environmental migrants, and an increase in their social vulnerabilities.

The last category of Urmia Lake migrants are environmental refugees who will flee for their lives rather than their livelihood. These migrants may escape the harshest environmental conditions leaving their residences either temporarily or permanently and will migrate either internally or outside national borders. Although their migration pattern cannot be conclusively determined, evidence from previous gradually degrading resources show that a large share of migration will be initially internal (IOM-UNFPA, 2008). Such internal migration patterns could be repeated in the case of Urmia Lake due to the fact that the two main ethnic minorities of the Lake area, i.e., Turks and Kurds may choose to migrate to nearest safe areas where they have linguistic, cultural and family ties (pull factors). In the second phase of their migration, similar pull factors could encourage the refugees to cross the Iranian borders to join families and friends in neighboring countries. For instance, Armenians living in Urmia area may choose to move to Armenia, Turks may migrate to Azerbaijan and Turkey and Kurds may travel to the Kurdish areas in Iraq or Turkey. However, simple linguistic and cultural affiliations cannot afford to explain migration patterns. Based on Crane's et al. report (2008), Turk minorities in Iran have a tendency to separate themselves from Turks in Turkey and Azerbaijan and prefer to remain Iranian Turks which makes it difficult to project their migration patterns.

The second question raised in this study meant to explore environmental migration trends caused by Urmia desiccation. As discussed environmental migration has already started in the lake's immediate area and it could increase as the Lake's degradation intensifies. Households may choose their destinations based on a myriad of "push" and "pull" factors including socio-economic, cultural and political factors. Migrating to farther distances (out of the 500 radius of the Lake) is also possible as people flee the worst. A map of international migration trends of the Kurds shows that they have previously migrated to neighboring countries in the region and to Europe due to different socio-economic and political reasons (for further information refer to: http://comeniusonexile.blogspot.fr/2010/06/blog-post.html (2010). This pattern could intensify as Urmia Lake gradually dries out. The regions affected by Urmia environmental migrants may be as distant as East and West Europe and Russia. Understanding the pattern of internal and external migration of environmental refugees requires further research and preparation of rehabilitation plans otherwise refugees will be the victims of conflicts, racial and ethnic discrimination and different forms of violations of human rights consequently undermining the security of the whole FBIR region.

5. CONCLUSION

The increasing depletion of the Urmia Lake would lead to increased social vulnerability in both its IBIR and FBIR areas. Main concerns include lack of access to safe water and food, health and education which are obvious violation of human rights (Universal Declaration of Human rights, articles 25 & 26). Additionally the desiccation of Urmia is feared to lead to a drastic rise in poverty and unemployment rates; loss of human, social and cultural capital leading to conflicts and insecurity. Social vulnerabilities of households in Urmia basin countries would of course be mediated by several factors including their level of income, education, health, age and other socio-economic factors. For a majority of households, 'temporary or permanent internal or cross-border migration may be viewed as an effective means of compensating for declining earning capacity, food and water security due to environmental change' (IOM-UNFPA, 2008:46).

Considering the above, the situation calls for an immediate and concerted effort of all countries of the basin as well as the international community. As it was discussed, Urmia basin countries have high environmental vulnerability, medium/high rate of unemployment, high urban population density, and are prone to health outbreaks. A sustainable management scheme and an adaptive environmental governance of the Lake may reduce or mitigate environmental impacts and social vulnerabilities caused by Lake's desiccation. To this end, Urmia basin countries may choose to plan and implement some/ all of the following strategies:

- Establishing bi/Multilateral cooperation task force committees to stabilize the degrading environment and rehabilitate the Lake's surrounding region;
- Adopting inter-state and regional agreements to address legal responsibilities, cost & benefit sharing (economic services), maintenance, rehabilitation, and water governance and planning;
- Drafting joint rehabilitation and resettlement plans in order to mitigate the impacts of environmental migration, health epidemics and security;
- Building/increasing legal and institutional capacities at national and regional level to increase efficiency and effectiveness of multilateral basin management;
- Developing local legal frameworks to prohibit use of underground water within immediate radius of the Lake;
- Adopting a joint system of monitoring and annual progress reporting in order to increase transparency and accountability among basin countries;
- Establishing environmental agreements to protect the Lake's environment;
- Adopting mechanisms for cooperation with relevant international organizations and taking advantage of foreign aids and expertise.
- Building capacity and training of the local communities on environmental governance and emergency evacuation plans;

As it was discussed in this article, Urmia desiccation has negative impacts on populations living within 500 KM^2 of the actual geographical location of the Lake, if not farther. Thus, the fact that Urmia Lake is located within the national borders of Iran does not mean that Iran is the only country concerned. This could mean that the Iranian government can play the primary role in addressing the situation by taking the initiative to inform the basin countries on the gravity of the situation and by engineering mutual co-operations and legal agreements. It is evident that at this stage of the Lake's depletion, it is within geo-political and socio-economic interest of all basin countries to address environmental degradation of Urmia, and immediately too. These efforts may eventually reduce the intensity of current and future environmental and social impacts of Lake's desiccation. One remaining concern, however, is compensating for the 'soft' violation of human rights in the surrounding areas of the Lake as during the past three decades many households have lived through the gradual impacts of Urmia depletion. ♦

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