

DROUGHT AS A WATER RELATED DISASTER; A CASE STUDY OF OROOMIEH LAKE

LA SEQUÍA COMO DESASTRE DE ORIGEN HÍDRICO; UN ESTUDIO DE CASO DE OROOMIEH LAKE

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ABSTRACT

Drought is a normal phenomenon in various types of climates, but it is more prominent in arid regions like that of the Middle East of Asia where its recurrence is likely to increase in the future, in terms of both frequency and intensity. Despite the long time existence of drought, its management is still not optimal because of the way it is generally perceived and misunderstood by policy makers and experts. During recent years however, a lot of progress has been made, with a major shift from the perception of considering drought as an emergency phenomenon, to long term planning for efficient management, but efforts are still required to elaborate and implement drought mitigation plans, for which most countries are still in the need for great help to reduce their vulnerability and to build their capacity to combat drought effects.

Water management in arid and semi-arid regions is facing a crisis. Lack of water in regions with chronic shortages of water may lead to mass migration of people causing social and political problems. Drought is a weather-related natural disaster, a dangerous hazard of nature, related to a deficiency of precipitation over an extended period of time, usually for a season or more. It has an impact on food production and it reduces life expectancy and the economic performance of large regions or entire countries.

Iran is located in an arid and semi-arid geographical region and receives an average rain fall of only 250 mm per year equivalent to one third of the world's average. Therefore, many parts of Iran suffer from extreme water shortage conditions. Moreover, with a high rate of population growth, a slow pace of building reservoirs, traditional water management systems, and recent years of drought in some central and eastern parts of the country (receiving only 100 mm-precipitation / year on average) the results have contributed to a major water crisis in these areas and has made the government face one of its most difficult challenges in the past few years.

Drought as a natural disaster occurring frequently from thousands of years ago has caused severe economic, political and social damages. Major tribal migrations are due to this devastating phenomenon. Some wars happened by tribes which faced droughts with the aim of accessing water resources and fertile land located at regions with better climate which contributed in changing the history.

In this paper in addition to defining drought, information related to Iran's climate and geographical conditions has been submitted and drought impacts during the recent decade has been highlighted. The negative impacts of drought on the current situation of Lake Oroomieh as a case study in the north west of Iran have also been presented.

Key words: Drought, Lake Oroomieh, Disaster, Climate change, Iran

RESUMEN

La sequía es un fenómeno normal que ocurre en varios tipos de clima, siendo más significativa en las regiones áridas, tales como las del Medio Oriente asiático donde es probable que exista una tendencia a una mayor recurrencia en el futuro, con mayor frecuencia e intensidad. Si bien la sequía es un fenómeno que existente desde hace ya mucho tiempo, su manejo resta todavía de ser el óptimo, debido, en gran parte, a la forma en que generalmente se percibe la misma y a la mala interpretación de los expertos y responsables políticos. No obstante, durante los últimos años, ha habido un gran progreso, apreciándose un cambio significativo en la errónea percepción de considerar a la sequía como un fenómeno de alarma, para incorporar el concepto de planificar a largo plazo para una gestión eficiente. De todas formas, se requieren aún mayores esfuerzos para elaborar e implementar planes de mitigación de sequías, para lo cual la mayoría de los países necesitan aún un gran apoyo a fin de reducir su vulnerabilidad así como para aumentar su capacidad para combatir sus efectos adversos.

La gestión del agua en las regiones áridas y semiáridas está enfrentando una crisis. La falta de agua en las regiones con escasez crónica puede conducir a la migración masiva de personas causando problemas sociales y políticos. La sequía es un desastre natural vinculado al clima, un riesgo peligroso de la naturaleza que se relaciona a una deficiencia de precipitación durante un período prolongado de tiempo, por lo general durante una temporada o más. Tiene un impacto en la producción de alimentos, reduce la esperanza de vida y el desempeño económico de grandes regiones o incluso de países enteros.

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Irán se encuentra en una región geográfica árida y semiárida con una precipitación media de sólo 250 mm por año, lo que equivale a un tercio de la media mundial. Por lo tanto, muchas regiones de Irán sufren condiciones de extrema escasez de agua. Además, el alto crecimiento poblacional, el lento ritmo para la construcción de embalses, sistemas tradicionales de gestión del agua y los recientes años de sequía en algunas partes del centro y este del país (sólo reciben 100 mm de precipitación media por año) han resultado en una grave crisis de agua en estas áreas, poniendo al gobierno frente a uno de sus desafíos más difíciles de los últimos tiempos.

La sequía como desastre natural, que tiende a ocurrir frecuentemente desde hace ya miles de años, ha causado graves daños económicos, políticos y sociales. Las migraciones tribales más importantes se deben a este fenómeno devastador. Algunas de las guerras que ocurrieron antaño pueden explicarse por el enfrentamiento de tribus que, ante una sequía, buscaban acceder a los recursos de agua y tierras fértiles situados en regiones con mejor clima, lo cual contribuyó al cambio de la historia.

En este trabajo, además de encontrar una definición de sequía, se ha presentado información relacionada con el clima y las condiciones geográficas de Irán y las consecuencias que la sequía ha generado en los últimos años. También, a través de un estudio de caso, se presentan los impactos negativos que la sequía tiene sobre la situación actual del lago Oroomieh, situado en el noroeste de Irán.

