اثرات خشکسالی بر روی خروجی های طرح حفاظت از تالاب های ایران

The Impacts of Drought on The Outcomes of The CIWP

«طرح حفاظت از تالاب های ایران»

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سازمان حفاظت محیط زیست

Conservation of Iranian Wetlands Project

THE IMPACTS OF DROUGHT ON THE OUTCOMES OF THE IRI/UNDP/GEF CONSERVATION OF IRANIAN WETLANDS PROJECT

A report to DOE and UNDP
July 2011

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EXECUTIVE SUMMARY

1. This report summarises the impacts of a persistent drought on the expected outcomes of the IRI/UNDP/GEF Conservation of Iranian Wetlands Project (CIWP), presents the mitigatory and adaptive measures that have been taken, and makes a number of recommendations.

2. The CIWP, which will end in December 2012, aims to enhance the effectiveness and sustainability of Iran's system of wetland protected areas through activities at two demonstration wetland protected areas (Lake Uromiyeh and Lake Parishan), and to establish mechanisms to roll the process out to wetland protected areas throughout Iran.

3. Prior to the project, wetland management in Iran could be characterised as top-down, sectoral and non-participatory. The project has met with considerable success in establishing participatory (bottom-up), integrated and ecosystem-based approaches to the management of wetlands in a basin context at the pilot sites, and is now supporting mechanisms to roll out this approach at national level. To this extent, the project is on target and the majority of the related indicators are "Green".

4. However, drought has persisted over parts of Iran for much of the project period. At both original demonstration sites there is evidence of long-term declines in precipitation and increases in temperature, as well as more frequent occurrences of drought. The situation in these wetlands has been exacerbated by unsustainable use of water resources, which the project is helping the Government to address. These combined impacts have led to considerable shrinkage of wetlands, and in some parts of the country major wetlands are entirely dry, with serious impacts on biodiversity and livelihoods.

5. The CIWP has recorded the risk of drought as serious and critical for the last several years, and various mitigation activities are being undertaken. However, the drought conditions have continued such that the risk has become reality. The Lake Parishan demonstration site has now been largely dry since 2009, whilst at Lake Uromiyeh water levels have fallen throughout the project period and salinity has become so high as to inhibit ecological functioning. Lake Uromiyeh's satellite wetlands have been less affected as a result of restoration measures. Biodiversity outcome targets are therefore mainly "Red"

6. This report concludes that drought at both demonstration sites has become more severe over recent decades both in intensity and duration, but that its impacts have been worsened by climatic changes and rapid intensification of water use. The project is working actively with government to promote more sustainable water use. At Lake Uromiyeh a comprehensive agreement has been concluded between the three concerned provinces for their water share that must be delivered to the lake, and a moratorium has been placed of further water resources

developments. At Lake Parishan, illegal wells are being closed. At both sites, promising work is underway to promote more sustainable agriculture and water saving.

7. On condition that these measures are fully implemented and that precipitation returns to near-normal levels, biodiversity at the demonstration sites should recover. However, the severe long-term decline in precipitation at Lake Uromiyeh over more than 50 years raises considerable concerns for the future, and will require further adaptive measures.

8. The ecosystem approach has provided an excellent mechanism to engage stakeholders to address these issues. It is therefore recommended that the project:(i) continues to mainstream the ecosystem approach to the management of Iranian wetlands, as the best approach to addressing water resources problems; (ii)at the demonstration sites, focuses attention in the remaining project period on implementation activities that will deliver more sustainable use of water particularly in the agriculture sector;(iii) supports government to ensure that the governance, institutional, financial and technical arrangements at the demonstration sites and nationally will enable biodiversity to recover as rapidly as possible once the drought ends.

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1. Introduction

1.1 Background

The Conservation of Iranian Wetlands Project (CIWP) is a 7 year joint initiative between the Government of the Islamic Republic of Iran (led by the Department of Environment), GEF and UNDP, which will end in December 2012. Iran has numerous important wetlands including 83 protected areas and 24 Ramsar sites. CIWP's Goal is "to enhance the effectiveness and sustainability of Iran's system of wetland protected areas (WPAs) as a tool for conserving globally significant biodiversity", and its Purpose is "to systematically remove or substantially mitigate threats facing globally significant biodiversity and sustainability at two WPA demonstration sites, while ensuring that the lessons learned are absorbed within WPA management systems throughout Iran".

Demonstration sites include two[1] of Iran's most significant wetlands: Lake Uromiyeh in the north-west and Lake Parishan in the south-east. The hyper-saline Lake Uromiyeh (Ramsar site, Biosphere Reserve and National Park) lies in a 51,876 km^2 closed drainage basin which supports significant populations of flamingos and white pelicans, while the surrounding freshwater satellite wetlands (such as Kanibrazan) also have significant biodiversity (eg white-headed duck population). Lake Parishan (max. 5,200ha), a Ramsar site and part of a Biosphere Reserve, is a shallow, permanent lake in the southern Zagros mountains, surrounded by eutrophic marshes, reedbeds and halophytic vegetation, which provide nesting grounds for Dalmatian pelican, and wintering ground for marbled duck and white-headed duck.

Despite their importance for biodiversity and people's livelihoods, Iranian wetlands are vulnerable to climatic impacts such as drought, as well as other anthropogenic factors such as over-extraction of water for agriculture, building of dams on incoming rivers, conversion of wetland habitats and over-harvesting of fish and other wildlife. Consequently, seven of Iran's 24 Ramsar sites are on the Montreux Record of sites in danger. In response to these difficult conditions, and to help preserve the biodiversity values of Iranian wetlands, the CIWP has assisted the Iranian government to introduce the CBD's ecosystem approach to wetland management.

Integrated wetland management has been introduced at the two demonstration sites, with a shift from sectoral top-down decision-making by government agencies, to more integrated and participatory approaches involving local communities and NGOs.Since the beginning of the project, substantial efforts have been put to preparing and implementing the site management plans using the multi-stakeholder decision-making mechanisms. Various aspects of wetland management have been addressed including biodiversity conservation, sustainable use and livelihoods (water, fisheries, tourism etc), and awareness raising.

At national level, the project has supported roll-out of the project approach through development of a National Wetland Strategy and Action Plan, and formation of a National Wetland Committee, various policy and financing mechanisms and development of a range of tools and guidelines. These will be used to improve wetland management throughout the country.

[1] Shadegan Wetland was added as a third demonstration site following the Mid Term Evaluation in 2009

1.2 Purpose of this report

In recent years, parts of Iran have experienced a severe and persistent drought. Whilst drought is a natural and quite frequent phenomenon, the persistence of the current drought is unusual. This has had a cumulative impact on Iranian wetlands, exacerbated by increasingly unsustainable levels of water use in much of the country. Whilst the project has worked intensively on the issues of water use and allocations to wetlands, ongoing declines in precipitation and increases in temperatures and evaporation have exacerbated the pressures on water resources available to wetlands.

The risk and impacts from the drought on project outcomes has been registered as severe and increasingly critical for several years. Although a number of mitigatory actions have been taken, with no recovery towards normal precipitation levels, the risk has become a reality. The Lake Parishan demonstration site has now been dry since 2009, and salinity levels at Lake Uromiyeh have become so high as to inhibit ecological functioning, while water levels have also dropped sharply.

In response to this situation, UNDP agreed with the National Project Manager and Senior International Project Advisor to undertake the following steps:

- Carry out a rapid analysis of the severity of the drought and causes and impacts of water shortage;
- Circulate the analysis report to relevant stakeholders;
- Discuss the matter in a Project Steering Committee meeting for further decisions that would strengthen counter-measures against the impacts of the drought;
- Revise the project workplan (and if needed, the project logframe) accordingly; and
- Reflect the situation in the next Project Implementation Report (July 2011) as appropriate.

2. Assessment of the climatic / drought situation in CIWP demonstration sites

This section reviews the available climatic data for the two CIWP demonstration sites, Lake Uromiyeh and Lake Parishan, to assess the evidence for drought occurrence and long-term climate change in the basins of the wetlands.

2.1 Lake Uromiyeh

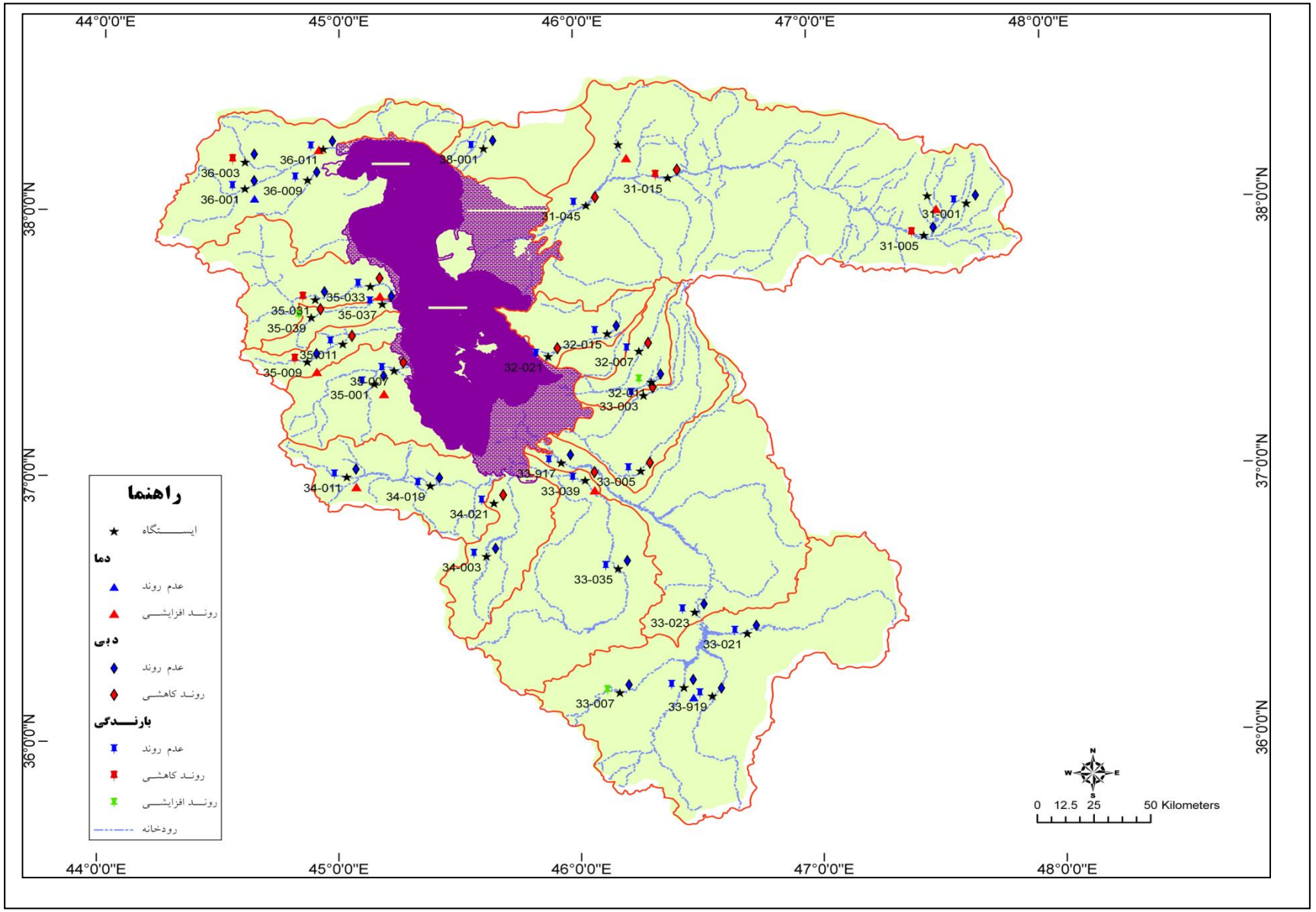
Climatologically, the Lake Uromiyeh Basin (about 51,000 sqkms) is typical of medium elevated terrains of median latitudes with generally cold winters and mild summers. During the last decade, the hydro-climatology of Lake Uromiyeh has received considerable attention. Several Iranian researchers and / or organizations have tried to assess the water status in the Lake and its watershed area and to evaluate the changes therein.

