Management Plan for the Hawizeh Marsh Ramsar Site of Iraq

Second Draft

Volume 1: Background, Vision, Principles and Annexes

A Report Prepared for the
Iraq National Marshes and Wetlands Committee

December 2008

This two-volume report, *Management Plan for the Hawizeh Marsh Ramsar Site of Iraq* has been prepared for the Iraq National Marshes and Wetlands Committee (INMWC) to assist the Government of Iraq in its implementation of national Ramsar Convention responsibilities. The drafting of this report was led by Nature Iraq during the Septembr 2007 to November 2008 period. It is one of a series of reports prepared by Nature Iraq to summarize and inform partner agencies on the status and progress of its biodiversity partnership initiatives in Iraq.

Financial support for the drafting of this report was provided by the Italian Ministry of the Environment, Land and Sea.

NOTE: This report is the second formal draft of this Management Plan. It is fully revised based on review comments provided by the members of the INMWC and other stakeholders after two meetings held at Sulaimani, Kurdistan, Iraq from April 30-May 1, 2008 and October 5-6, 2008. This second draft includes corrections to minor errors in the first draft released on May 1, 2008. The Plan remains in draft form, thus it will continue to receive additional input and observations by stakeholders and the INMWC as appropriate.

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Prepared by for the
Iraq National Marshes and Wetlands Committee

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Compiled and Edited by C.D.A. Rubec

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Volume 1

Foreword

Hawizeh Marsh is a symbol of the cultural and environmental richness that characterizes Iraq and in which all Iraqis take great pride. Hawizeh Marsh is a place of great beauty that has welcomed visitors for over 1000 years. It has been the refugia for globally threatened biota and threatened peoples and remains the home of a great culture exemplified by the Ma'adan people today. In recent decades, the environment of this area and its economic values have been greatly threatened. But things are changing.

Since the removal of the previous regime in 2003, a national effort has been underway with international donor assistance targeted on many aspects of the recovery and reconstruction of Iraq. Part of this effort has been projects to restore a healthy ecosystem for people and nature in the southern Mesopotamian marshes of Iraq.

The Government of Iraq has taken tangible steps toward this restoration. This includes major efforts to: reintroduce water in degraded parts of the southern marshes; cooperate in establishing an environmental monitoring and research program; set in motion planning for a National Park in the Central Marshes area of southern Iraq; and ensure the nation's accession to the Ramsar Convention on Wetlands in October 2007 that included designation of Hawizeh Marsh as a *Wetland of International Importance*. The Government of Iraq also established the Iraq National National Marshes and Wetlands Committee (INMWC) which has taken responsibility for the preparation and implementation of this Management Plan for the Hawizeh Marsh "Ramsar Site" under the Convention on Wetlands.

Iraq has much more to do for its wetlands, recognizing that this will not be easy to do. However, Iraqis have encouraged the global community of Ramsar government and non-government partners to continue to assist as Iraq explores all aspects of the wise, sustainable use of its wetland resources.

This Management Plan is thus presented here in its Second Draft (dated December 1, 2008) for the further consideration of the Iraq National Marshes and Wetlands Committee (INMWC) and all stakeholders. It will be revised as it is taken forward through the appropriate consultative processes.

Acknowledgements

The preparation of this *Management Plan for the Hawizeh Marsh Ramsar Site of Iraq* represents a valuable ongoing partnership between government and non-government interests in Iraq. The vision for this Plan was greatly facilitated by the *Needs Assessment Workshop on a Hawizeh Marsh Management Plan* (Nature Iraq 2007a) held in Amman, Jordan in September 2007 with representatives of Iraqi ministries that have responsibilities in various ways for the Marsh. That meeting established the table of contents, timetable and issues for presentation in the Plan. The First Draft of the Plan was subsequently discussed at a meeting held in Sulaimani, Kurdistan, Iraq with the Iraq National Marshes and Wetlands Committee, stakeholders, and representatives of other ministries and local Councils from April 30 to May 1, 2008. This meeting included representatives of the Iraq Ministry of Environment, Ministry of Higher Education, Ministry of Water Resources, Ministry of Agriculture, Ministry of Marshland Affairs, and Ministry of Municipalities and Public Works. It also included officials from the Missan and Basrah Governorates and local tribal leaders. A similar group, but including municipal councillors from Basrah and Missan, met to discuss a revised Second Draft of the Plan and identify priorities for "First Step" projects, again in Sulaimani from October 5-6, 2008. Thanks are extended to all of the individuals who gave freely of their ideas, expertise and obvious appreciation for the importance of the Marsh.

The preparation of this Management Plan has been led by Nature Iraq with financial support by the Italian Ministry of Environment, Land Sea. The Plan was compiled and edited under the leadership of Mr. Clayton Rubec, Canada Department of the Environment and the Centre for Environmental Stewardship and Conservation, acting on assignment to Nature Iraq. Much of the material presented here is drawn from available literature, and reports and contributions by Nature Iraq staff and its associates. In particular, thanks for contributed material are extended to: Mr. Andrea Cattorossi for Section 2.9 and Annex 2; Dr. Suzie Alwash for Annex 1; and Dr. Azzam Alwash for Section 3.2.

The spelling used in this report in English for "Hawizeh Marsh" is as submitted by the Government of Iraq in its documentation supporting Iraq's accession to the Ramsar Convention in October 2007 that included its nomination of this area as Iraq's first Wetland of International Importance. Other spellings for this area, such as *Haur Al-Hawizeh*, *Al-Hawaizah*, *Al-Huweizah*, and *Al-Haweija* are equivalent and no less correct.

The photographic images and maps included as Figures in this report are credited to: Mr. Mudhafer Salim, Nature Iraq (cover, Figures 8, 9, 12-14, 28, 35, and 38); Dr. Azzam Alwash, Nature Iraq (Figures 7a-d and 31); Nature Iraq (Figures 11, 15, 36 and 37); United Nations Environment Program (Figures 4 and 11); United States Geological Survey (Figures 6a-b); and the Italian Ministry of Environment, Land and Sea (Figures 1, 5, 10, 16-27, 29-30, 32-34, and A2.2-A2.15).

Management Plan for the Hawizeh Marsh Ramsar Site, Iraq

1.0 Introduction

1.1 Why are Wetlands Important?

Wetlands are found eveywhere in the world. They are recognized as among the most productive and diverse ecosystems on earth. The inland freshwater marshes, coastal salt marshes and estuarine wetlands of southern Iraq are no exception. They exist as the interface between the land and the sea as well as land and Iraq's flowing and static waters. For millennia, these wetlands have supported a wide range of flora and fauna and the peoples that depend on natural resources, all of which are highly adapted to survival in these water rich ecosystems. The marshes are critical in the whole life cycle for wild species' feeding, reproduction and health. A wide range of endangered wildlife use these wetlands as ecological refugia.

Inland wetlands slow and retain floodpeaks that periodically affect watersheds while their coastal counterparts buffer shorelines from tidal effects and other ocean surges. These systems act to trap environmental contaminants including toxic chemicals and heavy metals, as well as to purify waters that flow through them. In many parts of the world, both natural and artificially constructed wetlands are effectively used to cleanse municipal and industrial wastewaters as well as act as stormwater retention ponds. Local microclimate can be favourably influenced by the presence of wetlands. Wetlands act as sources of water in drought periods and are recharged by both surface and groundwater inflow in many regions.

Around the World, wetlands are often the life sustaining source of fibre, fish, birds and other fauna as food sources, and freshwater for upwards of half the world population that lives on, in and beside wetlands.

1.2 Defining "Wetlands" in Iraq

Iraq has an estimated 1,379,500 hectares of wetlands (Scott 1994), thus comprising about 3.2% of the surface area of the nation. About 82% of these wetlands are found in the southern governorates of the nation. Additional unrecorded shallow water wetlands exist in Iraq's territorial waters in the Gulf.

While Iraq has not yet formally defined "wetlands" or "marshes", the words "*hor*" and "*ahwar*" and are used in Arabic in Iraq to name these marshes. For the purposes of this Management Plan, the Ramsar Convention's definition of "wetlands" was adopted. This defines wetlands as "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide do not exceed six metres". This definition is derived from Article 1.1 of the Ramsar Convention text. In addition, Article 2.1 of the Convention's text notes that Ramsar sites "may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands".

In the case of Iraq, wetlands thus may include not only the fresh and brackish water marshes in the south of the nation (as common in Hawizeh Marsh), but also coastal, estuarine and salt-water tidal marshes along the Gulf and Delta of Shatt Al-Arab. Additional wetland types also exist in Iraq, such as the highly saline wetlands along the passages ways of the Main Outfall Drain – a large irrigation drainage water canal – as well as the small oases in the western desert, riverine marshes and meadows on the reaches of Iraq's rivers, and small fens in the

mountain basins and valleys of northern Iraq. All of these are included in Iraq's wetland resources. Wetlands present in the Hawizeh Marsh area include *Phragmites* and *Typha* marshes, lakeshore marshes and shallow water basins.

The Ramsar definition of "wetland" is very broad, reflecting the global scale of the Convention, and gives Contracting Parties great scope and flexibility for ensuring compatibility between national, regional and international wetland conservation efforts. It is understood that, at the national level, the above Ramsar definition must be interpreted in the context of biogeographic variation so it can be effectively applied. Many countries thus have more detailed wetland definitions and classification systems suited to their national needs.

The Convention fosters the listing of natural and semi-natural wetlands representative of those wetland types occurring in each of the nation's boundaries. But it also allows for the designation of purpose-built, human-made wetlands, assuming they satisfy at least one of the criteria required to define Ramsar sites. These criteria focus on ecological values for biodiversity such as fish and birds, water and biogeographic setting, supported by guidelines directed at cultural values. The Convention also has a very general wetland classification system that it urges Contracting Parties to consider as to what the representative, rare or unique wetlands are within their nation.

At some point, an Iraqi definition of wetland will need to be developed to be more specific to the nation's ecological parameters, as done by many other nations in their national wetland classification systems, wetland policies and programs.

1.3 Wise Use of the Marshes and Marsh Resources

Wise use is a central and vital part of the philosophy of the Ramsar Convention. The term "wise use" is considered to be virtually synonymous with "sustainable use" and closely related to "sustainable development". The concept of "wise use" was first recognized by the Convention in 1971, as embodied in the Article 3.1 of the text of the Convention as follows: *"The Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List of Wetlands of International Importance, and as far as possible, the wise use of all wetlands in their territory."*

Acknowledging the importance of "wise use" in balancing the needs of wildlife conservation against human needs, in 1987 the Convention further stated that: *"The wise use of wetlands is their sustainable utilization for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem. Human use of a wetland means that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations."*

Successive Meetings of the Contracting Parties have adopted *Guidelines for the Implementation of the Wise Use Concept* in 1990 and *Additional Guidance* in 1993 that are intended to assist managers in the Contracting Parties to meet their countries' obligations under the Convention. These guidelines can be examined in detail on the Convention's web site (see: www.ramsar.org).

The *Wise Use Principle* of the Ramsar Convention and more recent advice to Contracting Parties under the separate Convention on Biological Diversity could assist Iraq if it wishes to establish a long-term wise use program for all of its wetland resources, in all parts of the nation.

This might suggest:

a. development and adoption of a National Wetland Strategy or Policy;

b. compilation of an inventory of the location and biodiversity of all of Iraq's wetland resources;
c. establishment of targeted biodiversity and wise use research and public awareness initiatives relevant to wetlands;
d. creation of protected areas ranging from national parks to community-based stewardship projects that incorporate wetlands;
e. encouragement of the role and expertise of Iraqi ministries, non-government organizations and universities in working together on wetland activities; and
f. cooperative efforts on wetland conservation and management with Iraq's neighbouring nations and other nations further afield that may offer assistance as members of the Ramsar family of nations.

1.4 Hawizeh Marsh: A National and International Asset

The Hawizeh Marsh is a symbol of Iraq's rich natural and cultural history, a place in which all Iraqis can take great pride. It is a place of great beauty, where nature and people have flourished for millennia. The balance between the social and cultural values of its human residents and visitors until the last 20 years was respected when wars, water relocation and drainage intervened, and habitat destruction affected this area greatly.

These marshes lie in the southern, ecologically rich belt of the nation at the junction of the Tigris-Euphrates Rivers, thus being fed by one of the World's most ecologically important and politically charged watersheds. This area is also the key headwaters for the Gulf to the south.

Hawizeh is the home of a long, cultural history stretching thousands of years back to the Sumerians. It has been the refugia for people and biota in a troubled region of our planet but also the site in recent decades of conflict between Iraq and its neighbouring nations (e.g. the Iran-Iraq war of the 1980s). It has also been the source of a broad fisheries resource that once fed much of Iraq as well as the source for reeds used in paper production and dairy feeding. The marshes of Hawizeh supported the livelihood of many local people through agricultural production in the grasslands around its perimter.

The marshes of Hawizeh are mainly fed by the waters of the Tigris River in Iraq, with additional input from the Karkha River in Iran, and the rainstorm flows of water of the winter season fed by the mountainous region separating Iraq and Iran. Seasonal wetlands in the northerly reaches of Hawizeh Marsh, called the Sanaf, that are highly saline due to repeating cycles of evaporation and annual drying, are enriched by these winter rain waters. These marshes hold and slowly release these waters later in the year that eventually flow south through Hawizeh to the Shat Al-Arab in the summer and fall months and on to the Gulf.

The Hawizeh area (Figure 1) was essentially in a natural, undisturbed state as recently as the mid-1970s. The Iraq Ministry of Water Resources (formerly named the Ministry of Irrigation) constructed over 100 km of embankments along the western boundary of the Marsh in an attempt to reduce the effects of flooding on the adjacent agricultural grasslands. However, this embankment program was short-sighted as it eliminated the purging cycle of flood waters which had washed out salinity and deposited new enriching soil each year, thus reinvigorating these farming areas. During the 1980s, further extensive drainage occurred under the leadership of the Iraq army, creating a military buffer zone and no-man's land. Many areas were dried, reducing the natural extension of the Hawizeh Marsh and converting it mainly to a lake-dominated system. In the early 1990s, the former regime cut off the water supply to the Marsh, build more embankments inside the marsh itself and burned reed beds. In the end, Hawizeh was reduced to an area of less than 700 km^2.

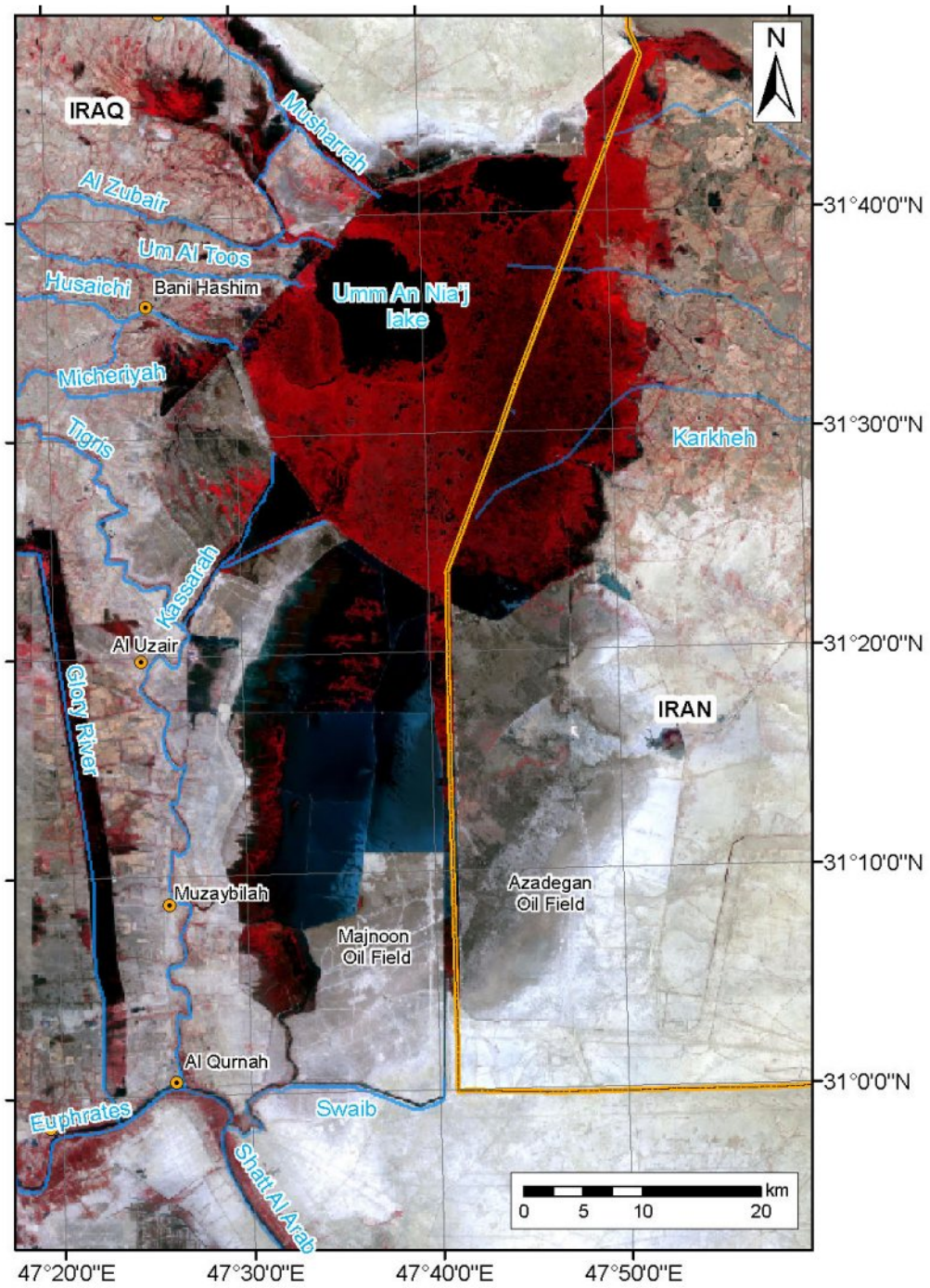

Figure 1: The Hawizeh Marsh of southern Iraq
(with Iraq-Iran border shown as yellow line)

Following, the removal of the former regime in 2003, local people set about breaking the embankments in the interior of Hawizeh Marsh. This resulted in recovery of about 900 km^2 of marshlands by 2004. Reed beds have been slow to take hold in these newly flooded areas in comparison to a similar situation that saw reflooding of marshlands in the Central Marsh area to the west of Hawizeh. This difference in reed recovery has been attributed to the shallower water depths (generally under 1 m in depth) affected by the western embankments that still protect agricultural lands adjacent to Hawizeh, as compared to Central Marsh where water depths are deeper. It is also important to note that Iran has constructed a large dam on the

headwaters of the Karkha River and is continuing to divert water to agricultural lands in southwestern Iran.

An expanded description of the history of the region is given in Section 2.3 and Annex 1 of this document.

1.5 Creation of the Ramsar Site – An International Wetland of Importance

Hawizeh was proposed as Iraq's first "Ramsar site" in 2005 when the new government dispatched an Observer Delegation to the 9th Meeting of the Contracting Parties to the Ramsar Convention. The Ramsar Convention, more formally titled the "Convention on Wetlands of International Importance Especially for Waterfowl", is a global environmental treaty named after the city in Iran where a group of 17 nations and non-government (NGO) partners first established the treaty in 1971. As of September 2008, 158 nations are Parties to this treaty.

This delegation of officals from both the Ministry of Environment and Ministry of Water Resources, voiced the Government of Iraq's decision that that in advance of the October 2008 10th COP of the Convention, Iraq would accede to this treaty. One accession requirement was the designation of at least one Wetland of International Importance and submission of a map and detailed Ramsar Information Sheet describing the area. The required map was developed in June 2005 jointly by the Ministry of Water Resources, United Nations Environment Program (UNEP), and Nature Iraq with assistance from the Canadian International Development Agency (CIDA). A site description and this map were submitted in concert with Iraq's accession to the treaty on October 17, 2007. This is the first multilateral international environmental treaty to which Iraq has acceded since 2003.

Figure 2: Marshes extending into an open water area in the northern part of Hawizeh Marsh

It was recognized that the potential for designation of additional Ramsar sites inside Iraq should occur over time. In fact, a list of at least 30 additional possible candidate sites was published by Wetlands International that may guide the future selection of such sites (Scott 1994).

2.0 The Hawizeh Marsh Environment

2.1 Location

The Hawizeh Marsh lies to the east of the Tigris River, straddling the Iran-Iraq border. The Iranian section of the marshes is known as Hor Al Azim, where it is fed primarily by the Kharkeh River. In Iraq, this marsh is fed by two main distributaries departing from the Tigris River near Amarah, known as Al Musharah and Al Kahla'a.

The Hawizeh Marsh Ramsar Site extends north to south from the Birkat Al-Adheem and Umm An Nia'j lakes, bordered by the Iran-Iraq frontier on the east and the Majnoon Oilfield to the southeast. Its edges are roughly bordered by villages, roads, dykes and agricultural lands in the west including the Al-Shayb, Al-Musharah, Al-Amanilyah and Al-Kahla'a Causeways to the northwest, and the Al-Uzayr and Al-Amamiyah and Al-Khana (Dasim) Causeways in the southwest extremities. Small linear portions follow wetland waterways of the Al-Kassarah Canal in the west and along the Iran border area in the east. The Ramsar site is dissected by numerous dykes with surface roads including the Lisan Ajearda Causeway running east-west. The towns of Al Qurnah, Muzaybilah and Abu Saeh are notable west of the site as well as many smaller villages. The areas immediately east are dominated by the Azadegan Oilfield in Iran.

Figure 3: *Phragmites* marsh in southern Iraq

The Hawizeh Marsh is centered on latitude 31°25'N and longitude 47°38'E in the Iraq Governorates of Missan and Al-Basrah. The total designated Ramsar site area is 137 700 hectares as described in Table 1. The estimated 1973 pre-drainage area of Hawizeh Marsh was 243 500 hectares, thus about 56% of the original area has been included in this Ramsar site designation. A transboundary wetland, about 75-80% of the wetlands incorporated in the Hawizeh Marsh is located in Iraq with the rest found in the Islamic Republic of Iran (where it is called the Hor Al Azim). The Iraqi designated Ramsar site excludes the marsh areas that extend into Iran. The estimated average elevation of this total area is 4.0 m above sea level, dominated by permanent and seasonal, freshwater to brackish marshes with *Phragmites* reed beds and open areas of shallow waters. The Hawizeh Marsh is an integral part of the

Mesopotamian marshlands complex centered at the confluence of the Tigris and Euphrates rivers.

2.2 Land Cover of Hawizeh Marsh

A 2005 analysis (UNEP 2005) of the land cover of this (then proposed) Ramsar site was based on data from an image taken by the Indian IRS-P6 Remote Sensing Satellite, acquired on 16 June 2005 (see Figure 4 and Table 1). It indicates that, on that date, about 47% of the Ramsar site was dominated by high, medium or low density hydrophytic vegetation (*Phragmites* sp.), 38% by shallow to deep open waters, and with lesser coverages of xerohalophytic barren ground (0.5%), agricultural lands (3%) and dry marshlands with salinized soils (almost 3%). The area also had about 0.2% of its area covered by man-made surfaces comprising villages, roads and dykes.

Table 1: Land Cover of the Hawizeh Marsh Ramsar Site (UNEP 2005)

Class	Land Cover	Area in hectares (ha)	Percentage (%) of Ramsar Site
1	Halophytic Vegetation (salt tolerant plant species predominantly)	3 350	2.4%
2	Xerohalophytic Vegetation (dryland adapted plants predominantly)	4 150	3.0%
3	Hydrophytes (including high, intermediate and low density subclasses of water loving plants predominantly)	65 150	47.4%
4	Barren or sparsely vegetated areas	800	0.5%
5	Dry, former marsh often with salinized soils	3 625	2.7%
6	Other terrestrial vegetation (including agricultural fields)	3 900	2.8%
7	Submerged aquatic vegetation	4 400	3.2%
8	Open water (with shallow and deep subclasses)	52 050	37.8%
9	Built-up surfaces (villages, roads, etc.)	275	0.2%
	Total	137 700	100.0%

Subsequently, an updated land cover mapping of the Hawizeh area was also performed specifically for the preparation of this management plan. The analysis was based on the February 2008 FORMOSAT satellite image of Hawizeh marsh (see Table 2 and Figure 5).

Table 3 presents a general comparison of land cover change in Hawizeh Marsh from June 2005 to February 2008. Marsh vegetation (47-48%), dry soil adapted vegetation (6%), salinized soil areas (3%) and total agricultural areas (2-3%) all remain about the same total area over this 32-month period. However, the area of submerged aquatic vegetation increased from 3 to 12% and the area of open water decreased from 38 to 26% with a small amount (4%) of wet soil areas (thus possibly dewatered or low water surfaces) being introduced.

