

# Integrated Management Plan for Lake Urmia Basin



**Map 0.1**

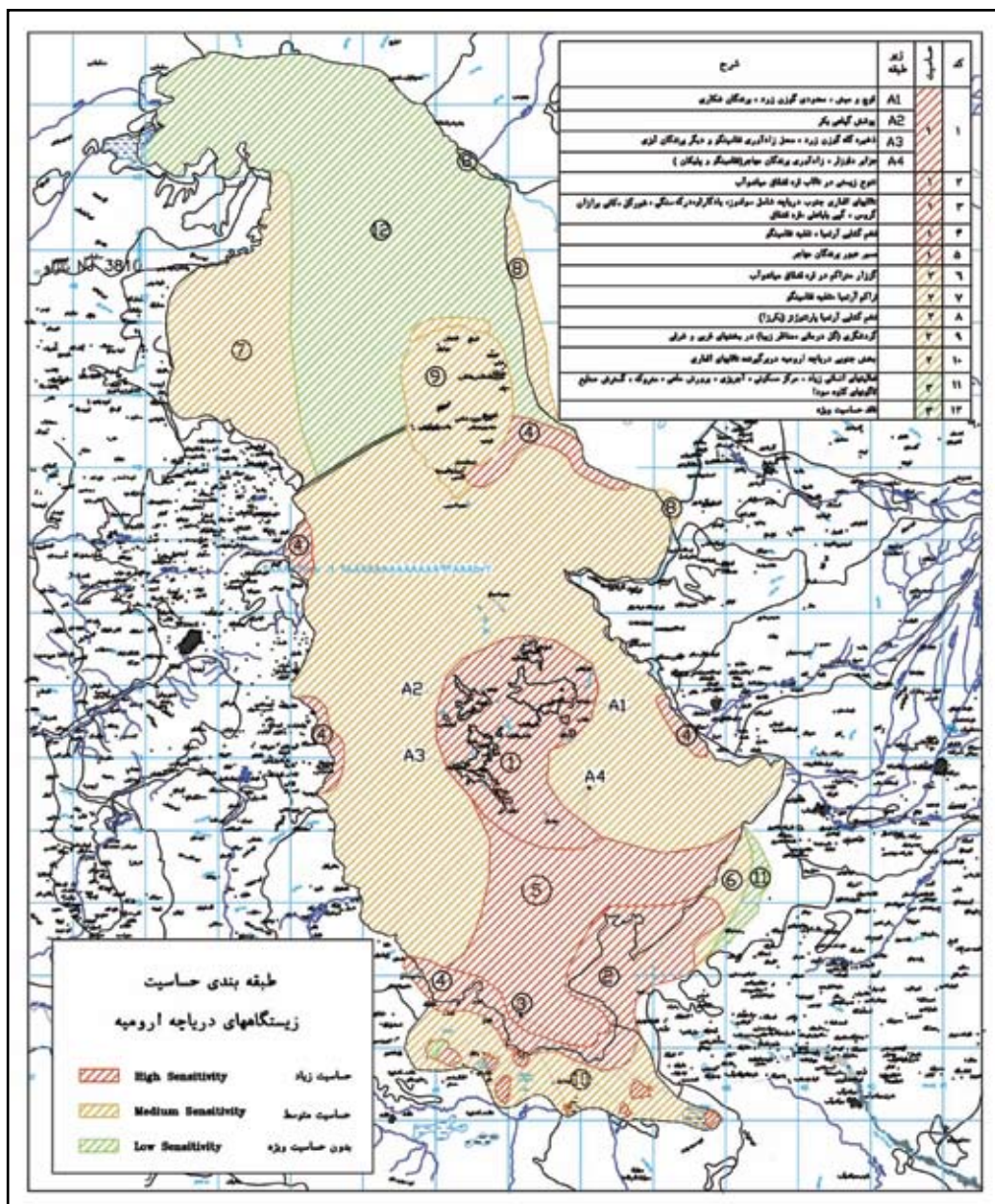
**Location of the Lake Uromiyeh Basin and Ecological Zone in Iran**

The map displays the following details:

- Provinces:** West Azarbaijan Province (pink), East Azarbaijan Province (green), and Kurdistan Province (yellow).
- Lake Urmia:** Shown in light blue.
- Ecological Zone:** Indicated by a red outline around the lake and surrounding areas.
- Critical Sites:** Marked with black dots along the ecological zone boundary.
- Towns/Cities:** Labeled include Salmas, Shabestar, Tabriz, Oskoo, Azar Shahr, Maragheh, Bonab, Mianeh, Mahabad, Bostan Abad, Sarab, Urmia, Oshnavieh, Haghadooh, Mahabad, Shahin Dej, Bokan, Takab, Saghez, and Urmia.
- Legend:**
  - Basin boundary (black line)
  - Ecological Zone (red line)
  - Province center (circle with dot)
  - Township center (black dot)
  - Critical Sites (black dot)
- Scale:** 1:1800000. Scale bar shows 0 to 40 Kilometers.
- Inset Map:** Shows the location of the Lake Urmia basin within Iran, with labels for Caspian Sea, Persian Gulf, Oman Sea, and Tehran.

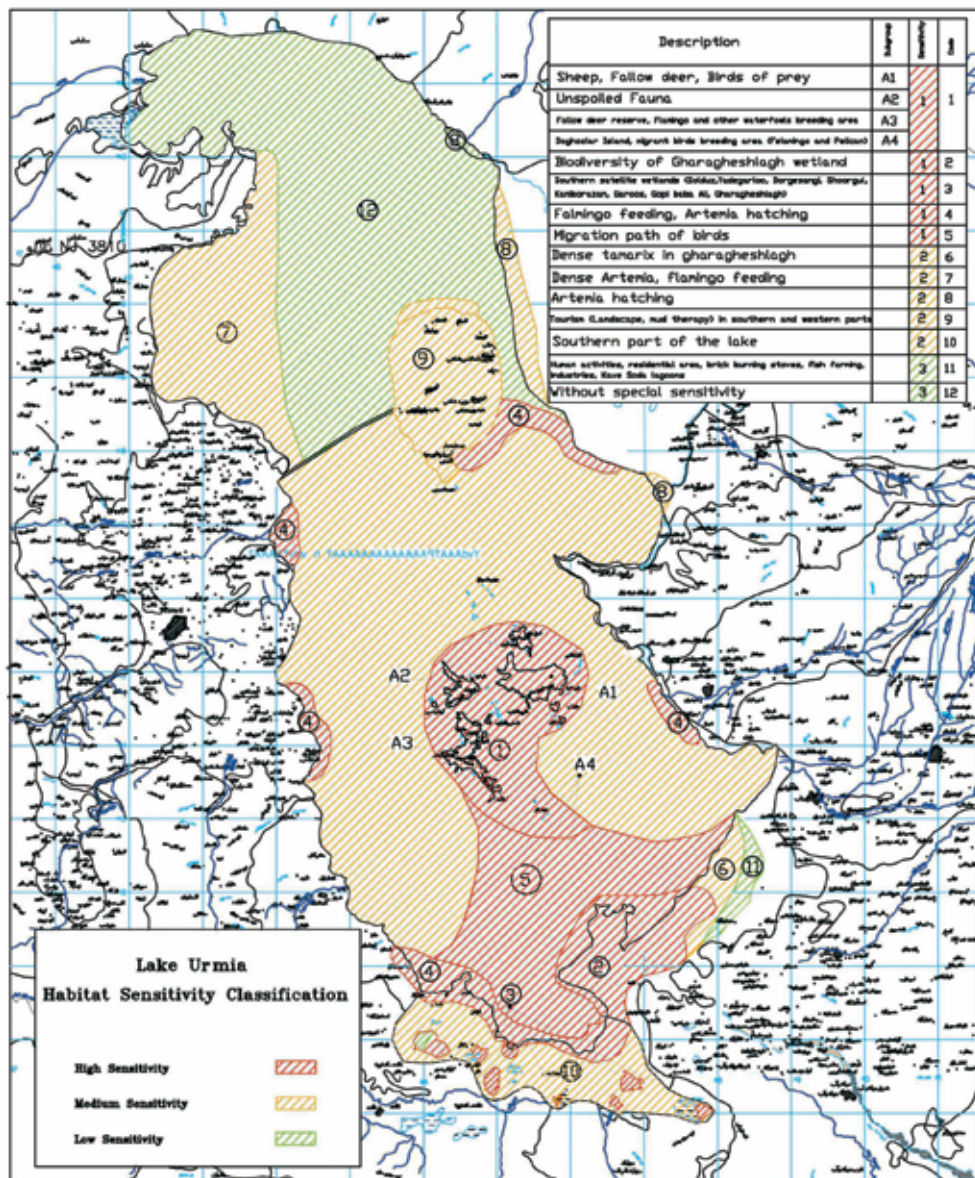
Conservation of Iranian Wetlands Project  
Management Plan for the  
Lake Urmia  
**Location of the Lake within its  
Basin**  
Source: Yekom, 2002

Source: Yekom, 2002



نقشه زون بندی حساسیت زیستگاههای دریایچه ارومیه





● LU Habitat Sensivity Zoning Map

**IN THE  
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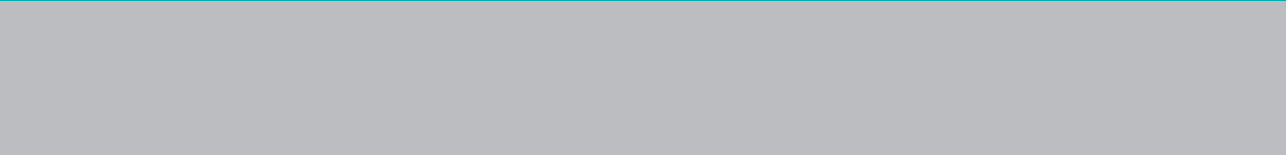
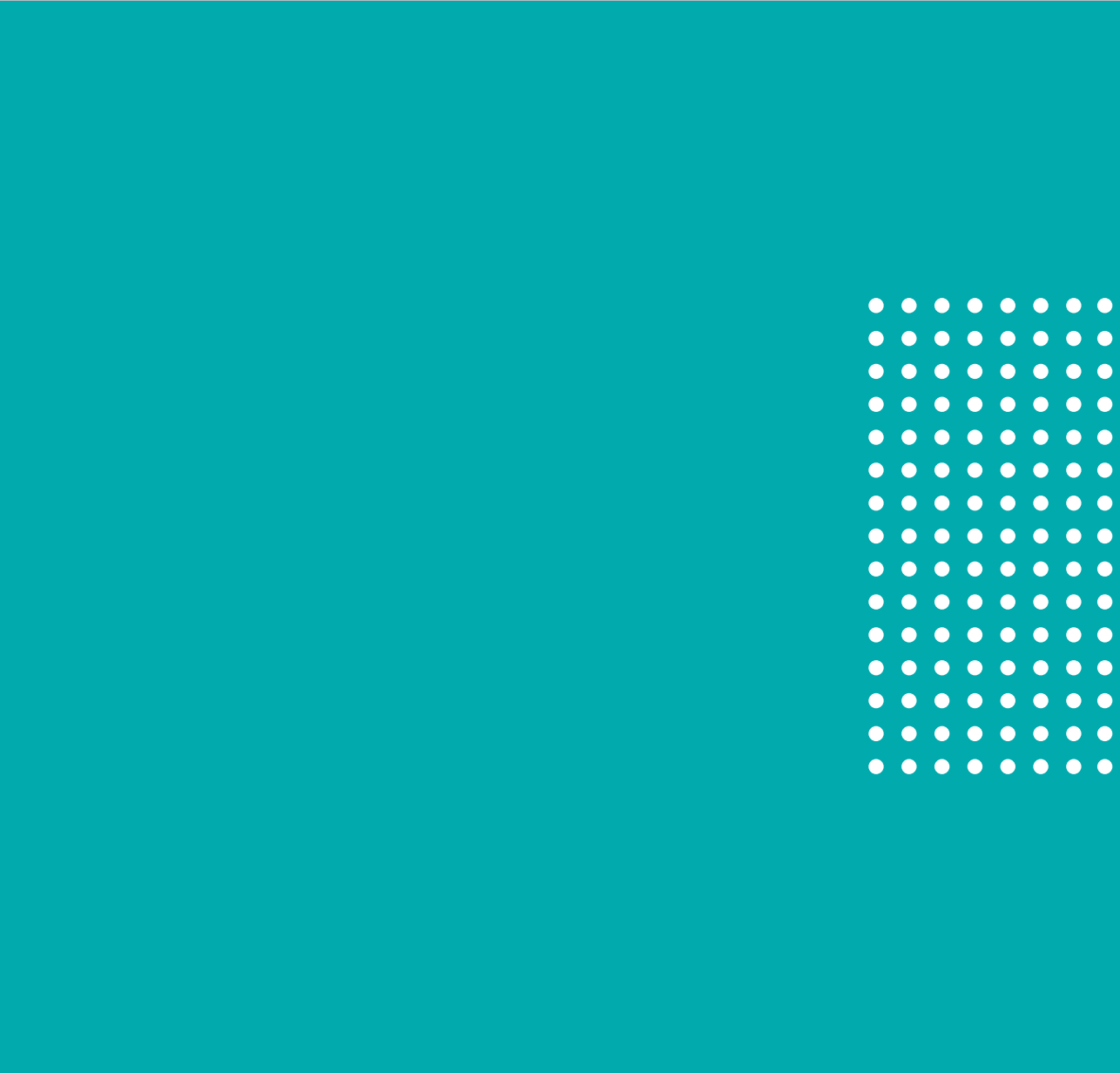


“Saving Wetlands, for People, for Nature”

# Integrated Management Plan for Lake Urmia Basin

Approved Version: 2010

Prepared in cooperation with Governmental  
Organizations, NGOs and Local Communities  
of Lake Urmia Basin





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## INTEGRATED MANAGEMENT PLAN FOR LAKE URMIA BASIN

The UNDP/GEF/DOE Conservation of Iranian Wetlands Project is working with the provinces of West and East Azerbaijan and Kordistan to develop an integrated management plan for Lake Urmia, based upon international best practice.

The plan aims to help provincial and national agencies to address the current critical ecological situation of the Lake, as required by Article 67 of the 4th National Development Plan. The management plan has been developed in two parts: firstly a high-level STRATEGY to be agreed between the provinces and key national agencies; and secondly an ACTION PLAN which describes the specific actions required by each stakeholder. The “Roadmap” for preparing this integrated management plan for Lake Urmia is attached.