Lake Uromiyeh receives water from direct precipitation over the Lake, surface inflows from the rivers, surface runoffs from surrounding lands and ground water seepage from adjacent aquifers. All these resources directly depend on precipitation over the basin. Hence, the hydrological condition of the lake directly reflects the climatic conditions in the basin, particularly precipitation, temperature and humidity.

Existing hydro-climatic information in this region is too short and in some cases inconsistent to facilitate a thorough analysis. For example, while the Lake's water level in 1965-68 indicates a preceding drought, precipitation data for Uromiyeh and Tabriz do not confirm this.
Notwithstanding deficiencies in historic data, the Lake and it's watershed area has faced a persistent drought from about 1998 to present time that has caused a great reduction in the lake's volume and area. As a consequence it has lost great parts of its ecological functions, and its vast salt deposits in the desiccated parts are now exposed to wind erosion, endangering the surrounding agricultural and settlement areas.

Since drought is a major issue in water resources management for the Lake, CIWP supported by UNDP TRAC funds defined a new project component to assess the potential for occurring drought and to evaluate options for its management. This Project has already analyzed trends in ambient temperature, precipitation and river discharges and has tried to analyze the fluctuations in the Lake water level as well.

Temperature: Analyses of long-term trends in monthly and annual ambient air temperature data show a noticeable increase in annual temperature for 10 out of 11 typical stations (Map1), [8]. However the trend in monthly averages is not uniform in all the stations for all the months. Only one station (Tazehkand station, Siminehrud River, West Azarbayjan) showed a noticeable increasing trend for all the months throughout the year, while other stations in both West and East Azarbayjan depicted such strong trends only in the months of July, August and September. In some of the stations, March also showed strong increasing trend. The only station with decreasing trend in the annual ambient air temperature is Anian (Jightochai) located in higher elevated territories of Kurdistan Province. None of the stations in southern part of the basin in Kurdistan, shows significant trends in climatic parameters.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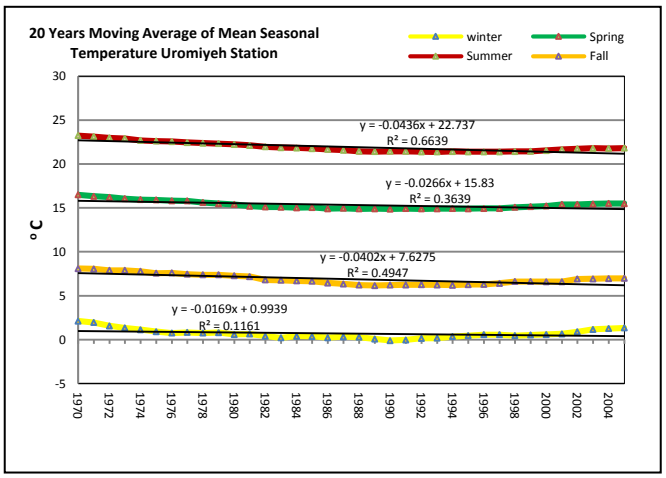
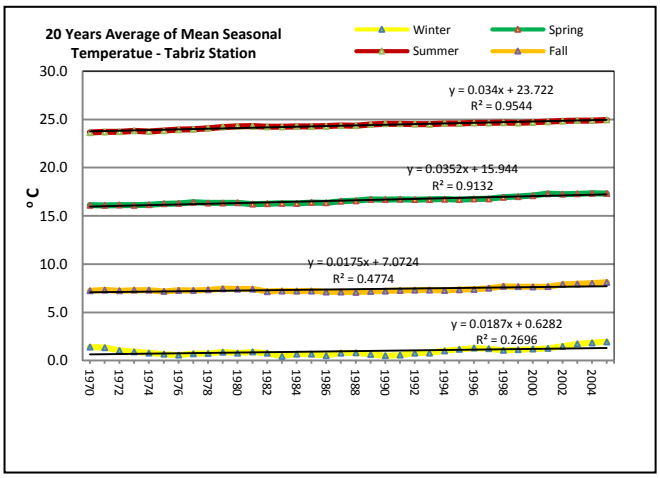
A separate analysis on the climatic data of Tabriz and Uromiyeh synoptic stations provided similar results. Moving average technique was used for these two stations with about 60 years of data. The results are discussed as below:

Seasonal temperature: Moving average technique was used to analyze the 60 years of seasonal temperatures data for Uromiyeh and Tabriz Synoptic stations. While Uromiyeh Station shows very slight and comparatively less significant negative trends in the average seasonal temperatures, Tabriz shows similar but positive and more significant trends particularly in summer and spring seasons. In Tabriz, the 20 year average of mean temperatures of summer seasons have raised in the order of 1.2 ^{o}C during 1970-2005 period.





Precipitation: the analyses made on 35 stations over the basin (11 in East and 20 in West Azarbayjan, and 4 in Kurdistan) indicated that in 5 stations there exist a decreasing and in 3 others an increasing trend in annual precipitation. In the other stations, no significant trend was detected [8].
Using the 20 years moving averages of annual precipitation over 60 years of data in Tabriz and Uromiyeh synoptic stations, a large and significant decreasing trend was detected in both stations (Figure 2). During the period 1970-2010, the decrease in average annual precipitation in Tabriz was about 90 mm, about two fold of that in Uromiyeh (50 mm) for the same period).

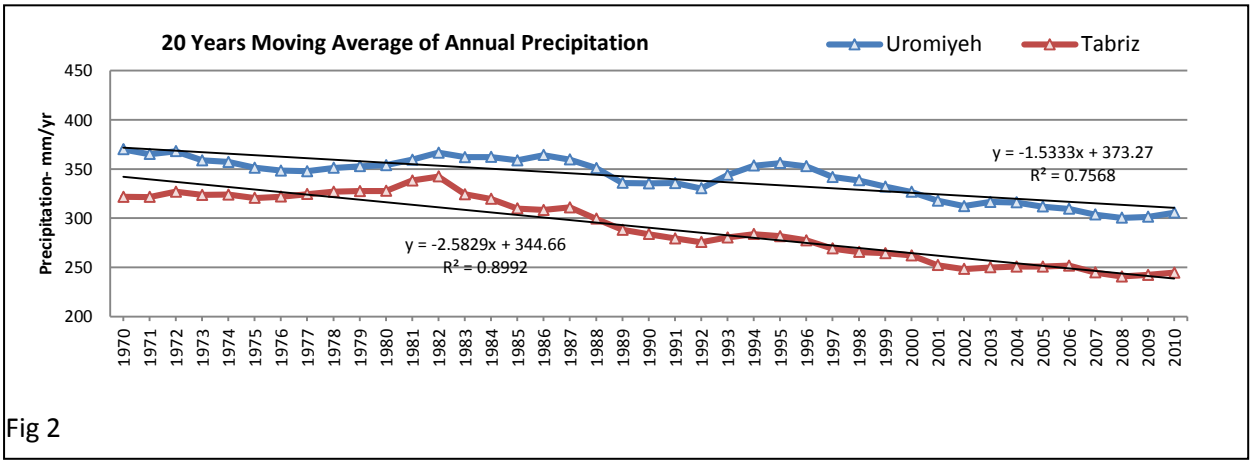


Fig 2

In conclusion, during the past decades precipitation has been noticeably decreasing and temperature noticeably increasing over the Lake Uromiyeh basin in West and East Azarbayjan. In Kurdistan Province no such changes in temperature and/or precipitation was detected.

Drought within the Uromiyeh basin

Several definitions have been given for drought. A generally accepted one is the definition based on percentage of long-term average given in Table 1 below:

Table 1

Drought classification

Drought class	**% of long term average**
Mild	70-80
Moderate	55-70
Severe	40-55
Very severe	<40

The shortcoming with the above classification is that it does not include the persistence of the drought. For example one year drought of 75% precipitation could be classified as mild but if the same occurs in several successive year (as happened in LU), the product could probably not be classified as mild.

Despite their profound impacts within the basin, droughts have not been well studied and their occurrence, intervals, severities and consequences are not quantified. To verify the occurrence of severe droughts, a simple presentation of the annual precipitation of 35 sample stations (used for trend analysis) is displayed in Figure 4. In addition to several annual droughts classified as mild, two more severe droughts each of about 3 years persistence occurred during 1989-91 and 1998-2001. The average annual precipitation during the two later periods was 243 and 209 mm respectively which classify both droughts as moderate!?

Unfortunately the precipitation data since 2007 were not available for all the stations over the basin to display the severity of the current drought. However the longer term of precipitation data of Tabriz and Uromiyeh stations were presented in Fig 3 to display the history of droughts up to the present time. As shown, Tabriz station depicts the start of a long term drought since 1995 which practically has continued till now. During this period, more than 50% of years have experienced droughts of various severities while the other years have precipitation well below the average. 2002 and 2006 were the only years during the period with precipitation slightly above the average.The same explanation is generally valid for the Uromiyeh station as well.

Fig 3 also shows that while in the Uromiyeh Station the annual precipitation in the last two years are not categorised as drought, they are still well below the average. At the same period the annual precipitations in Tabriz are all in drought category. Considering that Tabriz station in the eastern part of the basin generally represents the larger part of the LU basin, one may conclude that the drought condition is still prevailing.