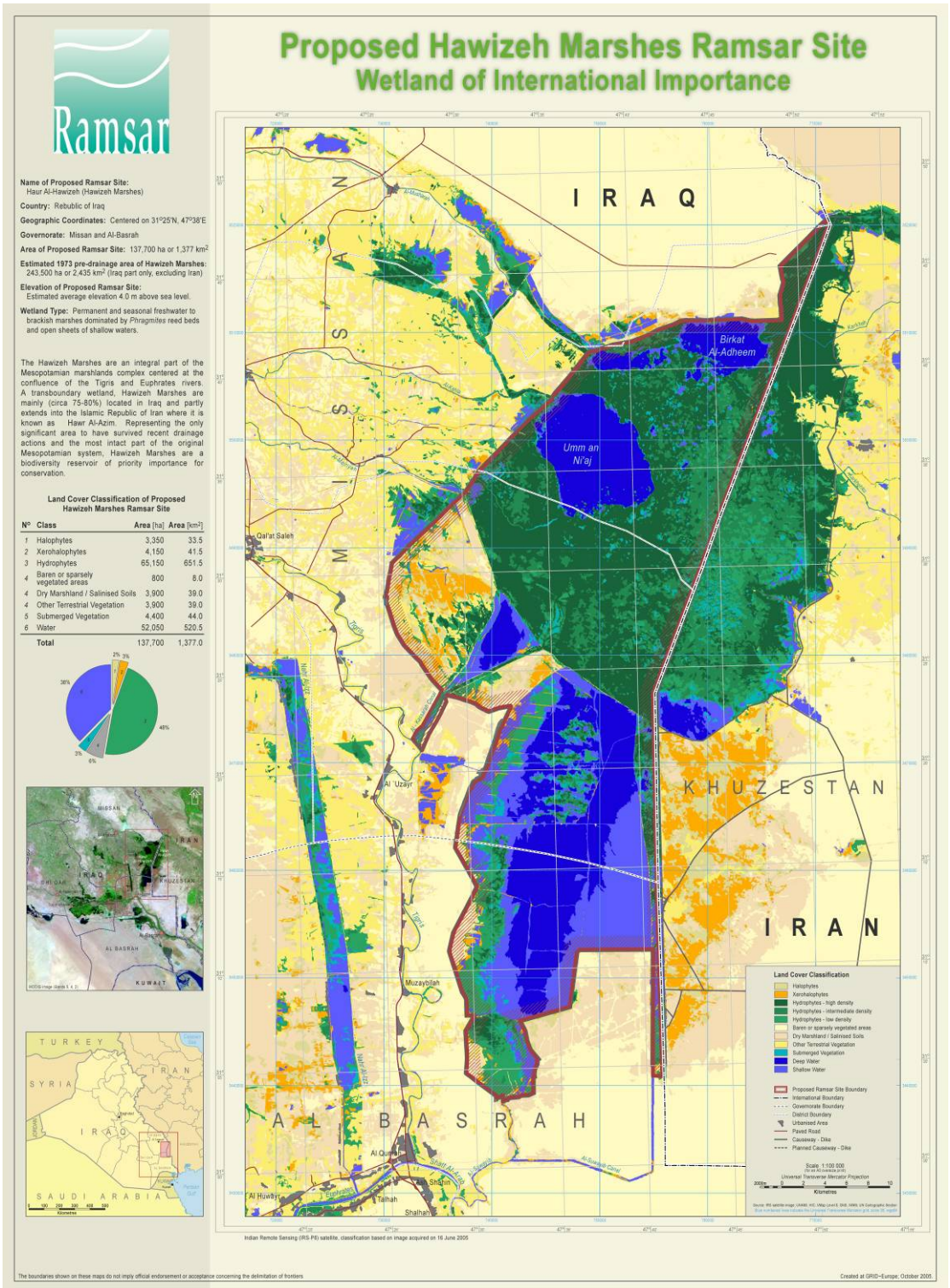

Figure 4: Land Cover Map of Hawizeh Marsh, June 2005 (UNEP 2005)

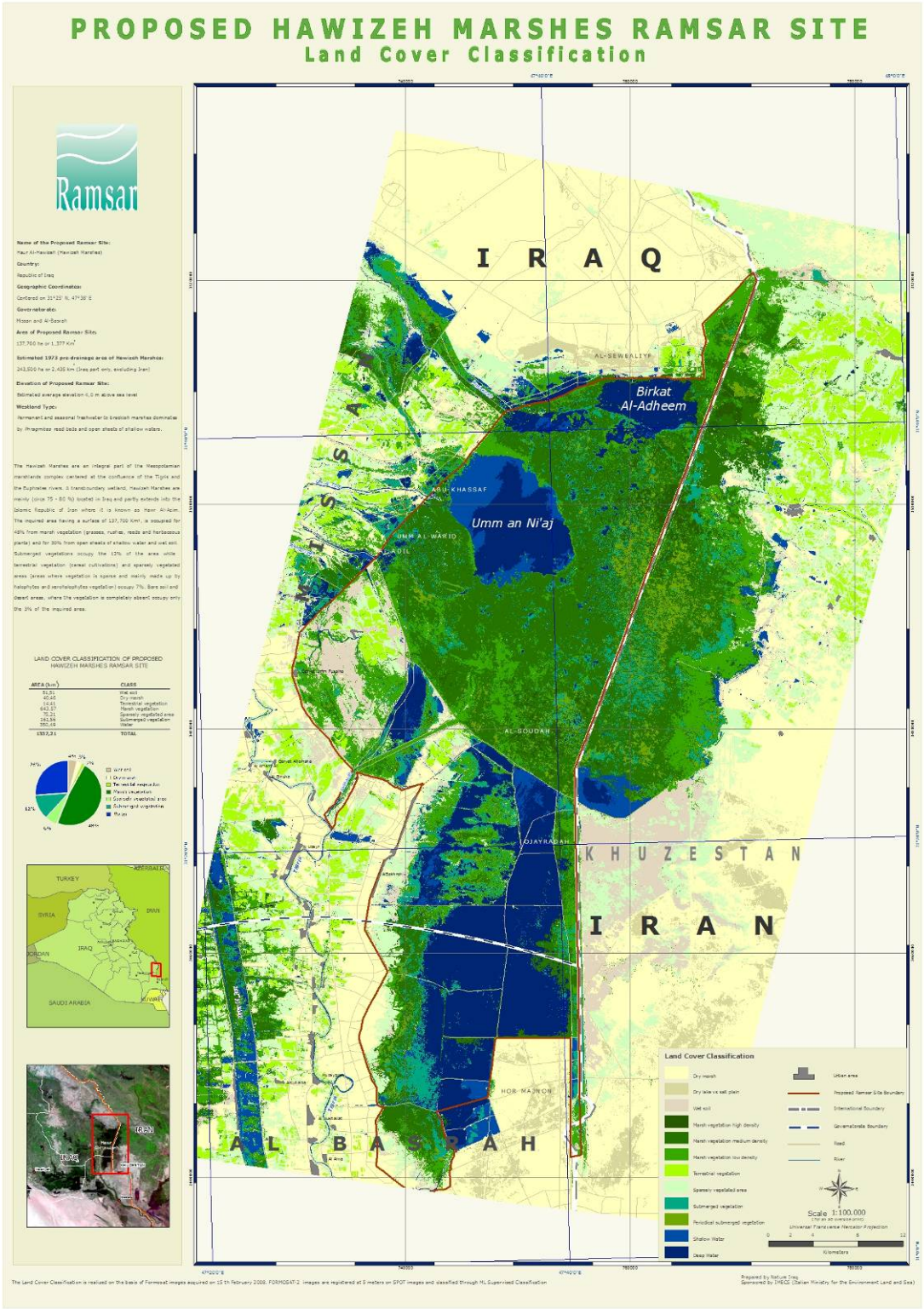

Figure 5: Land Cover Map of Hawizeh Marsh, February 2008 (Nature Iraq 2008b)

Table 2: Land Cover of the Hawizeh Marsh Ramsar Site in February 2008 (Nature Iraq 2008b)

Class	Land Cover	Area in hectares (ha)	Percentage (%) of Ramsar Site
1	Marsh Vegetation (including high, medium and low density)	64 357	48%
2	Terrestrial Vegetation (including cereals cultivation)	1 441	2%
3	Sparsely Vegetated Areas (including areas where vegetation is sparse and with halophytic vegetation)	7 520	6%
4	Submerged Vegetation	16 156	12%
5	Water (including shallow and deep waters)	3 5049	26%
6	Wet Soils	5 151	4%
7	Dry Soils	4 046	3%
	Total	133 721	100%

Table 3: Comparison of Land Cover for Hawizeh Marsh in June 2005 and February 2008

Land Cover Description	Percentage (%) of Ramsar Site June 2005	Percentage (%) of Ramsar Site February 2008
Halophytic Vegetation (salt tolerant plant species predominantly)	2.4%	6%
Xerohalophytic Vegetation (dryland adapted plants predominantly)	3.0%	
Barren or sparsely vegetated areas	0.5%	
Marsh Vegetation: Hydrophytes (including high, intermediate and low density subclasses of water loving plants predominantly)	47.4%	48%
Dry, former marsh often with salinized soils	2.7%	3%
Other terrestrial vegetation (including agricultural fields)	2.8%	2%
Wet soil areas	Not recorded	4%
Submerged aquatic vegetation	3.2%	12%
Open water (with shallow and deep subclasses)	37.8%	26%
Built-up surfaces (villages, roads, etc.)	0.2%	Not recorded
Total	100.0%	100%

2.3 History of the Hawizeh Marsh Area

This summary of the history of the Hawizeh Marsh area has been drawn from Iraq Ministry of Environment *et al*. (2006). Before the 1980s, during spring flooding the Tigris would directly overflow into the marshes. Extending for about 80 km from north to south, and 30 km from

east to west, the marshes covered an approximate area of 300 000 ha. The northern and central parts of the marshes were permanent, but towards the southern sections they became increasingly seasonal in nature. The permanent marshes had moderately dense vegetation, alternating with open stretches of water. Large permanent lakes up to six meters deep were found in the northern parts of the marshes.

In the early 1980s, during the conflict between Iraq and Iran, there was considerable environmental and physical damage done to Hawizeh Marsh as water was used as a military tool to shield against the advancing Iranian army. The area was drained and flooded according to military needs, and many fierce battles were fought in this marsh, especially along its border regions. Extensive physical damage to surface vegetation and soils occurred through military uses including the digging of trenches, bunkers and movement of military vehicles. The presence of unexploded ordinance continues to be a very real danger here. Chemical weapons were also used during the Iran-Iraq war; thus, dispersed agents continue to pose some threat at this time. There remains an unassessed threat from intact chemical canisters that could pose a danger to local inhabitants, to scientific survey personnel, and to biota. Numerous minefield and known ordinance areas are now marked but shifting water levels have masked these areas in some locations. These conditions exist on both sides of the international boundary line.

In 2003, the Hawizeh Marsh represented the remnants of a once vibrant set of Mesopotamian Marshes spread across southeastern Iraq and border areas shared with Iran. Almost 90% of these wetlands, the broadest extent of marshes in the Middle East just 20 years ago, were drained or damaged mainly by the series of directed actions by the previous Government of Iraq. This includes intentional drainage, redirection of incoming waters inside Iraq, and construction of various water control structures and hydroelectric facilities in Turkey, Iran and Iraq. These actions resulted in the loss of water, habitat and wildlife and forced over 400 000 local inhabitants, who depended on the resources of these marshes for survival, to relocate elsewhere in Iraq, Iran and other nations during the 1990s.

After 2003 and the overthrow of the Hussein regime, the government and people of Iraq with international advice and assistance have seen about 65% of the marshes constituting the Hammar, Central and Hawizeh Marsh areas rewatered through reflooding. This has facilitated revival of fish, birds and other wildlife species and habitat restoration. Many former local residents have also returned to this region in concert with this ecosystem recovery. But much remains to be done for all aspects of this area of Iraq.

Part of these recovery efforts included the proposal to designate the 137 700 hectares of the Hawizeh Marsh as a *Wetland of International Importance* (a “Ramsar Site”) under the Ramsar Convention on Wetlands. This occurred in October 2007. In addition, portions of the Central Marsh in Iraq have been proposed as a National Park (The “New Eden Project”). Management planning initiatives are underway in both of these areas today.

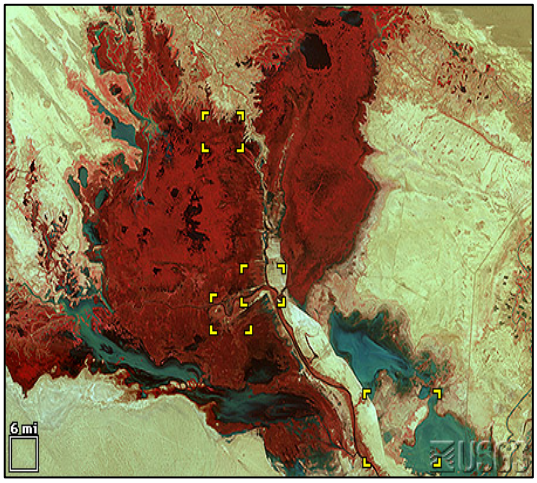

Figure 6a: Hawizeh Marsh in 1972 before dessication projects and diversions

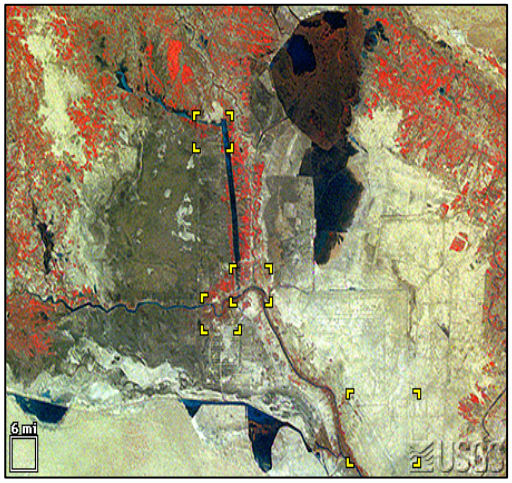

Figure 6b: Hawizeh Marsh in 1997 after dams, dessication projects and water diversions

Nature Iraq in concert with the Iraq Ministries of Environment, Water Resources, Marshland Affairs, Municipalities and Public Works, Agriculture and others, and with international assistance from the Government of Italy, has assisted the Government of Iraq and local stakeholders to develop this Management Plan for the Hawizeh Marshes. A more detailed text on the history of this region is presented in Annex 1 in Volume 1.

2.4 Marsh Reflooding and Restoration Since 2003

After the downfall of the Hussein regime in 2003, action by local people and managers at the Ministry of Water Resources resulted in numerous instances of release of waters to marshes across southern Iraq. At Hawizeh Marsh, many areas that had been intentionally drained or otherwise became dry in the previous decade, were reflooded. This was mostly undertaken through the breaking of embankments inside the Marsh, followed by the Ministry of Water Resources channeling increasing amounts of water through the Kahla'a and Musharah regulators. Since 2003, considerable effort has been directed at studying the best amounts of water and ways to promote a sustainable process for rewatering this damaged ecosystem. This is being done mindful that, in various cases, local people are supportive of keeping some former marsh areas dry to allow for agriculture or other development and that the availability of water is finite. These areas are mostly along the westerly embankments originally constructed prior to directed marsh drying projects in the 1990s. Table 4 describes some of the observations on the reflooding process and how it affected Hawizeh Marsh during the 2003 to 2008 period.

The UNEP IMOS (Iraq Marshes Observation System) Program from 2003 to 2006 and the New Eden Marshland Observation Project from 2006 to 2008, have provided monthly remote sensing monitoring of the southern marshes of Iraq, including at Hawizeh Marsh. This allowed development of a great deal of information on the changes that occurred at Hawizeh Marsh over the 2004 to 2008 period.

Some of these key observations (derived from Iraq Ministry of Environment *et al.* 2006) are summarized in Table 4. The last data set for the IMOS Program was derived in June 2006 when the UNEP support for this monitoring initiative on the marshes ended. The most recent observation made by the New Eden project was prepared in February 2008.

Figure 7a: The western edge of Hawizeh Marsh, June 2003

Figure 7b: Sanaf Marsh, a seasonally-inundated area north of Hawizeh Marsh, March 2003

Figure 7c: Northern area of Hawizeh Marsh, 2006

Figure 7d: Reflooded area of Hawizeh Marsh, 2006

Table 4: Observations on Rewatering and Restoration of Hawizeh Marsh 2003-2008 (UNEP IMOS Program/New Eden Project)

Date	Northern Hawizeh	Southern Hawizeh
February 6, 2003	Medium-size lakes are present, surrounded by some reed growth; most of the marshland vegetation is in winter dormancy.	Only sparse halophyte vegetation is present.
May 24, 2003	There is great expansion of marsh vegetation in dense stands, especially on the Iraqi side of the marshland.	This area is completely dry with no vegetation.
August 19, 2003	There is continued expansion of marshland vegetation towards the south and west in the newly-inundated areas.	The area remains dry with no vegetation.
November 23, 2003	The expansion of marsh vegetation in this area remains and appears to have	This area remains dry with sparse halophyte vegetation.

	stabilized.	
February 25, 2004	This area remains similar to the progress seen before; much of the marsh vegetation is in winter dormancy.	This area is covered by a large lake with very limited growth of marsh vegetation along its banks; the source of this water is from breached dikes allowing water to flow southwards from North Hawizeh.
May 19, 2004	Reeds exhibit lush regrowth extending further to the southeast.	The large lake remains with good growth of marsh vegetation along its northern extent, and lesser growth to the south.
August 30, 2004	This area has stabilized with extensive re-growth of reeds.	The area of inundation remains with slow regrowth of marsh vegetation along its banks and shallower areas.
October 20, 2004	There is increased growth of vegetation to the northwest and west; portions of the main marsh are going into dormancy.	This area continues to be dominated by a large area of open water, with continued slow growth of marsh vegetation along banks and shallower islands.
February 18, 2005	The pattern of marsh vegetation and open water lakes appears to have stabilized.	There appears to be much increased regrowth of reeds along the south-western shore of this lake, and slow continued regrowth elsewhere.
May 27, 2005	This area remains stable except for some expansion of water and marsh vegetation to the southwest.	It is likely that evaporation of some water here has led to a shallowing of water evidenced by areas of wet ground, which is enabling better regrowth of reeds within this area.
August 3, 2005	This area remains the same as before.	Marsh vegetation now covers all of the eastern shoreline and most of the western shoreline, and also some shallower banks within the open-water lake. Field observations have shown that the area of open water is approximately 1.5 meters deep which typically is too deep for reed propagation in this area.
October 2, 2005	This area continues to have dense marsh vegetation and open-water lakes.	This area appears the same as before.
December 19, 2005	This area remains stable with vegetation in dormancy.	This area remains stable with marsh vegetation in

		dormancy.
March 2006	This area continues to have dense marsh vegetation and open-water lakes.	Predominant open-waters lake marsh vegetation.
June 2006	Unchanged.	Unchanged.
May 2007	The area remains stable with predominant marsh vegetation	This area is predominantly open waters and lakes.
November 2007	Decrease of marsh vegetation	Predominantly open waters and lakes
January 2008	Predominant marsh vegetation	This area continues to be dominated by a large area of open water.
February 2008	Predominant marsh vegetation	Predominantly open water and lakes.

2.5 Stakeholders

A September 2007 Interministerial Workshop on Hawizeh Marsh (Nature Iraq 2007a) recognized that the following groups are potential stakeholders for the Hawizeh Marsh Management Plan:

Iraqi Ministries:
- Ministry of Agriculture
- Ministry of Culture
- Ministry of Environment
- Ministry of Higher Education
- Ministry of Marshland Affairs
- Ministry of Municipalities and Public Works
- Ministry of Oil
- Ministry of Water Resources

Local Governorates and Municipalities therein:
- Missan
- Basrah

Local Tribes and Councils:
- The Albo Muhammad and Al-Swaaidd tribes
- Elders
- Sheiks
- Councillors

Non-Government Organizations
- Local political and social groups
- Nature Iraq
- East Marshes Council of the Missan Governorate

2.6 Land Use and Ownership

Human beings have lived in the Hawizeh Marsh and the landscape for several millenia, learning how to live and to adjust with their surrounding environment. Natural factors and the local environment have shaped their use of natural resources, particularly the water itself and plants such as *Phragmites australis* and *Papyrus* sp. This has enspired a long and culturally unique history of working with these resources including affecting local building techniques.

This interaction was directed by the evolving nature of the local ecosystem and the influence of long-term changes in the Marsh, a synergy based on three interacting principles of the marsh: growth, change and decay. The dominant feature of settlement in the Marsh centered on small villages where the maximum number of people traditionally did not exceed about one thousand. The livelihood of the people was dependent on the cultivation of agricultural lands with crops such as rice, wheat and barley produced along the perimeter of the Marsh in the spring and the summer; harvesting of dates in the late summer and early autumn; water buffalo herding and fishing all year-long; and bird hunting in the winter and spring. Small manually-focused industries were also common which depended on local materials existing in the area. These activates did not require large urban centers or a high-level of services.

Several large settlement such as Basrah, Missan and Qalat Salah have been effectively supplying goods and services to the area and were fed by the Marsh in many respects. There are also numerous small villages in the area including Um Welha, Al-Awana, Um Nia'j, Al-Mayil, Abo Khasaf, Al-Raffay, Um-Warred, Al-Akraa, Al-Triabah, Um-Nateeha, Um-Aspeta, Al-Sakhrah, Bayett Helehil, Bayett Choban, Bayett Humood, Bayett Meri, Bayett Batah, Al Boghnaam, Bayett Kishyaish, Bayett Battool, Bayett Khalif, Bayett Husan, Bayett Nagish, Marrbay, Albo Bokheett, Bayett Khoaaf, Al-Baydhah, Al-Zichayeih and others (see Figure 10).

Generally, there are two main tribes, to which most social structure is related: the Albo Muhammad and Al-Swaaidd. The traditions and historical governance by these tribal groups has always made it a challenge to introduce new social conditions or laws such as those that might lead to changes in how the environment is viewed and its natural resources used. This continues to affect efforts to introduce change and build awareness on social issues or the practice of new laws here. The role of civil society and organizations in the Missan and Basrah Governorates to improve living conditions and the environmental management of Hawizeh remains poorly developed. There are few governorate, tribal or municipal councils in Missan and Basrah Governorates and the settlements around Hawizeh.

Figure 8: Young cattle herder in the marsh

Figure 9: Cleaning fish in the marsh

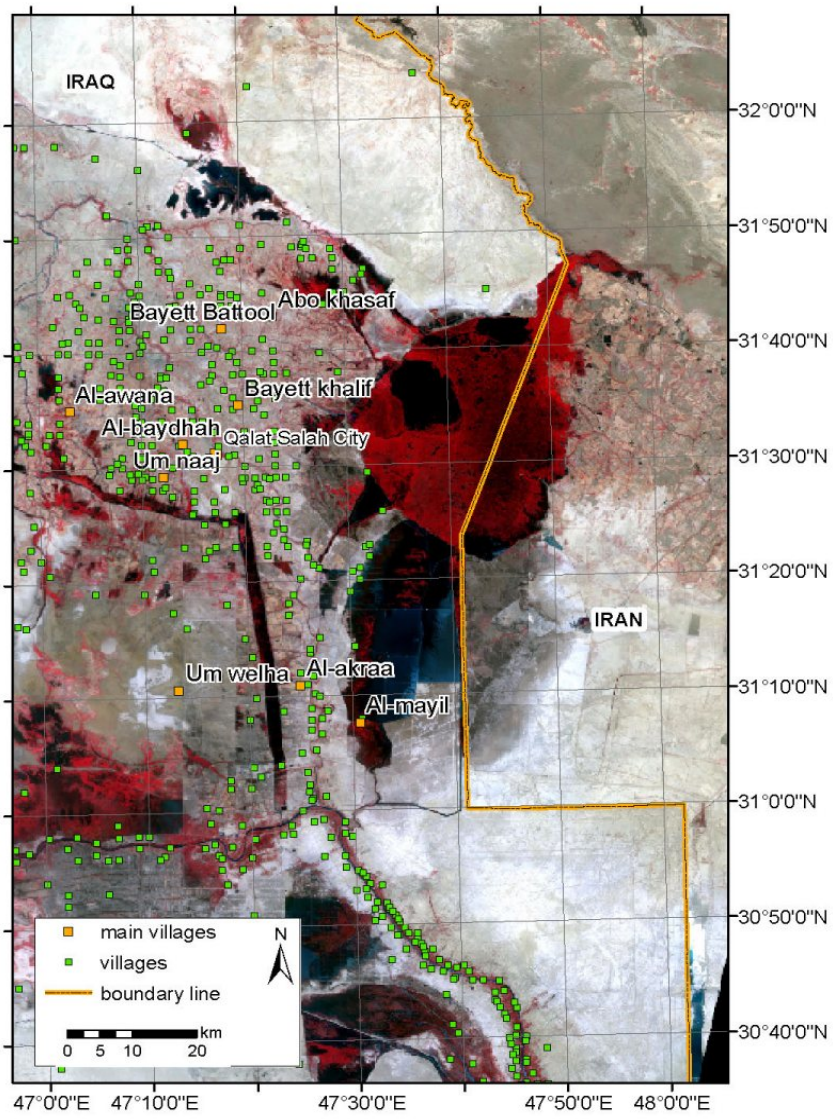

Figure 10: Location of the main villages (named with orange dots) and other villages (green dots) on the fringes of Hawizeh Marsh in Iraq

2.7 Habitat Types

There have been several efforts to characterize the habitats of the marshes of Iraq. This includes Maltby (1994), Scott (1994) and others. Scott (1994) for example recognized eight major wetland types in the Mesopotamian marshes including Hawizeh Marsh. These types were:

1) Permanent freshwater lakes with a rich submerged growth of aquatic vegetation, and typically with a marginal zone of floating aquatic vegetation.
2) Permanent freshwater marshes dominated by tall stands of *Phragmites*, *Typha* and *Cyperus*.
3) Rivers, streams, canals and irrigation channels, typically with little emergent vegetation and steep earth or muddy banks.
4) Permanent ponds, man-made irrigation ponds and duck-hunting ponds, typically with a pronounced drawdown in summer and little emergent vegetation.
5) Seasonal freshwater marshes dominated by rushes and sedges, typically occurring as a broad belt around the edge of the permanent marshes.

6) Seasonally flooded mudflats and semi-desert steppe.
7) Irrigated land and seasonally flooded arable land.
8) Shallow, brackish to saline lagoons, mostly seasonal and often with extensive areas of *Salicornia* sp.

Since an initial land cover assessment in 2005 of the Hawizeh area (see Table 1 in Section 2.2), Nature Iraq has been in the process of developing a more detailed habitat classification system and habitat monitoring program for the marshes of southern Iraq, including Hawizeh Marsh. This work has been built upon the knowledge base derived from four years (2004-2008) of field surveys of the habitat conditions of the southern marshes. Table 5 outlines the current habitat types and subtypes that characterize the Hawizeh Marsh and other marshes of southern Iraq.

Table 5: Proposed Habitat Classification System for the Southern Marshes of Iraq (Nature Iraq 2008a)

Habitat Type	Characteristics	Habitat Subtypes
Inland Standing Waters		
1.1 Ponds or lakes	Unvegetated standing water, free of all vegetation (floating, rooted submerged, or rooted floating plants)	--
1.2 Unvegetated mudflats	Unvegetated temporarily submerged mudflats, subjected to water level fluctuations	--
1.3 Emergent communities	Periodically or occasionally submerged habitats with perennial flowering plant communities adapted to aquatic environments that are subjected to water level fluctuations and temporary dissecation (*Cyperus difformis, C. michelianus, C. laevigatus*)	--
1.4 Aquatic communities	Communities formed by free-floating, rooted submerged or rooted floating vegetation	1.4.1 Free floating plant communities (*Lemna* sp. pl., *Salvinia natans, Spirodela polyrhiza*) including *Ceratophyllum demersum* and *Hydrocharis morsus-ranae* 1.4.2 Rooted submerged plant communities (*Potamogeton* sp. pl., *Vallisneria spiralis, Myriophyllum* sp., and *Najas* sp. pl.) 1.4.3 Rooted plant formations in floating mats (*Nymphaea* sp. pl., and *Nuphar luteum)*
1.5 Brackish and salt water vegetation	Salt or brackish ponds and lakes with perennial flowering plant communities	--

Inland Flowing Waters		
3.1 River, canal	Unvegetated rivers and canals	--
3.2 Submerged river vegetation	Freshwater submerged rooted vegetation	--
Marshes		
4.1 Permanent marsh vegetation	Marsh vegetation communities	4.1.1 Rooted helophytic vegetation with: (a) reed beds (*Phragmites australis*); (b) reedmace beds (*Typha domingensis*); or (c) other vegetation (*Cladium mariscus*) 4.1.2 Woody vegetation with tree-size formations, within the marshes with linear structure: (a) riparian with willows (*Salix* sp.); (b) riparian with poplars (*Populus* sp.)
4.2 Brackish and salt water marsh vegetation	Brackish or salt water marsh with helophytic vegetation	--
Deserts		
5.1	Desert shrub	--
5.2	Unvegetated desert	--
5.3	Unvegetated salinized soils	--
Woodlands		
6.1	Woodland, forest and other	--
6.2	Shrubs	--
Other Herbaceous Vegetation		
7.1	Grassland	--
7.2	Steppe	--
7.3	Sparsely vegetated land	--
Agricultural Land		
8.1	Crops	8.1.1 Rice production 8.1.2 Irrigated crops
8.2	Orchards and tree plantations	8.2.1 Orchard 8.2.2 Palm plantation
8.3	Rangeland	--
Aquaculture		
9.1	Aquaculture ponds	--
Human Settlements		
10.1	Town or village	--
10.2	Industrial site	--

Table 6: Legend for Nature Iraq Sampling Sites in Hawizeh Marsh: "KBA" – Key Biodiversity Areas Program site; "NB" – Nutrient Budget Program site; "HZ" – Hawizeh site number (see Figure 11)

Sampling Site – Local Name	Project and Site Code	Map Code No.	Latitude (North)			Longitude (East)		
			º	′	″	º	′	″
Al Sewalif	KBA (HZ 3)	1	31	41	44	47	42	55
Al-Udhaim	NB (9)	2	31	41	30	47	44	0
Al-Udhaim	KBA (HZ 2)	3	31	41	13	47	44	56
Al-Musharah	NB (1)	4	31	40	50	47	37	23
Al-Souda (North)	NB (18)	5	31	40	23	47	40	0.3
Al-Zubair	NB (2)	6	31	38	47	47	35	15
Abu Khassaf	NB (3)	7	31	37	0.5	47	33	7.7
Umm al Níāj	NB (16)	8	31	36	0	47	39	16
Umm al Níāj	KBA (HZ 1)	9	31	35	35	47	34	56
Umm al Warid	NB (21)	10	31	34	12	47	31	7.3
Al-Adil Old	NB (5)	11	31	34	5.6	47	30	3.9
Al-Adil	NB (4)	12	31	34	3.8	47	30	1.1
Al-Souda (South)	NB (20)	13	31	24	54	47	36	43
Al-Kassarah	NB (7)	14	31	21	39	47	26	57
Al-Baidha	NB (19)	15	31	21	28	47	38	58
Lsan Oajayrda	KBA (HZ 4)	16	31	19	55	47	37	51
Eastern Lsan Oajayrda	KBA (HZ 5)	17	31	19	36	47	37	50
Lsan Oajayrda	NB (22)	18	31	17	27	47	34	37
2 km from Lsan Oajayrda Police Station	KBA (HZ 7)	19	31	17	22	47	27	21
Near Lsan Oajayrda Police Station	KBA (HZ 6)	20	31	17	10	47	36	46
Hor Majnoon	NB (23)	21	31	8	18	47	35	0
Al-Suwayib	NB (8)	22	30	58	5.6	47	29	28

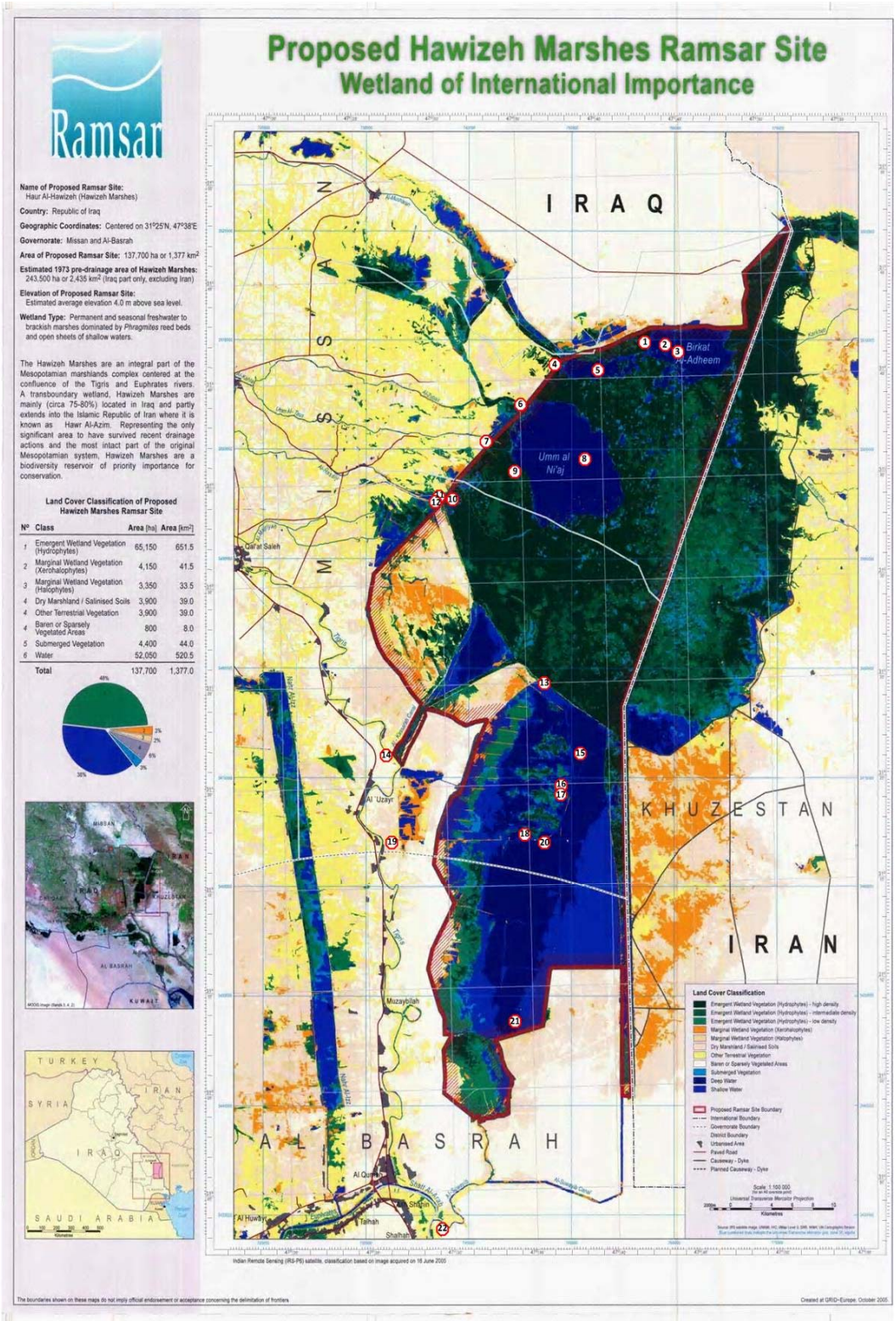

Figure 11: Location of Key Biodiversity Areas and other sampling points visited in Hawizeh Marsh from 2005-2008 (sites referred to are those listed in Table 6).