Two inter-sectoral participatory workshops have so far been held for the development of this management plan. The first was held in Urmia on 4-5 July 2007 to initiate preparation of a first draft of the STRATEGY; a second workshop was then arranged on 11-12 November 2007 in Tabriz to review the first draft, and to identify targets and priority actions to be undertaken. In each of the workshops, more than 50 participants from local and provincial organizations and representatives of local communities actively participated in the discussions. Diverse information and views on the attributes, values and threats of the lake and its satellite wetlands were shared by the different stakeholders during the first workshop, while the second workshop mainly focused on required actions.

The 3rd draft of this management plan was then sent to High Council for Water and discussed in details by the experts of this technical committee. This version of the management plan is a result of these discussions and includes the comments of the above-mentioned council.

A major achievement of the two workshops and the meetings of High Council for Water has been to clarify that a Common Approach should be taken by all three provinces involved and national bodies, as well as by the different sectoral stakeholders. Intensive discussions enabled the elements of this common approach to be defined. A 25 year Vision statement for the lake was developed, including the concepts of an adequate water supply allowing the Lake to sustain a rich biodiversity, landscape and cultural heritage which

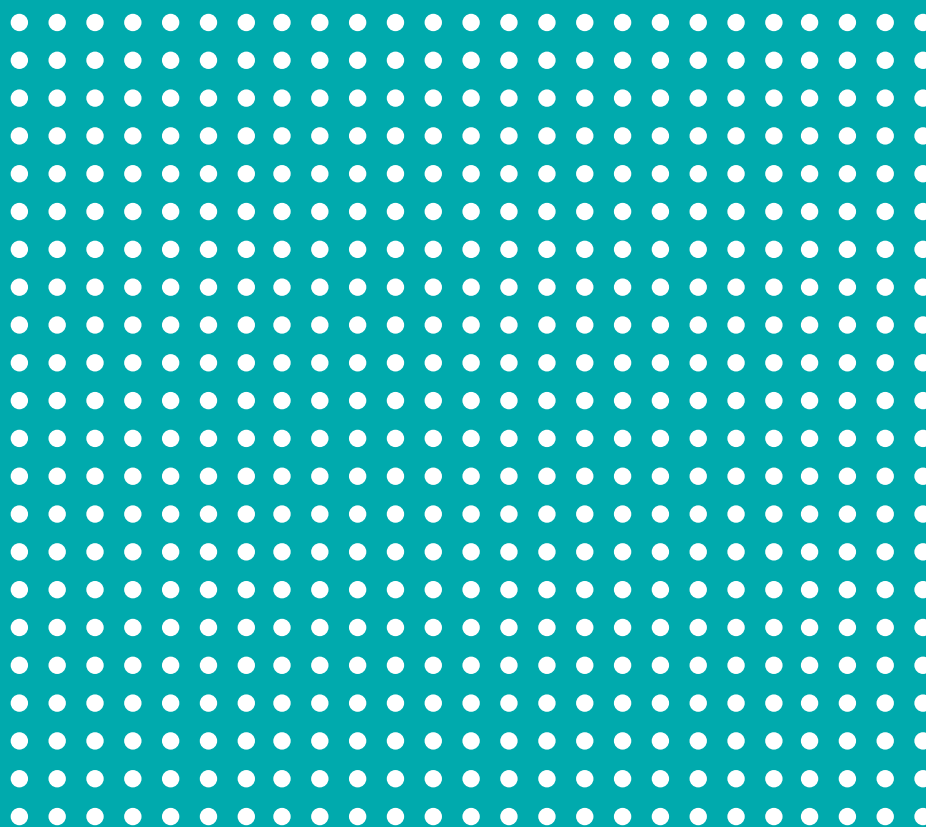
could be used sustainably by people. The priority actions required to achieve this Vision are now identified in the current version. This Final version of the Management plan is resulted from several management planning workshops and comments received on the previous drafts which includes the Vision, Goal, objectives and the main activities and responsibilities of each organization towards this vision. The monitoring plan and zoning of activities Lake Urmia and the structure and TOR of LU National committee have now been added to this program as additional annexes.

It's needless to say that Implementation of this plan which was signed on October 2008 by Head of Department of Environment, Ministers of Energy and Agriculture and Governors of 3 provinces under a Memorandum of Understanding, will not be feasible, without collaboration of governmental and non-governmental organizations and support from high level provincial and national decision makers. Although this program has been produced after receiving comments from different stakeholders but will remain open to any periodic revisions.

Following these improvements and in order to draw political & managerial support from high-level authorities of the country, and after necessary negotiations, the Cabinet endorsed a resolution number 44070/17182 on April 2010 which introduces the present management plan as the basis of activities at LU basin. Following this resolution, the implementation committee of LU Basin management plan was established and the deputy head of president was introduced as head of this committee.

This final version is a result of cooperation and discussions of project steering committee, Provincial coordination committees, High council for Water, Organizations at National and provincial levels including West and east Azerbaijan and Kurdistan province and also Local communities and NGOs. Hereby the conservation of Iranian Wetlands Project may need to thank all the stakeholders who have attended our workshops and have supported us by participating in discussions and giving useful comments for the Management Plan. We hope that implementation of this management plan would be a great step towards realization of Article 67 of national development program and application of ecosystem approach and sustainable and wise use of environmental resources in Lake Urmia basin.

**National Project Manager  
May 2010**



**Memorandum of Understanding  
For Conservation and Sustainable  
Management of Lake Urmia Basin  
Among  
Department of Environment  
Ministries of  
Energy, Jihad, Agriculture, Interior  
And Governors of  
West Azerbaijan, East Azerbaijan  
and Kurdistan provinces**



Iran's Department of Environment and Ministries of Energy, Agriculture, Interior and governors of East and West Azerbaijan and Kurdistan Province sign this memorandum of understanding;

Considering the national and international importance of Lake Urmia and its satellite wetlands as a valuable ecosystem providing rich biodiversity and great economic, social and cultural values for its basin;

Knowing that Lake Urmia is internationally known as a Ramsar Site and UNESCO Biosphere Reserve and as a National Park;

Recognizing the dependence of this lake on climate and human activities throughout the basin;

Worried that drought could threaten the functions of this valuable ecosystem and leave negative effects on the whole area;

Considering that there have been efforts for restoring functions of this lake, increasing water quantity and quality and decreasing the environmental impacts of development projects;

Emphasizing on need for participation of all the stakeholders throughout the basin;

Referring to articles 67 and 17 of Law in 4th National economic, social and cultural 5 years development plan, in line with ecosystem management approaches for Lake Urmia and Integrated of land and water resources management;

Acknowledging joint initiative of Department of Environment, United Nations Development Program and Global Environment Facilities in "Conservation of Iranian Wetlands Project" for facilitating preparation of integrated management plan for Lake Urmia;

And also honoring the efforts of High Council of Water for following up the issues related to Management of Lake Urmia Basin;

Insisting on need for cooperation among all the involved provincial organizations throughout Lake Urmia Basin as an integrated ecosystem:

### **Article One- Geographic Boundaries**

1. This MOU covers the whole catchment of Lake Urmia and all the lands within its boundaries including Lake Urmia and its satellite wetlands.

### **Article Two- Integrated Management Plan**

1. The long-term vision for management of Lake Urmia: "Lake Urmia

will have adequate water to sustain an attractive landscape and rich biodiversity where people and local communities can make wise use of its resources, and will enhance cooperation between the involved provincial organizations”.

2. The goal of the management plan: “To establish an ecosystem based management for the lake and its satellite wetlands within the context of sustainable development with effective involvement of all stakeholders including local communities.”

3. The strategic management plan for Lake Urmia which is the annex of this MOU includes strategic objectives and prioritized action plans, related indicators and the monitoring protocols and codes of practice for zoning for a 5 year period will be prepared and added to this plan later.

### **Article three- Implementation Procedures**

1. Based on this MOU, the national committee for sustainable management of Lake Urmia will be established at national level and the regional council for management of Lake Urmia Basin will be established joining West and East Azerbaijan and Kurdistan provinces.

Note 1: the main responsibility of this national committee is to define development capacities and coordinate these development activities in the basin in line with ecosystem based management approaches and ensuring sustainability of Lake Urmia and its satellite wetlands.

The regional council for management of Lake Urmia basin will publish annual reports of its activities.

2. At basin level, the regional council for management of Lake Urmia will be established. In fact, this council will act as an implementation tool for the national committee. Representatives from East/West Azerbaijan and Kurdistan provinces will be members of this council.

Note 2: This council will be responsible for implementing, evaluating and revising the management plan at the end of the 5th year.

### **Article four- Financial Provisions**

1. Each of member provinces of this MOU will foresee the costs of each action plan in its annual budget, and will allocate it to the responsible

agencies, after reviewing the received proposals.

Note 1: Budgets for NGOs and local communities will be allocated by provincial DOEs after approval.

Note 2: With cooperation of regional council for management of Lake Urmia basin, related ministries and organizations should allocate some budgets according to prioritized activities and action plans of the management plan.

2. The central secretariat of the regional council for management of Lake Urmia will be in West Azerbaijan and this province will chair the council for the first two years. After a two years period the members will decide who will chair the council.

3. The 3 member provinces will report to the council about the allocated budgets and related activities at the end of each year.

#### **Article Five- Conflict solving**

1. In case there is any problem between the parties in implementing the MOU, the legal offices of each party will solve the problem.

**Article Six-** This MOU contains six articles and 6 notes and was signed on October 18th 2008 and will be implementable from this date.

Note 1: This MOU is valid from October 18th 2008 for 5 years and would be valid for an additional 20 years unless one of the parties withdraws formally.

#### **Signed by:**

Deputy President and Head of Department of Environment  
Minister of Energy  
Minister of Agriculture  
Governor of West Azerbaijan  
Governor of East Azerbaijan  
Governor of Kurdistan

## STRATEGY FOR CONSERVATION AND WISE USE OF LAKE URMIA

### 25 YEAR VISION

"Lake Urmia will have adequate water to sustain an attractive landscape and rich biodiversity where people and local communities can make wise use of its resources, and will enhance cooperation between the involved provincial organizations"

### GOAL

"To establish an ecosystem based management for the lake and its satellite wetlands within the context of sustainable development with effective involvement of all stakeholders including local communities."

UNDP/GEF/DOE Conservation of Iranian  
Wetlands Project  
In cooperation with  
Provinces of West and East Azarbayjan and  
Kordistan

Attributes	Description
Name and alternatives	Lake Urmia, Urmia Lake, Chichest
Location	36,45-38,20 N – 44,50- 46,10 E
Area of the lake	5000 sq km
Area of the Catchment	51,876 sq km
Elevation	1276 m. amsl
Administration status	LU and its' satellite wetlands in East Azerbaijan province are administrated by West Azarbayjan Provincial Environmental Conservation Office (WAECO) Satellite wetlands in East Azarbayjan are administrated by EAECO
Conservation status	Lake is a National Park, Protected since 1957 (No hunting area)
International designations	Ramsar site, UNESCO Biosphere Reserve
Land tenure	State owned
Land use	Water body/wetland, pasturelands, cultivated lands
Main sources of water	Runoff from the catchment area, ground water
Ramsar wetland Type	The Lake is Lacustrine and its' satellite wetlands are Palustrine
Main ecological values	<p>Lake: Hyper-saline conditions support food chain from green and blue-green algae through dense concentrations of the endemic brine shrimp <i>Artemia urmiana</i> to large concentrations of flamingos <i>Phoenicopterus ruber</i>, ducks and waders. Islands support important breeding colonies of flamingos and white pelicans <i>Pelecanus onocrotalus</i>, and the endangered terrestrial mammals: <i>Dama mesopotamica</i> and <i>Ovis orientalis gmelini</i>.</p> <p>Satellite wetlands: Fresh to brackish water wetlands with <i>Phragmites</i>, <i>Tamarix</i>, <i>Juncus</i>, <i>Halochnemum</i>, <i>Suaeda</i>, <i>Salsola</i>, <i>Frankenia</i>, etc., supporting breeding, migrating and wintering waterbirds.</p> <p>Threatened bird species include: <i>Pelecanus crispus</i>, <i>Phalacrocorax pygmaeus</i>, <i>Anser erythropus</i>, <i>Branta ruficollis</i>, <i>Oxyura leucocephala</i>, <i>Marmaronetta angustirostris</i>, <i>Aythya nyroca</i>, <i>Vanellus gregarius</i>, <i>Otis tarda</i>, <i>Falco naumanni</i>. <i>Falco vespertinus</i>.</p>



Wetland Products	Salt harvest, grazing for domestic animals, Artemia harvest, fishery (some satellite wetlands only), controlling saline underground waters, water-birds for hunting, reeds, fodder, medicinal herbs
Wetland Functions	Lake: Biodiversity support, landscape, climatic moderation, pollution and sediment retention. Satellite Wetlands: Biodiversity support, landscape, ground water recharge, climatic moderation, pollutant and sediment retention
Wetland Services	Tourism/eco-tourism, recreation, education, training, research, therapeutic muds, cultural heritage
Main ecological changes	The water level in the lake has declined significantly, exposing large areas of extremely salty lands vulnerable to wind erosion. Increase of salinity has caused severe decline in Artemia density in the lake and as a result its capacity to host water birds has significantly declined. One important satellite wetland (Shur Gol) has been converted into a permanent water reservoir and another (Yadegarlou) is desiccated because of drainage works. Almost all the satellite wetlands are suffering from high eutrophication and reduction of freshwater inflows. A man-made wetland, Soldouz, is functioning very well.
Source: Lake Urmia Environmental Management Project, Yekom Consulting Engineers, 2002, IWRM of Lake Urmia, Report on the Pilot Wetlands, Pandam Consulting Engineers, 2005	

## STRATEGY FOR THE CONSERVATION AND SUSTAINABLE USE OF LAKE URMIA

### 1. INTRODUCTION

Lake Urmia (5000 sq.km) is a vast hypersaline lake in NW Iran, shared between the provinces of East and West Azarbayjan. It lies at the lowest point in the Urmia Basin (a closed drainage basin of almost 52000 sq.km, also including parts of Kordistan province). The Lake is a National Park, is one of the largest Iranian Ramsar Sites, and has been recognized by UNESCO as a Biosphere Reserve. The Lake is surrounded by a number of important freshwater-brackish satellite wetlands, several of which are also of global significance for their biodiversity.