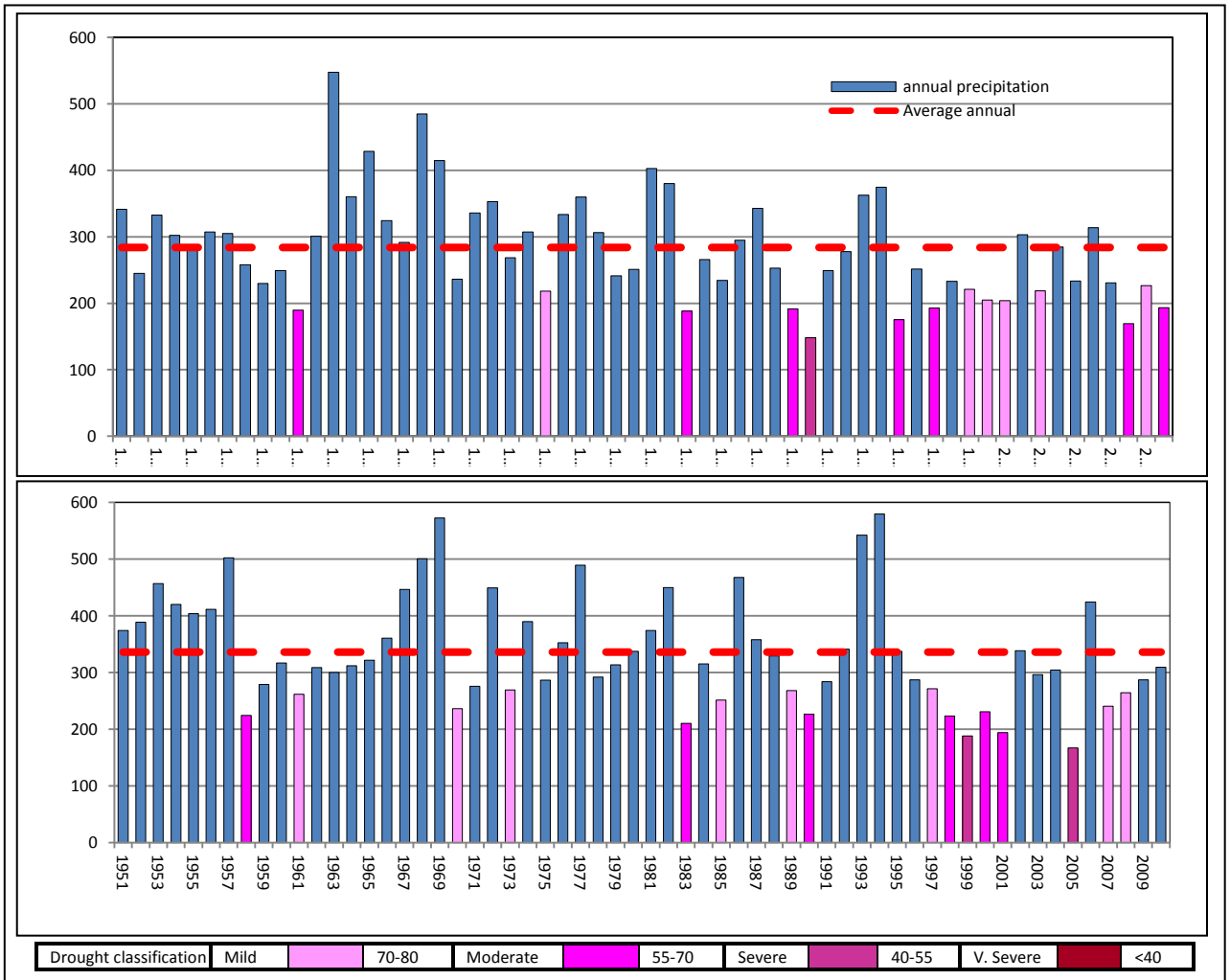
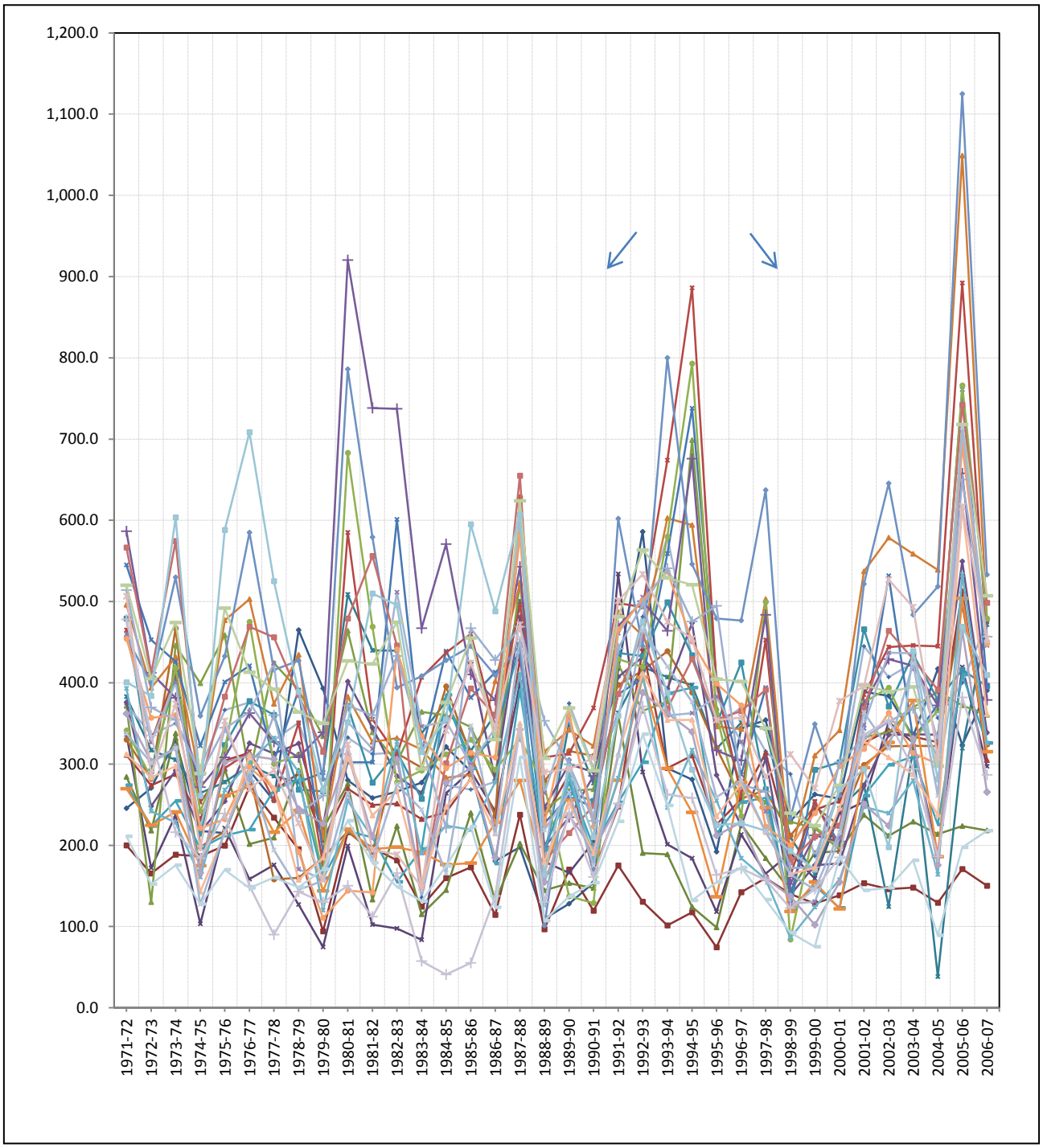


Fig: 3 History of drought occurrence according to Tabriz and Uromiyeh precipitation data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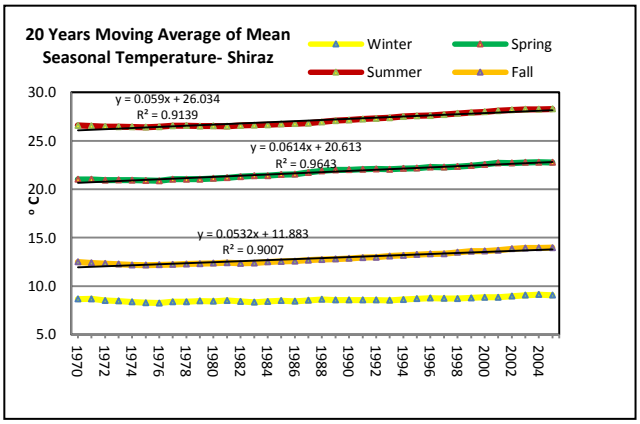
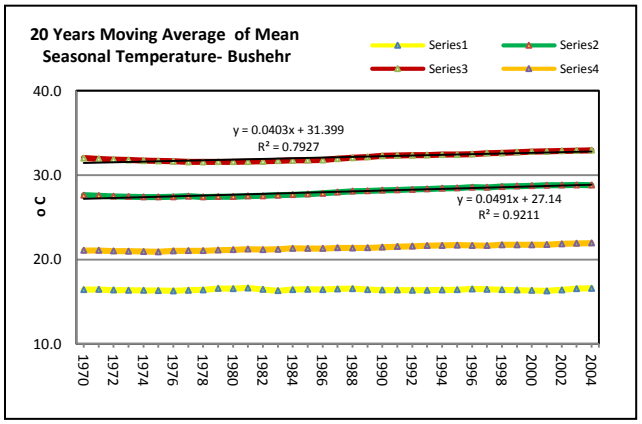
2.2 Lake Parishan

Lake Parishan is a small (270 sq. km.) closed basin lying between the Shapour and Dalaki river basins, both tributaries of Helleh River which ends in Persian Gulf. The Lake is recharged mainly through ground water and surface runoffs from the surrounding areas. Lake Arjan also contributes to the underground flows to Lake Parishan. All these resources are directly linked with the precipitation over the Parishan and Arjan basins. Hydro-climatology of Lake Parishan has received little attention by researchers. No good quality long-term data is available for analyzing the conditions in the basin. This is why Kazeroun area and Lake Parishan are not generally included in research works conducted to assess the trends in climatic parameters and droughts in Fars Province.

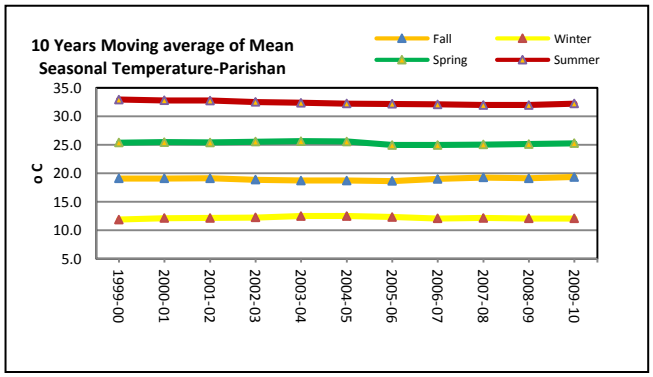
Because of short duration of the climatic data, trend analysis would not produce reliable results. The nearest stations with long duration of data are Bushehr in the south and Shiraz each about 150 km away. Bushehr, by the Persian Gulf, is particularly affected by climatic system which is in some aspect different from those inland stations. Both the stations have been analysed to conduct a preliminary assessment of the trends through moving average techniques.

Temperature: Both the stations show an increasing trend (Figure 5). However the trend in Shiraz is more significant and noticeable, particularly in summer and spring seasons. In Parishan area the moving average data does not indicate significant trend. One should consider the effects of higher humidity at Parishan as well as in Bushehr.





Precipitation: The moving average of annual precipitation of Shiraz and Bushehr (Fig 6a) display a very distinct drought during 1960s which then recovered in the following normal years. However since 2004, Shiraz station shows a continuous declining trend in precipitation which extends to the present time.



Although such longer data are not available for Lake Parishan area, the completely dry lake in 1965 (a very similar status to the present condition of the Lake) could be referred to as a clear evidence that such a drought had been covering the entire Fars province, including Parishan Area.