2.8 Flora and Fauna including Species at Risk

This section reviews the state of knowledge on the biological diversity present in the Hawizeh Marsh for plants, amphibians and reptiles, birds, mammals and fish. Recommendations for action in each of this biological categories are outlined in Sections 7..2 and 7.12.

2.8.1 Plants

Vegetation cover is an important indicator of ecological conditions in the Hawizeh Marsh, and is now used for monitoring and evaluating ecological changes. It is a fundamental element in the successful reestablishment and diversification of natural habitats for wildlife and thus is an important component of the Marsh. Wildlife depends upon vegetation for food and shelter. Moreover, the local people are dependent upon vegetation, in particular the common reed (*Phragmites australis*). This reed is used for construction of dwellings, for animal fodder (animals which provide dairy products for use and sale, and dung for fuel), and for weaving mats for sale to provide essential income. Other plants in the marshlands are also used for construction and potentially for food. A few plants are useful for medicines and as food supplements. These aquatic macrophytes are also a food source for invertebrate and vertebrate animals and offer biota shelter from predators. Macrophytes thus are keystone species in the functioning of Hawizeh Marsh.

The ongoing Key Biodiversity Area (KBA) survey led by Nature Iraq from 2005 to 2008 in the Hawizeh Marsh has described environmental conditions associated with the vegetation cover of the Marsh, identification of plant species biodiversity as well as identification, classification and evaluation of the natural plant communities. This work also aims to evaluate the changes that have occurred to the natural vegetation of the area in recent years. Field observations were made at 22 sampling locations selected in the Hawizeh Marsh (see Iraq Ministry of Environment *et al.* 2006). The sampling points for the broad Key Biodiversity Areas survey of the Marsh are identified in Table 6 and Figure 11.

Based on these KBA surveys, 23 aquatic, wetland and terrestrial plant species were confirmed to be present in the Hawizeh Marsh in the 2005-2008 period (see Table 7), but these under-represent the full diversity one might expect here. For example, an ecological assessment in the Hor Al Azim on the Iranian side of the border in 2003 found 56 species of wetland plants, which could be considered as a good reference for the undisturbed condition of this area. There is no definitive information yet on what plant species may be of significant conservation concern in these marshes. However, the northern portion of Hawizeh Marsh is more heavily vegetated throughout, including submerged plant species such as *Ceratophyllum demersum* that dominate the areas with open water.

Najas armata is dominant in some parts of Hawizeh Marsh perhaps because of the high transparency of the water and the low degree of water movement at some sites. This plant species is favoured by many fish species. Other plant species that are found in the Hawizeh Marsh in lower abundance include *Typha domengensis*, *Lemna* sp., *Salvinia natans*, *Hydrella* sp. and *Potomageton pectinatus*. Other terrestrial species found around the edges of the Marsh include *Alhagi graecorum, Tamarix* sp. and *Capparis spinosa.*

Phragmites australis, *Ceratophyllum demersum*, *Potomageton illucense*, *Potomageton pectinatus*, *Potomageton perfoliatus*, *Hydrella* sp., *Salvinia natans*, *Najas armata*, *Myriophyllum demersum*, *Typha domengensis* and various other reeds and grasses are common in the Hawizeh area. *Tamarix* sp. is particularly common in recently reflooded areas but tends to die out as water permanence occurs. All plant species recorded on KBA data sheets for the Hawizeh Marsh are listed in Table 7.

Table 7: Plant Species Seen in the KBA
Study Areas for Hawizeh Marsh 2005-2008

Species Name	Common Name
Emergent Plants	
Cyperus papyrus	Umbrella sedge
Typha domengensis	Reed mace
Phragmites australis	Common reed
Schinoplectus litoralis	Bulrush
Salicornia sp.	Glasswort
Submerged Plants	
Ceratophyllum demersum	Common hornwort
Myriophyllum demersum	Eurasian water milfoil
Najas marina	Spiny naiad
Najas minor	Slender naiad
Potamogeton crispus	Curly pondweed
Potamogeton lucens	Shining pondweed
Potamogeton pectinatus	Sago pondweed
Potamogeton perfoliatus	Clasped pondweed
Potamogeton nodosus	Longleaf pondweed
Vallisneria spiralis	Eelgrass
Floating Plants	
Salvinia natans	Water fern
Lemna gibba	Duckweed
Floating Leafy Plants	
Nymphaea alba	White water lily
Bacopa monneria	Brahmin
Terrestrial Plants	
Arundo donax	Giant reed
Tamarix sp.	Salt cedar
Populus euphratica	Euphrates poplar
Suaeda sp.	Sea blite

2.8.2 Reptiles and Amphibians

All reptiles and amphibians in Hawizeh Marsh are poorly understood in terms of the habitatneeds. There is no information to properly identify which of these species may be of major conservation concern. Some of the important reptile and amphibian species observed since 2003 in Hawizeh Marsh are:

- Common Tree Frog (*Hyla arborea)* - Rare
- Caspian Terrapin (C*lemmys caspica)* - Common
- Euphrates Soft-shelled turtle (*Rafetus euphraticus)* - Common

Other reptile and amphibian species that may occur in Hawizeh Marsh are:

- Marsh Frog (*Rana ridibunda)*
- Common Water Frog (*Rana esculenta)*
- Green Toad (*Bufo viridis)*
- Tessellated Water Snake (*Natrix tessellate)*
- Gray's Desert Racer (*Coluber ventromaculatus)*
- Spotted Sand Boa (*Eryx jaculus)*
- Desert Monitor (V*aranus griseus)*

Figure 12: A Common Water Frog in the southern marshes

2.8.3 Birds

There are two categories of bird species that are of conservation priority in Iraq: (a) those of "Conservation Concern" and (b) "Globally Threatened" as defined below by BirdLife International. These species were recorded during the Key Biodiversity Surveys of Iraq's southern marshes and the northern Kurdish Region of Iraq during the 2004 to 2008 period.

These categories are:
Species of Conservation Concern (CC): These includes endemic and near-endemic species; species known to be declining in all or most of their range; those with a major proportion (over 50%) of their world population breeding in the Middle East; and those that with internationally important wintering popultions in Iraq (Porter, In preparation).
Species that are Globally Threatened (GT): These are Red Data species identified by BirdLife International because of their globally endangered, vulnerable or near-threatened status.

Surveys in Hawizeh Marsh from 2005 to early 2008 covered four winter and three summer periods and recorded 132 bird species. These are noted as being of varying status such as: resident breeders, migratory winter visitors, and breeding summer visitors. Some are found in Iraq in both summer and winter. These are listed in Annex 5 together with their known status. Of these birds, 28 species are deemed to be of Conservation Concern ("CC"), six species of which are Globally Threatened ("GT") (see Table 8). Five of these species of Conservation Concern are "endemic species" (a non-migratory species) found only in the Mesopotamian Marshes and their environs or are endemic races found only in Iraq.

Figure 13 : Iraq Babbler

Figure 14: Waders on the marsh

Table 8: Bird Species of Conservation Concern
Recorded in the Hawizeh Marsh, from 2005 to 2008

"CC" – Conservation Concern;
"GT" – Globally Threatened;
"Endemic" – a non-migratory species or race as indicated

Common Name	Species Name	Conservation Status
Marbled Duck	*Marmaronetta angustirostris*	CC, GT
Red-crested Pochard	*Netta rufina*	CC
Ferruginous Duck	*Aythya nyroca*	CC, GT
Little Grebe	*Tachybaptus ruficollis*	CC, Endemic Race
Greater Flamingo	*Phoenicopterus [ruber] roseus*	CC
Sacred Ibis	*Threskiornis aethiopicus*	CC
Eurasian Spoonbill	*Platalea leucorodia*	CC
Eurasian Bittern	*Botaurus stellaris*	CC
Pygmy Cormorant	*Phalacrocorax pygmaeus*	CC
Darter (African Darter)	*Anhinga [rufa] melanogaster*	CC
Asian Imperial Eagle	*Aquila heliaca*	CC, GT
Macqueen's Bustard	*Chlamydotis macqueenii*	CC, GT
Purple Swamphen	*Porphyrio porphyrio*	CC
Spur-winged Lapwing	*Vanellus spinosus*	CC
White-tailed Lapwing	*Vanellus leucurus*	CC
Black-tailed Godwit	*Limosa limosa*	CC, GT
Collared Pratincole	*Glareola pratincola*	CC
Armenian Gull	*Larus armenicus*	CC
Slender-billed Gull	*Larus genei*	CC
Caspian Tern	*Hydroprogne [Sterna] caspia*	CC
Pin-tailed Sandgrouse	*Pterocles alchata*	CC
Spotted Sandgrouse	*Ptercoles senegallus*	CC
Hooded Crow	*Corvus [corone] cornix*	CC, Endemic Race
Grey Hypocolius	*Hypocolius ampelinus*	CC, Endemic Species
White-cheeked Bulbul	*Pycnonotus leucogenys*	CC
Basra Reed Warbler	*Acrocephalus griseldis*	CC, GT, Endemic

		Species
Iraq Babbler	*Turdoides altirostris*	CC, Endemic Species
Dead Sea Sparrow	*Passer moabiticus*	CC

2.8.4 Mammals

The information provided in Table 9 is based on published information for the Iraqi marshes, supplemented by observations at Hawizeh Marsh made during fieldwork in 2004-2008 and reports from local marsh dwellers. The Smooth-coated Otter (*Lutra perspicillata maxwellii*) is possibly the rarest and most famous mammal in the Marsh, being the focus of a popular book on the southern marshes.

Table 9: Mammal Species Sighted or Likely Occurring in Hawizeh Marsh 2004-2008

"SCC" – Possible Species of Conservation Concern as listed by IUCN

Common Name	Species Name	Hawizeh Status	Conservation Status
Long-fingered Bat	*Myotis capaccinii*	Not seen	SCC, Vulnerable
Grey Wolf	*Canis lupus*	Reported	SCC, Vulnerable
Smooth-coated Otter	*Lutra perspicillata maxwellii*	Reported	SCC, Vulnerable and Endemic
Common Otter	*Lutra lutra*	Reported	SCC, Near-threatened
Mesopotamian Fallow Deer	*Dama damamesopotamica*	Not seen	Least Concern
Striped Hyaena	*Hyaena hyaena*	Not seen	SCC, Rare; Near-threatened
Goitered Gazelle	*Gazella subgutturosa*	Not seen	Vulnerable
Marsh Bandicoot Rat	*Erythronesokia bunii*	Not seen	SCC, Rare; Near-threatened; Endemic
Mesopotamian (Harrison's) Gerbil	*Gerbillus mesopotamiae*	Not seen	SCC, Rare; Endemic
Honey Badger	*Mellivora capensis*	Reported	SCC, Rare
Jungle Cat	*Felis chaus*	Not seen	SCC, Rare
Indian Crested Porcupine	*Hystrix indica*	Not seen	Not rated
Wild Boar	*Sus scrofa*	Observed	Common
Small Indian Mongoose	*Herpestes auropunctatus*	Not seen	SCC, Rare
Asiatic Jackal	*Canis aureus*	Observed	Common
Red Fox	*Vulpes vulpes*	Not seen	SCC, Rare
Lion	*Panthera leo*	Not seen	SCC, Likely Extirpated
Leopard	*Panthera pardus*	Not seen	Not rated

There is insufficient information to accurately suggest the current status of all of these 18 species of mammals in the Hawizeh Marsh but the area remains a biological refugia in Iraq. Of the 18 species that may occur here, two are "red-listed", being identified by IUCN as species of conservation concern globally. Many of the animals are secretive or nocturnal, and appear only in isolated areas that are logistically difficult and currently dangerous to attempt to survey.

2.8.5 Fish

Hawizeh Marsh was once the single greatest source of commercially caught fish in Iraq, providing a significant proportion, once estimated at over 65%, of all fish consumed in cities across Iraq. Today, after decades of habitat degradation, a small fishery is slowly recovering. The Hawizeh Marsh is now dominated by introduced carp species (such as *Cyprinus carpio*) and invasive species. *Barbus sharpeyi (*bunni) is well distributed in the Iraqi marshes and has a high market value. However, about 50% of the other most common fish species in Hawizeh are either not marketable due to their small size or are unpopular due to religious restrictions locally. Carnivorous species are also reducing the catch of popular species.

After the carp, the most common species found in catches (Abd, personal communication) in Hawizeh Marsh now are:
1. Liza abu (khishni) - the most common species in Hawizeh but regarded as small and unmarketable.
2. *Carrasius auratus* (bugbug or goldfish) - an introduced species but also small (maximum 400 grams);
3. *Silurus triostegus* (juri) - a native species and the dominant fish by weight of catch.
4. *Aspius vortax* (sheleg) - a carnivorous species but unpopular and not fished due to religious norms locally.
5. *Mastacembelus mastacembelus* (marmareg) – an unpopular eel species and not fished due to religious norms locally.
6. *Heteropneustus fossilis* (abo alhakam) - also unpopular and not fished due to religious norms locally.

About 13 species of fish today are commonly seen in fish catches and in local markets, as described below in Tables 10,11, and 12. There are some data on fish catches (Table 11) in the Hawizeh Marsh from 2005, but these are still considered low numbers in comparison to market catches once known for this area. Fish size remains of concern as described in Table 12. Bunni (*Barbus sharpeyi*) and juri (*Silurus triostegus)* in winter and spring months were the most predominant portion of catches in 2005, while hemery (*Barbus luteus*) took on greater importance in the Spring period. Six of these species may be Species of Conservation Concern ("SCCs") in Hawizeh Marsh from a fisheries management perspective as they are considered economically desireable as well as under the greatest threat from habitat decline and over-fishing. These species are: *Barbus grypus* (shabout)*, Barbus sharpeyi* (bunni), *Barbus xanthopterus* (gattan), *Cobitus taenia* (lakh mukhattat), *Liza abu* (khishni) and *Tenualosa ilisha* (sbour) (see Table 10 and Annex 3)*.* Across southern Iraq, at least 20 species (including the six species named above) of the over 80 freshwater fish species known in Iraq (as outlined in Coad *et al*., In preparation) may be species of conservation concern in Iraq.

Considerable attention is needed to encourage reestablishment of a fishery that both supports local needs and has the potential to restablish a marketable fish catch to support local economic development. This will require facilitating hatchery and natural production of fingerlings to stock the Marsh and introduction of sustainable fishing practices with local fishermen. It would make sense to focus on increasing production of marketable, popular edemic species of fish such as *Barbus sharpeyi.* Overall, the local fishery remains unstable and not at a level yet considered sustainable or generally able to support a significant commercial fishery.

Table 10: Fish Species Observed in Hawizeh Marsh in 2005 and 2007

"SCC" – Possible Species of Conservation Concern in Hawizeh Marsh as per Coad *et al*. (In preparation)

Species	Observed in 2005	Observed in 2007	Proposed Conservation Status (Coad *et al.*, In preparation)
Acanthobrama marmed	X	X	
Alburnus mossulensis	X	X	
Aspius vorax (sheleg or shillik)	X	X	
Barbus grypus (shabout; large-scaled barb)	X	--	SCC, marketable, ecologically sensitive species
Barbus luteus (hemery)	X	X	
Barbus sharpeyi (bunni)	X	X	SCC, economically important, highly marketable species; Threatened
Barbus xanthopterus (gattan)	X	--	SCC, economically important, marketable species; Threatened by high water turbidity
Carassius auratus (goldfish or bugbug)	X	X	
Cobitus taenia (lakh mukhattat)	--	X	New species to Marsh in 2007; Endangered in Europe and Turkey
Ctenopharyngodon idella (samty, grass carp)	--	X	
Cyprinus carpio (common carp)	X	X	
Heteropneustus fossilis (abo alhakam)	--	X	Identified globally as a threatened species
Liza abu (khishni; freshwater mullet)	X	X	SCC, economically important; marginally marketable
Mastacembelus mastacembelus (spiny eel)	X	X	
Mystus pelusius (abu-zummair)	X	--	
Silurus triostegus (juri)	X	X	Highly marketable
Tenualosa ilisha (sbour)	X	?	SCC
Total No. of Fish Species	14	13-14	

Source: Abd (2005): Hawizeh Marsh records from Um Nyai Marsh, Al Udhiem Marsh and Al Uziar Marsh.

Table 11: Summary of Daily Fish Catches in Hawizeh Marsh in 2005 (Al-Noor 2005)

Month	Daily Catch in kg/Fisherman	Percentage (%) of Daily Catch by Major Species				
		Barbus sharpeyi (bunni)	*Barbus luteus* (hemery)	*Silurus triostegus* (juri)	*Cyprinus* sp. (carp)	*Tenualosa ilisha* (sbour)
February	29-32	58	--	29	16	--
March	5-35	52	--	43	5	--
April	5-28	56	--	32	--	8
May	12-22	21	43	33	--	--

Figure 15: Traditional net fishing in the marshes

Table 12: Range in Length of Fish in Daily Catches at Hawizeh Marsh from February to May 2005 (Al-Noor 2005)

Species Name and Common Name	Range in Length (cm)
Silurus triostegus (juri)	39-78
Barbus sharpeyi (bunni)	23-50
Cyprinus sp. (carp)	21-61
Barbus luteus (hemery)	12-22
Tenualosa ilisha (sbour)	32-54
Liza abu (khishni)	8-17
Samman	10-14
Mystus pelusius (abu-zummair)	17-19
Aspius vortax (sheleg)	31-45
Other carp species	8-25

2.9 Hydrology

2.9.1 Hawizeh Marsh Hyrdological Complex

The Hawizeh Marsh complex (Sanaf seasonal marsh and the Hawizeh/Al Azim permanent marshes) are mainly fed by the rivers flowing from Iran (Teeb, Diweridj and Kharkeh Rivers), and from Iraq (Musharrah, Khala'a and Micheriya Rivers, emanating from the Tigris river).

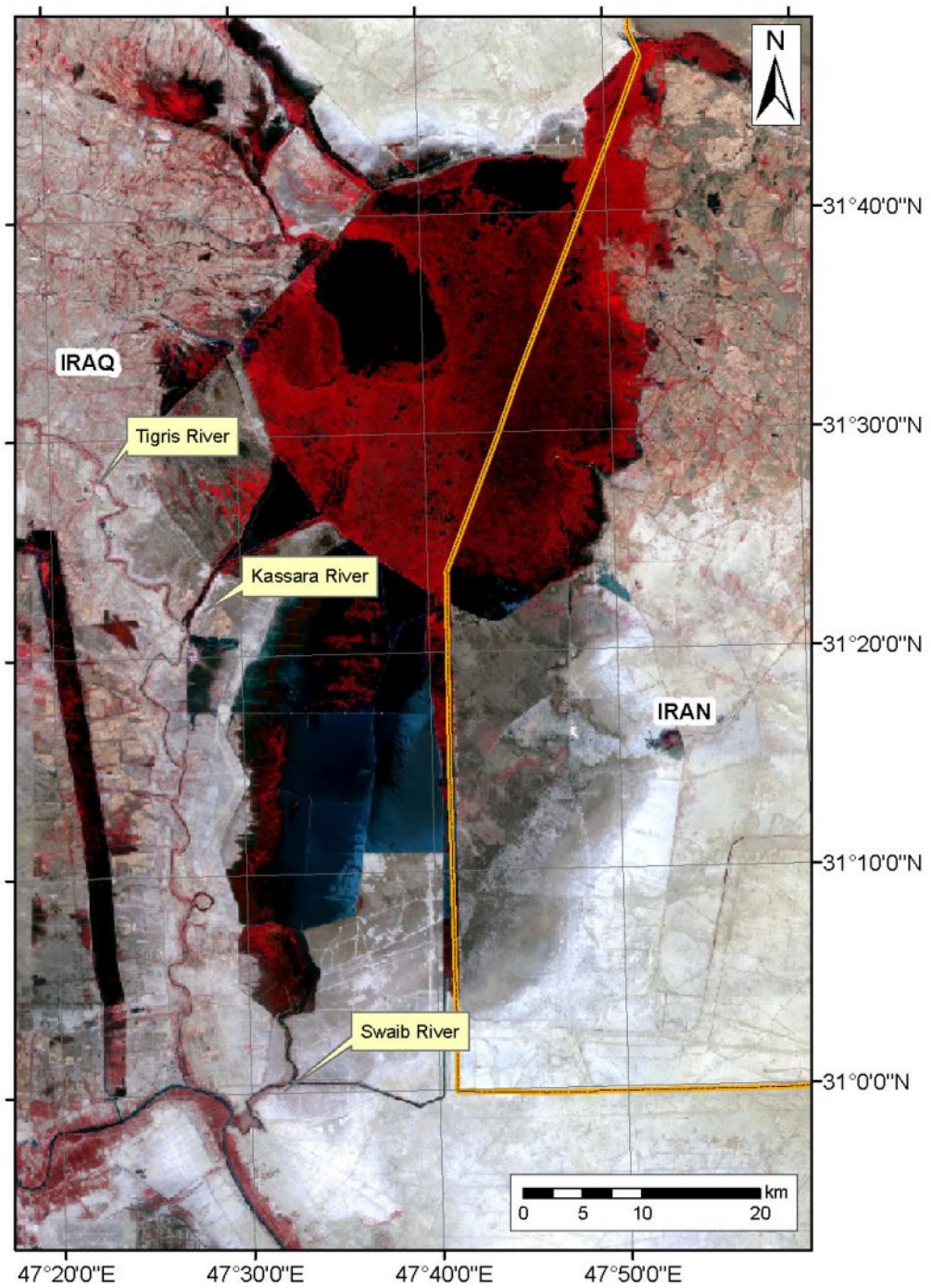

Figure 16: General hydrological layout of Hawizeh Marsh

From the Hawizeh Marshes water returns to the Tigris River via the Kassarah and Swaib Rivers, joining the Tigris respectively 59 km and 23 km upstream of the city of Qurnah. General information on the Tigris and Kharkeh river basin is provided in the following sections.

2.9.2 Tigris River

The Tigris is one of the largest rivers of the Middle East, stretching for over 1900 km, of which 1415 km are within Iraq with a catchment area of 235 000 km^2. The river emerges from

the southwest part of Turkey from Lake Hazar, being fed by a series of small watercourses originating from Geldjuk Lake at an altitude of about 1200 m above sea level.

When the Tigris River leaves the Diarbekirskya Plain, three large tributaries – the Batman, Garzan and Bokhtanchai Rivers – join its course. These three tributaries provide most of the water in the uppermost reach of the Tigris. The Khabour River, with a 6270 km^2 catchment area, joins the Tigris River at the Iraq-Turkey border. Downstream at Mosul, the river valley widens greatly. Here, 278 km away from the Turkish border, the Tigris is joined by its largest tributary – the Greater Zab. At 378 km, it is joined by its second- largest tributary – the Lesser Zab River. These tributaries provide the majority of its floodwater. The river traverses the Mesopotamian Plain receiving two more tributaries – the Adhaim River which joins the Tigris River at 828 km from the outfall (68 km downstream from Samarra) and the Diyala River which joins the Tigris at 683 km (32 km downstream from Baghdad at the Sarai gauge site). From Kut, the river runs through the marshland area. Levees run along both sides of the riverbed. The area on the left bank is occupied by the Hawizeh Marsh complex.

Past the city of Kut, the Tigris River enters the large agricultural plain developed around the city of Amarah. The Amarah area begins near the off-take of the Saad Canal, approximately 34 km west of the city of Amarah and ends 10 km downstream of the confluence with the Kassarah River. The length of the Tigris River in this section is approximately 128 km. The Tigris River branches off into several rivers and canals as shown in Figure 17.

Within the Kut region, the riverbank elevations are as high as 2 m, but within the Kassarah region, they decrease to as low as 0.5 m, thus creating an easy opportunity for the river to overflow. The river width gradually decreases from 400 to 500 m at Salman-Pak, to 50 m at Qalat-Salekh. At the town of Amarah, the Kahla'a River takes off from the Tigris on its left bank and flows towards the east (see Figure 18). The Tigris takes a south-easterly turn after a distance of 750 m, and at this turn, the Musharrah River takes off from the left bank of the Kahla'a River.

The Musharrah River flows eastwards up to the town of Musharrah, 30 km downstream. The average width of the river is 55 m. The river takes a south-easterly course thereafter and branches off after 7 km into the Shatt Al Amah and Al Malha Rivers. The two branches finally disappear into the Hawizeh Marsh 9 km downstream. A water control structure regulates the flow across the Musharrah River 790 m downstream of its off-take from the Kahla'a River. Numerous channels take off from the Musharrah River mostly on the right bank. The canals merge with Hor Al Chekka. Recent flow measurements in the Musharrah River are shown in Figures 19 and 20.

From its diversion with the Musharrah, the Khala'a River takes a southeasterly course thereafter up to the town of Kahla'a located 26 km downstream. The average width of the river is 100 m. A head regulator now exists on the Khala'a River, 1.35 km downstream from the Musharrah River off take.