The Lake and satellite wetlands have been selected as a demonstration site for the UNDP/GEF/DOE Conservation of Iranian Wetlands Project. This project aims to demonstrate reduction of the major threats to the internationally important biodiversity of this wetland protected area through promoting ecosystem-based management, coordinated through an integrated management plan.

For the last decade, Lake Urmia has been in a critical condition, as a result of declining water levels and increasing salinity. Many of its satellite wetlands have also been damaged by infrastructure works, land conversion, pollution and decreased water inflows. These problems, exacerbated by a long period of drought, threaten the globally important biodiversity and the many benefits that the Lake provides to Society.

### 2. PURPOSE AND CONTEXT

Article 67A of the 4th National Development Plan has given priority to development and implementation of a management plan for Lake Urmia. The Article states that:

“Ecological management plans need to be developed for all the

sensitive ecological entities with particular focus on Lake Urmia. DOE in collaboration with MPO, MOE and MOJA will develop required executive regulations for implementation of this article to be ratified by the Board of Ministers (Cabinet)."

The present exercise therefore aims to develop a high-level STRATEGY FOR THE CONSERVATION AND WISE USE OF LAKE URMIA which can be endorsed by the high level authorities addressed in Article 67A, as well as the concerned provinces. This STRATEGY will then be implemented through an ACTION PLAN describing the specific actions required of individual stakeholder groups. Additional documents include:

- A Zoning Plan and Codes of Practice, which define the zones where different human activities may occur and the limits of sustainable use
- A Monitoring Plan, identifying key indicators, their baselines and monitoring protocols for each indicator.

Together, these documents comprise the integrated management plan for the Lake. The purpose of this STRATEGY is to provide a long-term shared Vision and approach for the sustainable management of Lake Urmia and its valuable ecosystem services. Specifically, it aims to improve the engagement of local people towards a wise use of the wetland's resources, to encourage inter-sectoral and inter-provincial cooperation to achieve agreed objectives, and to raise awareness of the importance of Lake Urmia.

The STRATEGY builds on the work of earlier studies, and was initiated at a participatory workshop held in Urmia on 4-5 July 2007, involving representatives of the key stakeholder groups for Lake Urmia. The first draft of the STRATEGY was disseminated among all the stakeholders for comments, based on which a second

draft was prepared and discussed at a second workshop on 11-12 November 2007. During this latter workshop, the priority actions for implementation of the Strategy were identified.

This revised version of the STRATEGY is the product of integration of the discussions in the previous workshop into its earlier version and now has been reviewed and approved by higher national and provincial authorities. It is expected that through such collaborative works, a more effective involvement of all stakeholders in the wetland management is achieved.

### **3. METHODOLOGY APPLIED TO MANAGEMENT PLANNING**

A participatory strategic approach has been used to prepare the integrated management plan. It has been built from existing studies, and seeks to achieve a common approach towards a defined Vision, through the engagement and consultation of key stakeholders. Participation of stakeholders ensures inclusion of the views, knowledge and interests of the involved parties in planning. This enhances the sustainability of the plan and increases the likelihood of stakeholders support for and participation in its implementation. The management planning process requires identification of the values of and threats to the wetland, as well as the capacities of the main stakeholders to support the values and to resolve the threats. It seeks to ensure that main management actions will focus on the priority objectives for achieving a common vision. This is the approach recommended by the Ramsar Convention for preparing wetland management plans.

### **4. CHARACTERISTICS OF LAKE URMIA**

#### **4.1 Physical Characteristics**

The Lake Urmia basin in the north-west Iran occupies 52000 sq.km. of mainly mountainous territories in three provinces of East and West Azarbayjan and Kordistan. The area of the Lake is 5000

sq.km and is located in between the East and West Azarbayjan provinces. It lies in the center of a closed drainage basin, with all surface and ground water draining towards Lake Urmia. The particular geology of the Basin and the high evaporative and continuous deposition of salts leads to hypersaline conditions. The Lake is surrounded by a number of freshwater wetlands, which together form an important Ecological Zone around the Lake.

The basin is located at altitudes of 1280 to 3600 meters above mean sea level, the lowest part being the Lake and a sizable plain around it.

The climate of the basin is characterized with cold winters and relatively temperate summers. The average precipitation of the basin is estimated at about 350 mm main part of which occurs during fall through mid-spring seasons. Precipitation in summer months is comparatively very little. The mean annual temperature varies between 6.5 oC in higher altitudes to 13.5 oC in lower altitudes. July and August are the warmest and December and January are the coldest month of the year. The annual average pan evaporation in the basin is estimated at 1500 mm and varies between 1000 to 2100 mm according to the conditions. The annual evaporation from the lake is estimated to vary between 900 to 1170 mm.

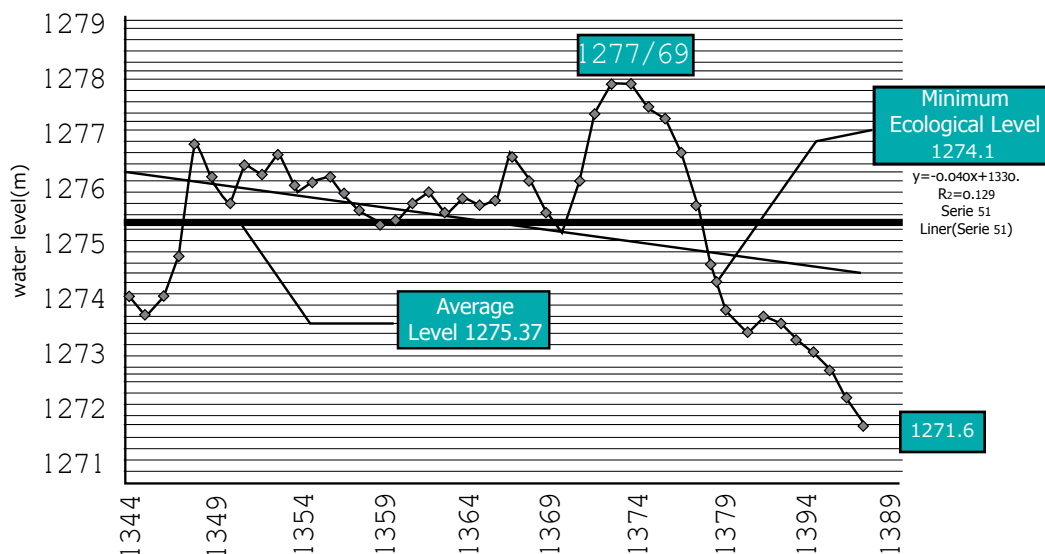
The water supply to the lake is provided through 14 rivers with permanent flows and a number of waterways with seasonal flows and occasional floods. The average annual inflow into the Lake is estimated at 5300 mcm, and varies from 760 to 15260 mcm. Direct precipitation over the lake as well as groundwater seepage flows are other sources of water supply to the Lake. Due to increasing water abstraction from groundwater resources, the contribution groundwater to the supply of the Lake is increasingly diminishing.

The water in the Lake is hyper saline ( $>200$  dS/m) and is varying according to the time and location. Freshwater flows from rivers and particularly flood flows, greatly enhances the Lake's water quality.



The Lake is a moderately shallow water body (average 5.4 meter). Its length varies between 130 to 145 km and its max width is 58 km. The range of water level fluctuation in dry and wet years is about 3 meters.

Based on the several studies conducted during the last decade, while Lake's water level is fluctuating above 1274.1 (amsl), the Lake would continue its normal ecological functions including supporting biodiversity and Artemia reproduction. If Lake's water level falls below this elevation, these functions would be negatively affected. Worth to note is that during normal hydrological periods, to maintain this water level in the Lake would imply an inflow of 3 bcm to compensate annual evaporation. This would mean that Lake would require a minimum inflow of 3 bcm per year.



Average fluctuation of water level at LU (1965-2009)

The Lake has been affected by several water resources development projects that have been executed within the basin. During the recent decades the agricultural water use has greatly increased resulting in less water inflow into the Lake. Also the highway of Shahid Kalantary has seriously influenced the hydrodynamics of the Lake.

## 4.2 Natural environment

Lake Urmia is one of the most important and valuable aquatic ecosystems in the country. It is the largest inland Lake in Iran and because of its unique natural and ecological features it has been given National Park status and has been designated as a Ramsar Site and a UNESCO Biosphere Reserve.

Within the ecological zone of Lake Urmia, close to 550 plant species dominated by annual and perennial herbs have been identified. The main vegetation communities are comprised of halophytic, pseammephytics, xerophytic and hydrophytic species.

Lake Urmia saline waters support dense communities of green and blue-green algae. The high productivity of these algae provides the basis of the food chain.

Within the ecological zone of the Lake, 27 species of mammals, 212 species of birds, 41 species of reptiles, 7 species of amphibians and 26 species of fish species have been recorded. The birds are the best studied and the most important vertebrate group.

Lake Urmia supports internationally important concentrations of wintering waterbirds, mainly ducks and waders. The islands inside the Lake support the largest breeding colony of flamingo (up to 20,000 pairs), and 200-500 pairs of breeding white pelicans. 11 species of globally threatened waterbird species have been recorded in this Lake. In the southern islands, two species of threatened mammals, *Dama mesopotamica* (Persian Fallow Deer) and *Ovis orientalis gmelini* (Armenian Wild Sheep) have been introduced.

The most important invertebrate in the Lake Urmia Basin is *Artemia urmiana*, an endemic brineshrimp. It is the main food source for many of the important waterbirds, eg. Flamingos. However due to rapid rise in water salinity, *Artemia* cysts are not able to hatch.

There are numerous aquatic and terrestrial habitats in the Lake Urmia Basin. 17 critical sites including the Lake itself together with important terrestrial habitats and surrounding wetlands have been identified as the most important sites for protection and conservation management. Most of the wetlands are not properly managed or monitored and many of them are under threats of degradation by intensive agriculture. Those are seriously affected by water abstraction in their upstream catchments

The extensive area of the Lake and its connectivity with the islands and surrounding freshwater wetlands has created an Ecological Zone of considerable significance supporting important flora and fauna. The continued functioning of the links between these components and the maintenance of key ecological processes within the Lake (eg. *Artemia*) are crucial.

#### **4.3 The human environment and administrative structure**

There are more than 36 cities and 3150 villages with more than 5 million inhabitants in the Lake Urmia Basin. Within its ecological zone, however there are 9 towns and 520 villages with more close to 700,000 inhabitants. More than 60% of the populations live in villages. In term of ethnic origins, more than 90% of the populations are Turks, close to 7% are Kurds and the remaining are multilingual origin. In term of religion, the majority are Shiite (more than 90%) and Sunnite (7%) Moslems. Important demographic features in the population within the ecological zone are: increasing age ratio, declining sex ration due to migration of men for work, rising unemployment and rapidly rising literacy.

There are four Ramsar Sites in the Basin. These are Lake

Urmia, Lake Kobi, Gori Gol, and Shur Gol (together with Yadegarlu and Dorge Sangi). The area of the Lake within the National Park and Ramsar Site is fully state-owned. Also within the Basin, close to 70% of the lands are state-owned, of which 85% are natural rangelands, and the remainder consist of the Lake, lowlands, salt marshes, forests and saline lands.

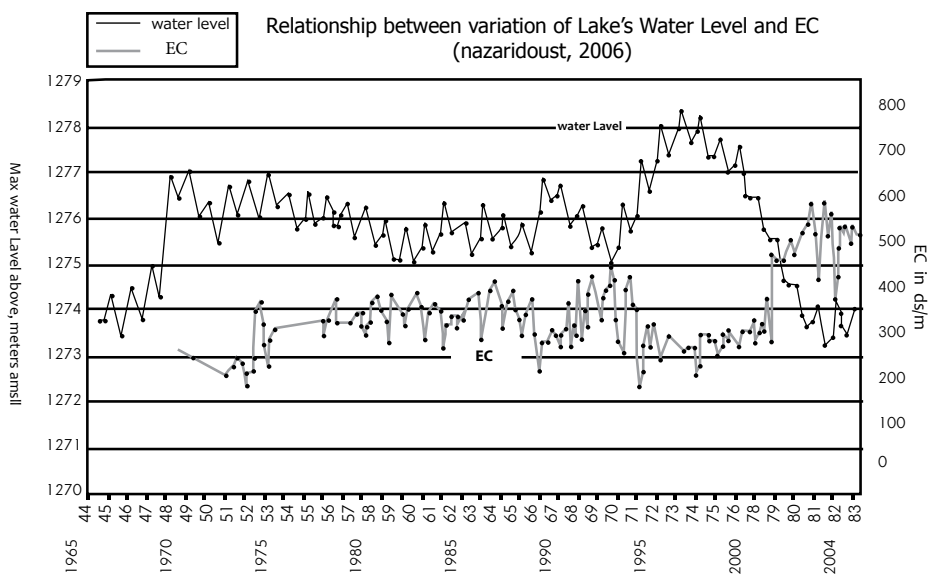
While industrial activities have rapidly increased during the last decades, agriculture and animal husbandry are still the dominant occupation within the basin,

In normal years, the total annual water use in the Basin exceeds 4700 mcm, of which close to 94% is utilized for agriculture. More than 64% of total water use is supplied from surface water resources and the rest from groundwater. To meet the increasing demands, several water resources development projects have already been constructed and many others are under construction or planned for future developments. Reportedly, numerous water development projects have been identified as feasible which are considered for the next 20 years. It is anticipated that by 2021, more than 6 bcm will be annually used of which close to 90% will be allocated to agricultural uses. This would result in 25% reduction of water inflow into the Lake as compared with the present condition.

During the period 1966-2002, the average TDS has been 267 g/l (EC=503 dS/m) according to WRI (2005) study at the average water level. The Latest TDS of 338 g/l (EC= 640 dS/m) was recorded in January 2008. This is above the tolerance level of *Artemia* production

Provincial office of the DOE in West Azarbaijan has full responsibility for management of the Lake. However, the DOE provincial offices in East and West Azarbaijan manage the individual satellite wetlands of relevant provinces. Each province is responsible for the management of the water and land resources within the territories of the province.

During the last decade, more than 35 environmental NGOs have been established in the Lake Urmia Basin. These groups show enthusiasm in their participation in the implementation of the management for the Lake and the satellite wetlands. They are well placed to raise environmental awareness and to provide voluntary support to the management activities.