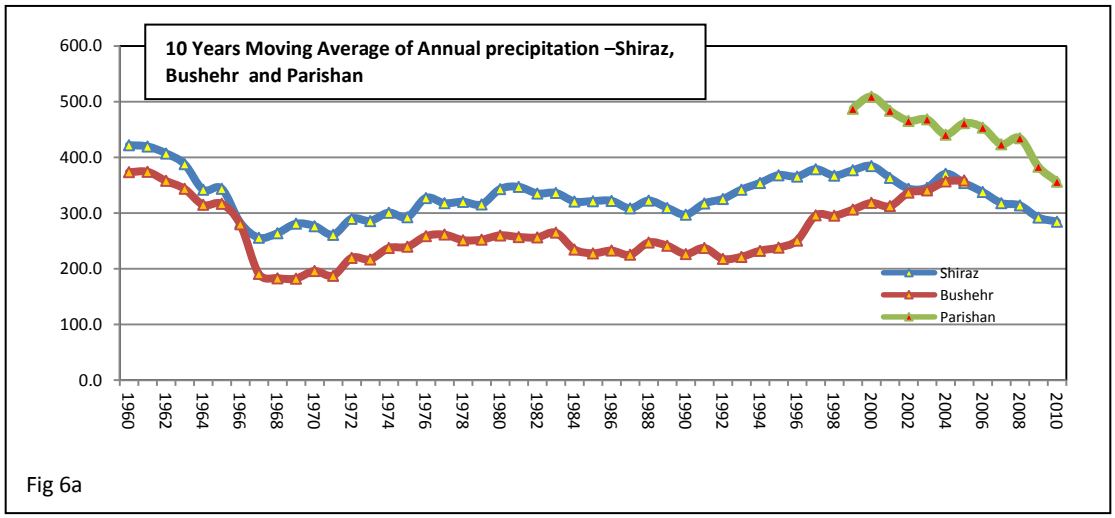


Fig 6a

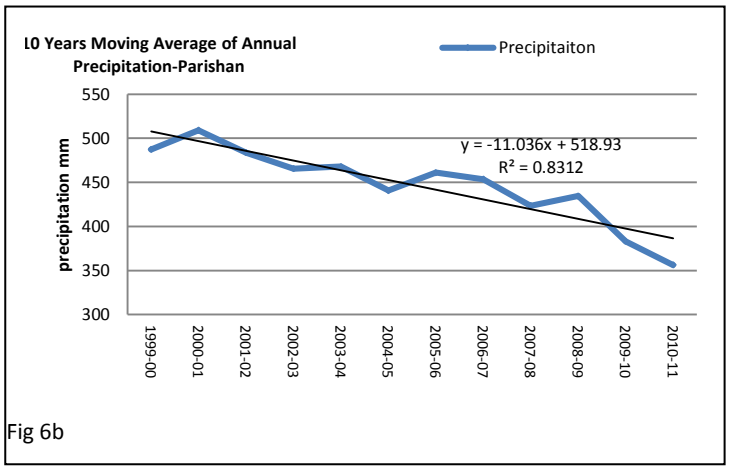


Fig 6b

To assess the drought condition in LP area, figures 6c and 6d are presented below. Fig 6c displays the status in LP and explains that during the last two decades ending to 2009, the area has been experiencing 2 years of moderate, three years of severe and 2 years of very severe droughts (2008 and 09); the condition which still persists. Longer term assessment of droughts in LP area may be drawn up from the droughts in Shiraz station (Fig 6d), that displays the persisting droughts of late 1950s that continued up to mid 1960s. It seems that the same droughts were prevailing in LP area as well; and caused desiccation of the Lake in mid 1960s.

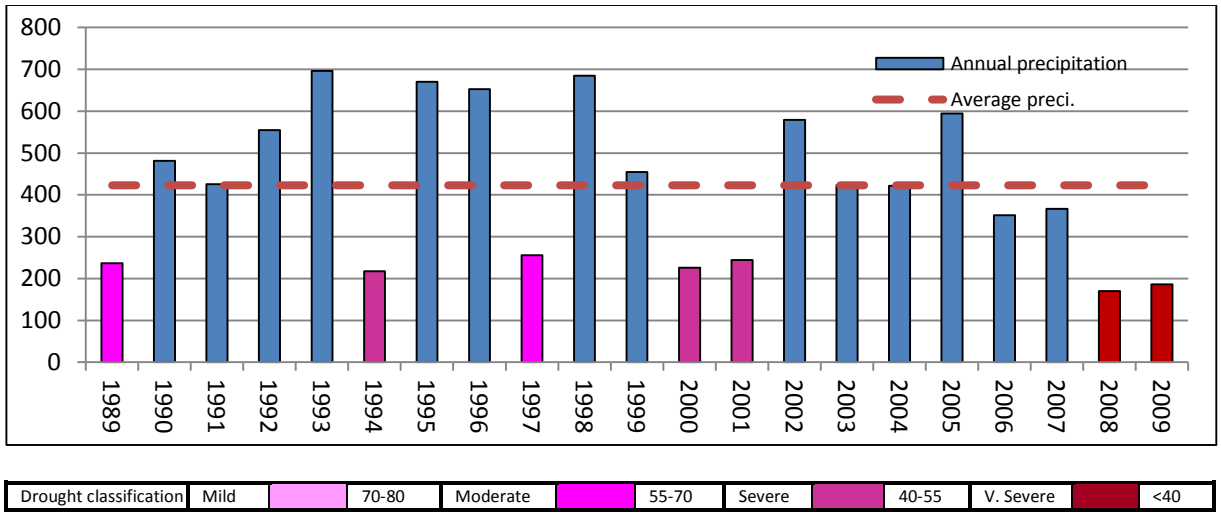


Fig 6C **Classification of droughts in Lake Parishan Area**

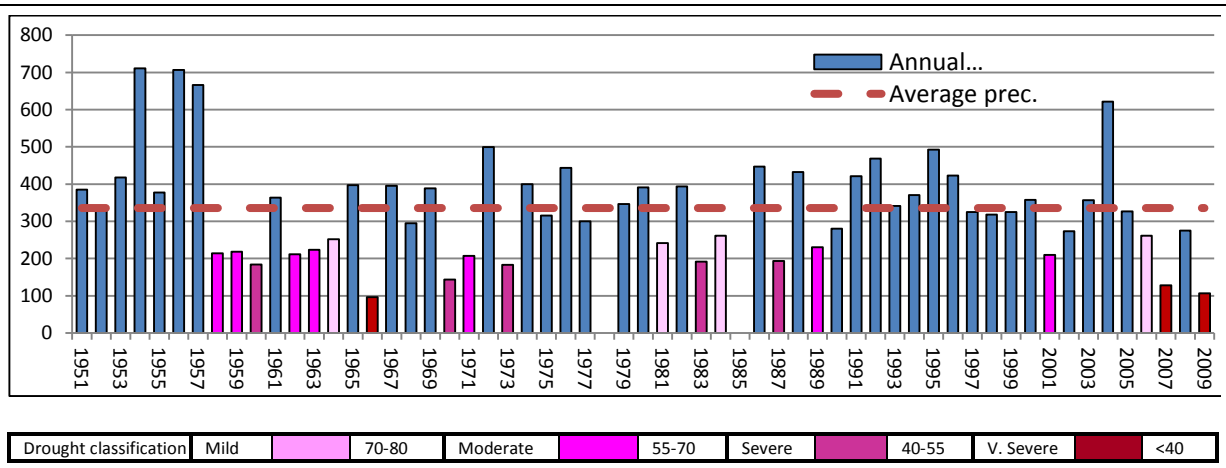


Fig 6d **Classification of droughts in Shiraz Synoptic Station**

3. Impacts of Drought on Water Resources

This chapter reviews the consequences of droughts and climate change on the water resources in the two demonstration sites, i.e. Lake Uromiyeh and Lake Parishan.

3.1 Water Resources of Lake Uromiyeh

Lake Uromiyeh receives water from both surface and ground water resources. Seventeen permanent and several seasonal rivers and flood ways contribute to recharging the Lake. Also, surrounding alluvial aquifers seep into the Lake. According to the historic information, in the normal years, the Lake receives about 4600 and 210 MCM/y from rivers and ground water aquifers respectively [12].

According to the studies of 2005[12] , in the hydrologically normal years totally about 2 BCM/y of surface and 1.5 BCM/y of ground water resources is used for irrigating about 350,000ha of agricultural lands. Only 1/3 of this area is commanded by seven large storage dams with a total

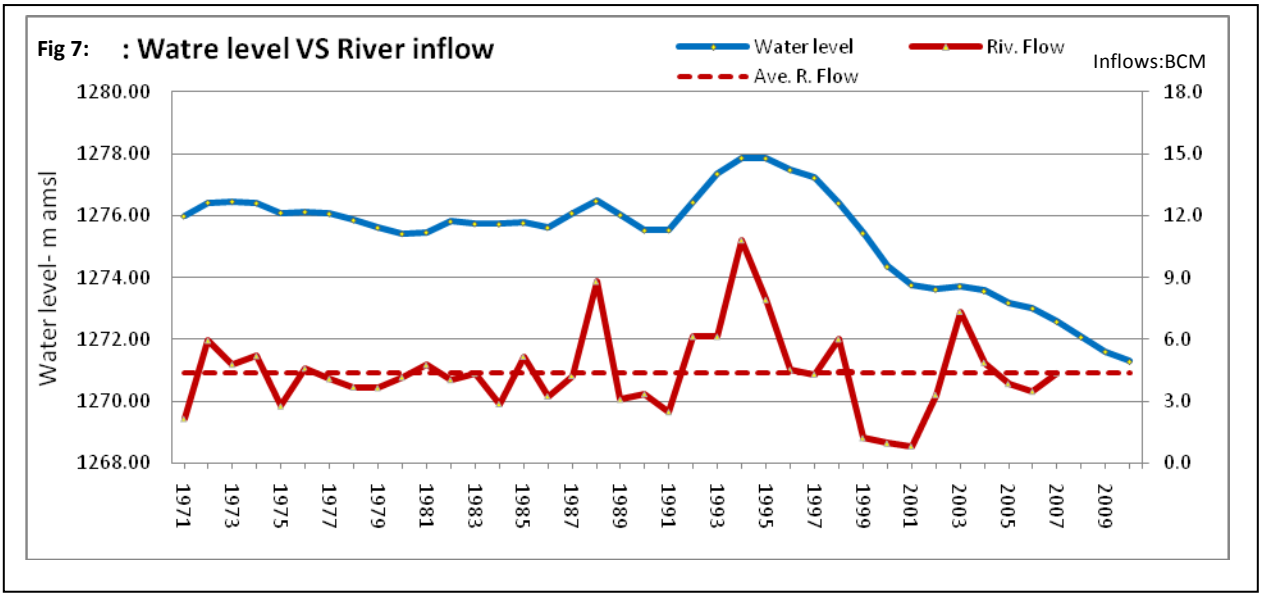
storage capacity of about 1500 MCM. It seems that presently the irrigated area has increased to around 470,000 hectares that means the water consumption should have raised to about 4.5 BCM/yr.