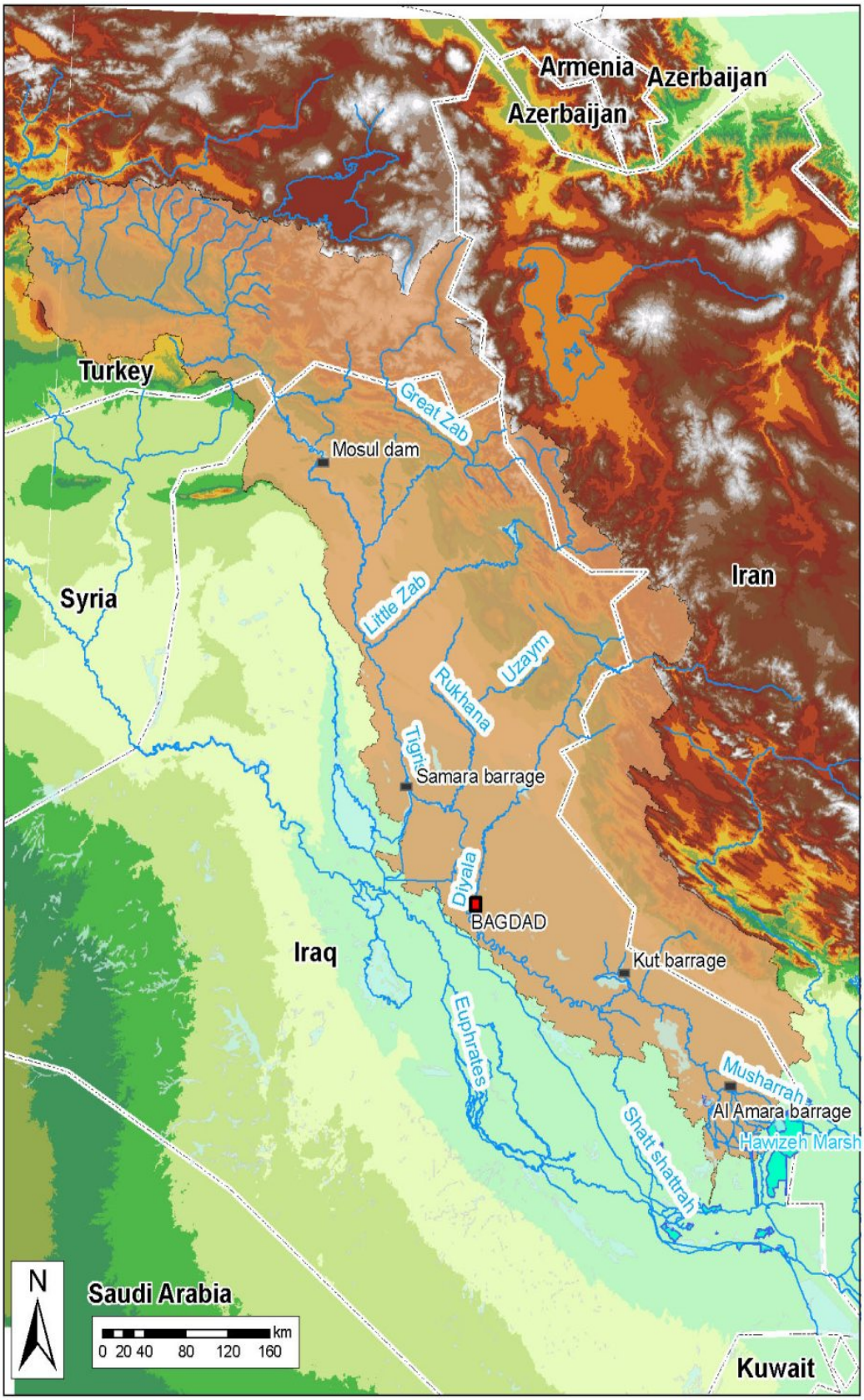

Figure 17: Tigris River Watershed

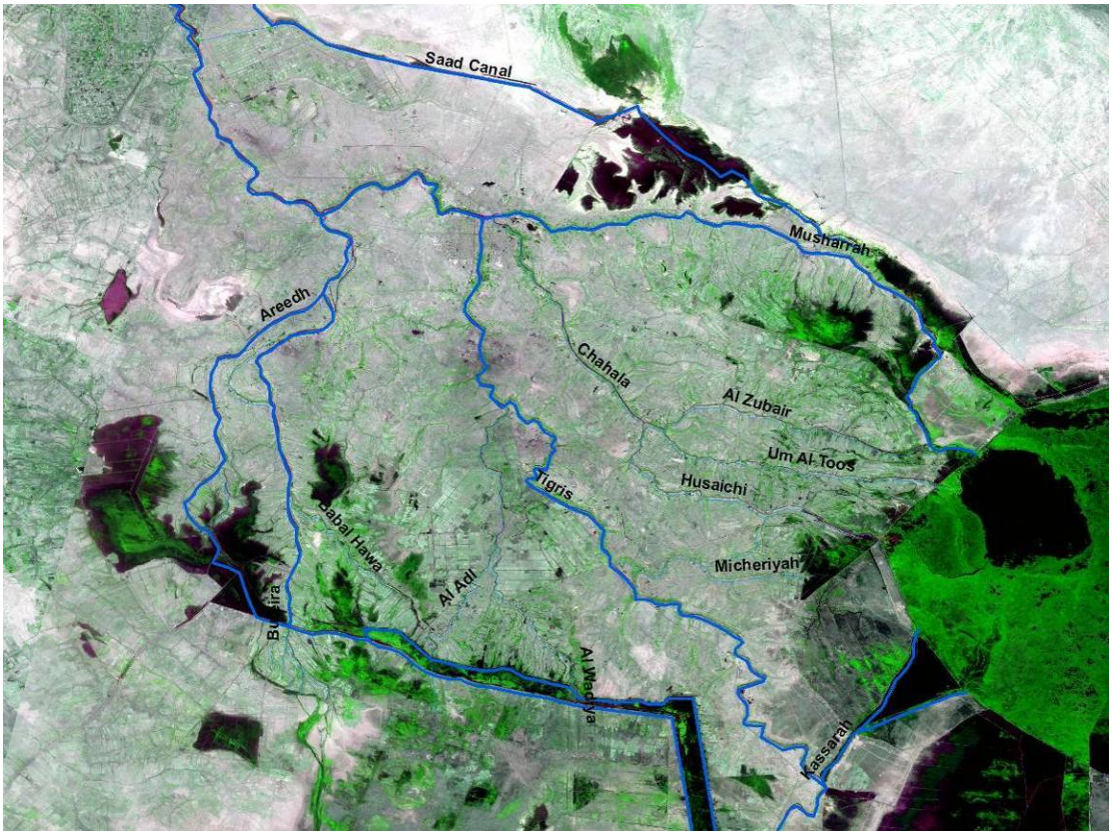

Figure 18: The hydrologic network within the Amarah area

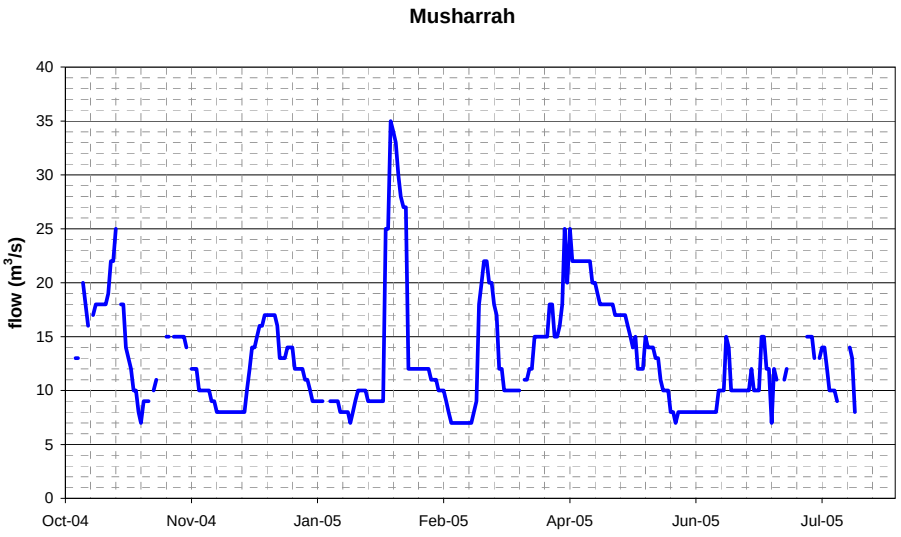

Figure 19: Daily flow measurements along the Musharrah River (2004-2005)

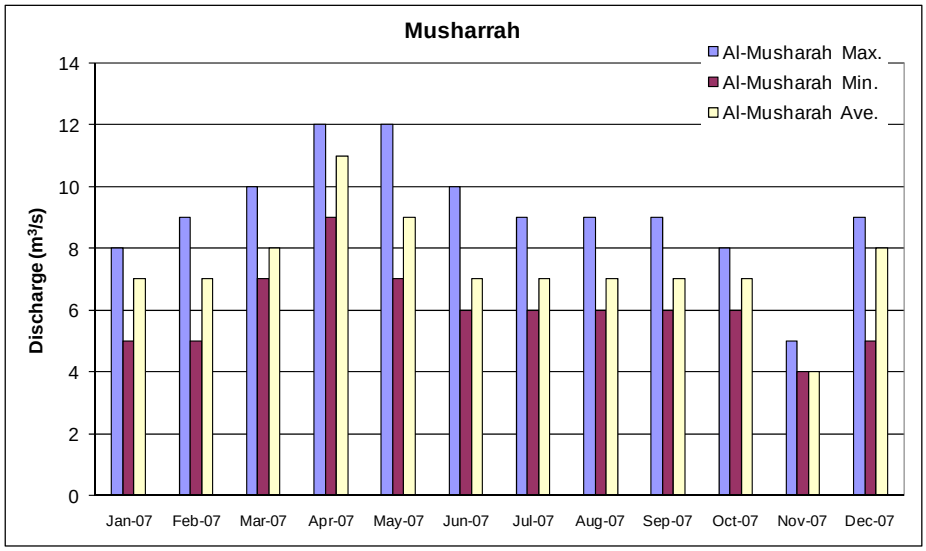

Figure 20: Monthly flow measured along the Musharrah River (2007)

At the town of Kahla'a, the Husaichi River branches off on the right bank. The Husaichi flows southward for a distance of 4 km and thereafter flows southeasterly. The average width of the river is 55 m. The river in its end reach finally branches off into Al Shalfa and Al Adl, which then disappears into Hawizeh Marsh. The Kahla'a River branches off into Um Al Toos to the right and Al Zubair to the left, 2 km downstream of the Husaichi take-off. Um al Toos branches off in a southeasterly direction and turns eastwards on its meandering course. The average width of the river is 65 m. Um Al Toos finally branches off into three streams (the Um Sahh, Shinsely and Sulail) that finish their course into the Hawizeh Marsh. The Al Zubair branches off into a northeasterly direction and meanders in an easterly course. The width of the river varies from 50 m to 150 m. It finally branches off into two streams (the Al Adil and Al Aaiwaj) after 8.5 km that finish their course into into Hawizeh Marsh. Flows recorded on the Kahla'a are shown in Figures 21 and 22.

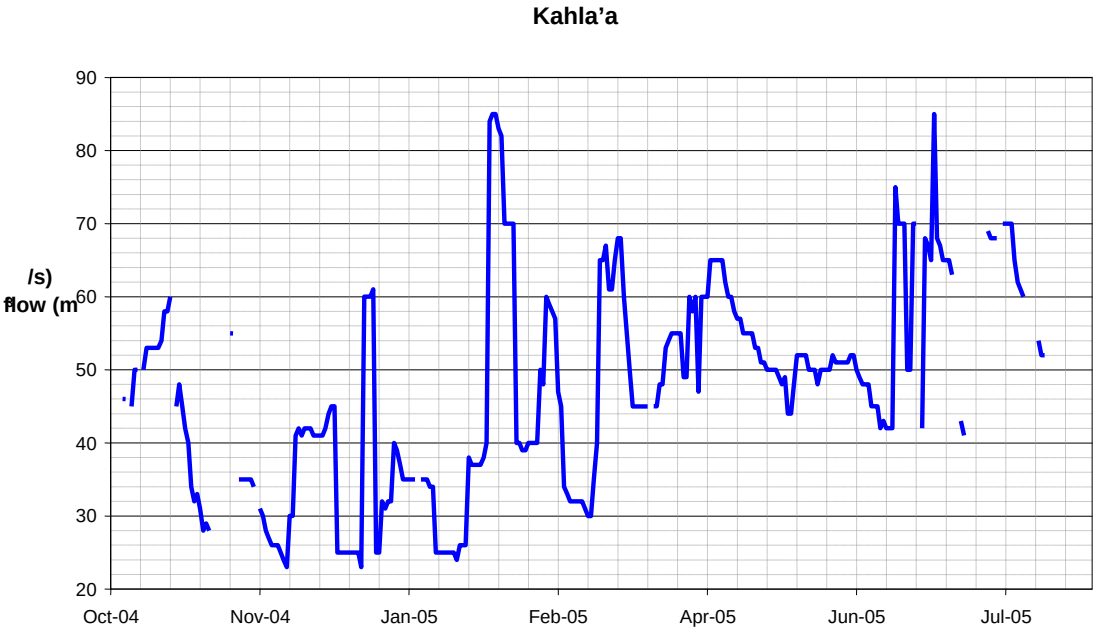

Figure 21: Daily flow measurements along the Kahla'a River (2005)

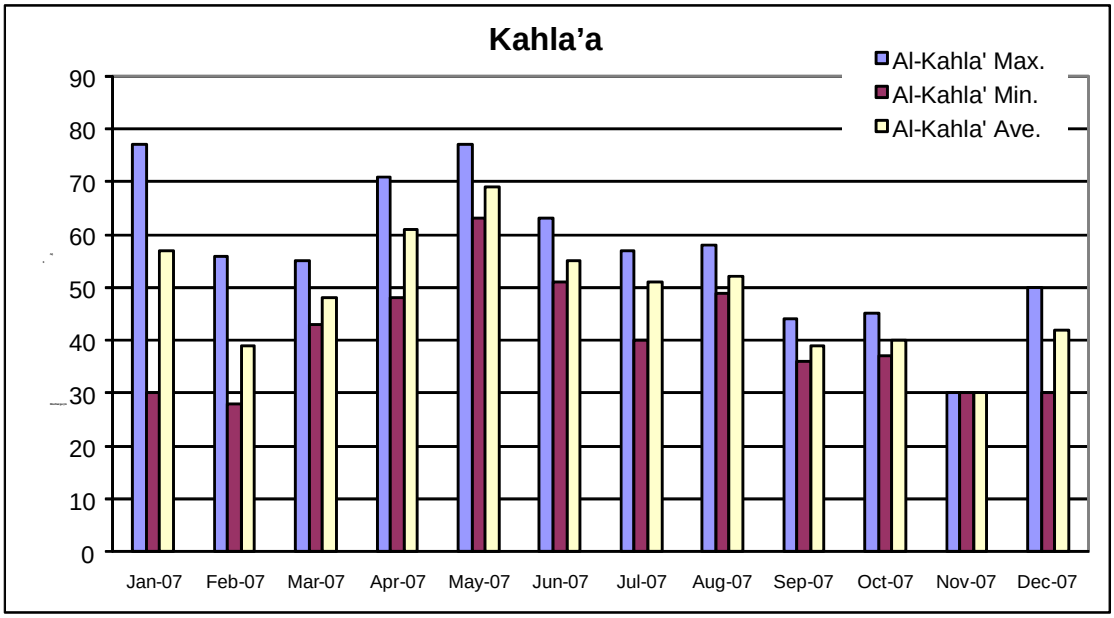

Figure 22: Monthly flow measured along the Kahla'a River (2007)

2.9.3 The Kharkeh River

The most important contribution to the flow to the Hawizeh Marsh from Iran is represented by the Kharkeh River which is amongst the largest rivers in Iran (Figure 23, Table 13).

The Kharkeh River drains a vast catchment area of about 48 500 km^2, mostly located within the northern Zagros Ranges. The Kharkeh has two main tributaries: the Seymareh and Kashgan rivers. These two tributaries join at Pole-Dokhtar, in Lorestan Province and then, within a short distance, the Kharkeh River enters Khuzestan Province.

The active contributing part of the catchments includes the territories upstream from the Pay-e-Pol gauging station in Khuzestan where the maximum discharges have been recorded. This station is considered to be on the divide between the mountainous catchments and the Khuzestan territory. A major dam and reservoir, called the Kharkeh Storage Dam, was built a short distance upstream from this station, draining an area of aproximately 42 600 km^2. Filling of the reservoir was completed during the 2000-2002 period.

There are several plains, totaling about 70 000 hectares upstream of the Azadegan Plain that are going to be developed by the water resources from the Kharkeh Dam. With the exception of one plain, the other plains are located on the right bank of the River and entirely depend on the water resources from the Kharkeh River. These are usually referred to as "the upper plains" of the development area in the Kharkeh Irrigation Development Project (KIDP).

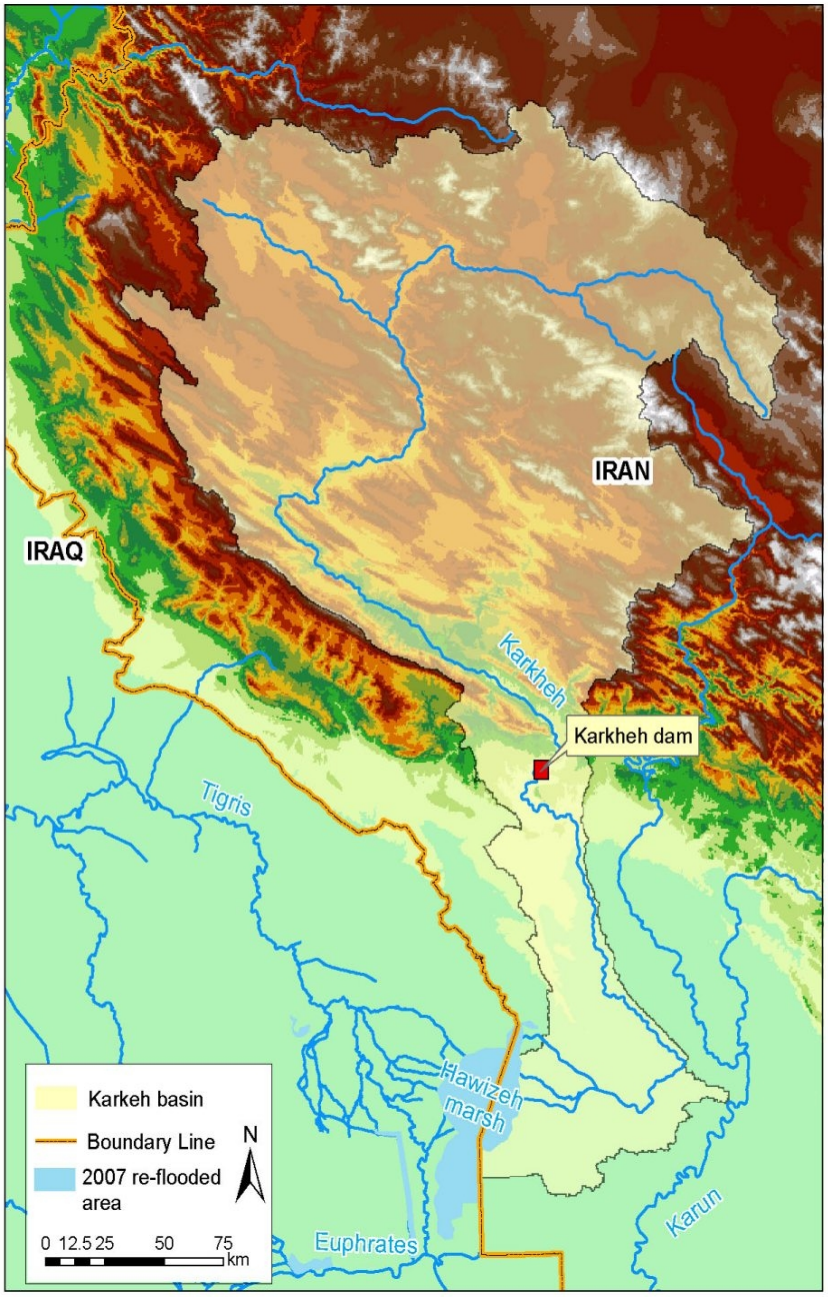

Figure 23: Kharkeh River Watershed

Downstream from the above plains, the large plain of Azadegan (covering 220 000 ha) constitutes the main development area of the KIDP. As far as the current and the future flow contribution from the Karkheh River, Table 13 and Figure 24 summarize the monthly inflows into Hawizeh Marsh before and after the irrigation development, with respect to the relatively undistrurbed portion of this marsh complex (the northern part) and the degraded portion (the southern part). Overall, the annual water inflows are projected to be halved by this development, with the main difference occurring in the spring months (UNEP 2004b).

The Kharkeh River in Khuzestan Province meanders through a rather flat plain. The slope of the river reduces continuously from an average of 0.43 m/km in the reach between Pay-e-Pol and Hamidieh, to an average of about 0.16 m/km between Hamidieh and Susangerd. Closer to the Hawizeh/Al Azim Marsh complex, the slope falls to a few centimeters per kilometer.

Table 13: Comparison between average monthly inflows (mcm/month) into Hawizeh Marsh from the Kharkeh River

Month	Average monthly inflows (mcm/month)		
	Without development	With development, northern part	With development, southern part
Jan	489	78	24
Feb	588	188	27
Mar	968	380	47
Apr	967	570	60
May	535	359	60
Jun	263	153	48
Jul	157	104	56
Aug	97	95	57
Sep	67	78	56
Oct	110	45	42
Nov	257	51	29
Dec	387	69	23
Annual	4987	2170	528

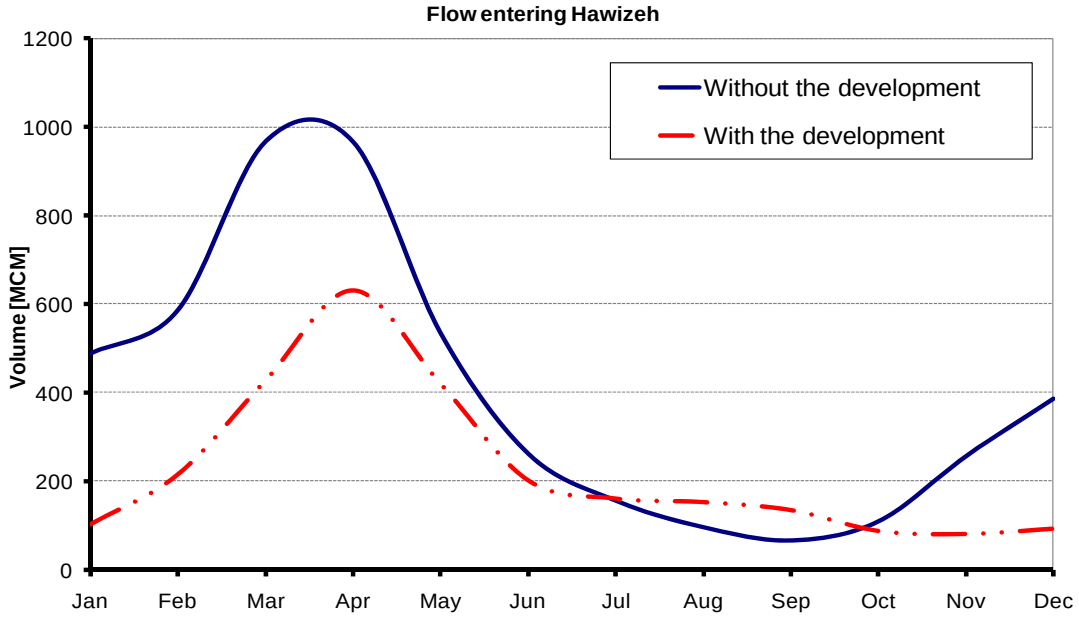

Figure 24: Comparison between historical and development scenarios for inflows into Hawizeh Marsh from the northern part of the Kharkeh River

The first bifurcation of the river occurs just south of Hamidieh where the Kharkeh Nour (formerly named the "Kharkeh Kur", or Blind Kharkeh) used to divert from the main Kharkeh River. Closer to Hawizeh Marsh, the river course branches in several channels.

The Kharkeh River course down to Abdolkhan station has had adequate capacity to keep the natural floods within its natural channel. However, from this point downstream, and mainly because of the continuous flattening of the slopes, the natural capacity of the river to carry the high discharges is reduced; hence, the high floods tend to spill over the banks and flow overland. This is particularly pronounced downstream from the Hamidieh Station, where the flood flows frequently used to overspill the riverbanks. Almost all the river reaches downstream from Hamidieh have been protected by earth dykes on both sides.

2.9.4 Hawizeh Topography

The flow contribution from Iran and Iraq ultimately discharge into the vast Hawizeh-Al Azim complex. The Hor Al Azim is a natural depression located at the outlet of the Kharkeh River. Only a small part of this depression lies within the Iranian territory, and the larger part is located in Iraq where it receives the flows from the Tigris River. There is no accurate survey of the natural physiography of the Marsh. However, from the restricted sources of tentative information and also from visual indications, the deepest part of the Marsh is in its northern part (including the permanent lakes of Hawizeh Marsh in Iraq) where the depth of water exceeds 6-8 meters (Iraq Ministry of Environment *et al*. 2006). Towards the south, the depth of the water reduces. However, in major parts of the Marsh, particularly those in Iran, the depth of water is less than 3 meters, allowing the growth of reeds.

Measurements made by military personnel have provided a tentative topography of the Marsh (Figure 25) and a classification of the water depth (Table 14). The table is probably applicable only to the Iranian part of the Marsh, though the range of figures seems to be compatible with other indications for the entire system.

Table 14: Classification of Water Depths in Hor Al Azim (Iran)

Depth range (m) %	Percentage of the Marsh (%)
0-2	57
2-3	32
3-4	8
>4	3

2.9.5 Hawizeh Water Balance

Regulation structures, canals, dams and embankments built in the past thirty years for irrigation and hydropower projects along the Karkheh and Tigris rivers had a major impact on available water for Hawizeh Marsh. Total water availability was estimated for both natural (without regulation structures) and regulated conditions. The available volume is approximately 48 billion cubic meters for natural conditions and 21 billion cubic meters for regulated flow (Figures 26 and 27).

Information about future agriculture development in the Tigris basin, affecting the available water for Hawizeh, is not consistent nor reliable. Regardless, if the agricultural projects in Iran are developed as planned, Hawizeh Marsh inflows of water from the Kharkeh River will likely be further decreased.