## 5. PRELIMINARY EVALUATION OF LAKE URMIA

The important and unique attributes of Lake Urmia are its vast size, its naturalness, its unusual ecological conditions brought about by hyper-saline conditions, and its valuable satellite wetlands (fresh-brackish water). The following tables describe the values of and threats to the lake, showing also whether they are increasing ( $\uparrow$ ), decreasing ( $\downarrow$ ) or stable ( $\rightarrow$ ) over the last decade.

## 5.1 Values

The values (functions, services and products) provided by the Lake and satellite wetlands are identified as follow:

Most of these values can be directly attributed to the Lake and or its satellite wetlands, and the functions and services they provide. This implies that if such values are going to be maintained, the lake and its important satellite wetlands need to be sustained. The economic value of these services has not been calculated, but the consequences of destroying the Lake or satellite wetlands are obviously very considerable.

### 5.1.1 Functions

Functions	Lake	Satellite wetlands	Description
Support to biodiversity	↓	↓	The hyper-saline lake supports an endemic brine-shrimp, <i>Artemia urmiana</i> , which is food for thousands of flamingos, ducks and waders. There are important breeding colonies of flamingo and white pelican. The satellite wetlands support internationally important breeding, migrating and wintering populations of water birds. Introduced populations of the endangered terrestrial mammals <i>Dama mesopotamica</i> and <i>Ovis orientalis gmelini</i> occur on islands in the Lake
Climatic moderation	↓	→	The large surface area of the Lake contributes to regulating microclimate of the area (temperature and humidity), making it very suitable for agriculture
Sediment and contaminant retention	→	→	The Lake and satellite wetlands trap sediment and contaminants from river inflows, preventing them spreading into the wider environment

Stabilizing salt deposits (safeguarding the surrounding areas)	↓	-	The Lake stores a huge volume of inflowing salts which otherwise could disseminate over the surrounding areas. Recession of water level causes vast salt flats to be exposed from where wind erosion and transportation can damage surrounding areas.
Control of salt water intrusion (sat-wetlands)	-	→	The satellite wetlands recharge the aquifers and prevent salt-water intrusion from the lake. This function is lost in desiccated wetlands
Landscape	↓	→	The Lake is famous for its beautiful landscape and scenery. These have been damaged by low water levels and the Kalantary Highway

### 5.1.2 Services

Services	Lake	Satellite wetlands	Description
Tourism / Ecotourism / Recreation	↓	-	The extensive tourism potential of the Lake and satellite wetlands is not well utilized
Therapeutic mud spa	↓	-	Contamination of mud has reduced its suitability for therapeutic uses
Cultural heritage/ values	→	→	
Research and training	↑	→	
Education	→	→	
Aqua-culture	-	↑	

### 5.1.3 Products

Products	Lake	Satellite wetlands	Description
Artemia harvest	↓	-	The harvesting of Artemia has not been possible in recent years due to the high salinity and low densities of Artemia
Salt harvest	↑	-	Mainly by industrial units
Grazing for water buffalo	-	→	
Pastures for domestic animals	-	→	
Reeds for construction and handicrafts	-	→	
Hunting of waterbirds	-	↓	Hunting restriction as management measure
Fishing	-	→	
Source of medicinal herbs	-	→	

### 5.2 Threats

Similar to the values, the management plan of IIP studies of 2002 identified several significant threats to the lake and its satellite wetlands which were reviewed, discussed and verified during the two stakeholder workshops for management of Lake Urmia. The following were listed as the main threats to the Lake and the wetlands:



### 5.2.1 External Threats (arising outside the Lake and the wetlands but influencing them)

Threats	Lake	Satellite wetlands	Description
Competition in water resources use /allocation	↑	↑	Agricultural, industrial and residential developments increasingly compete with water allocation to the wetlands and the Lake
Contamination of water	↑	↑	Increase in discharge of agro-chemicals, Increase of industrial waste waters and residential sewages.
Reduced flood inflows	↑	↑	Controlled by storage dams, occurrence of droughts and climate change has affected water resources of the basin, Lake and wetlands
Increased sediment inflows	↑	↑	Agricultural developments, Conversion of / or damage to natural pasturelands,
Reduced ground water inflows	↑	↑	Over exploitation of ground water resources in the upstream catchments and around some satellite wetlands
Alien species introduction	-	↑	Fish-culturing activities in the catchment areas
Disturbance to wildlife	-	↑	Explosions for mine excavation Explosion of out-dated ordnances Boats and aircraft

## 5.2.2 Internal Threats (arising Inside the wetland)

Threats	Lake	Satellite wetlands	Description
Conversion of wetland habitats	-	↑	Agricultural encroachment into the wetland areas, Construction of buildings in the pasturelands around the wetlands Hydraulic structures, eg; construction of Hassanlou reservoir, desiccation of Yadegarlou by drainage channel
Water quality degradation	-	↑	Increasing eutrophication Recharge of wetlands by irrigation drainage flows, Discharge of untreated rural sewages, Recharge by nutrient-rich ground water
Exotic species	-	↑	Introduction of fish larvae by Shilat
Disturbance to Lake's hydrodynamics	↑		Construction of Kalantary highway
Disturbance to wildlife	-	↑	Construction of roads and / or irrigation networks inside the satellite wetlands Boats and aircraft around flamingo / pelican colony Hunting (particularly satellite wetlands)
Pressure on resources	↑	↑	Over-harvesting of wetland resources

This analysis shows the large number of threats to Lake Urmia and its satellite wetlands, many of which are arising in the catchment area, outside the wetland boundaries. The majority of the threats are increasing in severity.

## **6. VISION, GOAL, AND OBJECTIVES**

The key elements of the STRATEGY are a shared Vision for what the Lake should be like in 25 years time, a common Goal for achieving that Vision, and a number of measurable Objectives that can be implemented through actions of the key stakeholders.

### **6.1 A 25 Year Vision for Lake Urmia**

An important outcome of the first workshop was the strong wish expressed by all the participants (with no exception) to sustain the lake and its satellite wetlands as a natural heritage for the benefit of local, provincial and national communities. They insisted on the necessity to protect the Lake and the wetlands against mismanagement, recognizing the severe consequences if the current trends of degradation continue. Also they addressed the Lake management as a tool capable for enhancing interactions between involved provinces. In trying to combine all the aspirations expressed by the participants into a single comprehensive definition, the following Vision was derived in the first, and subsequently ratified in the second, workshop

#### **25 YEAR VISION FOR LAKE URMIA**

“Lake Urmia will receive adequate water to sustain an attractive landscape and rich biodiversity where people and local communities can make wise use of its resources and will enhance cooperation between the involved provincial organizations”

## 6.2 Overall Management Goal

Participants at the first inter-sectoral workshop session in Urmia discussed the approach to management of the Lake that would be needed to move from the current “degraded/critical” situation, to the improved situation as described in the 25 year Vision. They agreed the following over-arching Goal:

### GOAL

“To establish an ecosystem based management for the lake and its satellite wetlands within the context of sustainable development with effective involvement of all stakeholders including local communities.”

The proposed Ecosystem Approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It is the primary framework for action under the Convention on Biological Diversity and comprises 12 principles. All around the world, the ecosystem approach is increasingly being adopted as a framework for the management of protected areas. Application of the ecosystem approach to the management of Lake Urmia involves the following main considerations:

- The Lake should be managed in the context of the Urmia Basin, since activities throughout the Basin will have impacts on the Lake. This means that a common approach needs to be set between the three provinces that share the Basin. The impacts of management activities on adjacent ecosystems must also be carefully considered.
- The management objectives for Lake Urmia should be set for the long-term, but must recognize that change is inevitable (particular

attention must be given to the issues of climate change). People should be at the heart of setting those objectives.

- Management should be decentralised to the lowest appropriate level. This means the provincial agencies should be responsible for managing the Lake and local communities/agencies for the satellite wetlands. Management must involve all key stakeholder groups, particularly local communities, both at planning and implementation stages. A preliminary list of the stakeholders is provided at Annex 1.

- The conservation of ecosystem structure and functioning to maintain the ecosystem services (Values) provided by the Lake should be a top priority. An appropriate balance needs to be set between the conservation and sustainable use of the Lake's natural resources, based upon the capacity of the system.

- Management should take account of the economic context - reducing market distortions that might damage ecosystem functioning (eg lack of water-pricing), and supporting activities for sustainable use and biodiversity conservation.

- Management should be evidence-based (including traditional local knowledge).

A further key element is that management will not succeed unless people are aware of the values provided by the Lake, and the threats to it. Raising public awareness must therefore be given high priority. Similarly, those responsible for management will need to develop the required capacity to carry out their work.

### 6.3 Management Objectives

The following objectives have been identified as the high level strategic objectives that are essential for achieving the Goal and Vision.

#### **Objective 1. To raise awareness of the values of the Lake and satellite wetlands and to enhance public participation in their management**

An essential tool for sustaining the Lake and its satellite wetlands

is to raise public awareness. This needs to cover the values of and threats to the wetland, the significant role it plays for livelihood of the local communities, and the way human activities can sustain or otherwise adversely affect their functionality. Raising awareness among the key decision makers on the consequences of further degradation of the lake on the surrounding areas and well-being of the nearby communities is particularly important. Public awareness can also effectively introduce the wetland to the national and international communities and thus open new opportunities and resources for enhancing its management. This can also act as a resource for additional economical benefits to the local people and improve their sensitivity in better sustaining the wetland.

Experiences worldwide indicate that sustainability of wetlands depends primarily on the extent to which local communities are active in their management. Local communities should therefore be fully engaged in the conservation and management of the Lake and its satellite wetlands.

### **Objective 2. Sustainable management of water resources and land use**

The quality and quantity of water supply to the Lake and the satellite wetlands is probably the most important factor affecting the sustainability of their ecological functioning. However both factors are subject to increasing impacts due to human activities including dams and irrigation developments in the upstream catchments. Increasing use of water and agro-chemicals inherent in irrigation development activities reduce the quantity and quality of water supply to the Lake and the wetlands. Industrial developments result in increasing release of harmful wastewater. Conversion of land use for urban developments results in additional municipal sewage outflows. Intensive use of steep uplands for rain-fed cultivation results in accelerating soil erosion with significant impacts on the quality and quantity of water supply to the Lake and

the wetlands.

These human-induced pressures add to the severe impacts of recent and continuing droughts, and emerging evidence of the long-term impacts of climate change.

The strong political support for economic and social developments and the crucial requirement for sustaining the Lake and its ecological functioning require careful planning for an integrated water and land use management within the context of the Lake catchment area, and a rigorous application of (Strategic) Environmental Impact Assessment.

### **Objective 3: Conservation of biodiversity and sustainable use of the wetland resources**

This objective aims to improve and restore the biodiversity of the Lake and its satellite wetlands through conservation of habitats and species and enhancing the ecological functioning of the system. It focuses specifically on improving the habitats for nationally and internationally important water birds, aquatic species as well as terrestrial mammals. To achieve these aims, the main threatening factors to the Lake and the satellite wetlands need to be carefully identified and appropriately mitigated. Wise use of these resources is a crucial requirement to the effective conservation of the habitats, which among others require raising awareness among the main stakeholders.

The following Tables identify the key issues for each objective and the actions that must be undertaken to implement each objective. For each issue, both a long-term (LT - 25 year) and short-term (ST - 5 year) Target is identified. The agencies that are responsible for each action are also shown.

Objective 1: To raise awareness of the values of and threats to the Lake and satellite wetlands, and to enhance public participation in their management			
Priority Issues	Targets	Priority actions	Responsible agent (R) Partner agent (P)
1-Awareness of high level policy makers and decision makers.	LT: High level policy/decision makers are actively supporting the Vision for the Lake by their words and actions  ST: High level policy/decision makers are aware of the values and threats of the lake and required actions	1- Establish a campaign supported by experts from water, agriculture and DOE to directly raise awareness of top policy/decision-makers. 2- Connect the project to the elected representatives of the provinces (MPs) and environment section at the Parliament. 3- Organize local, national and international study tours/seminars for top policy/decision-makers 4- Organize mass awareness-raising activities, such as a human ring around the lake during President's visit!!! 5- Prepare policy-maker briefing materials (high level summaries) of key issues.	R: DOE P: Governor Main organizations NGOs Media



2- Public awareness about the values and threats of the Lake	<p>LT: People of the basin are actively supporting the Vision for the Lake by their behavior and actions</p> <p>ST: People of the basin are aware of the values and threats of the lake and required actions</p>	<p>1- Concerted campaign of awareness through the mass media, including films, news bulletins, radio broadcasts, TV advertisements and speeches</p> <p>2- Include necessary training about Importance, Value, Threats and protection of Lake Urmia and its satellite wetlands in high school courses</p> <p>3- Arrange visits and scientific tours for students</p> <p>4- Development of a Visitor Centre for environmental awareness in both E and W Azerbaijan, including good information materials</p> <p>5- Signboards for the Lake and satellite wetlands</p> <p>6- Web site about the lake</p> <p>7- Training programs and resource materials for teachers</p>	<p>:R DOE :P</p> <p>NGOs DOE Media Religious bodies Ministry of Education &amp; Training Water Authorities, MOJA</p>
3- Participatory wetlands management and restoration projects with strong engagement of local communities	<p>LT. Local communities closely involved in management/ restoration of Lake and all satellite wetlands</p> <p>ST. Two pilot projects in each province</p>	<p>1. Establish 2 pilot wetland management or restoration projects in each province involving and empowering CBOs/NGOs and local communities</p> <p>2. Organize training for CBOs/NGOs at the pilot sites</p> <p>3. Organize local community participation training workshops for DOE staff.</p> <p>4. Support extension activities by 3 main organizations (DOE, Water, Agriculture), and examine options to establish a participatory watershed management agency/unit</p> <p>5. Use and empower university educated people from villages to participate in awareness and extension process</p>	<p>:R DOE/MOJA :P</p> <p>NGOs Local communities Agricultural extension water authority</p>