Palabras clave: sequía, Lago Oroomieh, desastres, cambio climático, Irán

INTRODUCTION

Around two billion people live in countries with limited water resources called arid and semi-arid regions. Water, with its qualitative and quantitative effects, plays a critical role in economic and social expansion of societies and, unlike many other inputs, is irreplaceable. Reasons for the impending crisis include: accelerating rates of population increase, periodic droughts, climate change, and mismanagement of water resources, all of which are increasing the desertification trends. As populations grow, water use is increasing with dramatic implications to many parts of the world.

Issues of water availability have greater impacts within the arid and semi-arid regions. Not only is there over-withdrawal of groundwater, shortages of water are intensifying due to reasons including the types of agriculture taking place (e.g. the growing of rice in water-short areas), and lands which are deteriorating to desert conditions. The result is that people from these regions particularly in villages are obliged to immigrate to other regions with adequate water resources. Due to the increasingly unsustainable situation in these regions, without responses from individual governments, gradually massive migration of people will likely occur.

WMO (1975) defined drought as: "A deficit of rainfall with respect to the long term mean, affecting a large area for one or several seasons or years that drastically reduces primary production in natural ecosystems and rain-fed agriculture." (Le Houerou, 1995)

The increase in drought intensity and duration has caused water resources and agricultural products scarcity. During the recent decades, drought frequency from the view point of intensity, duration, area under coverage, livelihood damages, and long term socio-economic damages has been higher than other natural disasters. In fact water scarcity and drought causes water pollution, environmental damages and negative impacts on fresh potable water resources supply. Figure 1 demonstrates the global drought

map and as observed severe droughts have mainly occurred in the Middle East Asia.

From the other hand due to population increase, social evolution and changes in the people's level of life, increases water requirement. In addition, precise anticipation of accessible water and appropriate planning for the existing water during drought is very important.

One of the definitions of drought is: a continuous duration of insufficient rainfall which causes severe economic damages to a country.

In order to determine the drought starting point, the deviation from the average rainfall with other climatic variations during a time period is determined and this is carried out by comparing the current situation with the past averages mainly based on thirty years of statistical data.

Drought is classified as (www.agriinfo.in):

1. Climatic drought
2. Hydrological drought
3. Agricultural drought
4. Socio-economical drought

Climatic drought definition should be made region-wise as climatic condition which causes rainfall decrease, varies from region to region.

Drought monitoring and compiling special models for anticipating and designing a risk management model is one of the most important issues which can help researchers and experts determine droughts.

When drought hits a country, all or most sectors of its economy are affected, but farmers, herders and the rural population often suffer more than the rest. Generally speaking, the more the economy of a country relies on agriculture, the more its economy is vulnerable to drought. Drought preparedness and mitigation is therefore the concern of all sectors. As shown in the following table Asia in amongst the continents which mainly suffers from droughts. North America and Africa are also drought prone areas.

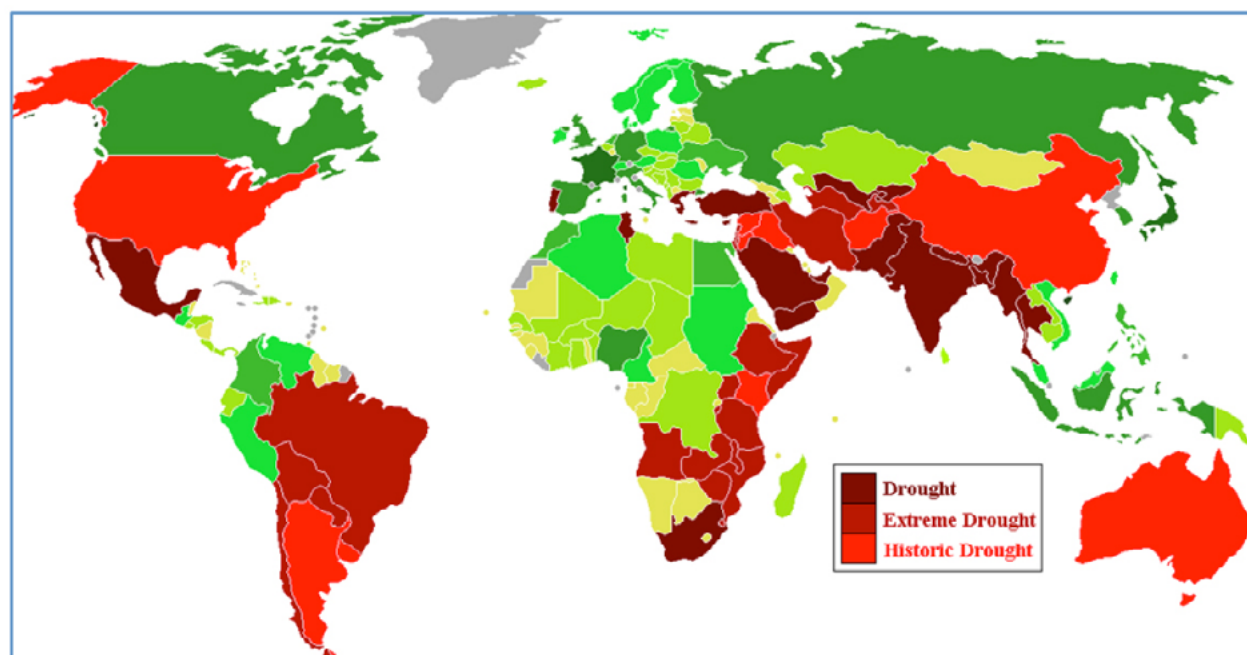


Figure 1- Global Drought Map (unitedcats.wordpress.com)