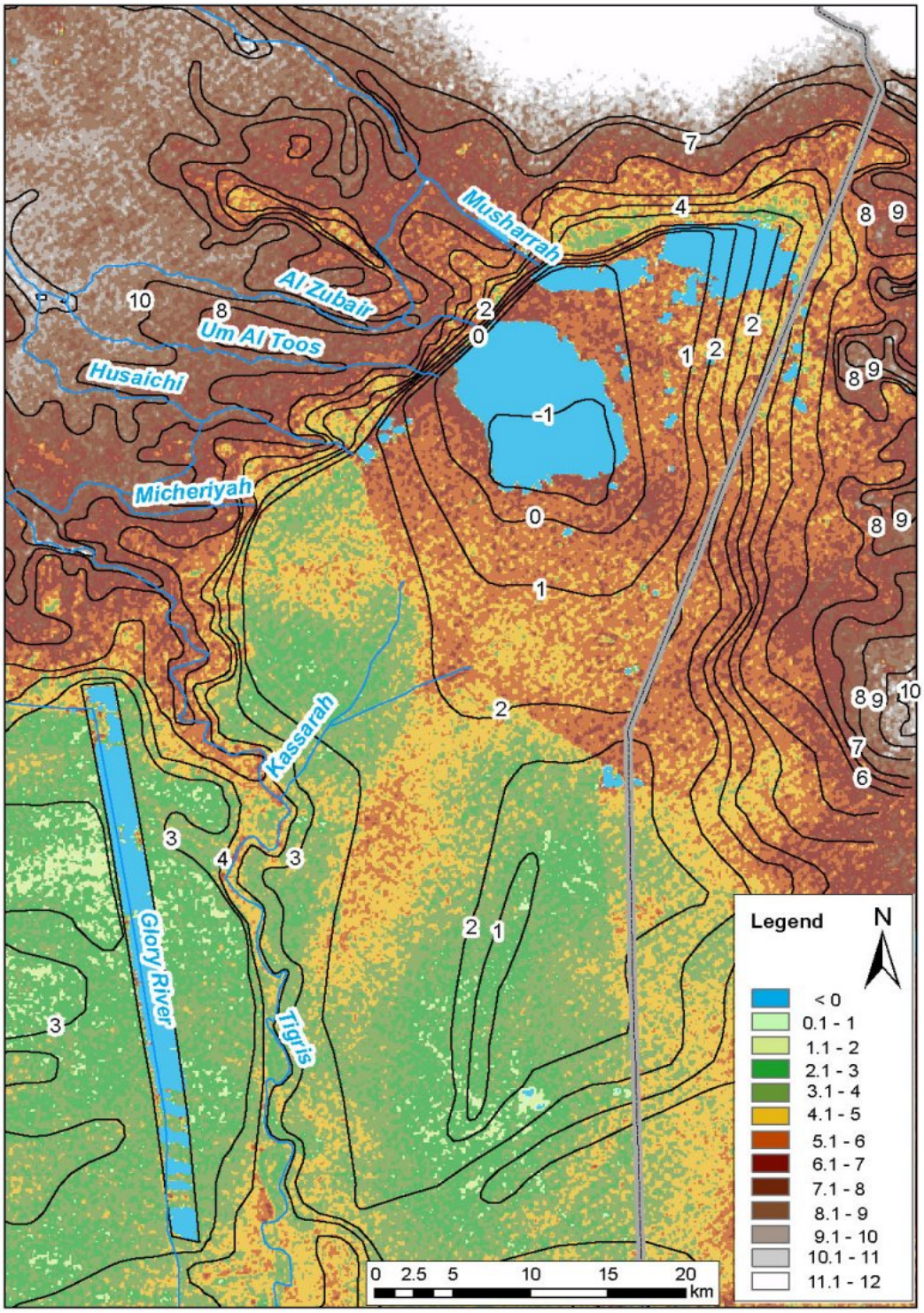

Figure 25: Topographical Map of the Hawizeh/Al Azim Marsh Complex

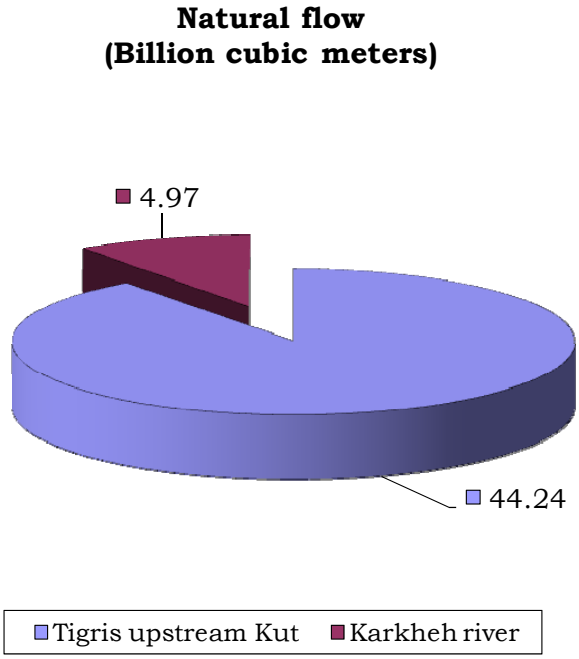

Figure 26: Available water in the Hawizeh/Al Azim Marsh Complex

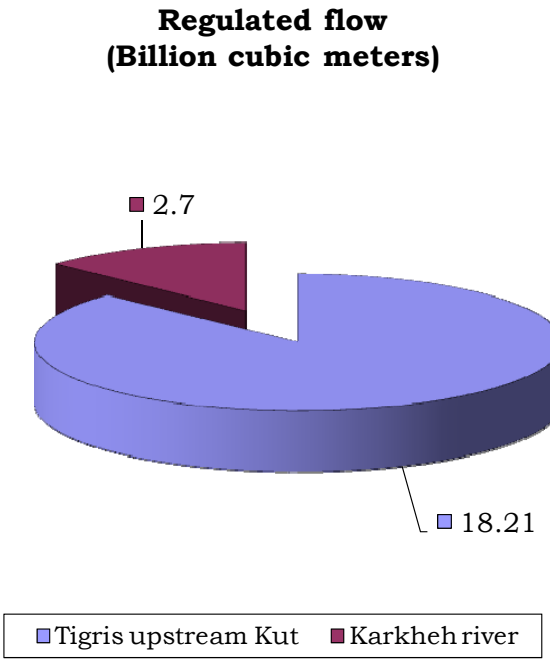

Figure 27: Available water in the Hawizeh/Al Azim Marsh Complex for the pre- and post-dams development

2.10 Protected Areas

The Assafia Wildlife Park, designated in about 2004 is the only protected area in the immediate Hawizeh Marsh and its environs. The mechanism used to create this area is not clear nor are its management objectives. The site is set aside for research on birds and fish in particular. It is under the management authority of the Iraq Ministry of Agriculture, Directorate of Basrah Agriculture in cooperation with the Marine Science Centre, University

of Basrah. The site is about 380 hectares in size and sits in the eastern fringe of the southern Hawizeh Marsh north of Basrah relatively close to the international boundary with Iran.

To date, it has only minor investment of management resources including a small trailer and several unpowered boats. Due the small size, it does not represent the range of habitats present in this area.

3.0 Mandate for this Plan

3.1 Developing the Plan

Nature Iraq in concert with Iraq Ministries along with international assistance from the Government of Italy, has assisted the Government of Iraq to develop this Management Plan for the Hawizeh Marsh. The Iraq National Marshes and Wetlands Committee has proposed that that this should be a comprehensive planning framework covering both the ecological and socio-economic factors affecting the people and Nature in this region.

A series of initiatives have occurred in support of developing this Management Plan as outlined in Table 15.

Table 15: Initiatives Supporting Creation of the Hawizeh Marsh Management Plan

Time Period	Initiative
July-October 2005	Nature Iraq and UNEP prepared two digital maps of the status as of June 2005 of vegetation, water and related land cover characteristics and cultural features of the area that the Government of Iraq proposed as the bounded 137 700 hectare area of the Ramsar site.
2005-2007	Nature Iraq, the Iraq Ministry of Environment and the Iraq Ministry of Water Resources cooperated in preparation of a 20-page "Ramsar Information Sheet" outlining the ecological and cultural features of this area and the rationale for its proposed designation as a Ramsar site. This was completed for October 2007 as part of Iraq's Ramsar Convention accession process.
June 2007-March 2008	A project consultant with expertise in the Ramsar Convention, wetland management planning and national wetland program development was seconded part-time to Nature Iraq from Environment Canada to assist in developing this project and a first draft of the Management Plan.
July 2007	Nature Iraq organized a working meeting with Iraq Ministry of Environment officials in Sulaimani July 3-4, 2007 to outline the proposed steps and to seek Ministry officials' advice on the path forward.
September 2007	Based on this meeting, it was agreed to host a broader workshop that occurred from September 7-9, 2007 to draft the outline for the Management Plan and derive advice from key Iraqi Ministries. This meeting was held in Amman, Jordan and facilitated by Iraqi, Italian, Jordanian and Canadian experts. It focused on: (a) the drafting of a table of contents, objectives and principles for the Plan, (b) defining the stakeholders, (c) comparing the Ramsar site needs with those of a parallel project underway in the Central Marsh area towards a National Park, and (d) discussing expectations and barriers to initiating the writing of this Plan.
December 2007-March 2008	An updated February 2008 version of the land cover map of Hawieh Marsh was prepared by Nature Iraq with its Italian partners.

May and October 2008	Representatives of Iraqi Ministries, Basrah and Missan Governorates, Nature Iraq, the INMWC and other stakeholders met in Sulaimani to review the first and second drafts of the Management Plan.

The September 2007 workshop concluded that the Management Plan development process had to focus on six results:

a. Ensuring the participation and advice of all relevant organizations.
b. Promoting better coordination and cooperation among stakeholder institutions and ministries.
c. Facilitating coordination between the Hawizeh Marsh Ramsar Site and Central Marsh National Park projects.
d. Ensuring that the existence of the Ramsar Site is compatible with the social and economic development of the area.
e. Ensuring the Plan reflects Ministry priorities, recognizes the importance of water level management, and is realistic vis-à-vis human and financial resources available for this initiative.
f. Serving as a model for management plans for future additional Ramsar sites in Iraq.

It was also agreed that issues that needed to be further addressed include:

- Clarity on the role of the Iraqi National Marshes and Wetlands Committee (INMWC).
- Clarity on the role of non-government and international partner organizations in this process.
- Cooperation between Iraq and Iran on water management to/from the Hawizeh Marsh and Al Azim Marsh.
- Acquisition of resources for this work.
- Capacity building and expanded training for Ministry staff.
- Oil exploration and future development.

On April 30-May 1, 2008, representatives of Iraqi ministries and other stakeholders met again to discuss the implementation of the goals, objectives and content proposed in a First Draft of this Management Plan. They agreed that further input on the proposed 14 Management Objectives and 93 Actions in that draft required further review. They agreed to meet again in early October 2008. Further discussions with local tribes, municipal councils, non-government organizations (NGOs) and other stakeholders on their engagement in this process and with representatives of the Government of Iran on the shared wetland areas along the Iraq-Iran border are also necessary.

3.2 Roles and Responsibilities of Federal Ministries, Local Councils and Tribes

One of the most important challenges in the coming months and years is to define and clarify the responsibilities and authority of the different governmental entities that have an effect on, or are affected by, the designation of the Hawizeh Marsh as a Ramsar site. The difficulty comes mainly from the transitional nature of the Constitution of Iraq which was re-written in 2005 and requires the promulgation of various laws to define the responsibilities of the federal government versus local governorates and the relationship between governorate councils and the local district councils. Furthermore, the authoritarian nature of the previous regime, that governed Iraq from 1968 to 2003, forbade the creation and operation of NGOs or any association that was not controlled by the government. This resulted in the current lack of experience of people to form NGOs and other associations to affect the political decision process, be it at the local or the federal level. Iraqi NGOs, in general, are thus not governed democratically and suffer from the interference of the federal government as well as local governments.

To add more complexity to this issue, there are various competing initiatives to create "regions" in southern Iraq in accordance with the newly established "federation law". The initiatives vary from the creation of a super region of nine governorates, to two regions: southern and middle, to a movement against the creation of any region.

Thus, it appears that the roles of the various entities affected and affecting the Hawizeh Marsh will have to be continously defined, even after consultations with stakeholders, to reflect the changing nature of the governing laws of Iraq. As such, the following describes the situation as it exists currently.

3.2.1 Role of the Federal Government

The new Iraqi Constitution reserves management of the oil and water resources of Iraq under the specific control of the federal authority. Thus, the Ministry of Water Resources and the Ministry of Oil affect the management of Hawizeh, given that a portion of the marsh is underlain with the "super giant" Majnoon Oil Field. While the Constitution does not specifically assign the environment to be under the control of the federal government, Iraq must view the environment as a federal issue to reduce the chance that there would be contradictory development of regulations between federal, regional and local levels.

3.2.1.1 Ministry of Water Resources

Given that the survival of Hawezih Marsh is dependent on the allocation of an adequate water supply, perhaps the most important entity in the proper management and survival of Hawizeh Marsh is the Ministry of Water Resources, for without water, there is little to manage. The management of the water resources of Iraq is central to assuring the proper management of the limited (some say diminishing) water supply of Iraq and to provide for the variation of the level of water in the Marsh (e.g. its "hydrocycle") which is as important as providing adequate water supplies for the survival of biodiversity not only in the marsh but the broader region as well.

The Ministry of Water Resources of Iraq (MoWR) established the Center for the Restoration of the Iraqi Marshes (CRIM) for the purpose of managing the restoration of the marshes. The Center has been developing projects and participating in meetings for the marshes and has been instrumental in translating studies into projects on the ground, especially lately, as the capacity of the staff increases through training programs and the Center's participation in international conferences through which knowledge is being transferred. This is especially important given the isolation of Iraq under the sanctions and the preceeding eight-year war with neighboring Iran.

The Ministry is developing an automated water gauging system to collect information about water flow continuously and instantaneously for the purpose of implementing a modern water management system. Both Italy and the United States have contributed components for the gauging system, including 28 stations provided by Italy, and 80 by the USA, a master station for down-loading information from satellites (by Italy) and training of staff to install, operate, and maintain the gauging stations. Regrettably, the deteriorating security conditions of Iraq has forced many of the trained and capable staff to leave Iraq, seeking security and stability elsewhere in the world. This leaves Iraq with the unenviable position of trying to manage a state of the art system, without much trained staff. Plans are underway to train additional staff inside Iraq, specifically, in the Kurdish Region, where security conditions allow for the presence of expatriate trainers to interact with Iraqis directly.

Other plans being developed by the MoWR include an accurate, up-to-date model that will be used in conjunction with the collected information from the remote gauging stations, to properly manage water resources and to move the water around Iraq with more efficiency.

This it is felt will ensure that all stakeholders are satisfied with the share they are getting from the limited supply of water resources.

The CRIM is also implementing the contruction of regulators at the exits of Hawizeh Marsh as well as its entrances to implement a robust management system that can affect changes in the water level, as needed seasonally, to assure the continuation and increase in biodiversity in the area.

3.2.1.2 Ministry of Oil

Hawizeh Marsh is underlain with at least one known "super giant" oil field called Majnoon. Oil related information is hard to come by in Iraq as it is treated as a state secret, as such it is not feasible to confirm that there are other oil reservoirs under the Marsh, but given the geologic conditions of the area, it would not be surprising that other oil reservoirs are discovered in the area in the future. During the 1970s and 1980s, the area underlain by the Majnoon oil reservoir was dried and development of the field was started. The embankments keeping the area dry have been well maintained and are monitored continuously. This is important because, if the embankments are breached, there would be drastic effects on the environment of the marsh from oil and hydrocarbon contamination. The development of slant drilling is also a harbinger of good news as the future development of oil reservoirs can be done with a limited footprint that would reduce disruption of the natural conditions.

3.2.1.3 Ministry of Environment

The environment as such was not defined in the Constitution to be under the purview of the central/federal government. This is a challenge as it is possible that in the near future various governorates can create authority over their own environmental issues, resulting possibly in the adoption of conflicting regulations in neighboring governorates or regions. This is a problem that has to be addressed either by the federal government or eventually the Constitutional Court, or the highest federal court. For the time being, the Ministry of Environment (MoE) has established local offices in Missan and Basrah, the two governorates that are affected by and affect the Hawizeh Marsh. MoE has also established a marshes unit inside the ministry headquarters to help monitor the developments in the marsh area.

The role of the MoE may be limited to observation and making recommendations for action once deficiencies are identified in any given area. This limits its effectiveness, but nevertheless, it gives the Ministry the mandate to observe and report upon the practices of other federal entities (such as the Ministry of Water Resources, Ministry of Oil and the Ministry of Agriculture to a lesser extent). It can use these measures to assure the correction of bad practices and cause positive changes.

The MoE was established only in 2003 and thus it is still growing and trying to define its responsibilities as it grows. The Iraqi Government has now assigned the role of management of Ramsar and other wetland issues to a group of ministries under the guidance and leadership of the Iraq National Marshes andWetlands Committee (INMWC) and thus, the adoption and implementation of the recommendations of this plan will fall under the responsibility of that body or its evolving structures and subgroups as discussed in Section 3.6 of this Plan.

3.2.1.4 Ministry of Marshland Affairs

This Ministry was formed only in 2007 and is currently undertaking a review of its mandate, roles and resource requirements. As this evolves, it should be factored in to discussions on the Management Plan.

3.2.1.5 Other Federal Entities

There are many other federal entities that either affect the environment of the marsh (such as the Ministry of Agriculture) or affect the stakeholders (through Iraq's ministries dealing with education, health, transportation, etc). Some of these ministries have been included in the INMWC, however, it should be kept in mind that as the governorates take on more authority from the central government in the on-going decentralization process, the roles of the central/federal government will become less important than the role of the corresponding local offices of these ministries.

3.2.2 Role of the Governorates

As the decentralization process continues, the role of the Governorates is becoming more important. Another level of decentralization that is taking place is the delegation of more power from the governorate to the local district level. It must be emphasized this latter transformation is occurring at the level of "consultations" rather than the yielding direct powers for deciding on expenditures. The execution of projects and the actual decisions on which projects are to be activated remains with the Governorates at this time. More changes may occur in the future.

Given that Hawizeh Marsh is shared by Basrah and Missan Governorates, the issue of coordination becomes even more important. It is known that each of the two governorates has formed a local council for the development of the marshes under guidance and help from the United Nations Development Program (UNDP). A further coordination step at the end of 2006 was to create a common higher council for the development of the marshes between the three southern governorates under the guidance and sponsorship of Nature Iraq. However, this council has never become active since its formation due to friction between the three councils. This tri-governorate marshes council may yet be activated to facilitate coordination between the federal government, represented by the Iraq Interministerial Ramsar Committee, and the local district level councils as well as the grassroots organizations and other stakeholders.

3.2.3 Role of Civil Society and Tribal Tradition

This is currently a minor role as Iraq does not have a history of traditional civil society development (i.e. grassroots and non-government organizations operating with democratic methods and transparency) under the previous regime. The role of these organizations will necessarily increase in the future as the democratic process takes root in Iraq and future generations learn to use their newly acquired personal freedoms to make their opinion and voices heard. For now, the role of civil society organizations is limited.

By contrast, tribal laws and traditions are even more important than the central government to adjudicate conflicts and resolve disputes at the local level. It should be remembered that Iraq until the 1950s had two different sets of criminal codes, civil and tribal. This was in acknowledgement of the tribal tradition that has governed the area for centuries if not millennia. The trible laws were abolished in the early 1960s as the newly established Republic at the time tried to modernize Iraq. To a certain degree, by the middle 1970s the effort of the successive central governments in Baghdad succeeded to diminsh the role of tribal councils. However, the rule of tribal law still existed to a certain extent in the rural areas, far away from the center of the power and the cities. In the late 1980s and in the 1990s, the previous regime started to exploit the tribal tradition to balance the power of the army and the Party, resulting in a reversal in the liberalization and modernization of the Iraqi society. The Iraqi state following the 2003 invasion has seen a period characterized by little rule of law and order and anarchy all over Iraq. The tribal councils still fill the vacuum to a certain extent and they remain important locally. Practically, even government officials must resort to coordinating

with the local tribal leaders as they control the rural areas around Hawizeh Marsh. The power of the government is effectively limited to the cities to a certain extent.

3.3 The Changing Role of Levels of Government/Need for Defined Process

As the Iraqi government system evolves, there is a need to redefine the roles of each of the institutions mentioned above in Section 3.2, through additions or deletions as necessary. Regretably, the current process of continuous revision of these roles seems to only result in paralysis. Thus, Iraq must define a more or less constant process through which Hawizeh Marsh management can be facilitated. This process must include all of the stakeholders to make it effective and the definition of this process cannot be dictated top to bottom. Rather, it has to be created through a consultative process. Currently, there appear to be two independent, internationally driven projects focused on marshes governance. One is sponsored by the Canadian International Development Agency (CIDA) and the other by the United Nations Development Program (UNDP). All parties await the results and the recommendations of these two projects. It is strongly suggested that the Iraq Interministerial Ramsar Committee should coordinate with these two projects to assure compatibility and prevent duplication of efforts.

3.4 Ramsar Convention Management Responsibilities

Through accession to the Ramsar Convention, Iraq has joined an international community of states with a common goal to manage and ensure the wise use of wetland resources for Nature as well as sustainable development for people. Iraq will be assisted in that effort by the actions adopted by the Contracting Parties to this Convention. A revised Convention work plan and budget for these actions are developed each three years, with the next meeting related to this to be held in late October 2008 in Korea. Iraq is expected to attend this meeting to voice its views on the Convention's work plan and to ensure its input to this process.

The Ramsar Convention is aided by a Secretariat based in Gland, Switzerland that supports the delivery of the Work Plan of the Convention by its staff, the 158 Contracting Parties (as of September 2008), five international NGO partners (BirdLife International, the International Water Management Institute, World Wildlife Fund International, Wetlands International and the World Conservation Union - IUCN), as well as the working bodies of the Convention. These bodies include the Ramsar Convention Standing Committee and its Subcommittees, national focal points on several issues, and a Scientific and Technical Review Panel. The Ramsar Secretariat distributes materials to the Contracting Parties, seeks their views on many issues, provides assistance and advice, leads organization of triennial Conference of the Parties Meetings and intersessional preparatory meetings, leads analysis of proposals for funds distribution through the Small Grants Fund, seeks supplementary project funding from donor nations and corporate interests, represents the Convention's interests in many international environmental fora, and undertakes many other duties. Overall, these functions will assist Iraq in its implementation of the Convention. The Convention's Secretariat traditionally has assisted OECD-DAC listed nations by providing travel funds for two delegates from each of these listed nations to Meetings of the Contracting Parties and to qualifying related meetings.

Iraq can also expect assistance and interest in its wetland programs by various donor nations and other states in the Asian Region of the Convention. This might take the form of project investments or travel and technical advisory assistance on many issues. In many cases, Ramsar nations establish bilateral relationships and projects among themselves on their own that further magnifies the effects of cooperation under the Ramsar banner.

3.5 Ramsar National Authority Office Responsibilities

With accession to the Ramsar Convention, establishment of a National Authority Office for this convention became a necessity in 2007. This function is currently being served by the Iraq National Marshes and Wetlands Committee (INMWC) in consultation with the Ministry of Water Resources and the Ministry of Environment. This Office would normally take on some or all of the following responsibilities:

(1) Assist the Government in organizing National Delegations to the triennial Conference of the Contracting Parties Meetings, and recommend members of this Delegation for approval by the Minister of Foreign Affairs in Iraq. Such Delegations, if resources permit, would represent the range of government and non-government stakeholders with interests in Iraq's wetlands.
(2) Ensure Iraq's annual dues are paid to the Ramsar Convention, currently set at 1000 Swiss Francs (SFr) per year from 2009 through 2012.
(3) Respond to enquiries and develop national responses to issues identified in the Work Plan of the Ramsar Convention that apply at the national level, and provide input to actions of the Contracting Parties of the Convention, in consultation with the Ramsar Convention Secretariat in Gland, Switzerland and other Contracting Parties.
(4) Ensure, where resources permit, Iraqi representation at international wetland-related fora, Asia Region meetings of the Convention, and in related meetings of other treaties (such as in regard to the joint Work Plan of the Ramsar Convention and Convention on Biological Diversity).
(5) Lead consultations on the management of Hawizeh Marsh, creation of additional Ramsar sites, and in promoting management, wise use and awareness of the importance of all wetlands in all areas of Iraq.
(6) Promote establishment of a national data base and research on wetland resources in Iraq. This could be undertaken in association with research institutions in universities and non-government organizations in Iraq and internationally. It could also facilitate a national wetland inventory, national biodiversity and fisheries surveys, national wetland education and awareness initiatives, and enactment of policy and/or legislation to ensure the wise use and protection of wetland waters and resources in Iraq.

A National Authority Office not only serves these international Convention duties, but could facilitate the actions of the Iraqi National Marshes and Wetlands Committee (see next section), act as its Chair and working secretariat, and facilitate the engagement of non-government and other stakeholders in the business of the Ramsar Convention in Iraq. It could thus take on a broader national role effectively as a national Wetland Management and Conservation Secretariat, if it chose to do so.

3.6 Role of the Iraq National Marshes and Wetlands Committee (INMWC)

After accession by Iraq to the Ramsar Convention in October 2007, a new body was created in Iraq: the Iraq National Marshes and Wetlands Committee (INMWC).

- This Committee, is the main body responsible for this Management Plan.
- An initial core group of six persons named by the Consultative Council to the Prime Minister's Office will grow to about 30 wetland experts and lead the full range of wedtland programming in Iraq.
- All members of the INMWC have equal status in its activities.
- Its initial members include representatives from the Iraq Ministry of Environment, the Ministry of Water Resources (Centre for Restoration of Irai Marshes) and several others including academic experts from Iraqi universities.

- Its Chairperson is currently a senior offical drawn from the Ministry of Water Resources.
- The INMWC is currently evaluating its structure, roles and rresponsibilities.

4.0 Vision, Strategic Goals and Management Objectives for Hawizeh Marsh

4.1 Vision

The Vision for the Hawizeh Marsh is:

Hawizeh Marsh is an integral component of the natural and human landscapes of Iraq and the Middle East, that has for millennia and will continue to provide sustainable livings and a healthy, natural environment with peace and security for generations now and in the future.

4.2 Strategic Goals

The five Strategic Goals for this Management Plan are:

1. Maintain the ecological character of the Hawizeh Marsh, focusing on those features that justify its designation as a Wetland of International Importance. These include:
   a. *Represents a marsh ecosystem typical of the Middle East, which is today rare in its geographical setting due to habitat destruction, and a wetland now existing as a relatively natural area and refugia to wildlife;*
   b. *Supports an appreciable assemblage of rare, vulnerable and endangered species of plant and animal life, notable migratory and endemic bird species, and is of special interest for maintaining genetic and ecological biodiversity in the Middle East.*
2. Maintain the natural biological diversity of this area at a landscape, community and species scale.
3. Restore wildlife populations and needed habitats for birds, fish and other species at risk.
4. Establish a safe, and secure living environment for people living here and using natural resources in this area.
5. Promote sustainable economic opportunities for local people in their ongoing use of water, wetland and terrestrial environmental resources in this area.

4.3 Management Objectives

Fourteen Management Objectives are set forth below to guide the prepration of this Management Plan. These are organized into four groups: managing the environment, managing water resources, managing cultural and social issues, and managing economic opportnuities. Discussion of the implementation of these Management Objectives and recommended actions are outlined in detail in Section 7 of Volume 2.

Management of the Environment

Management Objective #1− Responding to the Peer Review Process: To obtain an independent review and recommendations for action regarding major components of the Hawizeh Marsh environmental monitoring and management program.

Management Objective #2 − Conservation of Natural Heritage: To maintain the biological diversity of the Hawizeh area and restore and protect populations and habitats of species at risk while ensuring sustainable harvest of wild species for human needs.

Management Objective #3 − Environmental Monitoring and Protected Areas: To establish protected zones through regulation or planning mechanisms and, where appropriate, refugia in

the interest of ensuring sustainable wildlife and fish harvesting as well as species at risk populations re-establishment.

Management of Water Resources

Management Objective #4 − Water Quantity and Quality Management: To improve and protect the water quality of the site and manage water resources for the wide spectrum of water users in the Hawizeh Marsh in such a way as to preserve water quality and quantity for all current and future users.

Management Objective #5− Sustainable Development-Infrastructure Planning (Water Structures, Bridges, Roads, Dykes): To maintain the current level of human use of the Hawizeh Marsh and improve water circulation and connectivity at various locations.

Management of Cultural and Social Issues

Management Objective #6 − Maintaining Cultural Heritage: To protect and restore sites of cultural, historical and archeological significance in the area of Hawizeh Marsh.

Management Objective #7 − Promoting a Land Tenure System: To identify traditional and disrupted patterns of human use, ownership and occupation of lands in the area of Hawizeh Marsh, establish an operable land tenure system, and promote mechanisms for peaceful resolution of land tenure disputes.

Management Objective #8 − Creating a Legislative, Policy and Planning Framework: To put into place effective regulatory and planning tools that can be successfully implemented in cooperation with, and in the interest of, local peoples.

Management Objective #9 − Managing Border Issues with Iran: To promote a normalized state of affairs for the Hawizeh border wetlands, in which the Governments of both Iraq and Iran take an active, cooperative role in facilitating good governance of wetland resources in this area.

Management Objective #10 − Understanding Stakeholder Demands, Involvement and Needs: To incorporate in all plans and activities the needs and requirement of local and regional stakeholders (residents, fisherman, hunters, farmers, local civil servants, military and border officials, oil developers, etc.) who live, work and/or utilize the Hawizeh Marsh and the surrounding lands.

Management of Economic Opportunities

Management Objective #11−Managing Agricultural Development and Impacts: To ensure, with local community support, that appropriate lands for agricultural use are maintained and proper environmental and economic management of wastewater, salinization of soils and waters, water buffalo and cattle, and crop production are followed.

Management Objective #12 − Fisheries Restoration and Development: To restore sustainable fish populations of marketable quality and size and create economic opportunity for fishing in the Hawizeh Marsh.

Management Objective #13 − Facilitating Oil Development: To plan for operations and opening of the Majnoon Oil Field south of Hawizeh Marsh to ensure sustainability of the ecological character of the marsh, through use of new investments and new technologies such as lateral drilling.

Management Objective #14 − Consideration of Future Tourism Opportunities: To project and plan for future activities in the Hawizeh Marsh that can create economic opportunities, such as tourism, for local peoples and institutions and in which all Iraqis can take advantage of and be proud.

5.0 Principles for this Plan

The September 2007 Interministeral Workshop (Nature Iraq 2007a) established that there are three key principles for developing and implementing this Plan:

- It must benefit local people and improve the quality of life and the environment for these people and for Nature.
- It will be developed by the Iraqi Interministerial Ramsar Committee, and local councils, municipalities, stakeholders and people.
- It will be implemented by government ministries, and local councils, municipalities, stakeholders and people.

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Sections 7.0 to 11.0 follow in Volume 2.

Annexes 1-5 follow in Volume 1.

Annex 1: Historical Overview of the Southern Marshes of Iraq

Note: This Annex draws upon an original text developed by Dr. Suzie Alwash of Nature Iraq for the New Eden Master Plan (Iraq Ministry of Environment *et al*. 2006).