Objective 1: To raise awareness of the values of and threats to the Lake and satellite wetlands, and to enhance public participation in their management			
Priority Issues	Targets	Priority actions	Responsible agent (R) Partner agent (P)
1- Livelihood development in wetland-related communities	<p>LT: Community livelihood strategies and environmental management plans being implemented for all wetland-related villages;</p> <p>ST: Community livelihood strategies and environmental management plans for 4 villages; at least one alternative livelihood mechanism piloted</p>	<p>1. Undertake PRA studies for villages associated with pilot sites described above.</p> <p>2. Prepare and implement local community livelihood strategies for selected villages including options for establishing cooperatives</p> <p>3. Prepare and implement environmental management plans for selected villages</p> <p>4. Explore and develop alternative livelihood development options for wetland-related villages</p>	<p>R: Local Governors 3 main organizations Local communities' leaders NGOs</p>

2- Ecotourism	<p>LT: Increased Number of tourists and managing the number of tourists based on capacity of wetlands.</p> <p>ST: Carry out 2 pilot projects.</p>	<ol style="list-style-type: none"> <li>1. Hold workshop with international support to launch the preparation of an ecotourism plan. Identify pilot sites and carry out the following activities:</li> <li>2. Provide facilities and support research (particularly on marketing, visitor potential)</li> <li>3. Map and zone pilot wetlands in relation to ecotourism activities</li> <li>4. Prepare a map and show high priority wetlands for ecotourism</li> <li>5. Investigate possibility of developing bird watching sites</li> <li>6. Develop codes of practice for tourism regarding the status of each satellite wetland</li> <li>7. Raise public awareness on Natural tourism attractions and tourism regulations</li> <li>8. Invite local communities and provide technical and financial support for development and designing tourism plans</li> <li>9. Revise regulations for visiting National Park</li> <li>10. Review pilot projects and publish results</li> <li>11. Provide financial and technical support for related research activities before the implementation phase</li> <li>12. Support local communities (technically and financially) for development of ecotourism, including training youths in local communities for leading ecotourists</li> </ol>	<p>R: Cultural Heritage and Tourism Department</p> <p>P: DOE, Local communities NGOs Ministry of Roads and Transportation</p>
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Objective 2: Sustainable management of water resources and land use			
Priority Issues	Targets	Priority actions	Responsible agent (R) Partner agent (P)
1. Water supply to the Lake and satellite wetlands	LT: Inflows meet the requirement of the Lake to maintain water level above 1274 m. amsl	1. Prepare an agreed integrated management plan for water resources of the basin on the basis of all existing studies (including dam management strategies) 2. Prepare an agreed Master Development Plan for water and land resources of the catchment based on ecosystem approach. 3. Determine an agreed range of Lake water level fluctuation	R: Water Authorities DOE MOJA
	ST: During the coming 5 years agricultural water uses do not increase and facilities would be arranged to reduce water uses by 3% each year through improving efficiencies.	4. Planning to maintain the least water need for the lake, to maintain its' ecological functions 5. Investigate feasibility for water diversion from neighboring catchments and evaluate environmental impacts 6. Support and follow up LU Hydrographical studies 7. Investigate feasibility of measures to reduce excess evaporation from the Lake (i.e. segregation of the very shallow parts of the Lake in dry years), and evaluate environmental impacts	

<p>2. Water quality</p>	<p>LT: Pollutant levels at inflows to the Lake meet national thresholds</p> <p>ST: Main sources of pollutants are identified and quantified and a strategy is in place to reduce them</p>	<ol style="list-style-type: none"> <li>1. Investigate the annual volume (and sources) of inflow of chemicals, nutrients, heavy metals and other pollutants into the Lake and satellite wetlands</li> <li>2. Prepare and implement plans for optimization of the use of agro-chemicals in the farms</li> <li>3. Prepare plans for, and introduce monitoring the water quality of Lake, wetlands and the main rivers within the catchment area</li> <li>4. Prepare and implement plans for control of discharge of industrial sewage into the water resources of the basin.</li> <li>5. Support and follow-up implementation of Watershed Plans and stop degradation</li> <li>6. Investigate and support ecologically feasible methods of salt harvesting from the Lake.</li> </ol>	<p>R: Water Authorities DOE MOJA - Ministry of Industries and Mines</p>
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<p>3. Water use</p>	<p>LT: Efficiency of irrigation water use is increased by 15 percent.</p> <p>ST: Efficiency of irrigation water use is increased by 3 percent</p>	<p>1. Prepare and implement plans for improving on farm water management (Increase farm irrigation efficiency)</p> <p>2. Support development of more efficient water application system (drip, sprinkler, etc).</p> <p>3. Support implementation of volumetric water delivery to farms</p> <p>4. Support rationalization of water prices for agriculture</p> <p>5. Prevent illegal exploitation from ground and surface water resources</p> <p>6. Introduce less-water-demanding crops</p>	<p>R: MOJA Water Authority</p>
<p>4. Land use</p>	<p>LT:</p> <ul style="list-style-type: none"> <li>- Land use developments in the catchment area follow the agreed plans</li> <li>- All the wetlands around the Lake are mapped and marked</li> </ul> <p>ST:</p> <ul style="list-style-type: none"> <li>- An agreed plan for land use within the catchment is developed</li> <li>- The main wetlands are mapped</li> <li>- 50% of the main wetlands are marked</li> </ul>	<p>1. Prepare an agreed land use plan in the context of integrated management plan of catchment area (Master Development Plan)</p> <p>2. Prepare the boundary maps of the Lake and the satellite wetlands and mark the boundaries</p> <p>3. Identify important buffer areas around the wetlands and develop/implement codes of practice (for agriculture) within them</p> <p>4. Prevent illegal conversion of land uses of natural resources (particularly wetlands)</p> <p>5. Support preparation and implementation of watershed management and restoration projects</p>	<p>R: MOJA - DOE Water Authorities Housing and Town Development Government Offices</p>

Objective 3: Conservation of biodiversity, and sustainable use of the wetland resources			
Priority Issues	Targets	Priority actions	Responsible agent (R) Partner agent (P)
1. Important satellite wetlands	<p>LT:</p> <ul style="list-style-type: none"> <li>- Increase the areas of sat. wetland to 25000 ha, or;</li> </ul> <p>Double the areas of southern wetlands</p> <p>ST:</p> <ul style="list-style-type: none"> <li>- No further decrease in wetland areas, or;</li> <li>- Increase wetland areas to 2500 ha</li> </ul>	<ol style="list-style-type: none"> <li>1. Develop maps and prioritize wetlands according to Biodiversity &amp; Analyze the threats to the biodiversity of important wetlands</li> <li>2. Define the minimum water need of important wetlands to maintain its' ecological functions</li> <li>3. Investigate measures and restore the desiccated wetlands (ie..Yadegarlou, Guerde Gheet..)</li> <li>4. Improve the traditional systems of water supply to wetlands</li> <li>5. Investigate the levels of pesticide contamination and diseases in birds and fishes</li> <li>6. Investigate measures and control exotic fish species at satellite wetlands</li> <li>7. Investigate measures and restore Ghara Gheshlagh wetland and Otis tarda. Population</li> <li>8. Investigate measures and improve Ghori Gol wetland and population of white headed duckPrepare management plans for important satellite wetlands</li> <li>9. Strengthen the management system of the wetlands, including local communities</li> </ol>	<p>R: DOE</p> <p>P: Fisheries Local Communities NGOs Natural Res. Dept Water Authority MOJA Governor office veterinary organization Cultural Heritage Office Universities</p>

<p>2. Breeding population of Flamingo (Phoenicopterus ruber)</p>	<p>LT: 4000 pairs will be breeding in the Lake and Sattelite wetlands</p> <p>ST: 1000 pairs will be breeding in the Lake and Sattelite wetlands</p>	<p>1. Prepare/publish a status report on Flamingos, with management recommendations (including adequacy of breeding site/alternatives, and location of main feeding sites)</p> <p>2. Prepare and disseminate public awareness materials on flamingos (poster, films, car stickers etc)</p> <p>3. Provide strict protection to the breeding colony, and develop clear codes of practice for access by researchers in cooperation with international experts (including for counting, ringing and emergency rescue of salt-affected birds).</p> <p>4. Prepare a summary report on Evaluation of the Artemia reserves, particularly in relation to salinity, and investigate measures for increasing the capacities for production</p> <p>5. Prepare a summary report on Donaliella reserves, particularly in relation to salinity, and investigate measures for increasing the capacities for production</p> <p>6. Investigate Flamingo samples for pollutants and/or diseases.</p> <p>7. Support scientific studies such as PHD and M.S. Thesis</p>	<p>R: DOE</p> <p>P: Fihseries Local Communities NGOs Universities Artemia Res. Center MOJA Governor office Veterinary -Organizations Universities</p>
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Objective 3 cont'd: Conservation of biodiversity, and sustainable use of the wetland resources			
Priority Issues	Targets	Priority actions	Responsible agent (R) Partner agent (P)
3. Breeding population of White Pelicans (Pelecanus onocrotalus)	LT: 1000 pairs will be breeding in the Lake and Sattelite wetlands	1- Prepare/publish a status report on White Pelicans, with management recommendations (including adequacy of breeding site/alternatives, and identification of main feeding sites, habitats and prey species, and any conflicts with fisheries/aquaculture) 2- Protect and restore habitats and stop degradation 3- Prepare and disseminate public awareness materials on pelicans (poster, films, car stickers etc)	R: DOE P: Shilat Local communities NGOs Universities
	ST: 750 pairs will be breeding in the Lake and Sattelite wetlands	4- Reduce disturbance at breeding and feeding times, and particularly at the breeding site 5- Prepare/publish a plan for emergency rescue of the populations 6- Investigate possibility of establishing an artificial breeding site in safe areas of satellite wetlands 7- Investigate Pelican samples for pollution and/or diseases impacts (including eggshell thinning) 8- Support scientific studies such as PHD and M.S. Thesis	

<p>2. Population of Yellow Deer and Armenian Sheep on the islands of the Lake</p>	<p>LT: Maintain population in balance with the capacity of the natural rangelands (to be determined);</p> <p>ST:</p> <ul style="list-style-type: none"> <li>- Determine the safe capacity of natural rangelands</li> <li>- Maintain the present population in the islands</li> </ul>	<p>1- Publish report on the present status and ecological requirements and provide Short-term and Long-term management suggestions ( develop management plan for species)</p> <p>2- Determine the natural grazing capacity of the rangelands in the islands and publish the results</p> <p>3- Planning for management and protection of these species</p> <p>4- Construct appropriate facilities for drinking water (transfer of water from Ghobadlou)</p> <p>5- Assess the condition of health and diseases of populations and necessary actions for solving the problems</p> <p>6- Investigate possibilities for genetic improvement of the species and publish the results</p> <p>7- Prepare/publish a plan for emergency rescue of the populations</p> <p>8- Identify alternative abandonment places</p> <p>9- Support scientific studies such as PHD and M.S. Thesis</p>	<p>R: DOE</p> <p>P:</p> <p>Natural Resource Dept. Veterinary Office NGOs Water authority</p>
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3. Population of Artemia in Lake Urmia	<p>LT: 40 cysts per liter</p> <p>ST: 25 cysts per liter</p>	<p>1- Evaluate the Artemia resources and prepare a map of dispersal and abundance.</p> <p>2- Undertake necessary studies on possibility of restoring the Artemia resources and increasing the production capacity.</p> <p>3- Evaluate the population of unicellular algae and prepare a map of dispersal and abundance.</p> <p>4- Carry out necessary studies on possibility of increasing the population of Donaliella Algae and increasing the production capacity.</p> <p>5- Assess the Physicochemical characteristics and pollutants in water and its impact on Artemia population</p> <p>6- Develop methodologies for sustainable harvest of Artemia resources (Traditional and industrial harvests)</p> <p>7- Management the traditional harvest of Artemia by local communities.</p> <p>8- Raising Public awareness (produce and distribute educational and awareness raising materials)</p> <p>9- Support scientific studies such as PHD and M.S. Thesis</p>	<p>R: Fisheries, Artemia Research Centre</p> <p>P: DOE</p>
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<p>4. Biodiversity in river systems within the Urmia basin</p>	<p>LT: All the main rivers in the catchment investigated and management measures identified and being implemented</p> <p>ST: Reconnaissance survey of all main rivers 2 important rivers investigated and management measures identified and being implemented</p>	<p>1- Undertake reconnaissance survey of all main rivers (and deltaic sections) to identify and map management status (naturalness), main threats and sections of rivers with significant biodiversity importance. Publish the results. 2- Carry out study to determine the minimum environmental flows of the important rivers, and publish the results. 3- Hold workshop on river biodiversity and management 4- Special focus on deltas as high priority areas for Biodiversity 5- Launch demonstration project for two rivers to manage and restore important biodiversity features.</p>	<p>R: DOE and Natural Resources P: Shilat LC (Fishermen, Hunters, Reed harvesters, etc) NGOs Universities</p>
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## 7. GOVERNANCE PROCEDURES

The particular situation of the Lake Urmia Basin shared by three adjacent provinces of East and West Azarbaijan and Kordistan necessitates a strong and careful inter-provincial coordination for finalizing, approving and implementing the management plan. This chapter deals with the administrative procedures derived from workshop discussion that are deemed necessary to be followed for validating the plan and its formal approval and issuance.

### 7.1 Steps for developing and approving the plan at provincial level

The steps to be followed before the plan is approved are illustrated in Fig 1:

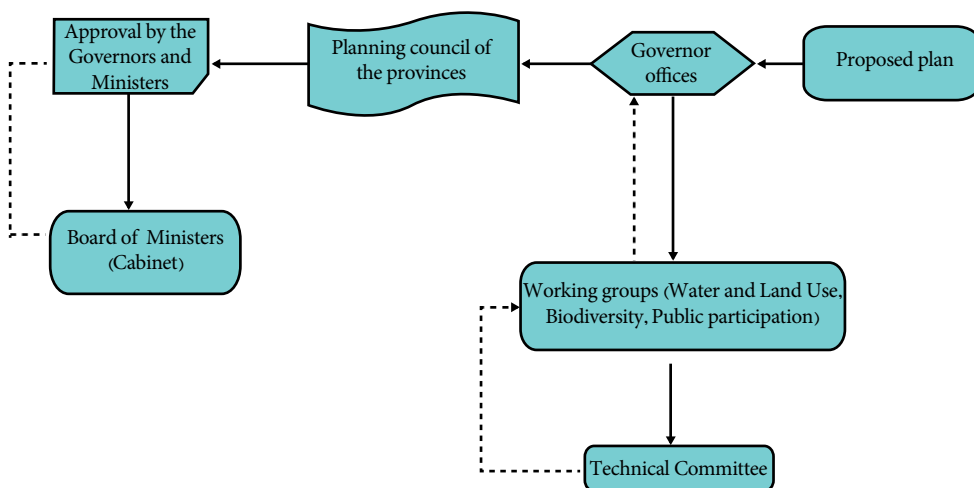


Fig Steps for developing, finalizing and approval of the Management Plan at province level

To strengthen the support for implementation of the plan, the following considerations were essential:

Involvement of three provinces in the planning process;  
Involvement of relevant national authorities in the process of final approval of the plan

Formal approval and commitment of the relevant authorities for implementation of the plan

The above considerations required that the stakeholders in the three provinces share in all the processes from early development to final approval of the management plan. To fulfill this requirement, the following flow chart was agreed to be the appropriate steps (Fig 2).