	No. of Droughts	No. of droughts ≤ 6 months	No. of droughts ≥12 months	Longest duration (months)	Maximum spatial extent (km ²)
Africa	44	28	4	19(1982-84)	40.0%
Asia	86	37	22	49(1984-88)	18.5%
Europe	40	24	4	20(1959-61)	42.8%
North America	57	34	8	44(1950-53)	39.3%
Oceania	24	17	1	12(1951-52)	80.2%
South America	45	37	4	16(1958-59)	51.2%

Table 1- Summary of large-scale drought occurrences for the six continents (World Climate Report, 2010)

GEOGRAPHIC AND CLIMATE CONDITIONS OF IRAN

Iran, with a dry to semi-dry geographic environment and with an average rain fall of 250 mm/year, is facing extreme shortages of water in its southern and central parts. Sixty-five percent of Iran's area is arid, 20% is semi-arid, and only 15% of landscape is considered as wet and semi-wet. Approximately 50% of Iran's population is living in the northern and western parts of country which have over 70% fall the water resources (Motiee et al., 2001). The rapid growth of Iran's population, the slow process of building water reservoirs, and recent dry years, have caused serious water shortages in central and eastern parts of Iran (Figure 2). The country's population has increased about 7 times during the last 80 years and

it has risen from 10 million in 1920 to more than 70 million in 2008. At present Iran is the 17th most populated countries in the world and based on the data presented by the UN it will be classified as one of the 10 most populated regions in the world by the end of 2050. Therefore the need for water has been increased but still the quantity of water is not adequate.

The four primary reasons for the serious water crisis in Iran are:

(i) Rapid increases in population. Since 1990, due to the cultural, social and economic changes in Iran, there has been a rapid increase in population in such a way that during the past 50 years, the population has increased from 20 to 70 million people, as demonstrated in Figure 3 (SCI,2005), much of which has settled in the major urban centers.



Figure 2- Geographic Location of Iran in Middle East and Annual Precipitation Map of Iran

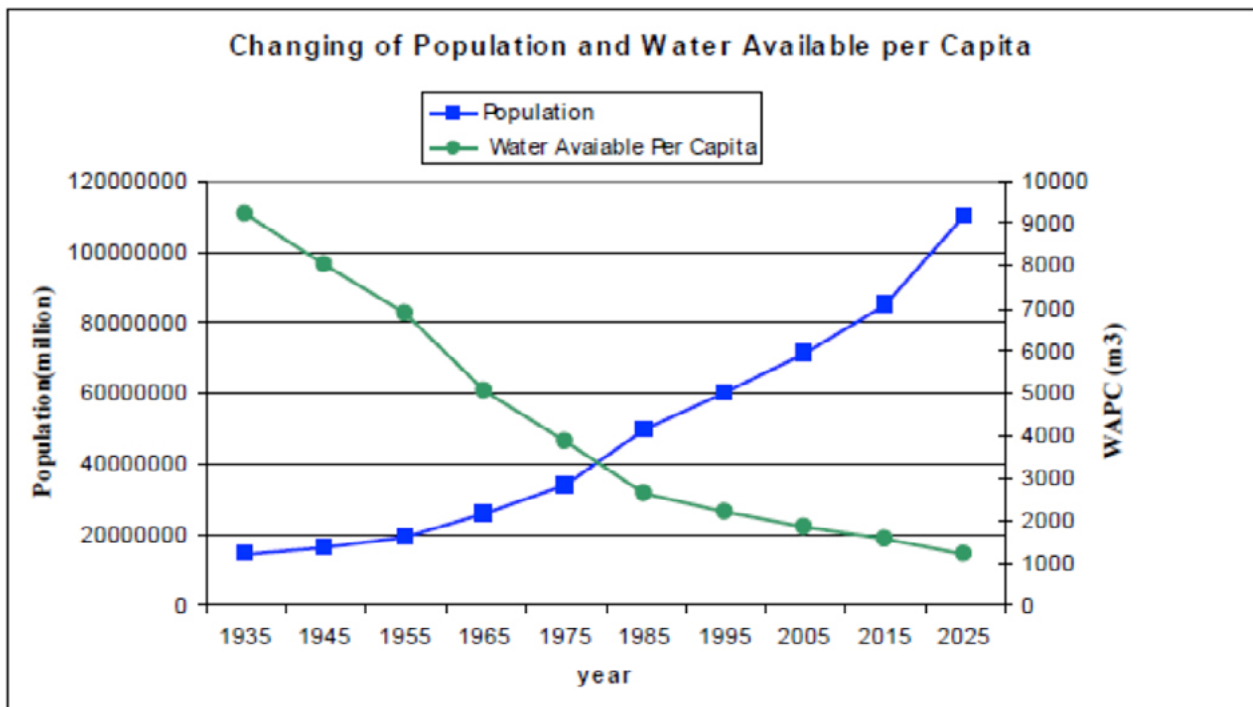


Figure 3- Population Increase in Iran (1935-2005) (SCI, 2005)

(ii) Occurrence of periodic droughts. Land degradation and desertification is one of the pressing challenges of Iran. About 85% of the area (approximately 39.4 million hectares out of 164.8 million ha) has been classified as arid and semi-arid, and receives between 30 to 250 mm of rainfall annually. An example of the impact of the drought and potential climate change is apparent on the lakes in central

and southeastern parts of Iran. The Hamoun Lake in south eastern part of Iran is a dramatic case of a drying water body to a desert. Figure 4 shows the satellite images of the Hamoun Lake between 1997 and 2010 (Partov, 2003).