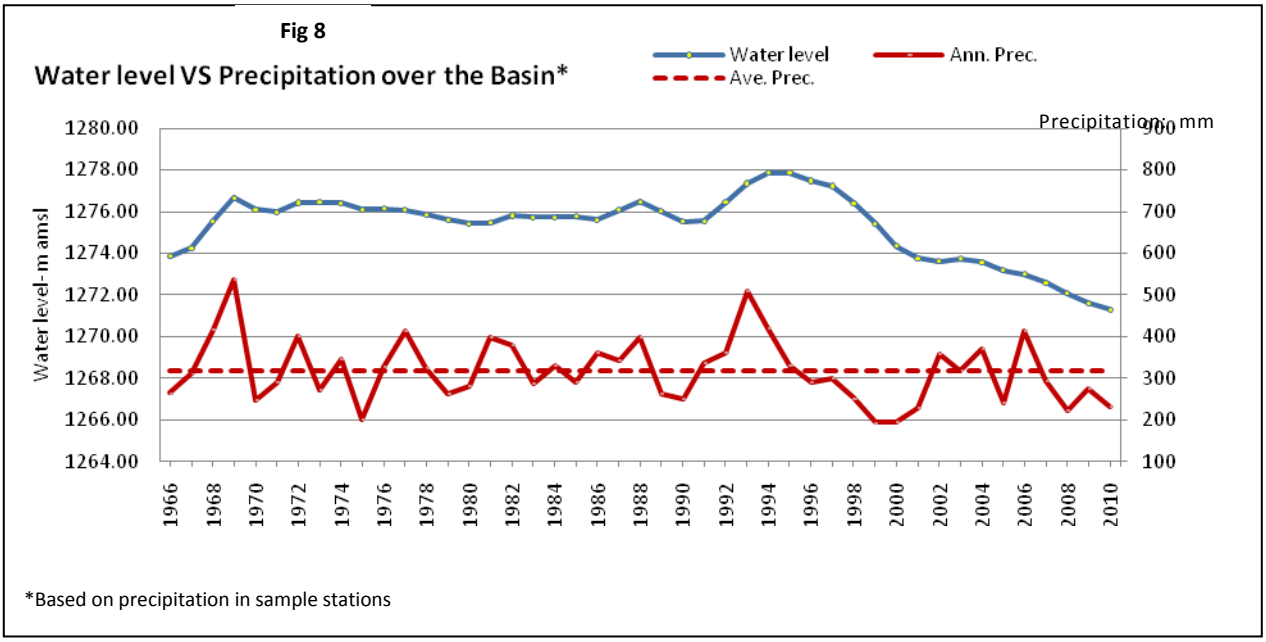
Being directly related to atmospheric precipitation, surface flows of the rivers within the LU Basin are also affected by droughts and the consequences of climate change. To evaluate these consequences an attempt was made to verify if any trend could be detected in the river discharges.
Trend analysis: To assess the trends in river discharges 35 gauge stations (11 in East and 20 in West Azarbayjan, and 4 in Kurdistan) were examined with the same technique of Standardize Precipitation Index (SPI). The results obtained indicated that while 80% of the stations revealed negative (decreasing) trends in monthly and annual scales, only in 9 stations (25% of the stations) the annual decreasing trends are statistically significant, and in only 3 out of these 9 stations, the trends are considerable. These are Tazehkand-Siminehrud, Tamar-Kherkhereh chai and Nazarabad-Derikchai all located in West Azarbayjan. None of the stations in Kurdistan Province showed a significant negative trend [8].Comparing with the stations in the upstream reaches, decreasing trends in river flows were observed more frequently in the downstream reaches of the rivers. This clearly reflects the effect of human activities in increasing uptake of river flows for different uses.

River inflows into Lake Uromiyeh: Reviewing the existing data, three distinct periods are detected (Fig 7):

- The first period from 1968 to 1991, in which the average annual precipitation and inflow into the Lake has been 331 mm (compared with long term average of 320 mm.) and 4.2 BCM/y respectively. During this period the average water level in the Lake was 1275.9 (varying between 1275.4 and 1276.7), i.e. almost stable and variations are within the range of annual evaporation from the Lake's water surface.
- The second period from 1992 to 1998 was a wet period in which an average of 6.5 BCM/y of flow (a peak of more than 11 BCM/y) entered into the Lake. During this period the average annual precipitation was 351 mm. Water level reached its maxima ever recorded, i.e. 1277.9. The average water level during this rather short period was 1277.2 m. amsl.
- The third period started in 1999 and is continuing till now. In this period, with the exception of year 2003 in which river inflows was slightly above the average, in the remaining years the inflows were below the long term average. During this period (up to 2006) the average annual precipitation has been about 275 mm/y and river inflows have been around 3 BCM/yr.

Data of river inflows into the Lake is missing for the years (2008-2011), partly because the field observations need quite a lot of calculations and processing before being available as river flow data. However precipitation data (Fig: 8) confirms that drought has continued, and it is estimated that during these years, much lesser flows than3 BCM/y has entered the Lake. As a consequence, water level has progressively receded since 2000. Latest observations in April 2011, has shown that water level has dropped to below 1271.5 m. amsl. In this condition roughly close to one third of the Lake's area is desiccated (Fig 10).





A separate study by USDA [1], indicated that the drought of 1997-2001 was also recorded in Lake Beysehir, SW of Turkey and Lake Buheyrat in central Iraq, the two neighbouring countries NW and W of Iran (Fig 9). The hydrograph of these two lakes (measured through satellite radar altimetry technology by USDA-foreign agricultural services) revealed very similar trend with those of LU. While both the lakes in Turkey and Iraq almost rapidly recovered from drought after 2003, LU continued receding. Indeed the fairly normal precipitations in LU basin in the following years did not continue

enough to recover the Lake and a second wave of drought since 2007 exacerbated the condition. A recent satellite image shows the existing condition of the Lake (Fig 10).

According to an investigation on inland surface water warming, during the last 25 years (1985-2010), the temperature of LU surface water has raised 2 deg. Centigrade, each decade.

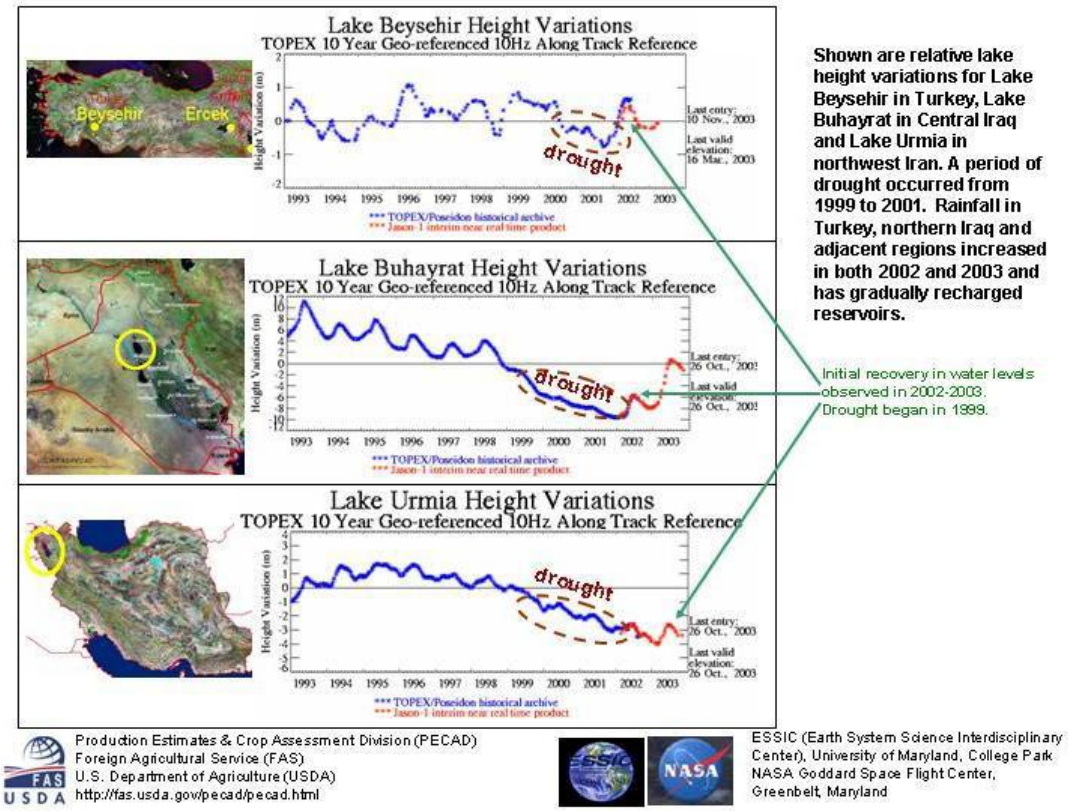


Fig 9 Water level measurements in Lakes Uromiyeh, Buhayrat and Beysehir

Every evidence, including climatology data, river flow data and ground water data confirms the occurrence and persistent of severe drought in LU Basin during the past years. However the drought of 1997-2000 seems to have been more severe than those in the recent years, despite the behaviour of the lake (recession of water level) has been more profound in the recent years. The reason is that in 1997, the lake has been benefiting considerable over- storage due to the preceding wet years (period 2 explained above), while in the recent years the storage of water in the lake has been continuously diminishing.

In the recent years, not only the limited storage of water in the lake caused a faster recession of water level, but also the higher ambient temperature and lower humidity during the period increased water uses in agricultural sector, resulting in lesser water to flow into the lake.

In addition to surface water resources, drought also has negatively affected ground water aquifers through lesser recharges. While at the same time ground water extraction has been increasing. Both these events jointly resulted in faster draw down of ground water level. Presently in several occasions, ground water aquifers within the basin were announced as being in the “crisis” condition; and additional ground water extraction is banned. However illegal extraction of ground water seems

Fig 10 A Satellite images of LU, 27 December 2010

Fig 10 B Satellite image of LU, 30 March 2011

to be continuing and very difficult to control. Thus the share of ground water to recharge the lake has been reducing due to the recent drought. The other important problem is that once a new well is constructed to produce additional water to mitigate the drought, it will continue water abstraction even when drought is over.

3.2 Water Resources of Lake Parishan

Lake Parishan is located in the depression of a small catchment of only 275 km^2 and is surrounded by high mountains in the north and lower ridges in the west, east and south. The average precipitation over the catchment is 450 mm/y. There is no permanent river in this small catchment; instead it is benefiting rich karstic ground water resources. At the same time the porous alluviums at the foothill of the northern mountain also create a very suitable alluvial aquifer in which numerous shallow wells are evacuating ground water for mainly agricultural uses.

The Lake has a 5000 ha area when full, and receives water from direct precipitation, surface runoff from the catchment area and ground water flows in the form of spring flows and seepage. Based on several evidences, it is believed that Lake Arjan, a similar wetland at an elevation of about 1500 m amsl (700 meters higher than Lake Parishan), in the northern mountainous territory some 10 kms away from Parishan has a profound effect in recharging the karstic reservoirs which recharge the ground waters in Parishan area.

According to existing information, in an average hydrological year the volume of water received by the lake from precipitation and surface runoff is estimated about 35 mcm/y. Also, ground water is a crucial contributor to water resources of the Lake. Existing data indicate that in hydrologically normal years, the springs totally discharge close to 30 mcm/y of which about 50% is used for irrigated farming downstream of the springs; and the remainder flows into the lake. Also seepage from the alluvial aquifer and karstic formations around the Lake and particularly those in the northern foothills are important sources of water supply to the Lake. The range of contribution of the latter resources in a normal hydrological year is estimated around 35-45 mcm/yr. During the last decade the cultivated areas commanded by springs have been increasing resulting in lesser flows towards the lake. Also almost 1000 water wells evacuate around 30 mcm/yr of water from alluvial aquifer mainly for irrigation purposes. Some of these wells were built during the last decade (Fig 11) and particularly as a means to provide additional water to compensate drought. Evidently any increased use of spring flows and any additional abstraction of ground water would result in lesser recharge of the Lake from springs and ground water resources.

As in other parts of Iran, the main user of water resources around Lake Parishan is agriculture. Agriculture, as the easiest available opportunity for occupation for the increasing rural population of the area has been and is imposing great pressure on water resources. During the past decade, numerous new wells were dug to produce additional water for irrigation of expanding irrigated farms. Figure 11 depicts the pace of constructing water wells and extracting ground water around the wetland, which implies direct competition with the water resources of Lake Parishan.