## **7.2 Monitoring and supervising the implementation of the plan**

To implement the plan, to monitor the activities and to review parts of the plan, a monitoring mechanism would be required. Among the different alternatives discussed in the workshop, the most desirable option was to assign the National Committee and the Regional Council to supervise and monitor the implementation of the management plan. The flow chart for conducting this task is illustrated below (Fig 3).

## **7.3 Financial provisions**

To provide budget for implementation of the plan, the following options were considered and discussed:

To define “new projects” and allocate budget from national resources separately in each relevant national organization (Ministries), to be allocated to the affiliated provincial operational agencies

To define a “new project” and allocate budget from national resources in one of the relevant national organizations (Ministries), and from there allocate budget accordingly to the relevant provincial operational agencies

To define a “new provincial project” and allocate budget accordingly to the relevant operational agencies within the province

To define budgetary items for a new activity among the existing projects of the operational agencies.

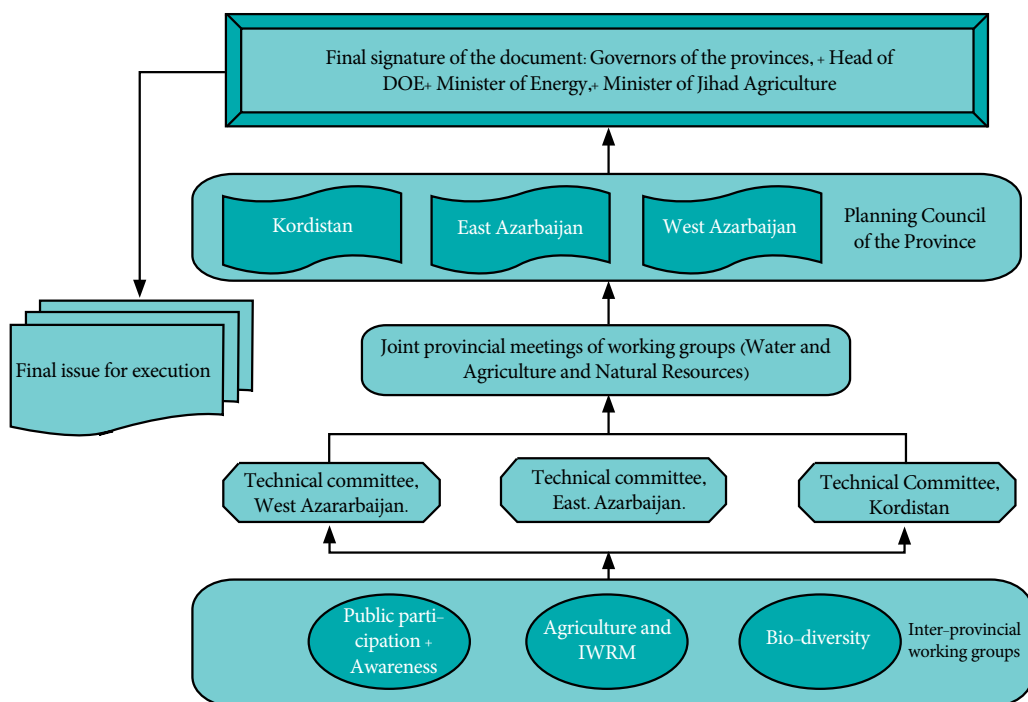


Fig 2 Process for approval of the Integrated Management of Lake Urmia

Considering the current procedures and bureaucracy for defining projects and allocating budget, the last option “To define budgetary items for a new activity among the existing projects of the operational agencies” was considered as easiest and straight forward option for allocating budget for the implementation of the plan. In this regards, the Lake Urmia Management Plan needs to

define the projects along with the nature of the activities, the time schedule for implementing the activity, budget requirement and the agencies who will be responsible for undertaking the activity.

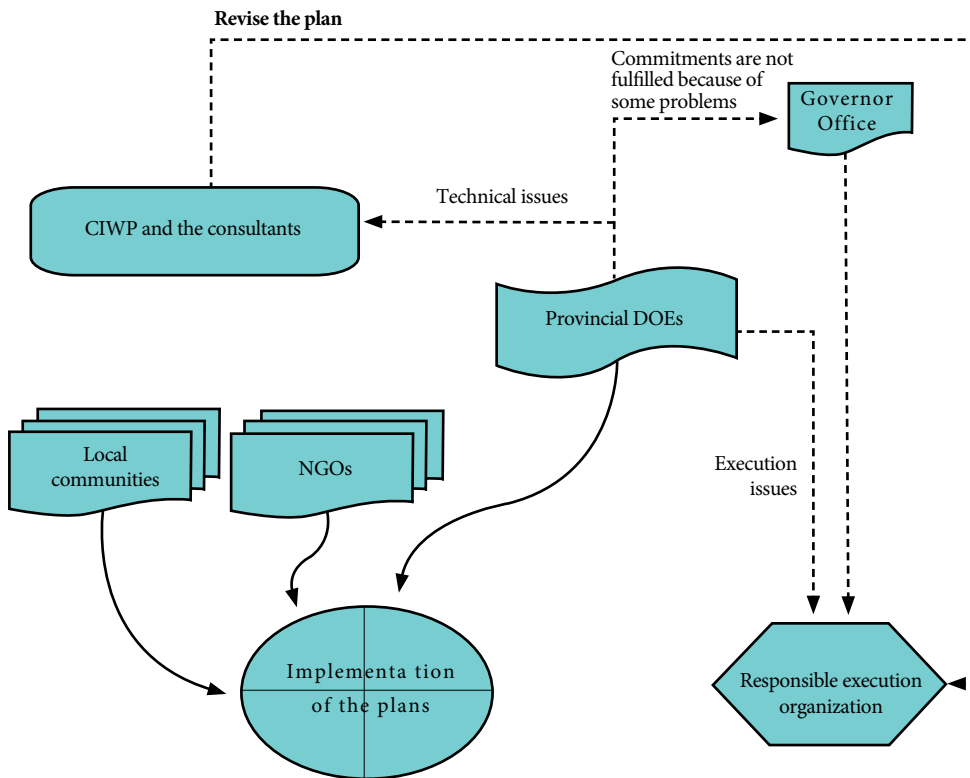


Fig 3 The process of monitoring the implementation of the plan

## 8. NEXT STEPS

According to the recent studies and reports and due to lack of inflows and severe decrease of water level, Lake Urmia is in a critical situation at present. This has caused several changes in Functions and Services of this lake, including considerable increase of salinity and its negative impacts on the aquatic ecosystem. Based on this



fact, at the end of the November 2007 workshop held in Tabriz, all the participants insisted on importance of adding prompt action to the parts Management Plan (which is a long term process). As a result, the next steps can be divided into two categories, concerning a) the management planning process; and b) urgent measures to deal with the present crisis at Lake Urmia.

### **8-1- Steps for implementation of Management Plan**

This management plan should have been finalized & approved technically, before implementation. Therefore after preparation of this version, following activities were followed up by CIWP, with coordination of all governmental and non-governmental stakeholders:

The 4th draft was sent to the relevant authorities as indicated in Fig 2 for final review,

- A memorandum of agreement was signed by Head of DOE, Ministers of Energy & Agriculture and Governors of East Azerbaijan, West Azerbaijan and Kurdistan provinces, in a ceremony attended by high level provincial authorities, members of parliament, UNDP Resident representative and other stake holders in October 2008.

- This management plan was also addressed in provincial missions of the cabinet to West Azerbaijan Province

- Establishment of a National Committee for implementation of the action plans

According to the mentioned activities, the next important step to implement the management plan will be establishment of the Regional Council and the institutional structures based on following actions:

- Prioritizing the action plans of the management plan and defining responsibilities of each provincial stakeholder

- Planning on injecting the proposed projects into provincial budget planning of basin provinces

- Establish a clear reporting procedure on progress through the provincial Technical Committees, working both separately (provincial level) and jointly (Basin level) and giving feed backs to LU regional council
- Monitoring implementation of action plans, result of its' implementation and also possible review of the management plan

### **8-2- Next steps for Urgent Measures**

At present, the water level at Urmia Lake (comparing to its average) has undergone a severe decrease which is threatening the environmental functions of this Lake, due to changes of water level and high salinity. In this regard and along with long-term management planning process for the Lake, planning for urgent and short-term actions to deal with the present situation and environmental crisis will be a necessity. As a result of assessments and several discussions about this issue, the necessary urgent actions for dealing with this environmental crisis have been identified.

The situation that the lake is witnessing at the moment has several root causes, of which we can mention drought/climatic change at the basin, implementation of agriculture and water resource development projects and increase in water use by different users. These problems have led to a negative water balance at the lake. Comparing to the average long-term level, the present water level seems unlikely to improve in such a short period. So there needs to be realistic and scientific crisis management, aiming for necessary measures to stop the present negative trend and increase the water level gradually.

The present crisis of Lake Urmia is a result of the current situation and historical activities at basin level, so any action to be undertaken should be integrated among provinces of the basin. The following measures are suggested:

1. Establishment of an inter-provincial Urmia Lake crisis management committee (among West and East Azerbaijan and Kurdistan provinces) or holding some joint meetings with crisis management authorities of the three provinces for decision-making and taking integrated and urgent actions. This committee needs joint expert working groups. These can be drawn from the CIWP which has facilitated establishment of 3 working groups with responsibility of the executive agencies, including "Integrated management of water resources & Agriculture", "Biodiversity" and "Awareness raising and public participation" with members of different governmental, non-governmental organizations and local people. 8 meetings have been held so far which have provided a good start for joint collaborations at basin level.

2. According to the minimum water level of the lake (enough to maintain its ecological functions) and its water need, which is equal to 3.1 BCM, This amount should be considered as a basis for all Water Resources Management or Water abstraction Projects and the main focus should be on providing the water need of the lake in balance with other water uses during normal or drought periods.

3. Development of a prompt action plan to allocate a percentage of water from the dams of the basin (say for example 20%) to the Lake, as "Environmental Flow" until the situation stabilizes or starts to ameliorate. This percentage should be adjusted as further studies become available, or on the basis of experience. According to the halting of development and agriculture activities in winter, it is important to start this procedure before the start of cultivation season; otherwise there must be strict monitoring to prevent diversion of water or any other activity that threatens flow of water to the lake.

4. The level of Land and water development plans should be defined based on the potentials of water resources at the basin, considering the sustainability of the Lake. Development and

implementation of action plans for promotion of water consumption at the basin will be a priority for budget allocation . (after finalization of Urmia Integrated Management Plan and doing related studies and coming to a common basin-level agreement on minimum water needs of Lake Urmia and maximum amount of permitted water use at basin level, the legal development projects could be restarted within the acceptable limits.)

5. Development of an integrated basin-level plan for increasing the water efficiency, especially for agricultural activities (known as the main water user sector) and preparing the necessary resources to reach these objectives. The saved water must be allocated to the lake.

6. A special subsidizing plan must be developed for supporting the farmers at basin level and encouraging them to lessen the use of water resources by changing their crops, increasing water efficiency, etc. The saved water must be allocated to the lake.

7. A prompt action for undertaking Volumetric Water Delivery at basin level, especially for agriculture section, with complete monitoring on the amount of use, preventing illegal uses, increasing the water price for the most demanding users and define a special water price for critical periods.

8. There have been some discussions about inter-basin water transfer to feed the lake and the possibility of importing water from neighbor basins could be considered in crisis management procedure. But such suggestion could be basically against ecosystem based management and may have potential negative environmental impacts on other basins. So doing EIA studies and decreasing probable impacts of inter-basin water transfer should be considered as a part of the urgent actions.

Indubitably, Implementing all the above-mentioned measures will be complex and demanding lots of efforts. According to the further studies of working groups, applying some of these solutions

together or implementing new ones would be considered.

We hope that with the support of Governor's offices and related governmental, non-governmental organizations and local people, and receiving necessary comments from national level related organization, the ground will be prepared for amelioration of the valuable ecosystem of Lake Urmia and its Socio-economic and environmental functions.

Main Stakeholders in Lake Urmia Management

Organization		Areas of influence / impacts
<b>Provincial level</b>		
1	West and East Azarbayjan & Kurdistan. Province Governors	High level management and decision making, Inter-sectoral coordination for provincial level plans and programmes
2	WA Province Department of environment Office	Provincial headquarter for management of the lake as well as wetlands within West Azarbayjan Preparation and implementation of management plans for the lake and satellite wetlands in WA. Technical support to lake management and satellite wetlands in WA. Financial support to lake management and satellite wetlands in WA. Administrative support to lake management and satellite wetlands in WA Provincial support to environmental NGOs in WA.