A1.1 Formation of the Marshes

The marshlands originated during the Holocene era following the end of the last glacial maxima. About 18 000 years ago, the global sea level was about 130 m lower than the present time and the Gulf would have been completely dry. At that time, rivers draining lower Mesopotamia would have been down-cutting and no marshes would likely have existed. Sea level began to rise from 14 000 until about 4000 years ago. Some researchers claim that at about 5000 to 4000 B.C., the marshlands were covered by a lagoonal marine environment, likely having brackish waters. Others disagree with this claim (Pons *et al*, 2002). With rising sea level, the rivers began to deposit sediment and create vast aggradational deltas, which caused the shoreline to progress to its present location, possibly between 3000 and 1000 B.C. The present fresh to brackish-water environment is estimated to have been established around 3,000 years before present (approximately 1000 B.C.). Prior to that time, the area may have been saltwater marsh with similar characteristics and functions.

A1.2 Early History of the Marshlands

Some of the world's first records of civilization are on the fringes of the marshlands, including: Ur, Uruk, Eridu, Larsa, Lagash, and Nina. Little archaeological exploration has been carried out within the marshes themselves. Mounds, known as tells, rising above the marsh waters are believed to be sites of ancient cities. These include the sites of Agar, Qubab, Ishan, Azizah, Dibin, and Waquf. These areas were used as platforms upon which modern-day marsh inhabitants built their homes and communities.

Artifacts in Tell Al-Abid (8 km north of Ur) dating back to civilizations of the Abid age (4500-3800 B.C.), the Warka age (3800-3500 B.C.) and Jamdat Naser age (3500-3200 B.C.). The artifacts included earthen wares, flint-stone tools and pottery with papyruses. Due to the fact that reeds were found with the artifacts, and were indicated in home construction for these civilizations, it is likely that the marshes existed at that time.

The Sumerians flourished around the marshlands between 3000 and 2000 B.C. The Epic of Gilgamesh, the world's first epic poem to be written, makes mention of the marshlands: "Ever the river has risen and brought us the flood" and "A reed has not come forth… all the lands were sea, then Eridu was made." In the Iraqi museum, there are artifacts representing Gilgamesh with water buffaloes in the Tigris and Euphrates. The boats used by marsh dwellers today are almost identical to those found at the Royal Cemetery of Ur. Clay tablets from the Sumerian period document the marsh environment alive with wildlife, essentially the same as the areas that exist today.

The Sumerian civilization was followed by the Assyrian Empire. The Assyrians called the marshes Narmrtu which meant 'the bitter water' or Tamdu Shamatu Kildi, which meant "the sea of the city of Kildah." They also called them the land covered with torrents "Rag tubit hashmr" or "the land covered with torrents of the bank of the Tigris." In 703 B.C., it was written that the King of Babylon "fled like a bird to the swampland" and the King of Assyria "sent ... warriors into the midsts of the swamps…. and they searched for five days" but the King of Babylon could not be found.

The Assyrians were followed by the Chaldean, Persian, and Greek Empires. Alexander the Great's leader 'Nearch' described this area accurately after he passed it. He said that it was 600 stadiums wide (approximately 114 km). It has been hypothesized that Alexander died from a disease he caught while traversing the marshlands. The Romans defined the marshes as "Chaldaicus Lacus."

A1.3 Marshlands during the Arab and Ottoman Empires

Historical sources indicated that the marshlands were small before the coming of the Arabs to Iraq because the first rulers of the area took great care in draining the water gathered in the lands near Babylon. They dug canals and drainage systems in large areas and cultivated lands and changed them into fields. The Arabs called the lakes and marshes Al-Bataih, "the lands covered with torrents." The areas between Kufah, Wasit and Basrah were well-populated.

With the advent of war and the increase in the area of the marshlands due to reduced irrigation and degraded flood control, people escaped to high lands. When the Arab (Islamic) Empire became stable, the rulers had no knowledge about the cultivation of the land. Dams were neglected and the gaps were not blocked. This further increased the flooded lands. During the Umayan caliphate only part of this area was cultivated.

The marshlands were described in a number of Arab books and accounts of journeys. Arab geographers stated that the marshlands had been there since the creation of the world. Al-Masudi (943 B.C.) pointed out that when the Tigris changed its course towards Wasit (Sabrab agrees with Al-Masudi), it branched off into several rivers ending in the lands between Wasit and Basrah. The main river ended up at in area called Al-Qatr. Later Abu Isad River was dug to divert the water of Al-Muhamadiyah. The Euphrates also fed into the marshlands, which in the past had been named the Babylonion marshes and in the Islamic Age, Al-Kufah Marshes. The Euphrates ended in an area a few miles south of Al-Kufah. This area was full of water and occupied an area of 1.6 million ha. The Euphrates used to meet the Tigris in the waters of these lands. After traveling out of them, the Euphrates took a unified course crossing the town of Al-Zubayr and ending up in Khor Al-Zubayr.

During this time, the area of the marshes shrank and increased according to the intensity of the floods of the two rivers throughout the centuries and according to the ability of the rulers of Iraq to control the water of the rivers. Qudama Bin Jaafar estimated that the length was more than 95 km. Al-Masudi estimated that it had an area of 26 000 km^2. Lesterneg estimated that it was 80 km wide and 160 km long. These numbers involved the area from Wasit to Basrah. Other sources estimated that the area was about 90 000 km^2.

The state and area of the marshes remained unchanged during the Ottoman reign. This was because they neglected agricultural and drainage works in the area. The Ottomans were also weak in their administration, controlling only the main cities such as Baghdad, Basrah and Mosul. Most of the authority devolved to regional tribal chieftains.

A1.4 The Marshes in the Twentieth Century

The most important developments happening to the marshes of the southern Iraq were the establishment of modern controls of the water of the Tigris and the Euphrates. This led to a decrease in the great floods that affected Iraq and consequently the area of the marshes in Iraq. In addition, the irrigation projects played an active role in determining the courses of the Tigris and Euphrates and their branches, making future changes improbable.

Impact of Dams

Water storage and distribution/control projects were the most important projects. Al-Hindiya Barrage was inaugurated in 1913. This dam controlled the distribution of water between Hilla and Al-Hindiya branches. It also controlled water and its distribution among the agricultural fields that were not a part of the marshes. This played an important role in increasing the amount of water flowing to the area of the Hammar Marsh. Al-Kut Dam was constructed in 1938, which directed more water flow towards the Gharraf River to supply irrigation for field agriculture, thereby decreasing the amount of water flowing from the Tigris into the Central and Hawizeh marshes.

Through the 20th century the "age of dams", construction of major hydraulic works played an essential role in controlling the floods. In 1990, the GAP project in Turkey went online, and for awhile the Euphrates River actually ran dry through the area of the marshlands. The post-1990 flow through the Euphrates is approximately half of what had been, while in the Tigris flows have decreased to almost a third of their pre-1990 discharge. Dams have reduced not only the overall water supply, but also its seasonality and the suspended sediment brought with the river water.

Impact of Agriculture

Agriculture has been undertaken in Iraq for over 6000 years and has had an indelible impact on the physiography, soils, and area of the marshlands. The earliest type of irrigation in southern Iraq is thought to have been in the estuary area, where the tidal influence was utilized. During flood tide, the rising river water is made to flow into the numerous ditches dug in the low levees bordering the river and the creeks branching off from it. At ebb tide the water flows back again. Thus an easy irrigation and drainage is ensured. This type of irrigation is still used on the banks of Shatt Al-Arab River for date cultivation.

The interior delta was the next area utilized for cultivation using the method of "wild irrigation". This made use of natural areas of inundation in the deltaic distributaries and floodplains. As soon as dry land emerged following the flood, seedbeds were prepared, and sowing would keep pace with the falling water surface. Gaps were made in river levees at their lowest spots, thus increasing the presence of meandering river branches, building up their own small levees. As time passed, these wild-irrigation streams would become choked by river sediment and shift their courses. Few areas in southern Iraq continue to utilize this method.

Increased production needs led to the development of controlled irrigation, involving the installation of primitive dams, sluices, water wheels, and extensive systems of dug canals. Because the Tigris is at a higher hydraulic elevation, water was diverted from the Tigris southerly towards the Euphrates. These canals were more geometric in pattern compared to the wild irrigation. The canals allowed for more agricultural development further above the deltaic areas. Eventually, almost the entire river valley was divided into numerous, small artificial basins bounded by the banks of the canals. Wheat and barley fields were characterized by more rectangular patterns, and rice production is more characterized by a fish-bone pattern, where a main canal has many laterals which branch off at angles. The rectangular pattern was more subject to choking by silt; cleaning out the canals led to the development of huge ridges formed on either side of the canals, or a new canal would be dug out next to the former canal.

As the canals ended in marshes, these also silted up and were found to be suitable for rice cultivation; therefore, marsh fringes are traditionally cultivated for rice. When the rice land is silted up and has to be abandoned, new rice land is reclaimed towards the end of the canal at

the border of the marshes. The abandoned rice land can be used for millet, which is not irrigated, or barley. Some higher banks may be used for date palm cultivation.

Impact of Petroleum Development

Southern Iraq is home to perhaps 5% of the world's total oil reserves. Since the first oil was discovered in 1902 in the north of Iraq, a total of 73 probable fields have been found, of which only 15 have been developed. The southern fields are generally anticlinal trap structures producing from relatively shallow depths, although deeper production zones are likely present. The largest oilfields in the marshlands area are:

- *South Rumayllah in the Hammar Marsh:* This is a super-giant oilfield in production since 1953. The northern portion of the oilfield extends into the marshlands. Approximately 300 km^2 of marshlands have been drained to accommodate its production footprint.
- *North Rumayllah in the Hammar Marsh:* North Rumayllah was discovered shortly after the main Rumayllah field in 1954, but did not go online until 1972. Approximately 200 sq. km. of marshlands were drained to accommodate its production footprint.
- *West Qurnah in the Hammar and Qurnah marshes:* This is essentially the northern extension of the Rumayllah oilfields and represents a separate super-giant oilfield. The field was initially developed in the late 1980s. Only the portion within Hammar Marsh is now under production, for which an area of about 150 km^2 of marshlands was drained.
- *Majnoon Field within Hawizeh Marsh:* This is a super-giant oilfield discovered in 1977. Approximately 300 sq km of marshlands were drained to accommodate the footprint of its production facilities.
- *Zubayr Field within Southeastern Hammar Marsh:* This oilfield has been producing since 1949; approximately 100 km^2 of marshland was drained to allow for production facilities.

The footprints quoted above represent the current outline of production facilities, not the total extent of the sub-depth field. Other fields within and near the marshes include Nahr Bin Omar, Suba, Nasiriya, Amarah, Halfayah, Rafai, and Noor. To date, the development of oil production facilities has necessitated the drainage of about 5% to 10% of the total marshland area. It is obvious that future development of oilfields within the area may necessitate additional drainage of the marshlands, and such developments should be integrated with the process of the Sustainable Development Strategy to allow for appropriate consideration of the land use needs for the local inhabitants, ecosystem conservation, and agriculture. Petroleum extraction is not necessarily incompatible with these necessary uses if the appropriate planning, consultation, and technical analysis is accomplished.

Impact of Recent Conflicts

The Middle East in general and Iraq in particular, have found themselves throughout history in the middle of warring influences from all sides. A detailed analysis of impacts of all historical wars is beyond the scope of this document, but a brief synopsis of impacts during the last five wars is warranted. Much of the following information is based upon *Desk Study on the Environment in Iraq* (UNEP 2004a).

In the early 1980s, as part of the war between Iraq and Iran, there was much damage done to the Hawizeh Marsh as water was used as a military tool to shield against an advancing army. The area was drained and flooded according to military needs, and many fierce battles were fought in this marsh. Extensive physical damage to the surface vegetation and soils occurred through the military usage, including the digging of trenches, bunkers, and movement of military vehicles. The presence of unexploded ordnance is a very real danger here. Chemical weapons were used during the Iran-Iraq war; dispersed agents most likely pose no threat at

this time, but there remains an unassessed potential for intact canisters that could potentially pose a threat to the local inhabitants, to scientific personnel, and/or to wildlife.

Also in the Iran/Iraq War, a road was built across the Qurnah marshes parallel to the west bank of the Tigris, effectively bisecting the marshes from north to south. The purpose of the road was for troop transport and military access. The elevated road cut off water supply to the Central Marsh between the road and the Tigris River, effectively desiccating a huge area. Along the Shatt Al-Arab, extensive date palm orchards were destroyed during this time period as well.

Fighting during the first Gulf War did not have much direct effect on the marshlands. At the end of the Gulf War in 1991, the retreating Iraqi Army sabotaged more than 700 oil wells in Kuwait, leaving them gushing oil and burning. Up to 2 cm of black soot was deposited over about 100 000 ha of desert as a result of atmospheric fallout, depositing an estimated half million metric tonnes of burnt debris. The atmospheric fallout was predominantly deposited downwind. Wetland vegetation in the Khuzestan lowlands of neighboring southwestern Iran was damaged by acidic "black rain" from the burning oil well-fields in Kuwait, and it seems likely that similar damage occurred in the wetlands around Basrah, only a short distance to the west. The type and magnitude of the damage is not known, but is likely to have been temporary and reversible. However, there is no documented impact from this event on the marshlands.

Following the first Gulf War, there was a widespread civil uprising in the south and over the area of the marshlands. Rebels utilized the marshlands as a refuge, which the Iraqi army could not effectively control. The marshlands drainage program implemented during the 1990s, described below, is believed by many to have control of the rebellion as its primary purpose. Following desiccation of the marshlands, the dried reed beds and villages constructed of reeds were burned.

Economic sanctions between the two Gulf Wars did further damage to the marshlands. Sewage treatment plants destroyed during the first Gulf War were not repaired, and untreated waste went downstream to their final resting point – in many cases, the marshlands. For the most part, humanitarian aid did not reach the area.

Again during the second Gulf War in 2003, the marshlands did not suffer much direct negative impact. There were some fires at the Rumayllah oilfield but these were extinguished relatively quickly. The route of the coalition forces on the “road to Baghdad” did not lie through the marshes. Hydraulic works such as major dams on Iraqi rivers, along with petroleum production facilities, were secured during the early days of the conflict, thus there were no adverse impacts as a result of flooding or petroleum burning. Efforts by local citizens and officials with the Ministry of Water Resources did result in the initial re-inundation of various portions of the marshlands within a short period after the commencement of the second Gulf War. This is described in more detail below. The ongoing violence within Iraq has been concentrated within major population centers and the marshlands remain sparsely populated. The most significant impact of the instability has been the tremendous logistical difficulties in providing humanitarian aid, attempting to reconstruct the area’s infrastructure, and obtaining scientific data from the region.

Annex 2: Management of Water in Hawizeh Marsh

Note: This Annex summarized by Mr. Andrea Cattorossi, reviews water management issues identified in the New Eden Master Plan (Iraq Ministry of Environment *et al*. 2006).

A2.1 Land Available For Marshlands Restoration

In order to restore the marshes, it is necessary to provide a large volume of water which is scarce in Iraq today. Besides water, of primary importance it is the definition of the land which can be reflooded while attempting restoration. Some larger portions of the lands once occupied by the marshes are today off-limits, as rural communities of medium-large size have developed their homes and their permanent agriculture projects. On the other hand, some other areas, which might be suitable for marshlands restoration, could be naturally restored only if large volumes of water are used due to the fact that they lie on higher ground. The recovery might take place according to several proportions of the former 1970s extent of marshes, in the short or medium term. Under any of these scenarios, all land villages and settlements must be provided with safety measures in case of flood events.

The actual extension of Hawizeh Marsh covers about the 75% of the original size of the wetland. If it does not interfere with other present or proposed future land uses, it would allow for implementation of some agricultural development plans, and would remain flexible with respect to final selection of marsh restoration areas to maximize opportunities for productive field irrigation and for petroleum and other natural resource development.

The following image represents a possible scenario for Iraqi marshlands recovery in the short and medium term. Green areas represent marshes recovered at 2005, blue areas represent wetland recovery proposed for further expansion of the existing marsh. For Hawizeh Marsh, the existing reflooding conditions are rather similar to the proposed target.

To obtain full Hawizeh marsh restoration (according to the 75% of the former extension target), water contributions from Iranian rivers must be ensured as well as adequate management of the incoming water. In fact, two regulation structures have been designed and will be built along the Kassarah and Swaib rivers, the main outflow points of the marsh. Overall, any restoration goal without the necessary amount of water flowing into Hawizeh Marsh is unrealistic.

A2.2 Methodologies for Best Practices in Water Utilization to Facilitate Marshes Restoration

A possible alternative for implementing best practices in water control management for the marshlands can be summarized as follows:

- A Target Curve (TC), representing the desired rate of change in water level inside the marshes during time, must be chosen. Depending on the choice, water allocation for the marshes might considerably vary as large volumes of water are required to reflood the marshes and bring the water level inside the marshes to the desired stage.
- Water inflows and outflows in the marshes must be fully controlled to allow for water levels to vary at the desired rate. By controlling the inlet and the outlets of the marshes, it is possible to reduce water losses due to evaporation and optimize water utilization.

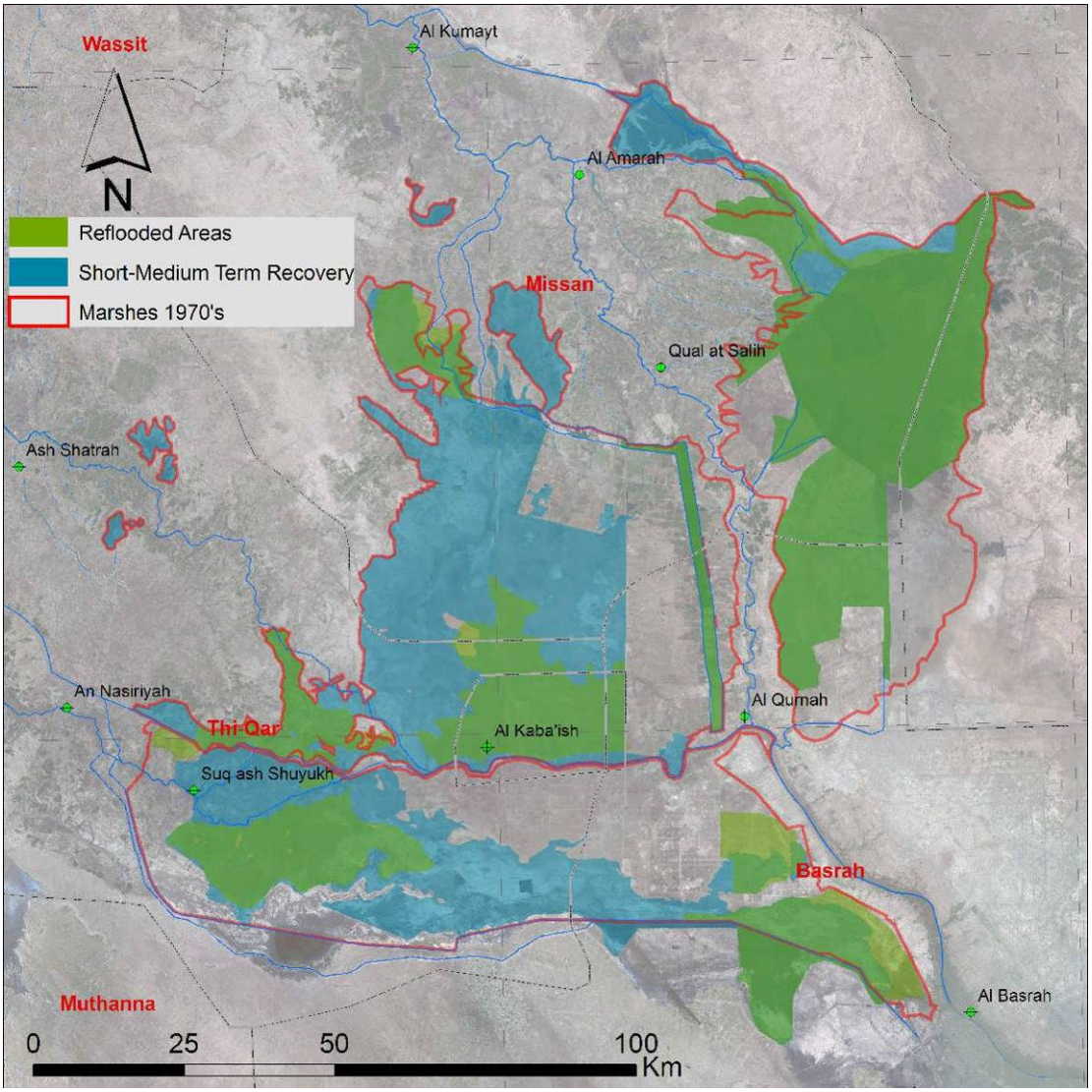

Figure A2.1: Areas proposed for marshlands restoration

Water Level Variation Targets

Water level variation during time is of paramount importance to guarantee the development of a healthy marshland system. By changing the water level, marshland dynamics meet the important requirements of maintaining flow movement and initiating wetting and drying processes. Identification of a specific Target Curve (TC) strongly influences water demand for large and complex marshlands such as those of southern Iraq. At the same time, identification of such a curve requires a lengthy stakeholder involvement process, aiming at finding the best compromise among parties which typically have conflicting goals and objectives.

Due to the fact that a participatory stakeholder process has not yet taken place for the marshes of southern Iraq, a tentative TC was selected based on the successful example set by the Al Azim (Iranian part of Hawizeh) Marsh. The following graph displays a multiyear water level variation record set measured inside the Iranian part of the marshes.

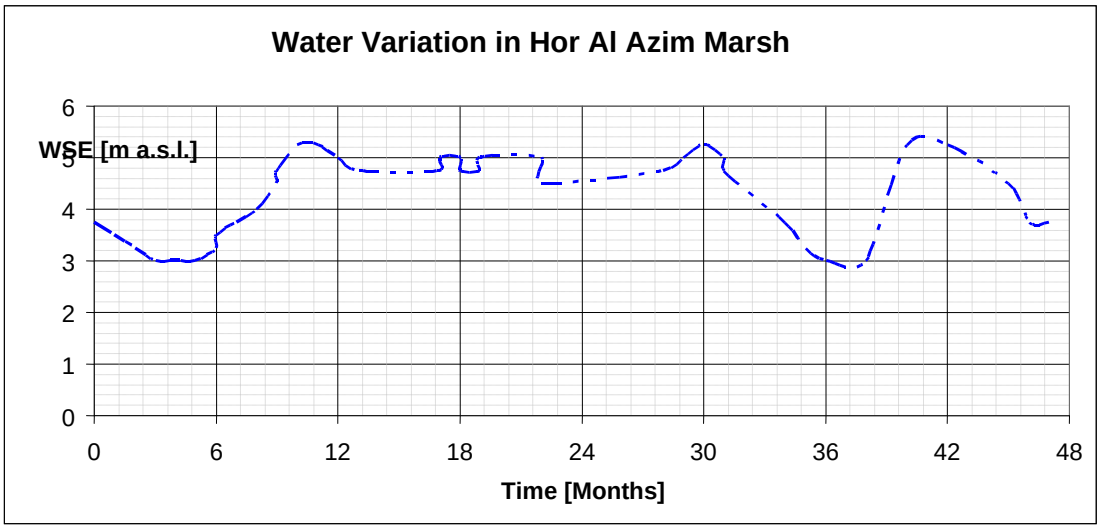

Figure A2.2: Water Surface Elevation [WSE] recorded from June 2001 in Al Azim Marsh.

The tools developed by the New Eden Hydrology Team are flexible enough to allow for a quick recalculation of the appropriate water requirements for marshlands management, should the TC be changed in the future. The TC which was finally selected proposes a water fluctuation of almost two meters during the year. The Al Azim TC curve was slightly modified in order to create the opportunity to better distribute water for the marshes and for agriculture. In practice, water peaks proposed by the "natural" TC curve (the one recorder) were modified to enable to minimize water entering the marshes during summer time (when it is most needed in agriculture and it is most dispersed in the marshes due to the evapotranspiration processes).

Reflooding

The extension of the flooded areas is subject to variability during the year, according to the hydrological regime; dry years imply a reduction of the flooded areas, while wet years contribute to in increase in extent of the marshlands. It is very important to stress this to understand the entirety of the areas that can be re-flooded. The reflooding methodologies proposed herein reproduce the natural variation of the marshes extent, as far as is possible. It must be clear that the actual extent highly depends on the topographical characteristics of the reflooded area; water tends to fill the channels in the marshes, before covering the floodplain. It should also be noted that marshlands change at a completely different rate then the reflooding process and although reflooded area might greatly change during the year, a similar rate of change is not apparent on the extent of vegetation extension.

Inflow-Outflow Management

"Natural" In-Out Management

The completely natural inflow-outflow system for the marshlands strongly depends on the presence of flood peaks and generally to the hydrological regime of the rivers that brings water in all the marshlands area. Before significant human impact on the hydraulic system, the area upstream of the marshlands was an inland delta that was periodically inundated during floods. On the other hand, during drought, the extent of the inundated areas decreased, causing an alternation in the behavior of the wetlands, and generally helping the development of biodiversity and optimizing environmental condition: the variation of the flood extension and of the water depth inside the marsh favor the ideal conditions for flora and fauna. For example, the most efficient nutrient cycling requires times of innundation and periodic drying; seed germination responds to changes in salinity with freshwater flooding.

The hydraulic system integrates rivers and marshes as a whole, and the components are highly interconnected; thus the marshlands area represented a system integrated with the channels of the delta. Moreover, man-made levees and embankments did not exist; thus there was less physical limitation to the extent of inundation except for the natural levees and gradual changes in terrain elevation. An exchange of flows between flooded areas and rivers was constantly present in the hydrological regime; for example Central Marsh received water both from the Tigris and from the Euphrates and returned water to the same rivers. Large flow peaks were entering these wetlands, water was expanding and floods were naturally attenuated while water was expanding over the floodplain. Large volumes of water moving through the wetlands helped maintain a strong level of connectivity between the various marshes and rivers.

The next image shows a schematic of the marshes as a natural system.

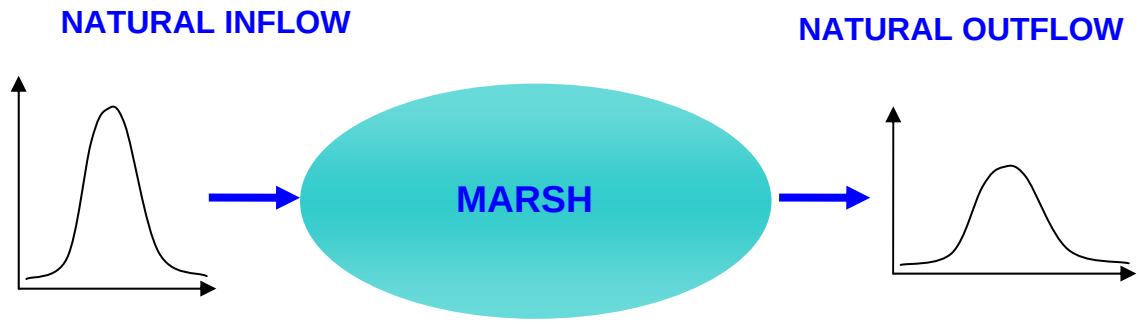

Figure A2.3: Natural In-Out management

"Semi-Natural" Management

Today marshes are managed in a completely different way then in the past: the presence of dams, man-made levees and embankments allows for a full control of how water enters the marshes and where water is allowed to spread in southern Iraq. Dams and levees were built in order to enable and protect human activities. An immediate consequence of the construction of dams and reservoirs was the disappearance of peak flows from the rivers and the reduction of total available water for southern Iraq. At the same time, the construction of an extensive levee system imposed physical constraints to the amount of land potentially available for marshlands development as well as to the connectivity between marshes and rivers. In today's conditions, marshes are no longer connected one to another, and if some connectivity still exists it is only because the local population has recently created breaches in the existing levees, or because a man-made canal brings water from one place to another.

In summary, the lack of peak flows and hydroperiods, the reduction in water availability, and the lack of hydrological connectivity are all factors contributing today to the existence of an unhealthy and unstable marshland system.

We will generally refer to this marshland condition and flow management as "semi-natural": inflows to the marshes are fully controlled, whereas outflows are uncontrolled although modified. This marsh management strategy is extensively applied today in southern Iraq. Unfortunately, it is a losing strategy, as large flows are not guaranteed anymore, and flow variation inside the marshes cannot be mimicked without an adequate artificial system. The next image shows a schematic of the semi-natural management of the marshes.