(iii) Development of different sectors in agriculture, industry and urbanization from 1990 to 2000 and still

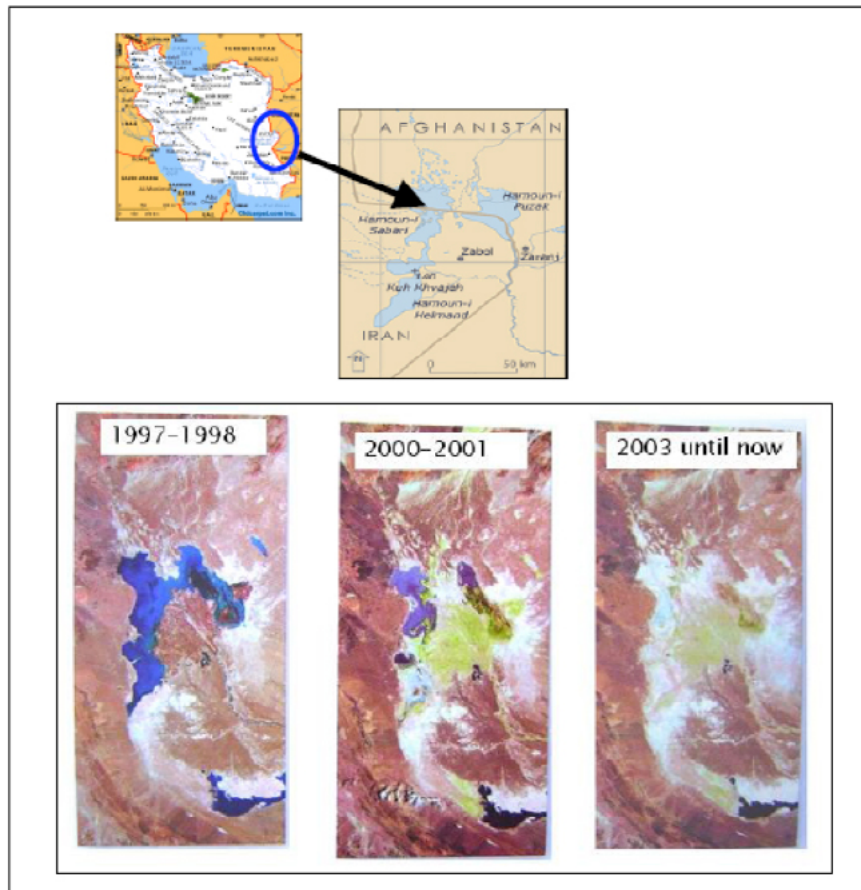


Figure 4- Location&the Satellite Pictures of the Hamoun Lake in Southeastern Iran Showing The Dry out Progress Since 1997 Until the Present(Wikipedia).

until now. Water demand increased rapidly in different sectors in agriculture, industry and urban services. The increased water demand has been identified primarily with agriculture, where most water consumption and the highest losses occur, a fact which has been noticed by the Irrigation and Drainage Department (Javan et al., 2002).

(iv) Lack of proper water management, and consumption and over-withdrawal of groundwater resources. Drought, climate change, and desertification are some reasons of immigration; consequently, due to not having access to sufficient amount of water, widespread immigration to other regions occurred.

(v) Progress of desertification towards cities in the southeast. Construction and operation of hydraulic structures such as dams, qanats, conveyance channels for reservoirs, and transmission and distribution systems in Iran have been functioning for more than 3000 years (Motiee et al, 2006). The situation is now accepted that Iran is facing a water crisis and is in a serious situation to meet the necessary water demands. Based on existing reports the rate of the availability of water will drop from 1800 m³/yr/cap.to 1000 m³ /yr/cap.(Motiee et al., 2001).

FRESH WATER CONSUMPTION

At present Iran is using 60% of the total renewable freshwater while due to the international norms the upper limit should be 45% of renewable freshwater; it means that the remain unexploited renewable fresh water is only 15 % total fresh water resources including environmental basic needs.

GENERAL OVERVIEW OF WATER RESOURCES

Iran is divided into six following major hydrological basins as follows:

1. The Caspian Sea basin in the north, which consists of 7 sub basins,
2. The Lake Oroomieh basin in the northwest,
3. The Persian Gulf and Sea of Oman basin consists of 9 sub basins and extends from northwest up to southeast of country.
4. The central plateau basin, which has 9 sub-basins, extends from northwest to southeast of the country and covers 5 dry Kavirs of which two (Lutand Central kavir) have nearly an area equal to 390000 km².

5. The Hamoun basin in the east with 3 sub-basins,
6. The Gharaghoun or Sarakhs basin in the northeast,

The internal renewable water resources of Iran are estimated at 130 cubic km per year. The surface runoff represents a total of 92 cubic km per year and ground water recharges is estimated at about 38 cubic km. The country also receives 6.7 cubic km per year of surface water from external source (mostly from Aras river in republic of Azerbaijan and Hirmand river of Afghanistan); while the surface runoff to the sea (Caspian, and Persian gulf and sea of Oman) and neighboring countries is estimated at 55.9 cubic km yearly. At present the per capita water resources of the country is 1380 cubic meters per year. In 1994 the total water consumption was 82 cubic km of which 92% have been used in agriculture, 6.5% in domestic and 1% industrial and mining activities. The total withdrawn of water in 1997 had been also 87 cubic km of which 94% was for agriculture, 5% for domestic and 1% in industrial and mining activities.