The very marked impacts of the drought in Lake Parishan area which is still continuing include desiccation of almost all the existing springs even those with karstic origin, and a significant drop in ground water level in the alluvial aquifer around the Lake, such that practically no effective flow or seepage has been entering the Lake since late 2009. As a resulting the lake has been almost

completely desiccated since then. The map in the following page displays the Lake on 11 June 2011. Tracks of vehicles provide evidence of the severe drought of the lake.

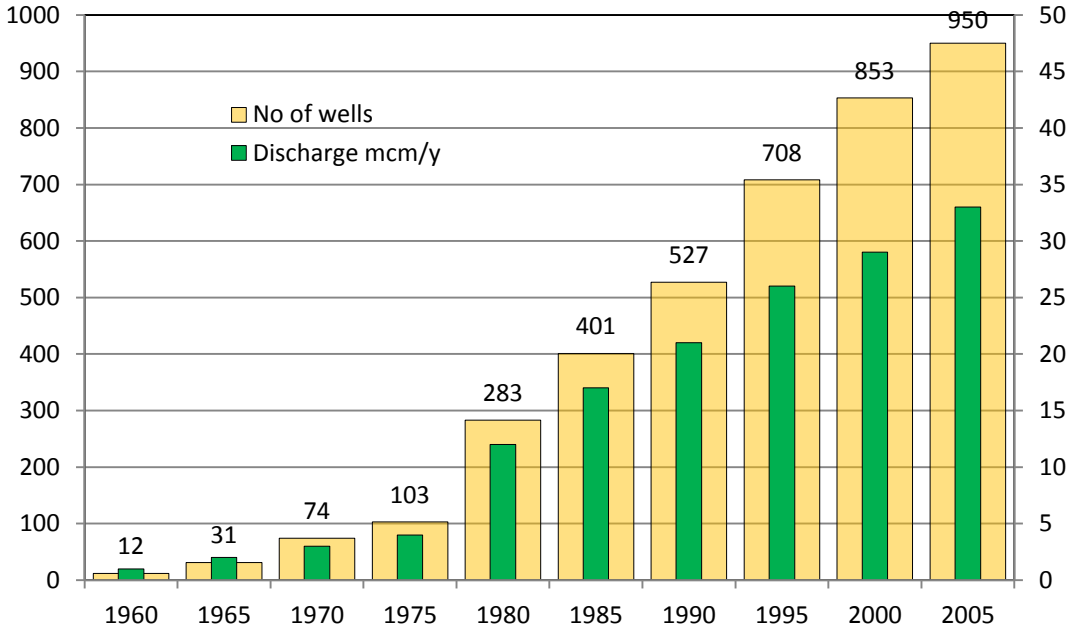


Fig 11: Trends in construction of wells and discharging ground water- Lake Parishan Area

As a conclusion, the persistent drought of the recent years combined with the impact from increasing abstraction of ground water resources has resulted in rather complete stoppage of both spring flows and seepages from ground water aquifers causing the Lake to almost entirely desiccate (Map 2). A concerted effort is needed to control water abstraction to sustainable levels, while it is expected that the lake will re-flood once precipitation returns to normal levels.

4. Impacts of drought on biodiversity and livelihoods

In arid regions, drought is a natural and recurring event which affects wetland biodiversity on the short- to medium term, with different species responding in different ways:

- 'avoiders' such as birds and mammals respond by moving away
- species such as plants and *Artemia*can persist in a dormant stageas spores, seeds or cysts, or have to cope with dwindling water availability to some extent as they cannot move away
- 'Tolerant' species, such as amphibians, reptiles and fish survive as reduced populations in small pockets of water or even move underground.

Under normal circumstances, a brief drought spell (1-2 years) is usually not problematic for all three groups: birds that have moved elsewhere soon return after discovering that the wetland is 'rewetted', seeds soon germinate, and tolerant species recover and multiply. When a drought is prolonged or aggravated by excessive water extraction, however, species may no longer able to cope and wetland biodiversity may suffer as a result.

The livelihoods of those who depend on wetlands may be greatly affected by drought conditions, most obviously for fishermen but also for those who depend on the wetlands for grazing or tourism businesses. Prolonged droughts may force them to change livelihoods or leave the area.

At the two project demonstration sites the recent drought has been aggravated by long-term climatic changes and by excessive surface water abstraction at LU and groundwater extraction at LP, severely impacting wetland biodiversity and livelihoods at both sites, the latter particularly at Lake Parishan. Annex 2 provides a "traffic light" analysis of the expected status of the CIWP Targets at the end of the project in December 2012. It shows that although very good progress has been made towards achieving the project's process targets for integrating the ecosystem approach to the management of wetlands in Iran, several of the biodiversity targets will not be met as a result of the drought.

4.1 Impacts of drought on biodiversity at LU

Salinity levels within Lake Uromiyeh are inversely related to water levels (and volume). Although naturally a hypersaline lake, salinity levels have doubled following the recent decline in water levels, with dramatic effects on the ecological functions of the Lake and its biodiversity.

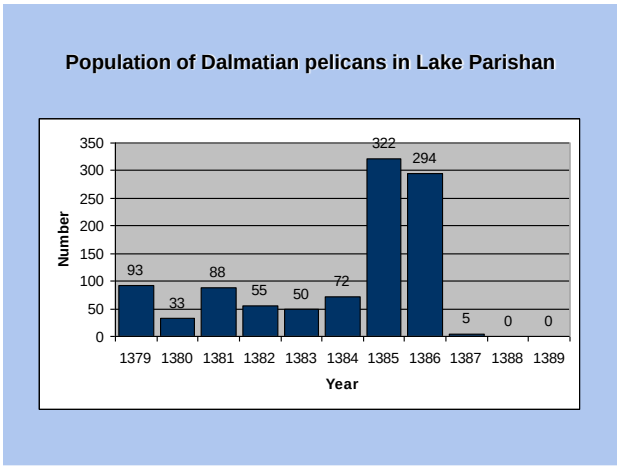
Large areas of the lakebed are now dry and the remaining part of the lake is now brownish in colour, apparently due to a change in metabolism of one of the dominant algae (food source of brineshrimp) *Donaliellasalina* at high salinity levels. The high salinity (>300g/l) has caused a severe decline in biodiversity (both species richness and biomass).The endemic *Artemiaurmiana* populations have stopped hatching, except at the mouths of incoming streams where salinities are lower. As a result, species that feed on brine shrimp have declined dramatically. The previously large flamingo *Phoenicopterusruberroseus* populations (up to 20,000 pairs in the past) have largely abandoned their breeding islands, and the vast numbers of migratory waterbirds (particularly shorebirds, gulls, terns and ducks) that visit the lake have greatly reduced in numbers. Increasing salinity levels have also affected the White pelicans *Pelecanusonocrotalus*, which used to nest in the islands. Yellow deer *Damamesopotamica* and Armenian wild sheep *Ovisorientalisgmelini* populations on the islands suffer from a lack of water and food due to the drought, and rangers often cannot reach the islands to provide supplementary food and water. The island ecosystems are now being interconnected and these large

mammals might start moving out of the islands towards the mainland, which would make them more vulnerable to hunting, etc.

Biodiversity in the satellite wetlands around Lake Uromiyeh has suffered less, as several of them receive significant return flows of irrigation waste water (eg Kaniberazan) or are supplemented by water from local dams (egSoldouz, ShurGol). These satellite wetlands provide a valuable refuge for waterfowl and other species of flora and fauna and need to be highly protected from anthropogenic pressures such as hunting and harvesting, as well as water pollution. Other satellite wetlands which do not receive such water, such as GaraQueshlaqhave dried out or become very temporary wetlands.

4.2 Impacts of drought on biodiversity at Lake Parishan

The impact of the recent drought on wetland biodiversity has been dramatic. The lake has been completely dry since 2009, except for an artificial small 1ha pond fed by a permanent spring (Gap spring). According to locals a similar drought occurred at LP about 35 years ago, and the lake subsequently recovered. However, at that time the number of wells around the lake was lower.



The once vast numbers of migratory wetland birds (up to 40,000+) have all disappeared, including marbled teal *Marmaronettaangustirostris*, ferruginous duck *Aythyanyroca*, white-headed duck *Oxyuraleucocephala,* pygmy cormorant *Phalacrocoraxpygmeus,* and the breeding population of Dalmatian pelican *Pelecanus crispus.* The two endemic fish species, *Barbus luteus* and *Barbusgrypus* are no longer present in the lake and occur only in adjacent canals. Reptiles and amphibians, as well as one of the target species of the management plan the otter (*Lutralutra*) have been substantially reduced in numbers. Aquatic plants remain only in dormant form, except the reedbeds (mainly *Phragmites*) which are still standing around the lake boundaries.

4.3 Impacts of drought on livelihoods at the demonstration sites

The drought conditions at both LP and LU have had substantial impacts on the livelihoods of local communities, and particularly on the ability of the CIWP to develop alternative livelihood options based on the values of the wetlands. These impacts have been most extreme at Lake Parishan as follows:

- Fishing has totally ceased since 2009; this has stopped the progress the project was making on establishing options for a more sustainable fishery, including the development of a cooperative
- The development of ecotourism as a sustainable livelihood alternative at the lake has been put on hold since the lake has lost its landscape and biodiversity values that would attract tourists.

Despite this, the project has assisted the development of a tourism strategy, and has provided training in ecotourism to local people.

- The rich pastures around the wetland have largely disappeared, greatly reducing opportunities for livestock grazing.

At Lake Uromiyeh, the overuse of groundwater has put huge pressure on agriculture in areas around the lake which are not provided with surface irrigation. Also, the low water levels and landscape impacts caused by the drought conditions have greatly reduced the potential of the lake for tourism and recreation.

5. Mitigatory actions to address the drought situation

As a result of capacity building and preparing the integrated management plans much better collaboration takes place between various stakeholders in addressing critical conditions of the two demonstration sites and the impacts of drought on the wildlife and the surrounding villages. CIWP has also been able to some degree strengthen local communities and NGOs by supporting them in protecting the satellite wetlands in LU, as well as building a restoration pond in LP. Thus, the ecosystem approach seems to have contributed to greater resilience and flexibility in enduring the impacts of the drought. There is little doubt that the drought conditions have provided urgency to the engagement of stakeholders in the CIWP, but they have also made it much harder to secure biodiversity and livelihood outcomes. Annex 1 provides an overview of the expected status of the projects targets at end-of-project.

The launch of CIWP coincided with the early years of what has become a severe and persistent drought at both demonstration sites. In the beginning, there were few concerns regarding drought, but as the project progressed, drought was regularly recorded as a risk. Latterly, this risk has become a reality, and the project and demonstration sites have encountered many related problems.

5.1 Mitigatory measures undertaken at Lake Uromiyeh

Lake Uromiyeh and its surrounding satellite wetlands are experiencing a highly unsustainable situation with regard to water resource management, aggravated by short-term droughts and the likely impacts of long-term climatic change. Lake level has fallen, the shoreline has receded dramatically and salinity levels have doubled. The results have been catastrophic for the livelihoods of local communities, biodiversity and the micro-climate of the area.

These conditions have given considerable impetus to the CIWP for finalisation and implementation of the management plan. A high-level National Committee for Lake Uromiyeh has been established under the Cabinet, and a Regional Basin Council comprising the Governors of the three provinces and related Ministers has been established. An emergency budget plan for 24 projects (totalling $1.32 billion) was submitted to cabinet and awaits approval. A recent decision to allocate $80 million for water saving measures by Jihad Agriculture over the next year is a positive development.