3	EA. Province Department of environment Office.	<p>Provincial headquarter for management of the satellite wetlands in EA.</p> <p>Preparation and implementation of management plans for the satellite wetlands in EA.</p> <p>Technical support to management of the satellite wetlands in EA.</p> <p>Financial support to management of the satellite wetlands in EA.</p> <p>Administrative support to management of the satellite wetlands in EA</p> <p>Provincial support to environmental NGOs in EA.</p>
4	Kurdistan DOE	<p>Facilitation of ecosystem based management approach among stakeholders</p> <p>Support Biodiversity</p> <p>Support public awareness</p>
5	W&E Azarbayjan and Kordestan Provincial MOJA	<p>Provincial headquarter for planning agriculture, animal husbandry and Natural resources and watershed plans and activities</p> <p>Provincial headquarter for agro-chemical management</p> <p>Provincial headquarter for agricultural extension, research and education supports</p> <p>Provincial support for fishery and aquaculture activities, introduction of species and/or propagation of fish larva</p> <p>Provincial support for rangeland management within the catchments</p> <p>Provincial support to nomadic affairs management</p> <p>Provincial support for land property and land use</p>

6	W& E Azarbayjan and Kordestan Provincial Water Authorities	Provincial level decision maker on water resources development plans and programs Decision makers in reservoir operation Water right allocation from rivers and springs Issuing license for water well construction and water withdrawal Water flow measurements/ monitoring (surface and ground water) Water quality measurements/ monitoring Lake water level measurement
7	West and East Azarbayjan and Kordestan & University of Medical Science	Provincial level decision-maker on rural health and sanitation plans and programs
8	W&E Azarbayjan Provincial Cultural Heritage and Tourism Organization	Provincial level decision-making on cultural heritage and tourism
9	Universities	Conduct research programs
10	W&E Azarbayjan Provincial Roads and Transportation Offices	Construction of Kalantary road in the Lake as well as roads and railway system development with occasional impact on the satellite wetlands, and shipping in the lake.
11	W&E Azarbayjan Provincial Industries and Mines Offices	Decision makers in industrial and mine development programs; Facilitators in communication with individual industries within the basin

#### Main Stakeholders in Lake Urmia Management - Local level

Organization		Areas of influence / impacts
<b>Local level</b>		
1	Local Offices of Governor in towns and cities	Local level inter-sectoral coordination
2	Local Offices of Department of environment in towns and cities	Wetland management (protection); Management of the protected areas around the Lake; Support local NGOs

3	Local offices for irrigation network management	Control of water (fresh or return flows) entering into the wetlands
4	Local offices of Jihad Agriculture	Rationing for agro-chemicals Rural services for agricultural extension Rural services for animal husbandry
5	Local Offices for Natural Resources	Rangeland management at local level
6	Local offices for Veterinary services	Control of animal diseases including poultry and birds
7	Farmers	Casual encroachment into the wetland areas; Use of chemicals at farm level; Conversion of pasture lands around the wetlands for agriculture; Careless use of water at farm level (low efficiency)
8	Reed harvesters	Harvesting of reeds
9	Artemia harvesters	Harvesting of Artemia
10	Salt harvesters	Local people, small scale traditional harvesters Industries, large scale salt harvesters
11	Local communities, rural population	Discharging sewage and wastes into the wetland, Rural physical development (affecting naturalness around the wetland) Influence on political sources
12	Fishers	Harvesting fish from the wetland
13	Buffalo herders	Grazing buffalo in the wetland, harvesting reeds
14	Hunters	Hunting water birds
15	Visitors	Waste residues around the wetland
16	Health and Sanitation Office	Health services to rural people, Health houses at villages
17	Local NGOs	Facilitating communicating with local people
18	Islamic councils	Facilitating communication with wetland stakeholders Influence on political sources





## **Annex 1: Table & Map of biodiversity sensitive zones of Lake Urmia**

Preliminary list of human activities for Lake Urmia and satellite wetlands,  
showing which are allowed in each sensitivity zone

Sensitivity	Location	Current human activities	Activities that should be allowed
High	Islands	None, except conservation activities	This column to be completed by the working groups
	Satellite wetlands	Grazing, recreation, water abstraction, Soldouz manmade wetland, mechanized agriculture	
	Estuaries of rivers	Shahrchai and Barandooz estuaries: agriculture Zarinerood and Siminerood estuaries: fish farming Mahabad river: Kaniborazan recreational site Godar river: rangeland	
Medium	Offshore	None	
	Coastal areas	<u>East</u> : Sharafkhaneh recreational constructions, recreational site, Ajichai estuary, Ajabshir army manoeuvre site, grazing, culture of Artemia, salt abstraction (traditional and non-evaporative), agriculture, road, natural resources researches, Agricultural Jihad recreational site. <u>West</u> : Education and recreation centre of university of medical sciences, recreational site, Urmia national park research station, traditional salt abstraction, rural wastes landfills, Golmankhaneh recreation centre, Artemia research centre, army bases, greenhouse agriculture, industrial estate (outside ecological boundaries), agriculture, animal husbandry.	
	Islami Island	None	
Low		bari tourist center, military site agriculture, rangeland	

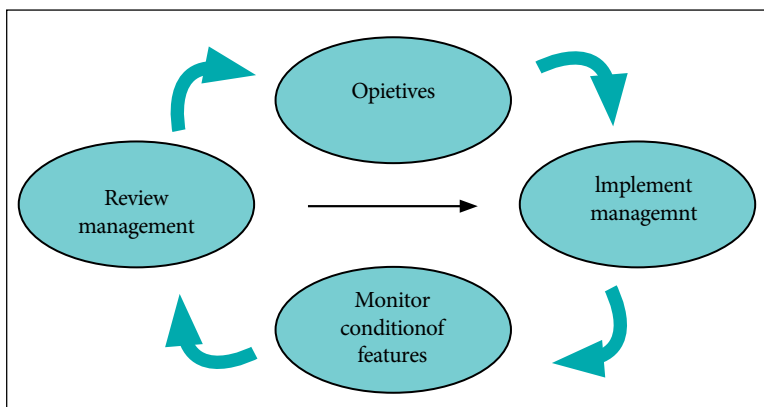


## **Annex 2: Lake Urmia Basin Monitoring Plan**

## I. Introduction to Wetland Monitoring

Wetland management in Iran has received more and more attention in recent years. In many instances this effort is being held back by a lack of relevant information on the nature of issues facing management, the cause of the problem and the effectiveness of management procedures and actions in resolving the problem. Effective monitoring programmes can help overcome such shortcomings. Monitoring is the systematic collection of data or information over time in order to ascertain the extent of compliance with a predetermined standard or position. An effective monitoring programme is not necessarily complex or expensive. Effectiveness is gauged by the relevance and timeliness of the data or information collected. Simple approaches to monitoring can be effective if they are well designed. However, even a well designed monitoring programme could have little value if the information that is collected is not utilized or does not influence the management process for that locality or site. Ideally, the locality or site will be subject to an interactive and holistic management plan that provides the means of responding to the information obtained from the monitoring programme. This can be termed an “adaptable management cycle”.

Figure 1: The adaptable management cycle



Essentially, monitoring provides the means of measuring the output of the management procedure - that is, it provides the means of measuring the (observed) state of the environment and the extent to which it may have been altered. Ideally, a monitoring programme should be established either before or after a particular management activity is implemented, or at a minimum, baseline information should be available. If monitoring is conducted before a particular management decision is taken it is essential that the information collected is then used to influence the management activities.

The key to a useful monitoring programme is good design. Monitoring programmes that are data rich and information poor are not effective management tools and this is further reduced if the programme provides misleading information. Ideally the development of a monitoring programme should be a straightforward and cooperative process between managers (who make decisions), scientists (who provide expert advice and interpret data), and other relevant stakeholders such as local community members (who often have excellent knowledge of local conditions).

## **II Framework for designing a Monitoring Plan**

The present Monitoring Plan was drafted based on results of the Wetland Monitoring Workshop which was held from 29 April to 1 May 2008 at the Department of Environment office in Urmia. In total, 40 persons attended, and there was a good representation from both West and East Azerbaijan provinces. Apart from government agencies, NGOs, local communities and universities were also well represented.

The methodology for drafting a Monitoring Plan was based on drafting monitoring protocols for each selected indicator. Monitoring protocols were based on the concept of establishing a monitoring

cycle. In order to be able to manage wetlands successfully, wetland managers need to have their information needs met, and provided to them in a form that is useful. It also needs to be updated regularly, as last year's information – for example – may no longer be applicable, and lead to a wrong decision. This process of acquiring tailored information about wetlands, and periodically updating this is termed the wetland monitoring cycle (see Figure 2).

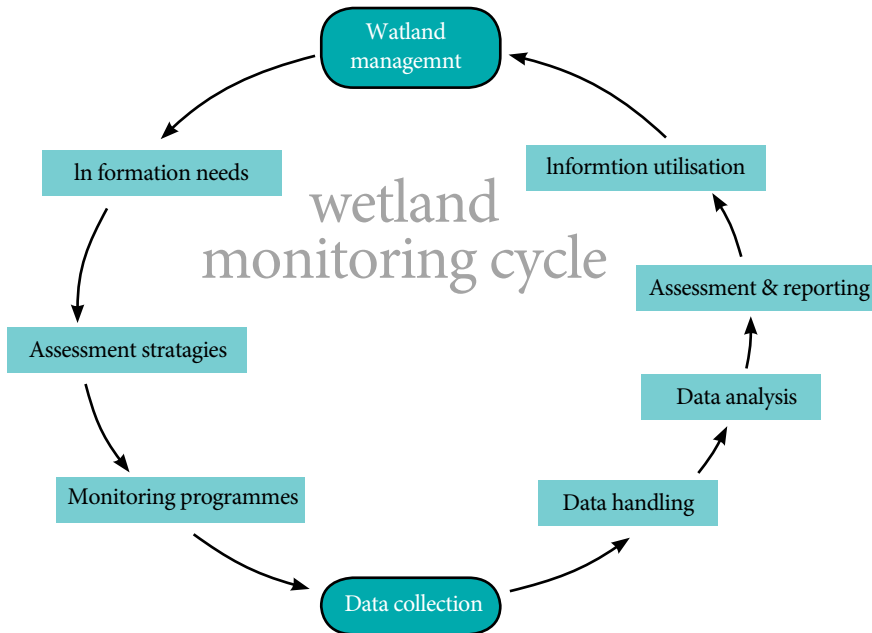


Figure 2. Wetland monitoring cycle

The approach used was to develop monitoring protocols for the various hydrological, biodiversity and socio-economic indicators, and together these protocols form the basis of the monitoring plan. These protocols were developed jointly by key stakeholders. The process of drafting protocols for the main parameters/key indicators

made significant progress during the mentioned workshop, and most protocols were completed in draft form. These protocols together comprise the Monitoring Plan, which in turn will form an integral part of the Management Plan.

### **III. Monitoring Plan for Lake Urmia**

In total five out of seven protocols were prepared for biological aspects of Lake Urmia, two protocols were prepared for water monitoring aspects and three protocols were prepared for the socio-economic aspects. Tables 1 to 3 summarize these protocols. All monitoring protocols are included in following tables and address the following aspects:

#### **1) Water**

- 1-1) Water Quality
- 1-2) Water Quantity
- 1-3) Water Use

#### **2) Biodiversity**

- 2-1) Artemia
- 2-2) Flamingos
- 2-3) Pelicans
- 2-4) Wild Sheep
- 2-5) Yellow deer
- 2-6) Rivers
- 2-7) Satellite wetlands

#### **3) Socio-economic**

- 3-1) Tourism
- 3-2) Sustainable Livelihoods
- 3-3) Public Participation and Awareness

As a result the Monitoring Plan for Lake Urmia should have the following components:

### A) Biological monitoring:

Monitoring Plan should focus on major biodiversity aspects at ecosystem level (rivers and satellite wetlands) and at species level (flamingos and pelicans, yellow deer and wild sheep, as well as artemia)

The main target rivers to be monitored for biodiversity are: **Zarrineh, Simineh, and Aji chay**. Other rivers may be added if necessary (such as Gadar, Mahabad, Shahr chai).

Target satellite wetlands to be monitored regularly are: **Kanibrazan, Yadegarlou, Qara Qeshlagh (both provinces)** and Gori Gol. If necessary other satellite wetlands may be added such as: Soldouz, Gopi Ali baba, Dorge Sangui.

Yellow deer needs to be monitored only in **Ashk and Espir islands**, while wild sheep needs to be monitored in **Qoyun dagji (Kabudan) island**. Flamingos and Pelicans may be monitored in **Satellite wetlands** as well as islands of LU. The main breeding site for pelicans are **Doguzlar Islands** and the main feeding ground is Qara Qeshlagh and other neighbouring satellite wetlands. For artemia monitoring needs to take place in predetermined sampling stations within the Lake (existing) and river estuaries (to be defined).

Monitoring needs to be conducted **seasonally** for all parameters except for mammals (**twice a year** – end of summer and end of winter).and **annually** for Satellite wetlands.



In terms of responsibilities for monitoring **DOE West Azerbaijan** will be directly in charge of monitoring Yellow deer, Wild sheep, Flamingos and Pelicans. DoE West and East Az and Kurdistan. will be responsible for rivers and satellite wetlands in their respective provinces. **Artemia Research Centre** will be in charge of monitoring artemia.

Reporting on each aspect of biodiversity needs to be adequately prepared once the monitoring is finished. Rivers, satellite wetlands and artemia will be monitored seasonally but reported annually, Two reports will be prepared on mammals: one mid-term report and one final report. Same applies to Falimngos and Pelicans.

In general the National DoE West Az. will be responsible for producing a comprehensive **annual report** on the state of biodiversity in LU and its satellite wetlands. This requires close provincial collaboration as some of the data will be collected by DoE East Az. (namely on satellite wetlands). Every five years an analytical report will be produced jointly by DoE WA & DoE EA, with support from DoE HQ in Tehran, to provide inputs to the overall Management Plan.

Monitoring data need to be stored in a Database in **DoE West Azerbaijan** as the lead agency in charge of management of Lake Urmia National Park. This Database should preferably be established in the National Park Office and be accessible to key stakeholders and collaborating agencies.

## B) Water monitoring:

Water quantity and quality need to be monitored in **rivers** and other **surface waters, ground waters,** the **Lake,** and some of the more important **satellite wetlands of Lake Urmia.**

There are at present 86 sampling stations in West Azerbaijan and 60 sampling stations in East Azerbaijan along the main rivers. Surface waters as well as ground water are being monitored by Water Authority in each province. Some additional stations are required to assess water level and quality in river estuaries. Monitoring stations are required for the most important satellite wetlands (4 stations). There are two functioning stations to monitor the quality of water of the Lake. An additional station in the southern side of the Lake is proposed.

Note: Target satellite wetlands are Kanibrazan, Yadegarlou, Soldouz, Gopi Ali baba, Seiran Goli (Dorge Sangi), and Qara Qeshlagh wetlands (Miandab and Mahabad).

Monitoring needs to be conducted **monthly** for all the above, except for satellite wetlands that need to be monitored **seasonally.**

In general the **Water Authority** is in charge of monitoring water quantity in rivers and other surface waters, as well as the groundwaters. Monitoring water in the lake and the satellite wetlands is the responsibility of **DoE** (each provincial office accordingly), except that DoE West Azerbaijan is directly responsible to monitor the water level at the lake.