DROUGHT SITUATION IN IRAN

Due to climate change, common droughts in Asia and the Middle East have changed and the intensity and duration of these phenomena have increased. Today, it can be stated that drought is one of the horrible enemies in the Middle East which gradually causes water tables, current rivers, lakes and qanats disappearance.

In Iran during 2000-2010 the average rainfall of the country and the surface runoff has decreased 15% and 40% respectively and this has caused the government to develop water resources and to further investment to confront droughts.

As the average rainfall in Iran (250 mm/year) is one third of the global average and 90% of the country is located in an arid and semi-arid climatic condition, due to population increase and socio-economic development and finally droughts and climate change, water resources systems have faced increased pressure.

The mean water consumption per capita in the agricultural, industrial, potable and hygienic sectors (domestic) in developing countries is 30%, 59% and 11% respectively. This ratio in the less developed countries is 82%, 10% and 8% respectively while in Iran this ratio is 92%, 2% and 6% respectively.

The present droughts in Iran, particularly the ones happening in 2008-2010 have completely imbalanced the country's climate. The decrease in rain fall and increase in temperature has caused many rivers, slumps and lakes to dry out. The utmost impact of this phenomenon could be observed in Oroomieh Lake which is further described in the next section.

In this concern adaptation with the existing climatic situation should be made by appropriate consumption management and saving. The consumption pattern particularly in the agricultural sector should be defined, based on the country's climatic conditions. Apparently we can't make benefit of prescriptions used for the countries producing crops with plenty of water.

IMPACT ON LAKE OROOMIEH

Recent studies indicate there are substantial impacts of climate change and drought influencing water resources (e.g. IPCC, 2007). The consequence may include increases/decreases in hydrologic parameters, and adjustments in the frequency and magnitude of hydrologic extremes. For example, the circumstances of lakes around the world show that a significant number of lakes are experiencing decreasing water levels. Some lakes have dried out completely due to a combination of these changes plus mismanagement of water resources. A dramatic example is the Aral Sea (Figure 5), landlocked in Central Asia, with a drainage basin of 1.8 million km²; due to mismanagement and drought, the water levels in the Aral Sea have decreased by 23 m (Micklin, 1992). This Sea is bordered by Kazakhstan in the north and Uzbekistan in the south.

In 1918, the Russian government decided to divert the Amu Darya and the Syr Darya, the two rivers that fed the Aral Sea, to irrigate areas of the desert. Unfortunately, many of the irrigation canals constructed in 1930s, were poorly built and allowed significant leakage and evaporation. By 1960, between 20 to 50 km³ of water was diverted each year to land, instead of to the Aral Sea and the Sea began to shrink. From 1961 to 1970, the Aral Sea's level fell at an average of 20cm a year and in the 1970s, the rate of water level decline nearly tripled to 50-60 cm per year. By the 1980s, the mean decrease was 80-90 cm annually (Bissell, 2002).

The water level in the Aral Sea has now decreased by 23 m. Its surface area has decreased by 74%, its volume, by 90%, and the salinity has increased from 10 to more than 100 g/L. The effects of these changes include: decimation of the native fish species, initiation of dust/salt storms, degradation of the deltaic biotic communities, and climate changes around the former shoreline. The population residing around the Sea has also been negatively impacted (Micklin, 1992).

Lake Oroomieh as another example in northwest of Iran with a surface of 5800 km² is the second most saline lake in the world (the Red Sea is considered as the first), and is demonstrating significant declines in surface levels. In 2008, the depth of water in the Lake was measured to be two meters less than the long-term average and the volume is estimated to have decreased by one-third (McBean and Motiee, 2009).

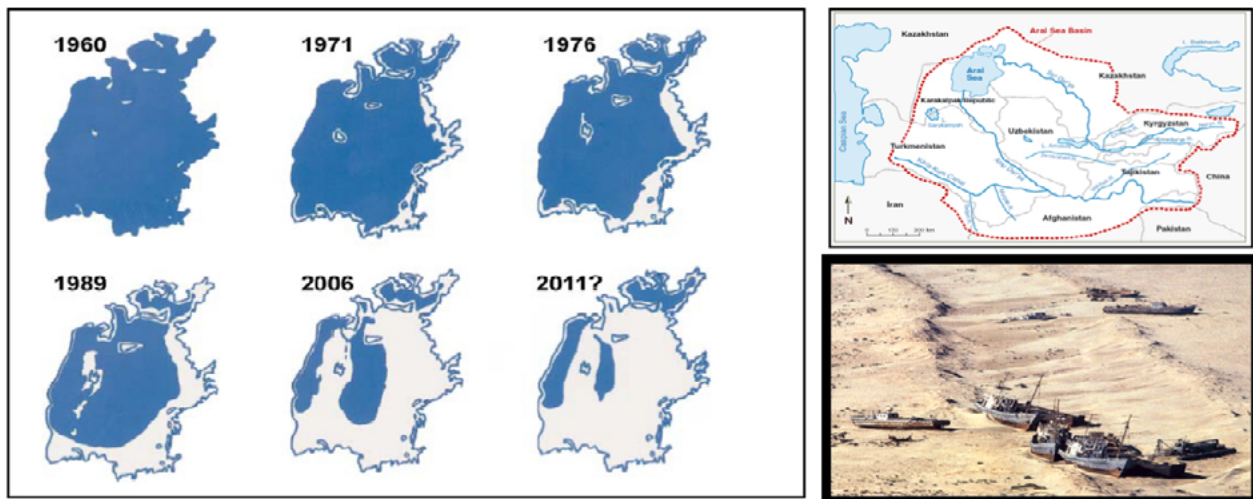


Figure 5- The geographical location of AralSea in the Middle Asia and the trend towards dryness in the recent decades (mappery.com).