As a result of the drought a new component was added to CIWP with additional $200,000 financing from UNDP-TRAC funds in order to focus on integrated drought risk management. This component's objective

is:*"The causes and impacts of the recurrent drought on the Conservation of Iranian Wetlands project's achievements are identified and duly addressed".* A key outcome will be that:*"The LU & Provinces and sectors water rights in drought conditions are identified and drought adaptation methods are introduced to the stakeholders",* as part of the Lake Uromiyeh Drought Risk Management Plan (LUDRMP).This work is being conducted in cooperation with Tarbiat Modarres University of Iran and will help establish evidence for the current water crisis but also will contribute to help local administration and sector experts to factor the causes into developing drought risk management related strategies and adapting action plans. International best practice has been incorporated into the process.

With support of the CIWP, and in line with the management plan, many mitigatory and adaptive measures to combat the drought situation in Lake Uromiyeh have already been undertaken by the Provincial agencies (most notably DOE, the water authorities and jihad agriculture) NGOs and local communities. These include:

- ✓ Intensive work to define the water rights of Lake Uromiyeh, and the provincial allocations that are required to sustain the Lake. These allocations have now been formally approved at the highest level, and will start to be made in the 2011-12 hydrological year.
- ✓ Conservation and restoration of the satellite wetlands as drought refuges for biodiversity, including: restoration of Soldouz, AghQala, Yadergarloo, GheerdeGheet, GoriGol; designation of Kanibrazanas a Ramsar Site, preparation of management plans for Kaniberazan and GoriGol. These measures have required close coordination with, and support from, the water authorities for the allocations of water – and many have been undertaken by NGOs.
- ✓ Rescue and washing salt from flamingos (DOE)
- ✓ Providing water to the large mammal populations on the lake's islands (DOE)
- ✓ Launch of a sustainable agriculture programme at pilot villages in E&W Azerbaijan. Here, Field Farmer Schools are engaging farmers in measures to save water and reduce the use of chemicals. (Jihad Agriculture)
- ✓ Experimental cloud seeding in E Azerbaijan
- ✓ Blocking of illegal wells
- ✓ Moratorium on all new dams and irrigation projects
- ✓ Prepare and disseminate "Wetland Drought" booklet by the local NGO, and organise awareness raising activities
- ✓ Support photo exhibition on LU drought and publish them as a booklet.
- ✓ Support "2nd National Congress of Environmental Crisis of Urmia Lake" which was held by Naghadeh University.
- ✓ Study visit for high level managers and experts from National DOE, MOE and MOJA from LU to visit critical situation of the Lake was organized and implemented in July 2010.

The highest priorities for recovery of the Lake are to assure the agreed water allocations, and to roll-out the sustainable agriculture measures across the basin.

5.2. Mitigatory actions at Lake Parishan

As with Lake Uromiyeh, a large number of mitigatory and adaptive activities to address the drought have been carried out by government agencies, NGOs and the local community, working collaboratively in support of the management plan. They are coordinated by the local and provincial management committees and use the technical advice of the working groups. These measures include:

- ✓ Assessment of groundwater use around LP and options for control

- ✓ Closing unauthorized water wells after meeting with Islamic Villages Councils & Governor's representatives in villages
- ✓ Launch of a sustainable agriculture programme at one pilot village. Here, a Field Farmer School is engaging farmers in measures to save water and reduce the use of chemicals. (Jihad Agriculture)
- ✓ Public awareness campaign with cooperation of NGOs
- ✓ Creation of a shallow 1ha pond at Gap Spring by Plan4Land NGO, the local community at Shahrenjan, with support from local and Provincial DoEs and CIWP – as a reservoir for biodiversity.
- ✓ Volunteers from local communities collected about 500 turtles from dry parts of the wetland and transferred them to areas near springs and water holes
- ✓ A*Typha*(bulrush) rehabilitation project has been established near Qala Narenji Village on the SE part of the lake, to demonstrate the effects of overgrazing on this valuable plant.
- ✓ Special measures for conservation of endemic fish species, including establishing in situ and ex situ refuges, and endemic fish research and conservation
- ✓ Marking the boundaries around high sensitivity zones with buoys in readiness for recovery of the water level
- ✓ Preparation of an ecotourism strategy, and training programmes for ecotourism guides in readiness for the recovery of the wetland.

These projects are helping to sustain biodiversity through the difficult drought conditions. The highest priorities for recovery of the Lake are to control the use of groundwater to sustainable levels, and to roll-out the sustainable agriculture measures across the basin.

5.3 Conclusions on mitigatory measures and prospects for recovery

There have been significant declines in biodiversity at both demonstration sites due to drought conditions. However with the support of CIWP, significant steps have been taken by national, provincial and local government agencies, as well as local communities and NGOs to help save the wetlands and their biodiversity. CIWP should continue supporting these efforts so that biodiversity and livelihoods can recover rapidly when hydrological conditions improve.

At LU, the prospects for recovery of wetland biodiversity are theoretically good, so long as: a) the commitments made by government and the provinces for water allocations to the lake are implemented, b) the current moratorium on further dams and irrigation developments is maintained, and c) precipitation returns to normal levels. Species that have migrated from the lake during the drought (such as flamingo) are likely to return once lake levels and salinity return to their pre-drought levels; 'dormant' species such as *Artemia urmiana* are likely to recover quickly in response to decreased salinities. Prospects for satellite wetlands are better, as restoration efforts have clearly shown that concerted efforts can deliver results even during drought periods.

The prospects for recovery of wetland biodiversity at LP are good, provided that the current drought conditions end within 1-3 years. The analyses presented in this report add some confidence to this statement, since there is evidence that there was a good recovery from an even more severe drought in the mid-1960s.Prospects can be further enhanced by enlarging and deepening the pond created at Gap spring, and conducting *ex situ* breeding of sensitive species such as the endemic fish. If the drought lasts

longer, sensitive species may disappear and become (at least) locally extinct, and *ex situ* conservation will remain the only option for medium- to long-term survival.

6. Conclusions and Recommendations

6.1 Conclusions

There is clear evidence of natural short-term droughts, long-term climatic changes (increased temperatures and reduced precipitation) and non-sustainable use of water resources at both demonstration sites. These pressures interact in a complex way, but when acting simultaneously can cause severe impacts on the condition of the wetlands as observed at both project demonstration sites. Of these three pressures, the unsustainable use of water is the one that the project can address, and is the priority for attention by government and other stakeholders. Droughts and climate change must not be used as an excuse for inaction over unsustainable water use.

Drought conditions have brought serious impacts at the wetlands both on the biodiversity (species richness and abundance) and on the livelihoods that depend on the normal ecological functioning of the wetlands, notably fisheries (at Lake Parishan), grazing and tourism / recreation. Biodiversity is well adapted to recover from short-term natural droughts, but the longer periods of dessication caused by climatic changes and anthropogenic impacts on water resources threaten the ability to recover. CIWP has supported important emergency and restoration measures to mitigate the effects of drought at both sites.

The CIWP has provided significant assistance to the government of Iran in addressing these challenges facing Iran's wetlands. The severe impacts during the project period have provided impetus to the progress that the CIWP has been able to make in developing solutions. The introduction of the CBD's ecosystem approach has enabled governmental sectors to work together to develop integrated solutions, and to gain the cooperation of local communities. As a result, the ecosystem approach has contributed to greater resilience and flexibility in enduring the impacts of the drought.

With support of CIWP, government agencies must focus on the sustainable use of water resources and ensuring the allocations of adequate quantities of water to sustain natural ecosystem functioning at the demonstration sites, in the context of apparent long-term climatic changes. This requires significant changes to: a) the agriculture sector, particularly in terms of water efficiency measures through improved technologies, capacity building and adaptation of crops; and b) the water sector through inclusion of ecosystem as a legitimate user of water resources, the determination and allocation of water rights to wetlands, and more integrated planning taking into account drought and climatic changes.

6.2 Recommendations

1. The ecosystem approach provides an effective mechanism for addressing the problems caused by drought and water shortages at the project demonstration sites, due to its focus on sustainable development, inter-sectoral decision-making and local, participatory and long-term solutions. CIWP should continue to promote this approach at the demonstration sites, and support government to

ensure that the governance, institutional, financial and technical arrangements are in place to roll out this approach to all Iranian wetlands.

2. The current progress through the implementation of the integrated management plans and inter-sectoral decision-making bodies such as the Lake Uromiyeh National Committee and Regional Basin Council, and the Lake Parishan local and provincial management committees are encouraging and should be supported strongly.

3. Agreement between all stakeholders on the water needs for each wetland is a pre-requisite for their effective management; water allocations should be enforced and monitored

4. The additional support provided by UNDP (TRAC funds) to enhance drought risk management has enabled stakeholders to focus on this specific issue at Lake Uromiyeh. The protocol for water allocations under drought conditions at LU should be finalised and implemented. The results of this work should be introduced as a model for all Iranian wetlands.

5. There is need for water saving measures particularly in the agriculture sector, to adapt agriculture to the climatic changes that are appearing (use of appropriate crops, technologies etc.). The current pilot project activities on sustainable agriculture (Farmer Field Schools) are yielding very promising results. Innovative financing mechanisms to encourage farmers to adopt such measures should be developed (eg. water pricing, incentives for water saving or insurance schemes to support farmers during drought periods).

6. Measures to enable biodiversity to adapt to and recover from drought conditions should be continued at the demonstration sites, with particular emphasis on further restoration of satellite wetlands around Lake Uromiyeh, and safeguarding endemic species at Lake Parishan. Preparations should also be made for the expected recovery of the wetlands, for example planning for a more sustainable fishery at Lake Parishan

7. Models of the interactions between precipitation, water use, inflows and water levels should be developed to allow better prediction of the conditions and recovery potential at the demonstration sites.

8. The speed of reporting and interpretation of key climatic and hydrological data should be improved, so that the results can be used effectively to manage water resources and wetlands.

9. UNDP and NPD should inform GEF that despite the good progress of CIWP in addressing the root causes of the problems at the demonstration sites, there is a high likelihood that the biodiversity indicator targets of CIWP will not be achieved within the project period because of the ongoing drought conditions, and the time required to achieve substantive changes to integrated land and water management which are now well under way.

7. References and further reading

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8. List of Annexes

Annex 1. Status summary of CIWP log-frame indicator targets.

Annex 2. Photographs of some actions to mitigate drought at the demonstration sites.

Description of Indicator	Baseline Level[4]	Target Level at end of project	Level at 30 June 2010	Expected achievement of target at EOP
Purpose: To systematically remove or substantially mitigate threats facing globally significant biodiversity and sustainability at two WPA demonstration sites, while ensuring that the lessons learned are absorbed within WPA management systems throughout Iran				Green = Target likely to be achieved Yellow = Target likely to be partly achieved Red = Target likely to missed
Population of indicator bird species in Lake Uromiyeh and satellite wetlands	209 pairs, Average 2003-2006. (Was15-25,000 prs in mid 1970s (Scott 1995)) 110 Pairs, Average 2003-2006. (Was 1000-1600 prs in mid 1970s (Scott 1995)) Average 2003-2006 (all satellite wets.) Marmaronetta angustirostris :9 Oxyura leucocephala : 40 Aythya nyroca :27 Branta ruficollis : 1 TOTAL: 77	Flamingos >2,500 breeding pairs annually White Pelican >200 breeding pairs annually 4 globally threatened waterbirds 20% increase in counts	Flamingos: 3670 white pelicans: 603 Marmaronetta angustirostris :25 (the decreased level of water in the lake and its wetlands seem to be the main reason for the decrease in the number of observed waterbirds) Oxyura leucocephala: 123 Aythya nyroca: 289 Branta ruficollis: 0 TOTAL: 437	The bird communities using the lake and the satellite wetlands have been differentially affected by the drought and by project activities. For the birds using the Lake (particularly flamingos), the impact of reduced water levels and extremely high salinity has greatly reduced food supplies of Artemia. Bird numbers have fallen dramatically and flamingos are only breeding sporadically in small numbers. The conditions in some satellite wetlands have improved due to restoration and conservation measures of CIWP. As a result, and despite the drought, populations of some globally threatened species have increased slightly.