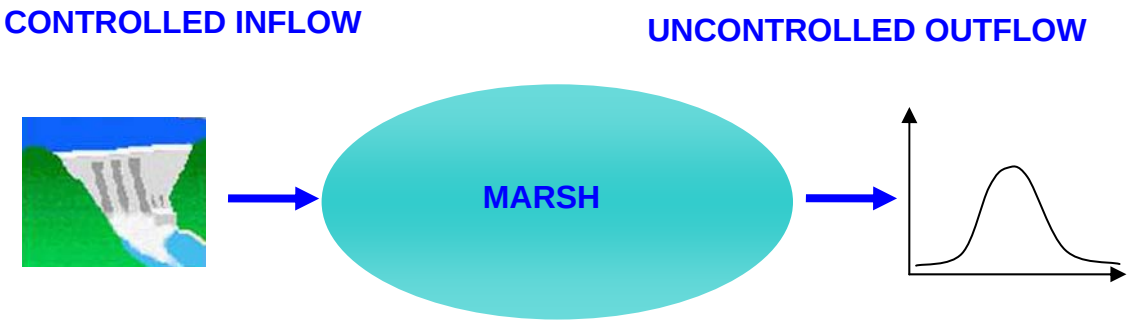

Figure A2.4: Semi-Natural In-Out management

"Controlled" Management

Recognizing that both "Natural In-Out" and "Semi-Natural" management are no longer feasible or adequate in today's Iraq, a last alternative appears to be the most appealing. We will refer to this strategy as "Controlled" management, referring to a system where both inflows and outflows are fully controlled. "Controlled" management attempts to gain the necessary flow-through and water level variations required by the ecological system to thrive.

From a hydraulic standpoint, "Controlled" management will operate the marshes as if they were tanks that must be filled and emptied through time. To do so, it is necessary to close or limit the outflows while the "tank" is filled and the water level is rising, and limit inflows and outflows when a drop in water elevation is required. Although simple in principle, "Controlled" management is the hardest to operate: scheduled flows must be secured at the marshlands inflow's points and receiving water bodies must be ready when it is time to release water out of the marshes.

"Controlled" management is not only feasible but also the most water-saving and efficient strategy. It was selected by the New Eden team as the preferred solution for Iraqi marshlands management. The following sections clarify the pros and cons of each different alternative, first considering possible inflow and then possible outflow strategies.

The next image shows a schematic of the controlled management of the marshlands.

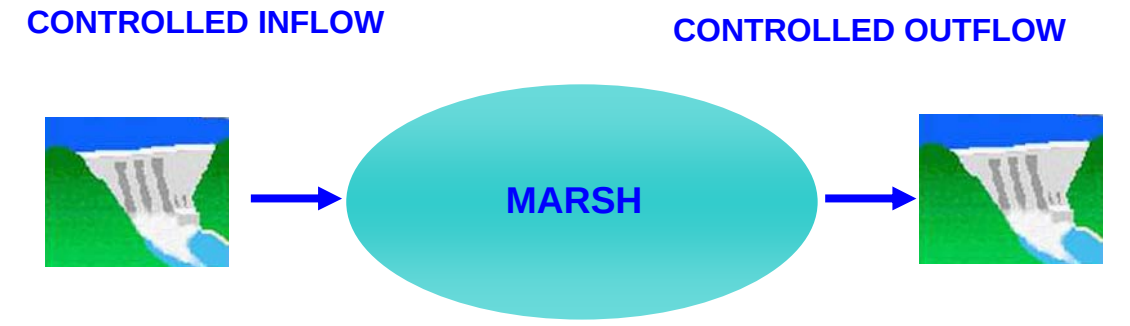

Figure A2.5: Controlled In-Out management

Upstream Water Control

The previous sections discussed possible alternatives for overall marshland management and indicated that a 'Controlled" strategy allows for a level of flow control which might make the recommended level of marshland restoration possible. "Controlled" management requires that a system of water regulators exists both upstream and downstream of the marshes. Water

control structures can be operated in different ways in order to meet the desired water flow-through and water level variation inside the wetlands. The following paragraphs present three alternatives for operation of the upstream water control structures.

Steady Inflow (SI)

A first option for upstream water control consists in using available hydraulic structures to maintain a constant inflow in the marsh. This operation is simple and leaves all the responsibility for changing water level inside the marsh to the outflow water control structures. We will from now on refer to this operation as "Steady Inflow" (SI). The following figure explains the SI concept.

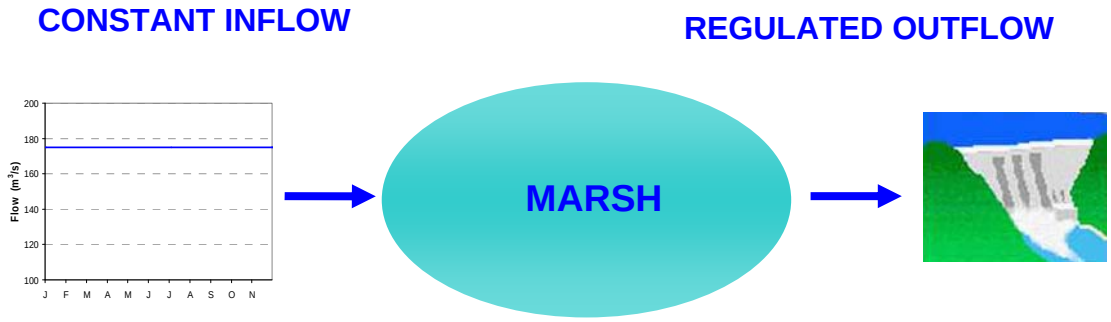

Figure A2.6: Inflow management: constant inflow

The overall goal of marshland management is to have the water levels inside the marsh changing at the rate and magnitude defined by the Target Curve (TC). Steady Inflow is only partially responsible for the success of the operation, which is also affected by the size of the downstream water control structures and their operation strategies. On the other hand, SI is capable of ensuring that a target maximum water level is reached at the desired time of the year.

The following figure displays the results of the RES-SIM model while attempting to operate Central Marshes according to the SI operation rules: the marsh well respond to the desired rising climb of the flood but hardly manages to follow TC during the decreasing phase. SI is clearly not an efficient strategy for marshlands management: water is constantly pumped into the marsh even during times when fitting of TC would require flooded areas inside the marsh to reduce their water level and extension.

At all times, RES-SIM is operating reasonably large downstream water control structure while attempting to meet the rules imposed by TC. At this time, SI is a preferred way to operate water control structure is southern Iraq as it is difficult to gather flow discharge measurements in time to change operations schemes on a needed basis.

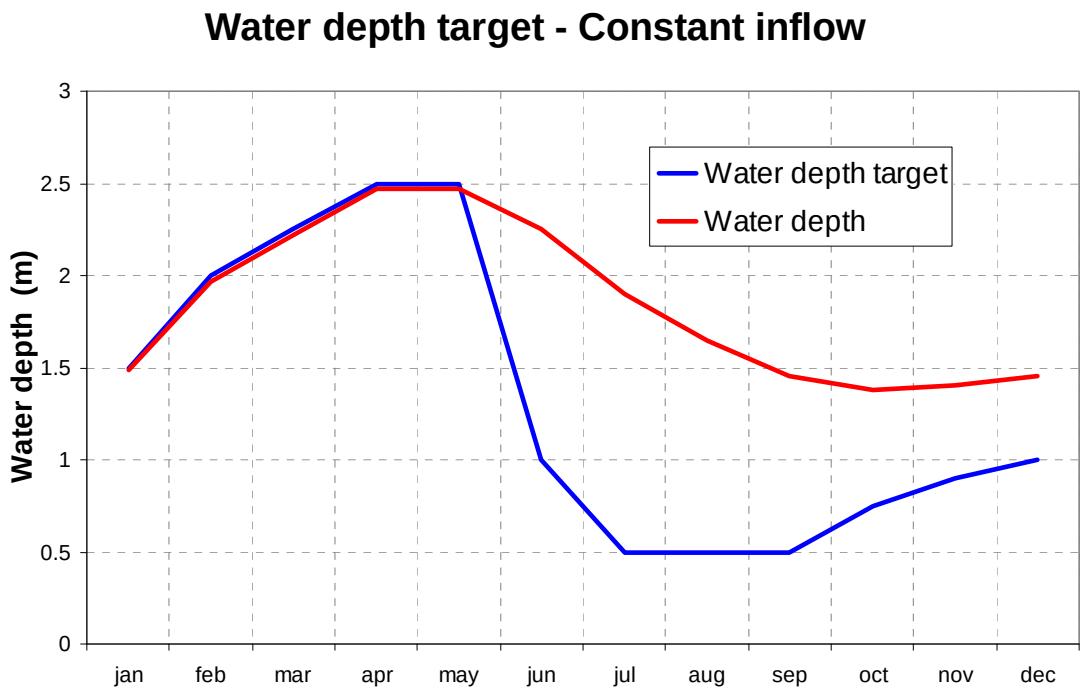

Figure A2.7: Constant inflow: fitting of the water depth target curve

Steady Inflow Optimized (On-Off)

The second option for the upstream control is to use a hydraulic structure to maintain either a constant inflow or no inflow at all according to the period of the year: basically the way of management is similar to the SI system, with the only difference that inflows are switched off when not needed. This On-Off system is still quite simple to implement with a hydraulic structure; the operations on the gate openings are not so frequent during the year. The figure below shows a schematic of the system.

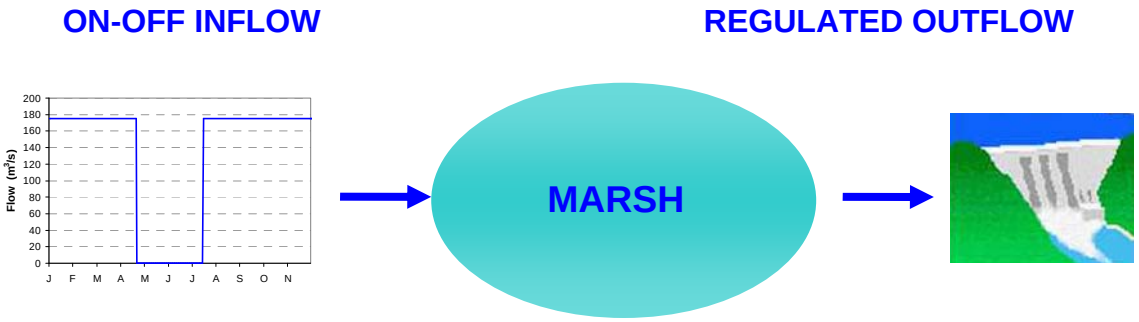

Figure A2.8: Inflow management: on-off inflow

The inflow discharge can be decided in order to obtain a good fitting with the target curve for the highest water level; during the period of time in which the water level has to decrease, the inflow must be switched off in order to avoid wasteful use of water and to gain a more accurate fitting of TC. The figure below illustrates an example of the water elevation variation obtained in the Central Marshes marsh considering the On-Off inflow: it is possible to see that during the rising climb of the flood, the fit of TC is not as good as for the SI system, but when the water elevation starts decreasing the On-Off inflow for the system tends to be more reactive to the TC requirements. On-Off operation rules are more water-saving efficient then SI and do allow the marshes a better fitting of the Target Curve: minimum and maximum water level changes are met at all times; the difference that can be noticed during the summer

period is due to the discharge capacity of the outflow, which will be discussed in the following paragraphs.

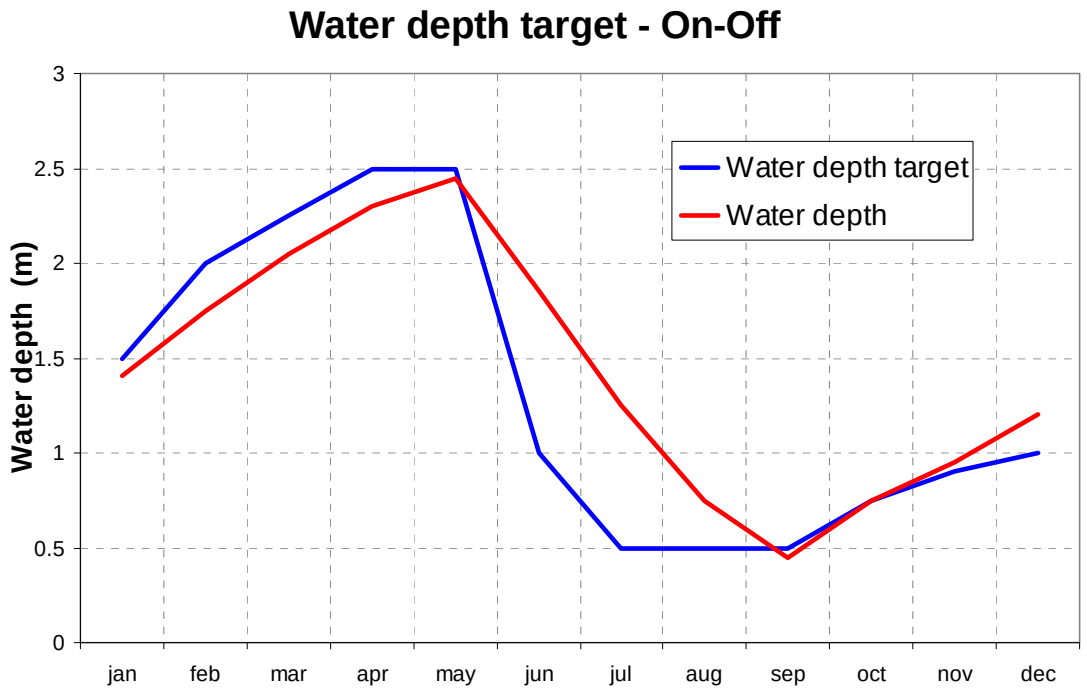

Figure A2.9: On-Off inflow: fitting of the water depth target curve

Optimized Inflow (OI)

A third option for operation of the upstream water control structures is to constantly optimize the inflow necessary to obtained the required water level changes inside the marshes. The OI system is clearly more complex to operate as an active management is required at all times; the operations on the gate's openings are quite frequent and changes must be made almost on a monthly basis. The figure below shows a schematic of the system.

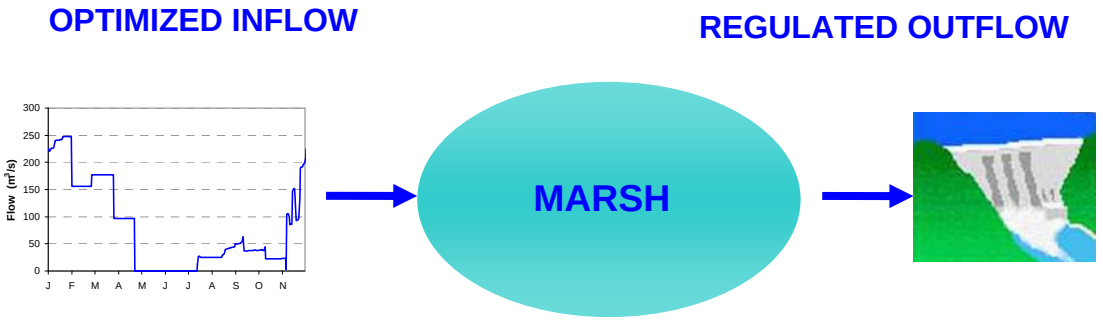

Figure A2.10: Inflow management: optimized inflow

RES-SIM simulations provide clues on the performances of the proposed operation strategy. Modeling results provides inflow discharge distributions which allow to best fitting TC wile using the least amount of water. In the OI system, a minimum inflow of about 10-30 m^3/s is guaranteed all year-round in order to stimulate flow movement inside the marsh at all times. Similarly, an outflow of approximately 20 m^3/s is kept flowing trough the outflow structures to allow for water movement, sanitary discharges into the receiving water bodies, and simulate the presence of small navigation passages trough the regulators.

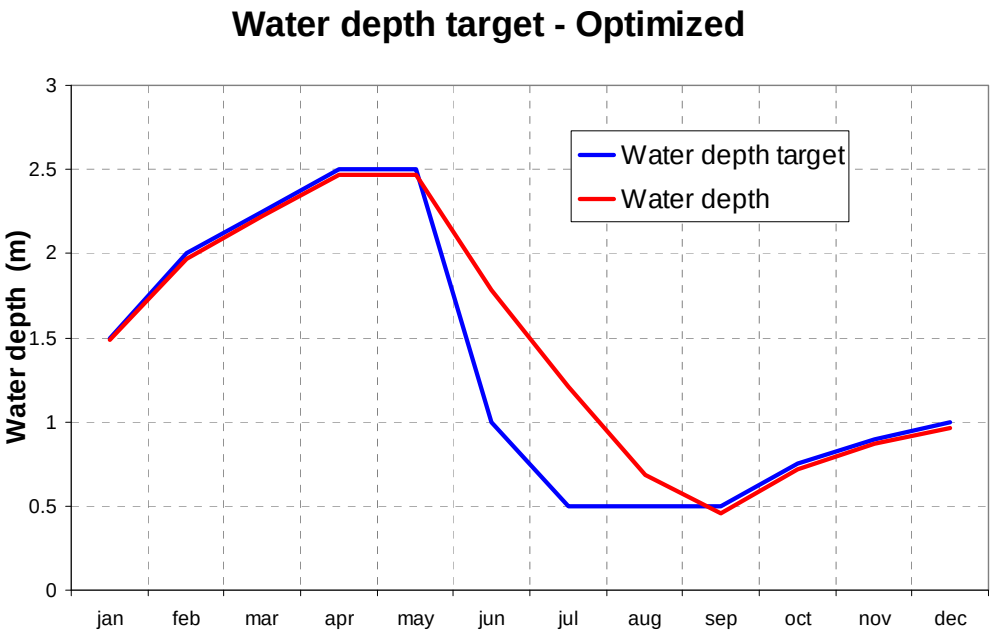

Figure A2.11: Optimized inflow: fitting of the water depth target curve

The figure above illustrates an example of the water elevation variation obtained in the Central Marshes according to the OI operation: it is possible to see that there is a good level of approximation with the target curve during all the year, except in summer, when the water depth variation spans from the minimum to the maximum requested level; the difference that can be noticed during the summer period is due to the discharge capacity of the outflow, which will be discussed in the following paragraphs. The OI upstream water control system doesn't waste water, and from this point of view it is the most efficient inflow system.

Water Volumes Comparison

Water for marshland restoration can be managed in three basic ways. Q-constant or Steady Inflow (SI) implies that inflow is a constant value during the year: the available water in the rivers oscillates during time and it is necessary to regulate the flow entering the marsh in order to make it constant. Q-On-Off implies that inflows are switched off during those months when water is not required to enter the marshes. Q-optimized or Optimized Inflow (OI) implies that inflows are constantly regulated year-round at monthly bases.

Numerical models clearly show that the best management strategy for the marshes can be achieved by combining smaller (other then the historical ones) scheduled flow releases from upstream with a downstream water regulation. Scheduling of large flow releases from upstream (required if we attempt to mimic historical floods) is not possible in Iraq today. At the same time complete downstream water control with constant year-round upstream flows, would not represent a good solution either: large volumes of water would be wasted due to evaporation during the warmest months and water would be released to the marshes when they needed it the least.

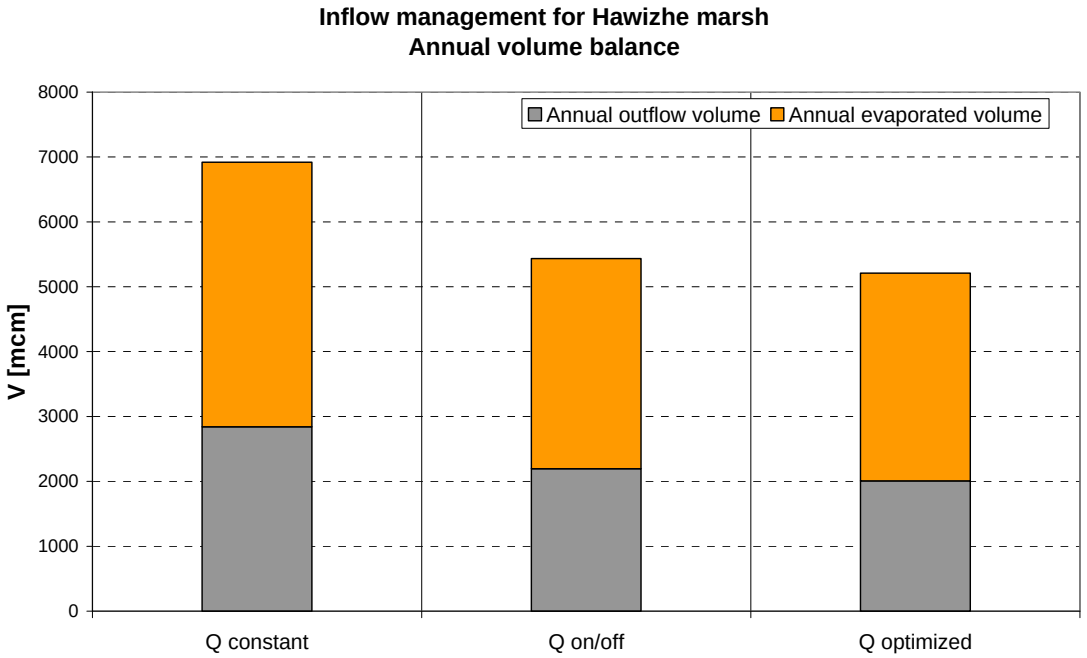

Figure A2.12: Annual volume balance for the SI, On-Off and OI methods

Results from the modeling analysis are summarized in graphs like the one depicted in the figure above. This graph shows how active management of the marshes (continuously changing inflow and outflow) could alone save up to ten billion cubic meters of water. In the graphs, each bar alone shows the total volume of inflow water required by the specific operation strategy. The gray part of the bar represents water leaving the marsh, whereas the orange portion is the water loss due to evaporation inside the marshes.

It should also be noted that all three methods (SI, On-Off and OI) more or less fit the Target Curve, but they do so utilizing different water volumes. It is reasonable to think that, in practice, marshlands should be managed with a set of operation rules which are somewhere in between On-Off and OI. After all, if it is true that OI is the most water conservative, it is also true that OI allows for the least water movement inside the marsh due to the smallest amount of flows.

Downstream Water Control

The opportunity to artificially operate the marshes from a downstream location is easily explained: head regulators effectively control water level in the upstream water bodies by opening and closing their gates. The design discharge capacity of each control structure influences the way the marsh might respond to the Target Curve: the larger the design discharge, the better the fitting of the target curve. This is clearly explained if we think that a large structure is capable of emptying the marshes in less time. A perfect fitting of the TC could be, in this sense, obtained with a structure having a design operation capacity equal to the 100-year flood event. For example, in Hawizeh Marsh, a perfect fitting of the Target Curve would be gained only by building a head regulator capable of operating up to 325 m^3/s (meaning that 325 m^3/s should go through the gates and not through emergency spillways). The concept is clearly explained in the two following graphs. Nevertheless it is not reasonable to build hydraulic structures that can handle such large discharges.

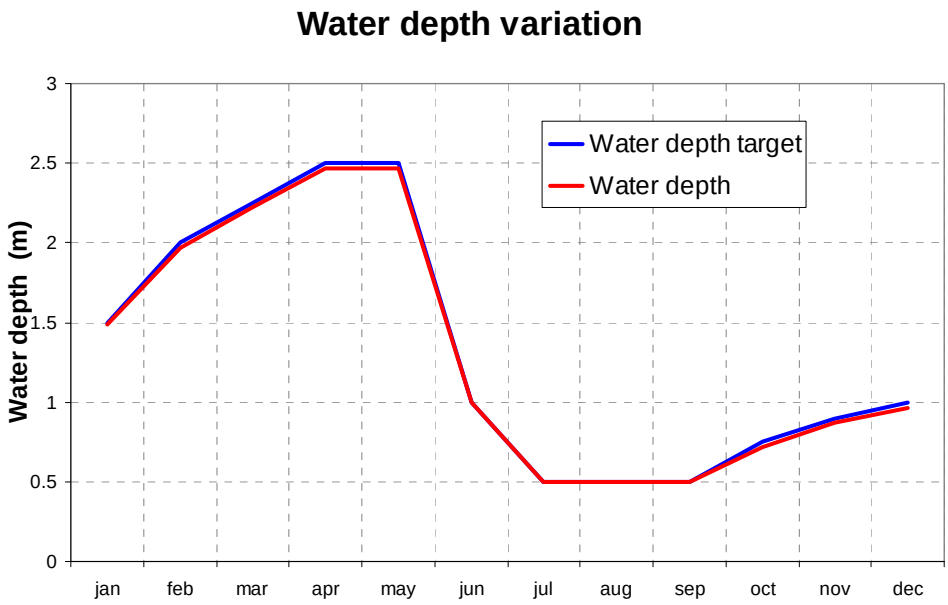

Figure A2.13: Maximum outflow: fitting of the water depth target curve

We should not forget that the Target Curve proposed here is just one of the many possibilities and that it might be changed in the future. Furthermore, is must be kept in mind that water level changes might not need to change in such a short amount of time and that water level changes are more important that the time required for that change to happen. This approach allows the possibility of considering hydraulic structures with lower discharge capacities, such as 50, 100 and 200 m^3/s.

In the figure below, it is possible to see how the water depth changes according to the different maximum discharge capacities analyzed; the example shows what happens for Hawizeh Marshes when we operated downstream water control structures of respectively 100 m^3/s, 150 m^3/s and 200 m^3/s of design operation capacity.

It is important to notice that the larger the outlet hydraulic structure, the less water is lost due to evaporation over the year (see figure below). The evaporation is higher in the case of hydraulic structures with lower discharge capacity rather than high discharge capacity. Considering the figure below, the inflow for the 200 m^3/s discharge capacity scenario is nearly equivalent to the 50 m^3/s one, i.e. 4900 m^3, versus 5200 m^3; on the contrary the evaporation volume is quite different: in the first case it is 3950 mcm, while in the second it is 3200 mcm; the reason for the difference in evaporation is due to the fact that, with low discharge capacity, it takes much more time to empty the marsh, and so the surface area free to evaporate is greater. With respect to the outflow, in the first case it is about twice the second case, i.e. 2006 mcm versus 996 mcm.

Inflows as well as outflow flow requirements increase with the size of the structure. In practice, larger structures have higher construction and operation and maintenance costs but they do allow for an decrease in water losses due to evaporation and they do provide larger quantities of water to the receiving water bodies in a shorter amount of time. The direct benefit of having a larger and more expensive controlled outlet could be seen if downstream water is needed for navigation, or agriculture, or to feed a downstream marsh (as it might be the case of the Central and Abu Zirig Marshes.

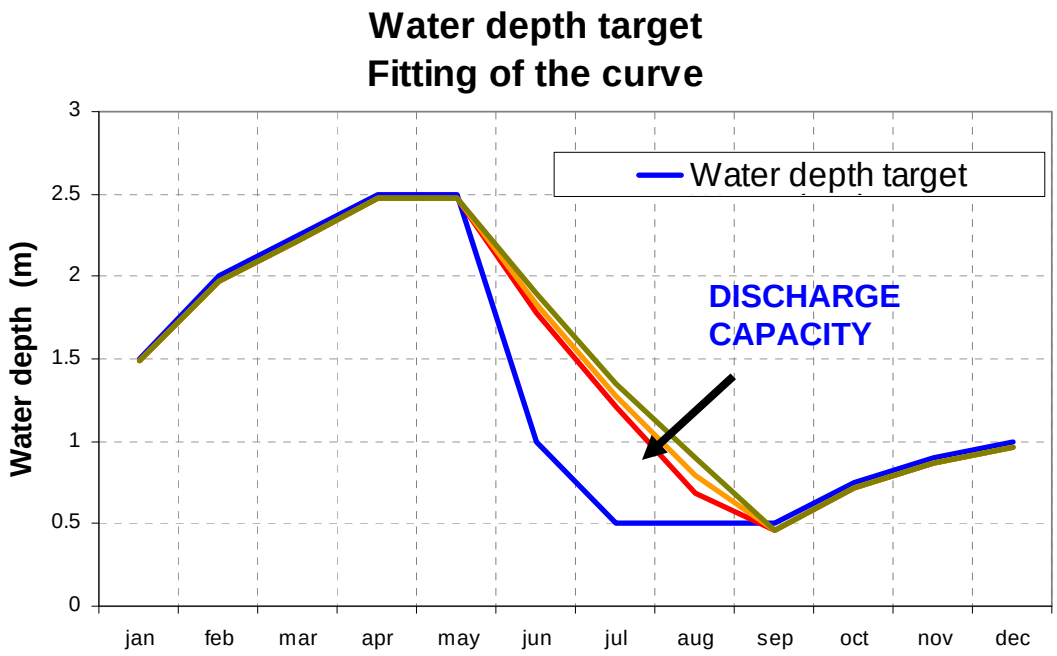

Figure A2.14: Fitting of the water depth target curve according to the discharge capacity

In summary, while choosing the most appropriate hydraulic structure, a designer should look at the cost and benefits aspects related to:

- the amount of water saved from evaporation;
- the cost for construction and operations and management of the hydraulic structure;
- the socio-economic benefits deriving from having more or less water in the river network or in the marshes system.