OROOMIEH LAKE SPECIFICATIONS

Oroomieh Lake is located in the north west of Iran. This lake is divided between east and west Azerbaijan. Lake Oroomieh is the biggest lake in Iran and the second salty lake in the world. The water basin of this lake is around 51876 km² which is approximately 3% of the total area of the country. This basin by having large agricultural plains is one of the most important focal areas in agricultural and livestock activities in Iran. The normal capacity of this lake is over 30 Billion Cubic Meter (BCM).

Lake Oroomieh is one of the biggest permanent intakes in the west Asia and it is one of the most important natural habitats of the animals in Iran. At present there are 27 species of mammals, 212 bird species, 41 species of reptiles, 7 species of amphibian and 26 species of fish in this lake.

The water in Lake Oroomieh is so saline and it is mainly supplied by 6 rivers and the soluble salt is nearly two times as much as the oceans. Therefore

no kind of fish or mollusca except crustacean live in this lake and the water never freezes. Swimmers can also swim on the water due to the high concentration of salts.

MAIN REASONS OF OROOMIEH LAKE DRY OUT

According to the measures made in 2010 and 2011, at present 1/3 of the lake surface has dried and been changed to salt marsh. The volume of this lake has reduced to 15 BCM which is less than half of the normal capacity. According to the recent photos, the water surface has dropped two meters below the normal depth. The increase in salt concentration is one of the negative results of this decline. The average salt concentration of this lake in long term was between 150-170 gr./lit. while the present concentration of salt is 330 gr./lit. Figure 6 shows the lake water level fluctuation since 1995 which results in a considerable decrease in the depth of the lake.

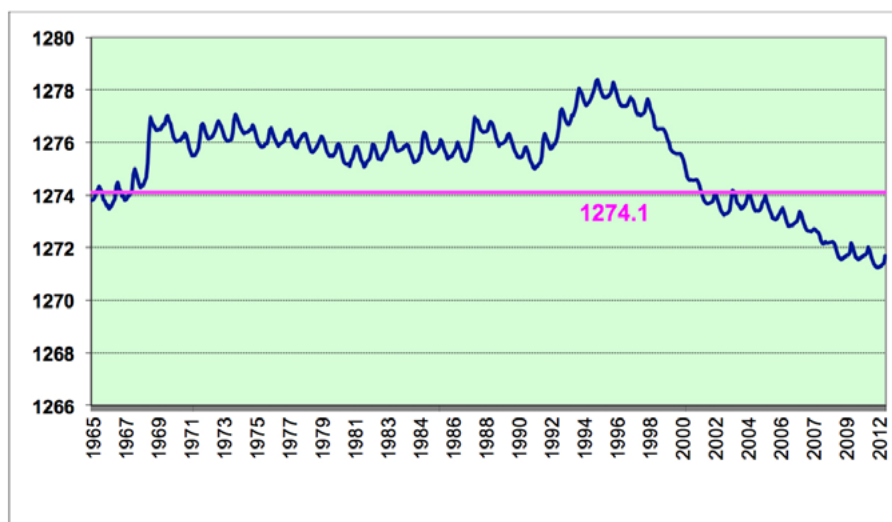


Figure 6: Lake Water level fluctuation

EFFECTIVE PARAMETERS IN DECREASING THE LAKE VOLUME.

The mainly uses and users of the water of this Lake are aqua life, tourist and environment.

A number of parameters have caused a part of Oroomieh Lake to dry out. 60% of it is related to drought and climate change factors and the rest is related to human parameters of which some are related to operation and others are related to the structures and dams controlling water. Water use in Agriculture and industry in the upstream areas of the lake have also had considerable impacts on the lakes volume decline.

One decade of continues drought (2000-2010) in the water basin of the lake has caused a severe reduction in the surface water of the basin towards the lake. According to the rainfall statistics during 2002-2005,

130 mm and during 2007-2010, 240 mm of rainfall decrease has been recorded in the water basin. Figure 7 demonstrates the shrinking process of the lake since 1995.

Climate change has had severe impacts on the water volume and depth of many lakes all around the world including the Oroomieh Lake. Global temperature increase of around 2 degrees Centigrade during the past 20 years, evaporation increase as well as rainfall decrease are all considered as the consequences of climate change. If this trend is continued, the destiny of this lake would be similar to the Aral Sea in the coming 2 decades.

The following figures (8, 9&10) demonstrate the rainfall, temperature and evaporation trend during the past 20 years respectively.