Lake Uromiyeh's status and salinity levels	The current status of "a magnificent example of a natural, hypersaline lake with great scenic beauty" at risk due to increased salinity levels and decreased water levels. Salinity 258.46 gr/lit	Safeguard as "a magnificent example of a natural, hypersaline lake with great scenic beauty." Salinity less than 240 gr/lit .	Drought crisis has further reduced water levels and scenic beauty Salinity: 370 gr/lit	Falling water levels in the Lake since 1997 have resulted in a receding shoreline, leaving several kilometres of exposed mud and sandflats in many places. Salinty is more than 50% above target level.
Area of protected satellite wet	0ha	1000 ha satellite wetlands gain increased protection	230 ha Gorigol (Non hunting area), Garegheshlagh 48000 ha (Non hunting area)	Kaniberazan satellite wetland (927ha) was also designated a Ramsar site in 2011
Breeding population of globally threatened Dalmation Pelican at Lake Parishan	There is no 2000-05 data on breeding population. Scott (1995) quotes 5-10 pairs for mid 1970s Wintering: 64 (2000-05 Jan. average)	(>200 pairs annually)	Wintering: 0 (Jan 2010) because of Severe drought	Lake Parishan has been dry since summer 2009. Consequently all waterbird breeding activity has ceased. Measures such as zoning to reduce disturbance at the nesting sites have been established in readiness for recovery of the hydrological conditions.
Area of disputed agricultural lands encroached into Lake Parishan	Ca. 800 ha (Still under negotiation)	Reduced by 50%	0% (The issue raised in local management committee, mapping has been started, a committee formed for conflict resolution)	Work continues intensively and with some promise to resolve the disputed areas. Although the wetland boundary is now marked, the drought has allowed farmers more access into the wetland
Ecosystem approach being applied strategically to WPAs at national level	No strategy 0 provinces	Ecosystem approach to WPAs being promoted through national strategy by end 2010 and being implemented in minimum 5 provinces by EoP	Second draft of National Strategy prepared and Shared with stakeholders for finalizatiation,Shadegan Management Plan finalized in Stakeholders workshop and will be approved in a near future)	Good progress. National Wetland Strategy will be approved by Cabinet in 2011

Outcome 1: Local WPA management structures (e.g., National Park offices, DoE Provincial offices) possess and use enhanced capacities to effectively manage WPA sites, including dealing with most 'internally arising' threats to globally significant biodiversity				
Number of staff of DOE and other key stakeholders trained in ecosystem-based management	0 persons 0 key subjects	Training provided in a minimum of 4 key subjects for at least 25 staff of DOE and other key stakeholders at LP and LU by 2010	100 persons LP 150 Persons LU 70 persons National, 200 Shadegan Wetland 40 Guards Note 1. Training subjects included: mapping and delineation, zoning, IWRM, management planning, ecotourism concept & initiate strategy planning, eco village concept, training of trainers and guard training and etc. Note 2. DoE staff are now better prepared to carry out demarcation of wetlands. The eco-system approach is better understood by officials and local stakeholers as well as the benefits of wetland ecosystems. Officials and other stakeholders are now much more sensitized on partipatory approaches to water basin management.	Achievement well beyond target, and training continues

Signed Management Plans being implemented	No signed management plans for either site 0 implementation	LU and LP management plans designed and approved by end 2009 and 50% of priority actions being implemented by EoP	at least 15% of priority actions for LP and 10% of LU are planned and approved for implementation through stablished national, provincial and local management committees ;and some of them are in action LP management plan has been signed by local and provincial stakeholders. LP management structure has been established (LP Local Management Committee and LP Provincial Technical Committee).	
Sustainable use strategies and priority actions being implemented (fishery, tourism)	0 Fishery / Tourism strategies 0 zoning plans	Zoning plans developed and approved by end 2009, strategies for sustainable tourism and fisheries approved by end 2009 and implementation ensured by EoP	LP and LU zoning plans approved for implementation SW zoning Plan is being developed and its approval process is followed. LP ecotourism strategy planning initiates. LP Eco-tourism strategy is being developed LP Fishery strategy initiated based on previous draft (Fishery stopped in the wetland because of drought)	Zoning plans have been finalised (LP&LU). Workshops have taken place to prepare tourism and fishery strategies (LP), but no implementation can take place until the wetland has re-flooded (LP)

Area of wetland habitats conserved and restored	Area delineated and marked = 0 ha Area with enhanced protection = 0 ha Area restored = 0 ha	Wetland boundaries identified and marked by end 2009, 1000 ha satellite wetlands better protected by end 2010, and 500ha wetlands restored by end 2011	80% of LU boundaries (250 Km) marked , 10 Km of LP boundaries Marked, 1530 ha restoration project of Yadegarlu, 200 ha Gorigol restored, 1700 ha Hasanlu restoration project started Implement Otter and other LP biodiversity restoration project in habitat, Proposed a proposal to restore LP endemic fish out of habitat by Shilat of Fars province, Implement fencing Typha at LP,	
Management guided by baseline studies and monitoring key indicators	LP No baseline LU: Yekom 2002 No monitoring plans 0% implementation	Baseline studies and monitoring plans completed by end 2008, site annual reports produced in 2009, 2010 and 2011 and 50% of protocols being implemented by end 2011	Summary Baseline report of LP prepared for comments Summary Baseline report of LU is being prepared based on prevous version LP and LU monitoring reports shared for being used by local stakeholders	
Number of locals receiving awareness activities	Small-scale sectoral activities by NGOs	20% of local population have been engaged by direct “wetland”	LU: 15% LP: 15%	Over the lifetime of the project, this target will have been met - but activities are seriously constrained by the drought conditions
Awareness of local communities	Awareness = XX	awareness raising activities by end 2010, and ”Wetland” awareness of local communities raised by 20% by EoP	LU: 15% LP: 15%	Over the lifetime of the project, this target will have been met - but activities are seriously constrained by the drought conditions

NGO and local community involvement in management	0	NGOs and local communities strengthened and represented on management committees by end 2008	Three NGOs and 5 representatvies of LP local community are present in LP local management committee One national NGO and 6 local NGOs cooperating with CIWP in demonstration sites A two section training package (8 days) was held for NGOs around demonstration sites	
Community participation in priority activities	0%	Local communities participate in 25% of priority actions of management plans	LU: 15% LP: 15% (LP local community represetatives are involved in most technical sub-committees to review and decide on projects implementation, Local community around nominated LU satelite wetlands are also involved in all management planning and implementation activities.)	
Outcome 2: Intersectoral coordination structures established at provincial and basin level				
Appropriate high level, intersectoral governance	No Council, 0 meetings	Lake Uromiyeh Basin Council or Authority established by end 2009 and meeting minimum once per year	• LU National management committee established and two meeting was held	
Management committees	No committees 0 meetings	Inter-sectoral management committees for LU and LP established by end 2009 and meeting at least twice per year	LP local and provincial managemtn committees established and had 4 meetings till now.	

Working Groups	No working groups No meetings	3 Inter-sectoral working groups for LU and LP established by end 2008 and meeting at least twice a year.	LP : 1 meeting of Alternative livlihood WG, 2 meetings of Socio-economic WG were held. LU: 3 meeting of Water and Agriculture WG were held.	
Water allocations to environment	No strategy, no agreed target No strategy and 0% implementation XXX	Strategy for adequate environmental water allocations to LU agreed by end 2009, and being implemented by end 2010 Strategy for sustainable abstraction of groundwater at LP agreed by mid 2010 and 25% implemented by EoP	LU: Strategy for adequate environmental water allocations to LU agreed by end 2009, and now it is implemented through Water and Agriculture working group meetings and it is in final stage of decision making. LP: Some baseline studies done on abstraction of groundwater at LP for further strategy development	This work is receiving added emphasis as a result of the drought
Pollution levels	No baseline or strategy and 0% implementation	Pollution baseline and strategy prepared by end 2009 50% priorities being addressed by EoP	LP: Baseline study finalized	Water quality issues have been given reduced priority due to the critical importance of securing water quantity for the wetlands. Target likely to be met in part.
Watershed/river restoration and projects	LP: 0 LU: 0	Minimum one new pilot watershed/river restoration project being implemented at both LP and LU by end 2011	4 rivers of Yadegarlu and Sirangoli, one Canal of Kanibrazan, one of Canal Gorigol restored.	
Outcome 3: National-level WPA management and inter-sectoral co-ordination structures possess and utilise enhanced capacities to strengthen WPA management, inter alia, by supporting the exchange of knowledge and lessons learned through Outcomes 1& 2 above				

Raised capacity for ecosystem approach	0	Capacity of 50 key staff from DOE, MOE, MOJA and other key sectors raised to address the ecosystem approach to WPAs, by end 2010	100 high level managers and key staff from DOE, MOE, MOJA and other key sectors were getting acquainted with ecosystem approach and implementation.	Well beyond target
Policies influenced in direction of ecosystem approach	0	Project influences at least 3 key policy issues in direction of ecosystem approach for WPA management	Ecosystem approach to wetland management was introduced at relevant forums and incorporarted in the final draft of the 5th national 5-year development plan 2010-2014 submitted to national Parliament for approval.	NDP4, NDP5, Cabinet decisions on water allocations
NWCSAP	No strategy or plan	National Wetland Conservation Strategy and Action Plan approved by end 2010 and being implemented	Second draft of the National Wetland Conservation Strategy and Action Plan was developed and shared for comments.	
Number of replications	0	Minimum 3 replication sites applying the ecosystem approach to management of WPAs by EoP	Based on midterm evaluation, no more replication sites will be added to project and CIWP focuses more on three demonstaration site and country wide roll out strategy	Replication site approached dropped as a result of MTE. Shadegan wetland added as third demonstration site. CIWP approach now being rolled out nationally, initially to 10 wetlands
Iran Wetland Database and Guidelines	0	National tools, including wetland database and 4 key guidelines, available by EoP	One company selected and contracted for the database development and it will be ready till 2010.	
Public awareness of wetlands	XXX	National public awareness of wetland values raised by 20% by EOP	Public awareness activities carried out at the national level. Activities included the broadcasting of a series of 15 video clips (Tab-e-Ab), holding public awareness fairs, several media interviews and talk shows by project management.	Very high level of activity. Evidence for achievement of indicator will require repeating a poll survey undertaken in 2008

Annex 2. Photographs of some actions to mitigate drought at the demonstration sites

Local community and NGO members building a restoration pond at Gap Spring

Established pond at Gap Spring in Lake Parishan

DOE West Azerbaijan staff trying to pull a boat to access one of the islands

DOE West Azerbaijan staff trying to wash way the salt from the affected birds

The newly established AghQala wetland(south of Hassanlo wetland, Ramsar Site)

Typha grazing experimental plot