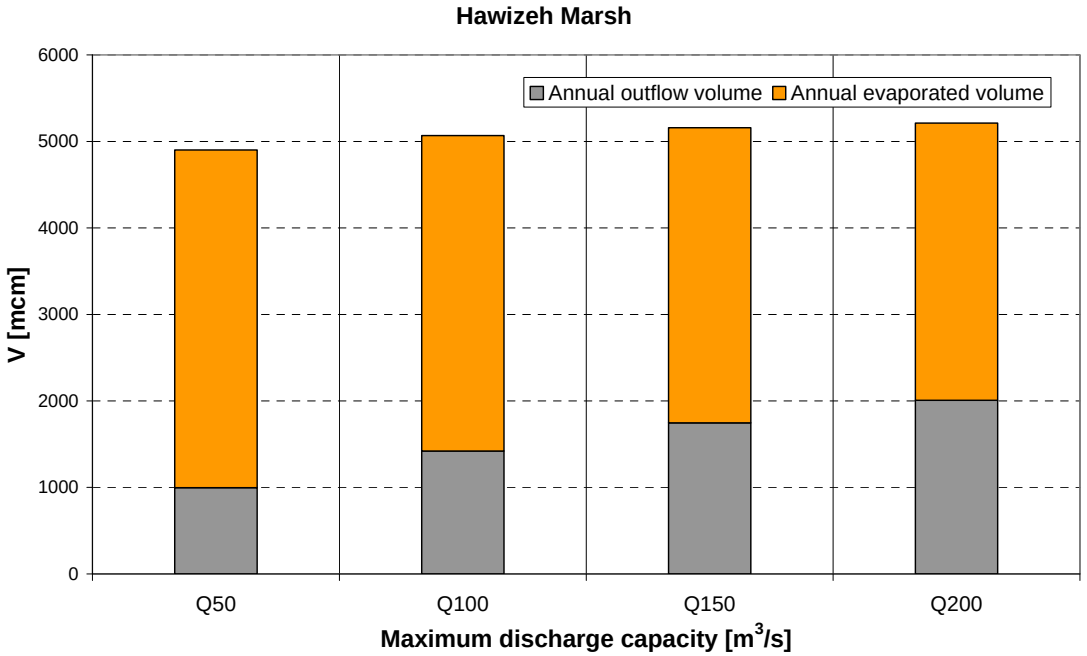

Figure A2.15: Annual volume balance for Hawizeh Marsh with different outlet discharge capacity

Water Control Structure Design Capacity

A standard engineering approach while designing civil structures is to size them so that they can withstand a design rare event. Such an event is typically an estimate based on an extrapolation made from historical records. Typically, in the case of the design of control structures, the design event is chosen to equal the 100-year flood events (a flood that has 1% of occurrence probability).

A general recommendation made by the Hydrology Group within the New Eden Team was that such standard practice should not be applied in southern Iraq as it would lead to a general over-design of the structures. The Tigris and Euphrates Rivers, as well as their tributaries, are today fully controlled by large reservoirs which alone could mange a 1000 and in some case even a 10 000 year flood event. Water control structures for marshlands management should be sized to properly manage the flood events which each individual marshlands management plan would recommend.

In the previous paragraph, some discussion was made about the opportunity to select the most appropriate size according to factors which involve not only the individual cost of the structure, but also its function and the benefit of being able to manage larger inflows and outflows.

It is standard procedure in Iraq to design control structures that are able to control 10 to 20% of the design capacity (the 100-year flood) leaving the opportunity to discharge larger flows trough emergency spillways. Based on the results of the numerical models and the socio-economic evaluation, it is proposed that Hawizeh outflow structures should be able to control and operate up to 210 m^3/s.

Annex 3: Freshwater Fish of Concern in Iraq

At least 20 of the over 80 species of fish found in the freshwaters of Iraq, as derived from Coad *et al*. (In preparation), may be "Species of of Conservation Concern (SCC)" in Iraq. Six of these, as designated "**KBA**" have been recorded in the Key Biodiversity Areas survey of Hawizeh Marsh from 2004 to 2008 (see Table 10).

Table A3.1: Possible Species of Concern Nationally in Iraq (derived from Coad *et al*. In prepration)

Species	Common Names	Economic Importance	Priority for Conservation Action
Family Clupeidae (herrings, shads, sardines, pilchards and menhadens)			
Tenualosa ilisha **KBA**	Sbour; zoboor; soboor; sobour. [hilsa, Indian shad or river shad].	High	High
Family Cyprinidae (carp, minnows)			
Alburnoides bipunctatus	None [spirlin, riffle minnow or riffle bleak].	Moderate	High, possibly, rare in Europe
Barbus barbulus	Abu-barattum; abu baratem; abu bratum; nabbash.	High	High, possibly.
Barbus esocinus	Bizz; farkh; farch; farkh-el-biz; mangar. [Tigris "salmon", Euphrates "salmon", pike barb].	High	High, possibly; under severe threat in the Syrian Euphrates; part of a world survey to assess the status of large freshwater fish species by the World Wildlife Fund and the National Geographic Society
Barbus grypus **KBA**	Shabout; shabbout; hamrawi. [large-scaled barb].	High	High in some regions of Iraq; it is in need of conservation in some parts of its range
Barbus kosswigi	None.	None	Unknown; it appears to be rare
Barbus lacerta	Shabout moraqqat	Low	Unknown-Low; this species is near threatened in the South Caspian Sea.
Barbus sharpeyi **KBA**	Bunni	High	Moderate. May be threatened by over-fishing.
Barbus subquincunciatus	Abu khazzama; a'djzan; agzan; adzan. [black spot barb, leopard barbel].	Low	Unknown, possibly High; it is now very rare in Iran and "critically endangered". Syrian populations in the Euphrates River and parts of its tributaries are also in a perilous state.
Barbus xanthopterus **KBA**	Gattan; ghattan; kattan; khattan; nobbash; thekar.	High	High; this species is now relatively rare.

Caecocypris basimi	None.	None	High, Listed as Vulnerable (D2) in the *2004 IUCN Red List of Threatened Species*.
Cyprinion kais	Bunni saghir; bnaini; kais	None	Moderate; This species appears to be rare.
Hemigrammocapoeta elegans	None.	None	Unknown; This species is rarely collected in Iraq
Typhlogarra widdowsoni	Samak aa'ama. [Iraq blind barb].	None	High, Listed as Vulnerable (D2) on the *2004 IUCN Red List of Threatened Species*.
Family Cobitidae (loaches)			
Cobitis taenia **KBA**	Lakh mukhattat. [spined or spiny loach, stone loach, weatherfish, spotted weatherfish, Siberian loach].	Low-Moderate	Unknown, possibly High, This species is classified as rare in Europe.
Family Sisoridae (sisorid or sucker catfishes)			
Glyptothorax kurdistanicus	None	None	Moderate-High, possibly; poorly known in Iraq and may be rare enough to warrant conservation efforts
Glyptothorax steindachneri	None	None	High, possibly; This species is poorly known in Iraq and may be rare enough to warrant conservation efforts should it prove to be a valid taxon.
Family Mugilidae (mullets or grey mullets)			
Liza abu **KBA**	Khishni; hishni; hosoon or hashsoun; maid; abu-khraiza; abu sukkanejn [abu mullet, freshwater mullet].	High	Moderate; a ban on fishing from mid-January to mid-May has been recommended.
Liza klunzingeri	Maid; biah; biah zahbee; beyah zhabee. [Klunzinger's mullet (keeled mullet and back keeled mullet].	Moderate	Moderate; this species needs to be carefully monitored as it is part of a fishery.
Family Sparidae			
Acanthopagrus latus	Shanak; shagoom; shaam; sha'm; shaem; sheim; sha-om. [yellow-finned porgy or seabream, yellow-finned black porgy, Japanese silver bream].	High	Moderate; the status of freshwater populations is unclear as they appear quite rare.

Annex 4: Full Text of Recommendations of Peer Review Panel

This text is derived from *Report of Peer Review of Nature Iraq Marsh Management and Monitoring and Other Habitat/Water Initiatives* (Nature Iraq 2007b).

Major Recommendations

- The New Eden Master Plan is an ambitious and generally well-focused wetland restoration program and should be supported by the Iraqi government and the international community.
- We recommend a rigorous, yet strategic program of monitoring of hydrology, water quality, biota, and soils/sediments for the restored marshes. But we recommend quality of data over quantity and further recommend that monitoring be established as an endowed effort that will not depend on grants and contracts that may come and go.
- A joint water process such as a commission for the Euphrates and Tigris Rivers encompassing the Governments of Turkey, Syria, Iran and Iraq should be established. Iraq should consider renegotiating the now obsolete "water sharing agreements" that might exist. Efforts should also be made to highlight these issues in international forum and media.
- Efforts should be made in Iraq to establish a joint water commission that includes the relevant Government departments and other stakeholders where national water management issues can be dealt with in a holistic way.
- In the management of natural resources in the marshes, efforts should be made to involve local users/stakeholders. In that way local communities may get ownership of the management plan, agree about harvesting quotas and do the policing themselves.
- A review of all water chemical analytical procedures, especially for phosphorus and nitrogen, should be done for the monitoring effort and a comparison (inter-calibration) with one or several established laboratories should be done as well.
- When reliable analytical procedures are in place and cooled samples can reach the laboratory within two days, a one-year water sampling program should be implemented with emphasis on nitrogen and phosphorus. The objective is to establish comparative baseline data for all major inflows and outflows.
- Some presented data on cadmium concentrations in water in one inflowing stream (at the workshop) are high and therefore of concern. New samples should be taken and analyzed by an established laboratory with experience with this element. If confirmed, remedial actions and damage control must be implemented. Release of the water into the Gulf should be avoided.
- All efforts should be made to investigate old studies. Lack of baseline data makes the efforts to restore the marsh complex somewhat un-focused. It will be difficult as well to assess the success of the restoration efforts and if the marshes are evolving as desired.
- This plan of the Marshlands restoration is generally robust and we recommend its prompt implementation. It will provide the following benefits:
    - flood control, drought moderation, and provision of microclimate;
    - nutrient management (e.g., N, P, K, Na); and pollution control (heavy metals, organic contaminants, etc.) for the downstream Persian Gulf;
    - soil management (erosion prevention, soil salinity, soil quality, etc.);
    - habitat regeneration for fish, birds, and other wildlife;
    - overall sustainability and quality of life in the area; and
    - carbon sequestration.

Management of the Proposed [Central Marshes National] Park and Ramsar Site

The proposed [Central Marshes] National Park and the proposed Hawizeh Ramsar Site wetland should have their objectives focused on solving the major problems of the wetland

area today: loss of biodiversity, salinization of water and soil, pollution; overgrazing, illegal fishing and hunting; spreading of settlements without appropriate land planning. Primary objectives should include: (a) restoration of the marshlands ecosystem; (b) protection of endangered species; and (c) conservation of cultural heritage.

Assessment of Monitoring Program

Hydrology

Monitoring the hydrology of a wetland is like monitoring its heart rate. It is essential to have a complete and continuous understanding of the hydrology of the marshes. The essential parts of this monitoring should include continuous records of the hydroperiods (water levels over time) in several locations and an accounting of the surface inflows and outflows. More attention needs to be paid to this monitoring and it should not be kept as engineering data not shared with ecologists and biologists. We found it surprising that there were not more historical records of the wetland hydroperiod for the Iraqi marshlands. Such a history, or records, should begin immediately as part this monitoring program. The hydrologic monitoring of the wetlands, if done properly, should include stage measurements in the center of each wetland basin and flow measurements at key inflow and outflow positions where possible.

Water chemistry

Nitrogen and Phosphorus

The soluble phosphorous concentration in Al-Furat is given as 280 ug/l (we assume that this is given as PO_4-P, but it is not stated) and "historical data indicate that the phosphate concentrations in the Tigris River can range as high as 1,400 ug/l." (Vol. 2, Book 6, page 6). There is, however, no original reference given for this statement.

"Inorganic nitrogen concentrations, predominantly nitrate, in the Tigris River have been reported to range in the excess of 840 ug/l, with median values around 300 ug/l" (Iraq Ministry of Environment *et al.* 2006). This report is cited frequently but was not available to the Panel. Based on these values and a number of assumptions, the possible retention of phosphorous and nitrogen in the wetlands is calculated. However, as the total dissolved concentrations of phosphorous and nitrogen are not known, and the combined forms in organic complexes, etc. are usually considerably larger than the inorganic forms, such calculations are unlikely to come near reality. This is because the flux of nitrogen and phosphorus between inorganic forms, into living (micro)-organisms and back into dissolved organic complexes occurs very fast, on the scale of hours. The nitrogen and phosphorus data (presented in Vol. 1, Book 4, pages 65–69) are for the same reasons of little value for the understanding of nutrient dynamics, eutrophic status etc of the inflowing rivers and the wetlands themselves. Similarly it is not possible to deduct the function of the wetlands for nutrient retention, which otherwise would be useful in the advocacy of the importance of the wetlands for the water quality of the Gulf. The presented water chemical data (in the report presented at the meeting) are probably at least partially not correct. In particular the data on nitrogen and phosphorous might be too low. There are also cases in the presented table where the PO_4-P concentration is larger that the Total-P, which cannot be the case, as the former is a part of the latter. A review of all analytical procedures for phosphorus and nitrogen are recommended and a comparison (inter calibration) with one or several established laboratories should be done as well.

When reliable analytical procedures are in place and cooled samples can reach the laboratory within two days, a one-year water sampling program should be done. At least the following constituents should be analyzed: PO_4-P, Dissolved-P, NO_3-N, NH_4-N, Dissolved-N,

(particulate P and N if possible), salinity, and pH. It is useful if major constituents (Ca, Mg, Na, K, SO_4, Cl, and HCO_3-CO_3) can be analyzed at the same time but only if all the ones specified in brackets can be done. Sampling should be done regularly once or twice a month depending on resources. Samples should be taken in all major inflows to the marsh complex, all major outflows within the marshes, and the final outflow to the Gulf. Hydrological data (stage, flow, temperature, etc.) should be taken at the same time.

Cadmium

The presented data on cadmium concentrations in river water (at the workshop) are very high and of great concern. New samples should be taken and analyzed by an established laboratory with experience with trace metals. If the high concentrations are confirmed, the source of cadmium needs to be identified and the risk for contamination of food (in particular vegetables through irrigation) should be analyzed. The channeling of the contaminated water needs to be carefully considered. It is very questionable to allow this water to enter the sea as this will mean that it is out of control and third parties might be affected. The use of (part of) the wetland complex as a deposit is in this context preferable until the source has been identified and remedial actions taken.

Biology

Monitoring biota in the wetland is an important part of the plan, not only to help conserve biological diversity but also to help manage the fragile ecosystems; provide new feeding opportunities for fish and waterfowl; control distribution and abundance of invasive species; and maintain a balance of species in aquatic and riparian communities.

Monitoring organisms of the wetland should mainly include identifying and monitoring the important components of biological diversity, and characterizing life histories of key species and necessary habitat conditions. Integrated approaches should be included in the monitoring plan, such as:
1. Define life history stages for a diverse cross-section of flora and fauna species, such as aquatic plants, invertebrates, and resident and anadromous fishes, along with any known relationships to flow components and their seasonality.
2. Consider specific life history aspects including adult foraging, survival, and gonadal development; spawning migration and activity; egg, larva, and juvenile development; juvenile growth and survival.
3. Define relationships between flow components and maintenance or access to critical habitat for completion of life history stages for key species.
4. Describe ways in which flow components will influence primary productivity, decomposition processes, and nutrient dynamics.

Monitoring Frequency/Extent

Field monitoring for the National Park and the Hawizeh Ramsar Projects is proposed on a schedule of 14 sites every three months. Field sampling in an area this large with lack of roads and infrastructure is difficult; thus this sampling regime is viewed by this committee as ambitious despite the apparently small number of sample sites and frequency. We see the need for more attention to detail in some measurements such as water quality and fish production, and less frequent sampling of other variables such as soil/sediment quality and macrophyte biomass/productivity, which can be estimated annually. We think that this monitoring should be supplemented wherever possible by emerging technologies that allow remotely sensed data, radio and satellite transmission of data, and occasional (every three years perhaps) synoptic surveys of less detail and more sampling sites throughout the marsh areas.

Wetland classification

The land use classification scheme being implemented for the National Park and the Hawizeh Ramsar Projects is at an appropriate scale of detail. We recommend that the wetland classification system used by Ramsar be investigated for its appropriateness in this situation, given that one site is being proposed as a Ramsar site and others may follow.

Annex 5: All Bird Species Recorded in Hawizeh Marsh in Summer and Winter by Nature Iraq Surveys during 2005 to 2008

This record was prepared by A.F. Omar of Nature Iraq and R.F. Porter of BirdLife International specifically for this Management Plan.

CC – Species of Conservation Concern: These include endemics/near-endemics; those species known to be seriously declining in all or most of their range; those species with a major proportion (over 50%) of their world population breeding in the Middle East; and those species with internationally important wintering populations in Iraq (Note: this category is based on a provisional assessment – Porter, In preparation).
GT – Globally Threatened Species: These are species of Conservation Concern that are also identified by BirdLife International as endangered, threatened or vulnerable.

Common English Name	Species Name	Summer	Winter	Status in the Hawizeh Marsh as determined by these surveys
Black Francolin	*Francolinus francolinus*	X	X	Resident breeder
Greylag Goose	*Anser anser*	-	X	Winter visitor
Whooper Swan	*Cygnus cygnus*	-	x	Rare winter visitor
Common Shelduck	*Tadorna tadorna*	-	X	Winter visitor
Ruddy Shelduck	*Tadorna ferruginea*	-	X	Winter visitor
Gadwall	*Anas strepera*	-	X	Winter visitor
Eurasian Wigeon	*Anas penelope*	-	X	Winter visitor
Mallard	*Anas platyrhynchos*	X	X	Winter visitor; some remain in summer
Northern Shoveler	*Anas clypeata*	X	X	Winter visitor; some present in summer
Northern Pintail	*Anas acuta*	-	X	Winter visitor
Eurasian Teal	*Anas crecca*	-	X	Winter visitor
Marbled Duck **GT, CC**	*Marmaronetta angustirostris*	X	X	Resident breeder and winter visitor
Red-crested Pochard **CC**	*Netta rufina*	-	X	Winter visitor
Common Pochard	*Aythya ferina*	-	X	Winter visitor
Ferruginous Duck **GT, CC**	*Aythya nyroca*	X	X	Winter visitor; some may remain to breed
Tufted Duck	*Aythya fuligula*	-	X	Winter visitor
Little Grebe **CC, Endemic Race**	*Tachybaptus ruficollis*	X	X	Resident breeder and winter visitor
Great Crested Grebe	*Podiceps cristatus*	X	X	Resident breeder and winter visitor
Black-necked Grebe	*Podiceps nigricollis*	-	X	Winter visitor
Greater Flamingo **CC**	*Phoenicopterus [ruber] roseus*	X	-	Passage migrant and winter visitor
Sacred Ibis **CC**	*Threskiornis aethiopicus*	X	X	Resident breeder

Glossy Ibis	*Plegadis falcinellus*	X	X	Winter visitor; may also breed
Eurasian Spoonbill **CC**	*Platalea leucorodia*	X	-	Breeding summer visitor
Eurasian Bittern **CC**	*Botaurus stellaris*	X	X	Resident breeder and winter visitor
Little Bittern	*Ixobrychus minutus*	X	X	Resident breeder and winter visitor
Black-crowned Night Heron	*Nycticorax nycticorax*	X	X	Resident breeder and winter visitor
Squacco Heron	*Ardeola ralloides*	X	X	Resident breeder and winter visitor
Goliath Heron	*Ardea goliath*	X	X	Resident and dispersive.
Cattle Egret	*Bubulcus ibis*	X	X	Resident breeder and winter visitor
Grey Heron	*Ardea cinerea*	X	X	Resident breeder and winter visitor
Purple Heron	*Ardea purpurea*	X	X	Resident breeder and winter visitor
Great Egret	*Ardea [Egretta] alba*	-	X	Winter visitor
Little Egret	*Egretta garzetta*	X	X	Winter visitor; some remain in summer
Pygmy Cormorant **CC**	*Phalacrocorax pygmaeus*	X	X	Resident breeder and winter visitor
Great Cormorant	*Phalacrocorax carbo*	-	X	Winter visitor
Darter (African Darter) **CC**	*Anhinga [rufa] melanogaster*	X	X	Resident breeder
Common Kestrel	*Falco tinnunculus*	-	X	Winter visitor
Short-toed Snake Eagle	*Circaetus gallicus*	-	X	Rare winter visitor
Western Marsh Harrier	*Circus aeruginosus*	-	X	Winter visitor
Long-Legged Buzzard	*Buteo rufinus*	-	x	Winter visitor
Hen Harrier	*Circus cyaneus*	-	X	Winter visitor
Eurasian Sparrowhawk	*Accipiter nisus*	-	X	Winter visitor
Asian Imperial Eagle **GT, CC**	*Aquila heliaca*	-	X	Winter visitor
Macqueen's Bustard **GT, CC**	*Chlamydotis macqueenii*	-	x	Rare winter visitor
Water Rail	*Rallus aquaticus*	-	X	Winter visitor
Little Crake	*Porzana parva*	-	X	Winter visitor
Purple Swamphen **CC**	*Porphyrio porphyrio*	X	X	Resident breeder
Common Moorhen	*Gallinulua chloropus*	X	X	Resident breeder and winter visitor
Eurasian Coot	*Fulica atra*	X	X	Resident breeder and winter visitor

Black-winged Stilt	*Himantopus himantopus*	X	X	Resident breeder and winter visitor
Pied Avocet	*Recurvirostra avosetta*	X	X	Resident breeder and winter visitor
Northern Lapwing	*Vanellus vanellus*	-	X	Winter visitor
Spur-winged Lapwing **CC**	*Vanellus spinosus*	X	X	Resident breeder and winter visitor
Red-wattled Lapwing	*Vanellus (Hoplopterus) indicus*	*X*	X	Resident breeder and winter visitor
White-tailed Lapwing **CC**	*Vanellus leucurus*	X	X	Resident breeder and winter visitor
Common Ringed Plover	*Charadrius hiaticula*	-	X	Winter visitor
Little Ringed Plover	*Charadrius dubius*	X	X	Winter visitor; some may breed
Kentish Plover	*Charadrius alexandrinus*	X	X	Resident breeder and winter visitor
Common Snipe	*Gallinago gallinago*	-	X	Winter visitor
Black-tailed Godwit **GT, CC**	*Limosa limosa*	-	X	Winter visitor
Spotted Redshank	*Tringa erythropus*	-	X	Winter visitor
Common Redshank	*Tringa totanus*	X	X	Winter visitor; some remain in summer
Marsh Sandpiper	*Tringa stagnatilis*	-	X	Winter visitor
Common Greenshank	*Tringa nebularia*	X	X	Winter visitor; some remain in summer
Green Sandpiper	*Tringa ochropus*	-	X	Winter visitor
Wood Sandpiper	*Tringa glareola*	-	X	Winter visitor
Common Sandpiper	*Actitis hypoleucos*	X	*X*	Winter visitor; some remain in summer
Ruddy Turnstone	*Arenaria interpres*	X	-	Recorded in summer, but probably wintering birds that have not returned
Little Stint	*Calidris minuta*	X	X	Winter visitor; some remain in summer
Temminck's Stint	*Calidris temminckii*	-	X	Winter visitor
Curlew Sandpiper	*Calidris ferruginea*	X	X	Winter visitor; some remain in summer
Dunlin	*Calidris alpina*	-	X	Winter visitor
Ruff	*Philomachus pugnax*	-	X	Winter visitor
Collared Pratincole **CC**	*Glareola pratincola*	X	-	Breeding summer visitor
Yellow-legged Gull	*Larus michahellis*	?	?	Status uncertain
Armenian Gull **CC**	*Larus armenicus*	X	X	Winter visitor; some remain in summer
Great Black-	*Larus ichthyaetus*	-	X	Winter visitor

headed Gull				
Common Black-headed Gull	*Larus ridibundus*	X	X	Winter visitor; some remain in summer
Slender-billed Gull **CC**	*Larus genei*	X	X	Resident breeder and winter visitor
Gull-billed Tern	*Gelochelidon* [*Sterna*] *nilotica*	X	X	Winter visitor and breeding resident
Caspian Tern **CC**	*Hydroprogne* [*Sterna*] *caspia*	X	X	Winter visitor; also recorded in summer
Common Tern	*Sterna hirundo*	X	-	Breeding summer visitor
Little Tern	*Sternula* [*Sterna*] *albifrons*	X	-	Breeding summer visitor
Whiskered Tern	*Chlidonias hybrida*	X	X	Breeding resident and winter visitor
Pin-tailed Sandgrouse **CC**	*Pterocles alchata*	X	-	Breeding resident
Spotted Sandgrouse **CC**	*Pterocles senegallus*	X	-	Breeding resident
Rock Dove	*Columba livia*	*X*	-	Probably a breeding resident
Common Woodpigeon	*Columba palumbus*	-	X	Winter visitor
Eurasian Collared Dove	*Streptopelia decaocto*	-	*X*	Probably a breeding resident
Laughing Dove	*Streptopelia senegalensis*	-	X	Probably a breeding resident
Egyptian Nightjar	*Caprimulgus aegyptius*	*X*	-	Breeding summer visitor
Indian Roller	*Coracias benghalensis*	X	-	Breeding summer visitor
White-throated Kingfisher	*Halcyon smyrnensis*	X	X	Breeding resident
Common Kingfisher	*Alcedo atthis*	X	X	Winter visitor; also recorded in summer
Pied Kingfisher	*Ceryle rudis*	X	X	Breeding resident
Blue-cheeked Bee-eater	*Merops [superciliosus] persicus*	X	-	Breeding summer visitor
Eurasian Hoopoe	*Upupa epops*	X	-	Status uncertain
Daurian/ Turkestan Shrike (Isabelline or Rufous-tailed Shrike)	*Lanius isabellinus*	-	X	Winter visitor
Great Grey Shrike/ Southern Grey Shrike	*Lanius excubitor/ meridionalis*	-	X	Winter visitor
Rook	*Corvus frugilegus*	-	X	Winter visitor

Hooded Crow **CC, Endemic Race**	*Corvus [corone] cornix*	X	X	Probably a breeding resident
Grey Hypocolius **CC, Endemic**	*Hypocolius ampelinus*	X	X	Breeding resident and winter visitor
Sand Martin	*Riparia riparia*	X	-	Breeding summer visitor
Barn Swallow	*Hirundo rustica*	X	-	Probably a breeding summer visitor
Crested Lark	*Galerida cristata*	X	X	Breeding resident
Eurasian Skylark	*Alauda arvensis*	X	-	Status uncertain; probably a winter visitor that occasionally remains in summer
Zitting Cisticola	*Cisticola juncidis*	-	X	Probably a breeding resident; not yet observed in summer
Graceful Prinia	*Prinia gracilis*	X	X	Breeding resident
White-cheeked Bulbul **CC**	*Pycnonotus leucogenys*	X	X	Breeding resident
Cetti's Warbler	*Cettia cetti*	-	X	Winter visitor
Basra Reed Warbler **GT, CC, Endemic**	*Acrocephalus griseldis*	X	-	Breeding summer visitor
Great Reed Warbler	*Acrocephalus arundinaceus*	X	-	Breeding summer visitor
Clamorous Reed Warbler	*Acrocephalus stentoreus*	X	-	Breeding summer visitor
Chiffchaff	*Phylloscopus collybita*	-	X	Winter visitor
Iraq Babbler **CC, Endemic**	*Turdoides altirostris*	X	X	Breeding resident
Common Babbler	*Turdoides caudata*	X	X	Breeding resident
Common Starling	*Sturnus vulgaris*	-	X	Winter visitor
Common Blackbird	*Turdus merulus*	-	X	Winter visitor
European Robin	*Erithacus rubecula*	-	X	Winter visitor
Bluethroat	*Luscinia svecica*	-	X	Winter visitor
Rufous-tailed Scrub Robin	*Cercotrichas galactotes*	X	-	Breeding summer visitor
Black Redstart	*Phoenicurus ochruros*	-	X	Winter visitor
Eurasian Stonechat	*Saxicola torquatus (S. rubicola)*	-	X	Winter visitor
Isabelline Wheatear	*Oenanthe isabellina*	X	X	Winter visitor; some may remain to breed
Desert Wheatear	*Oenanthe deserti*	-	X	Winter visitor
House Sparrow	*Passer*	X	X	Breeding resident

	domesticus			
Spanish Sparrow	*Passer hispaniolensis*	-	X	Winter visitor
Dead Sea Sparrow **CC**	*Passer moabiticus*	X	X	Breeding resident
Western Yellow Wagtail	*Motacilla flava*	X	-	Status uncertain; summer visitor that may breed
White Wagtail	*Motacilla alba*	-	X	Winter visitor
Tawny Pipit	*Anthus campestris*	-	X	Winter visitor
Water Pipit	*Anthus spinoletta*	X	X	Winter visitor; some remain in summer
Reed Bunting	*Emberiza aureola*	-	X	Winter visitor