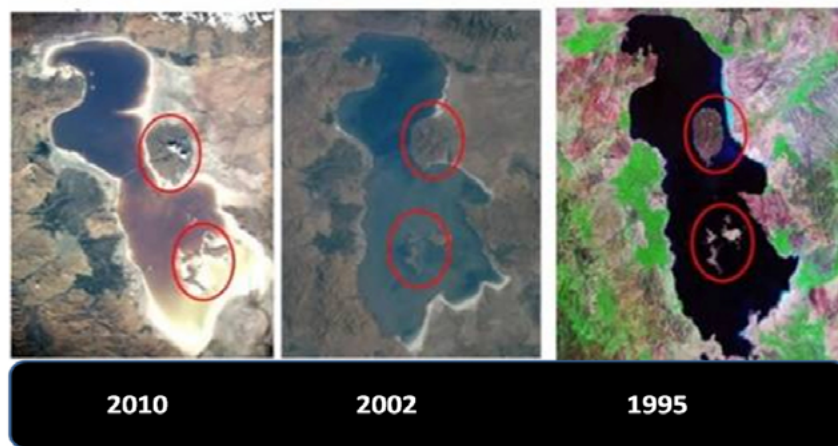


Figure 7- Gradual trend of the lake drying out from 1995 to 2010 with the use of satellite images (scoopweb.com)

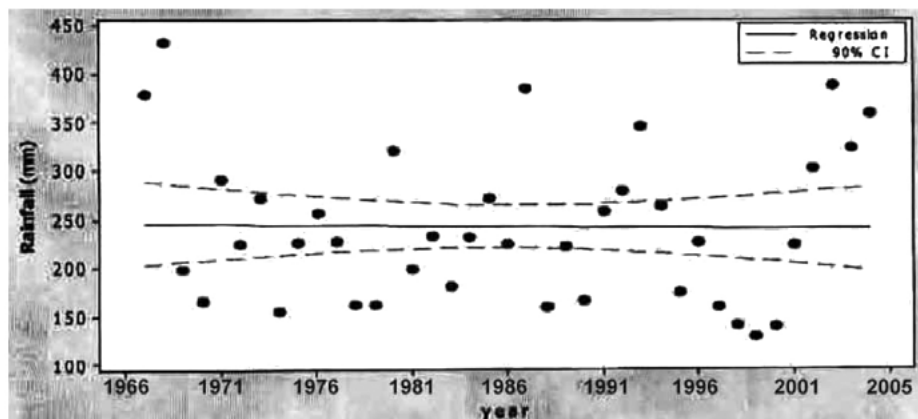


Figure8: Estimated Rainfall Height on Oroomieh Lake (Motiee, H., 2012)

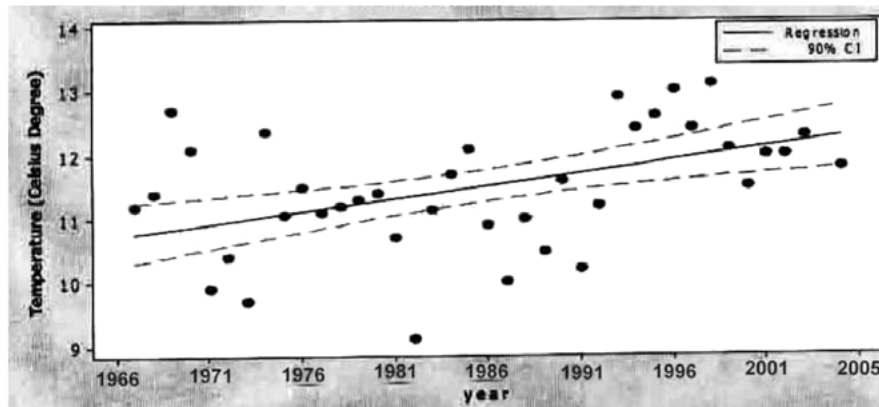


Figure 9: Trend of Temperature in Oroomieh basin (Motiee, H., 2012)

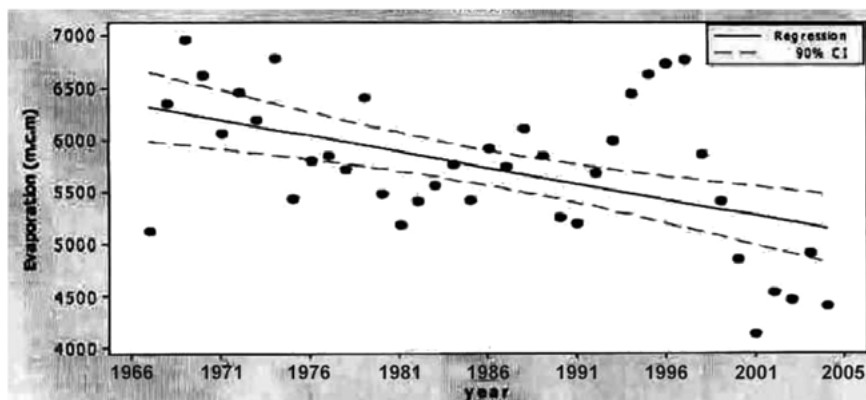


Figure 10: Volume of Actual Evaporation of Oroomieh Lake (Motiee, H., 2012)

ENVIRONMENTAL NEGATIVE IMPACTS

One of the damages is the bio-diversity impacts. Birds migrating to the region gave birth but their population is decreasing nowadays due to the high salinity of the lake water.

One of the other negative impacts which has caused the farmers anxiety is the salt which could be possibly spread throughout the region by wind after the lake has dried out. This can lead to soil salinity in the region. As the salt formations have a crystal shape this is just an unproved theory. Figure 11 displays the salt mass in the dried beach of the lake.



Figure 11- Salt crystals after the lake beach dry out (wdict.net).