The same organizations will be in charge of storing data and

reporting accordingly. However annually, DoE West Az. (should gather all the necessary data from the Water Authorities and relevant DoEs offices and prepare a comprehensive annual report on water quantity and quality. Every five years an analytical report needs to be prepared by DoE WA on water quality and quantity to provide inputs into the Management Plan.

### C) Socio-economic monitoring:

Indicators for monitoring have been identified by the socio-economic working group: Tourism, Public Awareness and Participation, and Sustainability of Livelihoods.

Tourism is to be monitored in Lake Urmia National Park (mainly at Ports and Islands) and in the satellite wetlands (namely Soldouz, Gori Gol, Kanibrazan, and Dorge Sangi).. However, Awareness and Participation, and Sustainability of Livelihoods need to be monitored ideally at **watershed level** but at least in the Satellite wetlands.

Level of Tourism needs to be monitored **monthly** (and weekly during peak holidays) at least in the first few years. Level of Awareness and Participation, and Sustainable Livelihoods need to be monitored at least **annually**.

For reporting the monitoring results however, Tourism is to be reported **seasonally** (or at least twice per year); Results of monitoring of Awareness and Participation, and Sustainable Livelihoods need to be monitored **annually**.

For Tourism monitoring should be conducted by the **Deputy for Tourism** in collaboration with DoE (for LU National Park) and local communities (for satellite wetlands). Level of Awareness and

Participation will be monitored by DoE Public Participation/Public Relations office. Sustainable Livelihoods will be monitored by Governors Office - Rural Office/Economic Affairs Coordination Unit.

The organizations which are responsible for monitoring will also report the results. Monitoring data should be stored in Databases in organizations which are conducting the monitoring.

The above results could be summarized in the following tables (Table 1 to 3).

Table 1 –Biological Monitoring programme

Biodiversity Objectives	Parameters	Sampling location	Time of sampling	Lead Agency	Agency reporting	Time of reporting	Storage of data	Budget required
<b>Artemia</b>	<ul style="list-style-type: none"> <li>• Cyst + biomass</li> <li>• Diapause in water samples</li> </ul>	Predetermined sampling stations in LU and river estuaries	Seasonally	Artemia Research Centers	Artemia Research Centers	Annual	Database in Artemia Research centre	
<b>Flamingos</b>	<ul style="list-style-type: none"> <li>• Breeding habitat</li> <li>• Feeding habitat</li> </ul>	LU islands and river estuaries, Satellite wetlands	Seasonally	DoE West Azerbaijan	DoE West Azerbaijan	Annual	Database in DoE West Azerbaijan	
<b>Pelicans</b>	<ul style="list-style-type: none"> <li>• Breeding habitat</li> <li>• Feeding habitat</li> </ul>	LU islands and river estuaries, Satellite wetlands	Seasonally.	DoE West Azerbaijan	DoE West Azerbaijan	Annual	Database in DoE West Azerbaijan	
<b>Wild Sheep</b>	<ul style="list-style-type: none"> <li>• General health</li> <li>• Vegetative cover</li> <li>• Water reservoirs</li> </ul>	Qoyun dagji Island	Twice a year (end of summer and end of winter)	DoE West Azerbaijan	DoE West Azerbaijan	Annual	Database in DoE West Azerbaijan	

<b>Yellow Deer</b>	<ul style="list-style-type: none"> <li>• General health</li> <li>• Vegetative cover</li> <li>• Water reservoirs</li> </ul>	Ashk and Espir islands	Twice a year (end of summer and end of winter)	DoE West Azerbaijan	DoE West Azerbaijan	Annual	Database in DoE West Azerbaijan	
<b>Rivers</b>	<ul style="list-style-type: none"> <li>• Density</li> <li>• Diversity of indicator spp</li> <li>• DO, BOD</li> <li>• Hardness, pH</li> </ul>	Main rivers: Zarrineh, Simineh, Aji chay	Seasonally	DoE + Water Authorities (in each province)	DoE + Water Authorities (in each province)	Annual	Database in each provincial DoE	
<b>Satellite Wetlands</b>	<ul style="list-style-type: none"> <li>• Waterfowl</li> <li>• Vegetation</li> <li>• Fish</li> <li>• Amphibians</li> <li>• Reptiles</li> <li>• Zoonethos</li> </ul>	Main wetlands: Kanibrazan, Qara Qeshlagh (Mahabad + Miandab) Gori Gol	Seasonally	DoE + MoAJ (in each province)	DoE + MoAJ (in each province)	Annual	Database in each provincial DoE	

\*These databases need to be accessible to DoE West Azerbaijan as the lead agency in charge of LU National Park

Table 2 –Water Monitoring programme

Water aspect	Parameters	Sampling location	Time of sampling	Lead Agency (Monitor + Report)	Time of reporting	Storage of data	Budget required
<b>Quality</b>							
<b>a) Rivers:</b>	<ul style="list-style-type: none"> <li>• Water level</li> <li>• Flow</li> </ul>	<p>Existing stations in West Az. (86) East Az. (60) &amp; Kurdistan</p> <p>New stations need to be established on river estuaries</p>	<p>Monthly for flow measurements</p> <p>Daily for water level (gauge readings)</p>	Respective Water Authorities	Annually	Respective Water Authorities	
<b>b) Ground waters</b>	Water level	Representative number of wells around wetlands and around the Lake	Monthly	Respective Water Authorities	Annually	Respective Water Authorities	

<b>c) Lake</b>	Water level	Two stations: Sharafkhaneh and Golmankhaneh.  One station to be added south of the Lake.	Monthly	Respective Water Authorities & DOE West Azerbaijan	Annually	DoE West Az.	
<b>d) Satellite wetlands</b>	Water level	1 to 3 stations in each wetland need to be established	Seasonal	DoE West and East Az. Respectively	Annually	Respective DoEs	



Water aspect	Parameters	Sampling location	Time of sampling	Lead Agency	Agency reporting	Time of reporting	Storage of data	Budget required (annual)** – Total – Government – CIWP
Quality								
a) Rivers	Salinity pH EC Cations Anions DO BOD COD Hardness Turbidity Dissolved nutrients  Contaminants such as: – Heavy metals – Pesticides – Bacteria  Biological aspects: Phytoplanktons Benthose	Existing stations West Az. (86) and in East Az. (60)  New stations need to be established on river estuaries	Monthly for ordinary observations and seasonal for more comprehensive analyses	Respective Water Authorities	Individual reports by respective organizations and comprehensive report by DoE West Az.	Annual	Water Authority Database	

b) Ground waters	Same as above	Existing stations West Az. (86) and in East Az. (60)  New stations need to be established around satellite wetlands.	Monthly for ordinary observations and seasonal for more comprehensive analyses	Respective Water Authorities	Water Authority	Annual	Water Authorities West Az. Database	
c) Lake	Same as above	Two stations: Sharafkhaneh (East Az.) and Golmankhaneh (West Az.)	Monthly for salinity and seasonal for the rest	Respective Water Authorities	DoE West Az.	Annual	DoE West Az. Database	
d) Satellite wetlands: water and sediment quality	Same as above	Four stations in each satellite wetland, namely: Kanibrazan, Soldouz, Gopi Ali baba, Dorge Sangui, and Qara Qeshlagh wetlands.	Seasonal	DoE East Az. and DoE West Az.	DoE West Az.	Annual	DoE West Az. Database	

Water Consumption (Agriculture)	<ul style="list-style-type: none"> <li>• Irrigation water use of different crops</li> <li>• Area under cultivation of different crops</li> </ul>	Entire watershed of the Lake Entire watershed of the Lake	MOJA + Water Authority MOJA + Water Authority	MOJA + Water Authority	Water Authority Database	
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Table 3 –Socio-economic Monitoring programme:

Socio-economic aspect	Parameters	Sampling location	Time of sampling	Lead Agency	Partner .Org	Time of reporting	Storage of data	Budget required ((annual
<b>Tourism</b>	Number of visitors to natural attractions*	Mainly in the satellite wetlands and entry points to LU National Park (main ports and islands) such as: Golmanphaneh, Mohammadyar, Goorchin Qala	Monthly + for one week each month and during holidays*	Tourism Organization + NGOs, Local communities	DoE West Az.	Biannual	Database in DoE West Az.	



## IV. Implementation Measures:

- **Team Work:** Monitoring is a collaborative effort. When one organization is responsible it means that this organization is in charge of planning and achieving results but close collaboration of other key organizations is critical to successful implementation of the monitoring plan. Successful implementation of this Monitoring Plan requires close collaboration and good coordination between DoE, Water Authority, Artemia Research centres, MoJA, key local communities, NGOs and research institutes.

- **Data Storage:** To avoid putting extra burden on any particular organization for monitoring, all responsible organizations need to follow up their routine monitoring work with the condition to make the data available to other key stakeholder organizations. Databases need to be established in the agencies involved in monitoring, and mechanisms developed for data sharing, preferably through the internet. The Permanent Secretariat of LU basin management plan based in WA DOE should be provided with a copy of updated data . A central database is to be established at DoE, who will be responsible for revising the Management Plan based on the monitoring data.

- **Methodologies/Procedures:** A good monitoring plan will produce good data and will help in taking informed management decisions. It is necessary that all procedures for monitoring are developed in details and published in each responsible organization. CIWP could provide funding (external expertise and advice) on revising these procedures and standardizing them.

- **Funding:** As monitoring programmes are costly, each responsible organization will provide its own funding (through national and provincial budgets), however, funding for expert advice, training,

equipment and establishing databases may be available through CIWP.

- **Reporting:** A single integrated monitoring report should be produced annually by provincial DoE offices which would summarize all the results obtained from monitoring to be used as a key source for giving feedback to the Management Plan. This should be an annual monitoring report entitled “State of the Environment of Lake Urmia and its Satellite Wetlands in Year XXXX” that summarises monitoring results at site level. It should be made widely available in hard copy and on the web. The first report should be prepared for early 2009 based on monitoring that was done in 2008.

**Capacity Building:** In general it seems that the expertise for monitoring is adequate except training needs for use of new equipment or new techniques. However, the number of experts available is far below the required level and there needs to be a comprehensive training programme for implementing the Monitoring Plan. Also, capacity for interpretation of combined data and integrating them into a comprehensive analytical report needs to be acquired within the organization that is responsible for implementation of the Monitoring Plan.

**- Mitigating risks associated with implementation of the Monitoring Plan**

Risks associated with implementation of the Monitoring Plan fall into two main categories: those that hamper implementation of the monitoring, and those risks posed to the environment by implementing monitoring. These risks, plus ways for mitigating these, are provided in Table xxx below.

No. Risks	Mitigation approach
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## **Risks hampering monitoring**

1 Sudden climatic changes (extreme hot and cold seasons)

Be prepared for general trends of climatic changes at local, regional, national and global levels by sharing experience and exchanging information

2 Lack of budget (lack of equipment, insufficient personnel/experts) Be prepared by preparing proposals beforehand to ask provincial and national government for necessary budgets (for example, assess the needs for new equipment and personnel and include them in the budget proposals)

3 Lack of participatory approach (lack of cooperation between various stakeholders, misinformation from officials, misinformation from local communities) 1. Get necessary training for using participatory approach in decision-making to open up new opportunities for collaboration between agencies and various stakeholders (hold multi-stakeholder meetings)

4 High turnover rate of officials Document as much as possible and openly share documents between officials in the same organization to facilitate the integration of new officials into the process

5 Local communities not available in certain seasons Train more than just a limited number (including volunteers from NGOs or CBOs)

6 Unreliable data (no quality control) Seek expert advice at national and international levels for quality control (revising the existing procedures)

7 Delay in implementation of monitoring (or in producing monitoring reports) Establish a monitoring team within DoE and provide necessary training (assign responsibilities) and make sure An Integrated Monitoring Report is produced every year – starting in 2009.

Risks posed to the environment by the monitoring

1 Monitoring activities result in disturbance to sensitive wildlife

(e.g. waterbird breeding colonies) or habitats. Do not closely approach breeding colonies or roosting areas, but monitor from a distance. Avoid making unnecessary noise, do not wear brightly coloured clothing or use brightly coloured equipment. Avoid making sudden movements near wildlife. Limit the number of samples or sampling points. Do not move through sensitive habitats but around them as much as possible.

2 Accidental introduction of exotic species or diseases. Observe hygiene when handling wildlife (e.g. use gloves, clean trays), and when entering sensitive areas.





## **Annex 3: ToR & STRUCTURE OF LU BASIN REGIONAL COUNCIL & NATIONAL COMMITTEES**

## **TOR of National Committee for sustainable management of Lake Urmia:**

- Develop and approve the long term vision and general strategies for management of Lake Urmia basin in line with sustainable development, aiming to maintain the potential of LU ecosystem
- Design mechanisms and general policies for sustainable management of the Lake Urmia basin in line with ecosystem approach and article 67 of fourth national development law.
- Develop and approve development objectives and criteria for the basin, with specific focus on sustainable management of water, agriculture, land use, biodiversity and socio-economic aspects.
- Assess specific measures and actions to be done in times of environmental crisis, such as drought
- Plan and allocate a specific amount of budget for specific inter-sectoral coordinated activities, related to sustainable management of LU basin.
- Specify and endorse development capacities of different sections, regarding environmental capacity and sustainability of Lake Urmia.

## **TOR of Regional Council for sustainable management of Lake Urmia:**

- Make an assessment of development capacities/priorities at the basin level and develop draft of vision and general approach for management of the basin to be suggested to the National Committee.
- Lead and guide integrated development plans of the basin, in line with environmental capacities and high-level managerial policies and mechanisms notified by the National Committee.

- Coordinate, harmonize and resolve any overlaps or contradictions of sectoral development plans with each other and fit them within the capacities of the basin.
- Define and agree on share of each province to provide minimum water allocations to the Lake and also the amount of allowed water use in each province.
- Cooperation and effective communication with different stakeholders, especially local communities in line with sustainable management plan objectives.
- Full and timely communication with all the stakeholders and people and informing them of the plans, to ensure clarity and to prepare the ground for their full involvement in implementation of the action plans.
- Establish 4 technical working groups in order to provide necessary technical support related to ecosystem based management of the Lake
- Prepare annual reports and work plans and sending them to the national committee to be endorsed for implementation.
- Monitor complete implementation of approved plans, by different stakeholders of the basin