INTERNATIONAL DROUGHT INITIATIVE (IDI)

In this part the International Drought Initiative proposed by the Islamic Republic of Iran to UNESCO which was later approved in the 19th Intergovernmental Council of UNESCO-IHP, is described. This initiative has been defined due to the high importance of drought in the world and the necessity for better relation and coordination amongst international organizations for knowledge and experience transfer.

Today's world, needs a global movement to face and encounter the challenges of natural disasters related to water, especially droughts, so that through systematic measures carried out by governments at national level and integrating them with the activities of international governmental and non-governmental organizations and entities, effective and coordinated action plans could be prepared. This global movement through mobilizing political wills and resources can create effective measures in order to predict and produce preparedness and mitigation plans at global scale.

Introducing the "International Drought Initiative" (IDI) can be a starting point and driving force for this global movement. In this draft concept paper, the objectives and framework for establishing and organizing such an initiative are presented in anticipation of further deliberations by experts and relevant entities.

AN OVERVIEW OF THE CURRENT SITUATION

With respect to drought management, different measures are carried out in various countries according to their level of development and lessons learnt on the impacts of past droughts. These measures have different aspects and dimensions. In developed countries, integrated plans are defined and executed and responsibilities are well divided. In developing or less developed countries which are much more vulnerable to droughts, no systematic and harmonized measures have been taken. In the latter countries, most of the measures carried out are concentrated after drought events, e.g. granting different helps and incomplete aids. International governmental and non-governmental entities also implement different programs and plans according to their functions and mission of which some concentrate on research, technical and practical assessments and some other on improvement of knowledge and awareness. Usually, at critical periods, some financial and logistic contributions will be provided for the affected regions by United Nations or affiliated entities.

With regards to the above mentioned matters, it can be concluded that the overall measures implemented at national and international levels don't have an organized and intelligent solidarity and coordination. Although, individual activities are so valuable and useful, a good use won't be made from the potential synergy of the set of these activities which can have an important effect and consequence in drought management.

IDI OBJECTIVES

According to the above-mentioned points and the necessity of strengthening communities to effectively face and encounter the consequences of this phenomenon, especially in developing and less developed countries, taking benefit of developed countries' experiences in this process and according to the contents of UN Convention to Combat Desertification (UNCCD) which emphasizes on compiling a drought preparedness plan, the International Drought Initiative would create an appropriate opportunity for a global movement related to different aspects of this phenomenon.

The methodology to prepare and compile policies and strategies related to drought management, the way to act in emergency situations, compiling practical plans to confront this phenomenon, clarifying stakeholder's participation, establishing warning systems, using networks to gather meteorological data, methodology of assessing damages and procedure for addressing environmental conflicts are among the issues that can be addressed in the framework of this initiative.

Role of the entities affiliated to UN and non-governmental organizations, and also countries in successfully compiling and executing drought management plans and their cooperation in achieving the goals is imperative and vital for successful implementation of this program. This program should be implemented to reduce the existing gap between developed and developing countries by utilizing valuable experiences and precise assessments of future needs. This program should also, guide the countries under coverage to follow acceptable standards in an appropriate time schedule by implementing necessary activities. It seems that this procedure will help to realize sustainable development and it contributes in mitigating the impacts of economical, social and environmental aspects of droughts in the coming decade of the 21st century. The objectives of the International Drought Initiative can be considered as follows:

1. Surveying the current situation of drought management in selected countries (or all countries) in different aspects such as: policy making, structural and non-structural plans;
2. Surveying the plans and measures of international and regional governmental/non-governmental entities involved in drought management;
3. Preparing and compiling the World Report on Drought Management (WRDM) in the current situation according to the outcomes of the two previous items and investigating the gaps and weak and strong points;
4. Executing necessary surveys to clarify needs and priorities of global measures in the framework of IDI;

5. Establishing the World Drought Watch (WDW) and Global Drought Preparedness Network (GDPM);
6. Helping different countries specially developing and less developed countries to prepare and compile strategic and practical drought management plans;
7. Develop and build capacities in: drought monitoring, mitigation, preparedness techniques and methodologies;
8. Holding international and regional conferences, seminars and workshops to exchange viewpoints, improve joint activities and exchange knowledge and experience related to different aspects of drought management;
9. Prepare and compile short-term, mid-term and long-term plans (perspective) for IDI and defining the indicators for assessing the progress made;

GOVERNANCE STRUCTURE OF IDI

As the success of IDI in realizing its goals depends on coordination and participation of interested countries as national and local governments function to design, implement, provide monitoring and evaluation of programs to deal with drought from one hand, and international and regional governmental / non-governmental entities from the other hand, the governance structure of this project should be set in such a way to practically encourage their participation in different steps from policy making to execution.

It is therefore suggested that a steering committee including representatives of some of the countries with valuable experiences in drought management as well as representatives of some of the international governmental entities such as: UNESCO-IHP, WMO, FAO, UNDP, GWP, WWC and ISDR be organized. This committee would be responsible for preparing and compiling the working procedures for the initiative in anticipation of its formal launch in late 2009.

The Regional Centre on Urban Water Management is prepared to organize the first meeting of the steering committee in the first quarter of 2009. According to the preliminary mutual understandings with UNESCO-IHP it was decided to carry out necessary investigations on the list of representatives of selected countries and also international and regional governmental / non-governmental organizations as the initial members of the steering committee. Upon finalizing the steering committee composition, formal invitations will be made by UNESCO.

It is worth mentioning that establishment of IDI as a global measure, has been highly received in some meetings related to water and supports have been made toward this suggestion.

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