IUCN - The World Conservation Union
Sindh Programme Office

Status Paper on
Wetlands of Sindh

By

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October 2002

The views expressed in this draft paper are those of the author and may not reflect IUCN's position on this issue. After consultation and finalization the views would encompass those of stakeholders.

CONTENTS

EXECUTIVE SUMMARY

Wetlands are among the most productive of eco-systems in the world, often referred to as the “supermarkets” because of their extensive and rich food webs and bio-diversity. The importance of wetlands in Pakistan was first brought to notice to the international community in 1967. In 1987, the total numbers were listed as 119. Pakistan became signatory to the RAMSAR convention in 1976, at the time the total covered area of wetlands of Pakistan is approximately 7,800 square kilo-meters and the number of internationally important wetlands was eight. In 2001, this number became sixteen. Six of these sixteen are located in the province of Sindh.

The document identifies the significance of the wetlands in general and their role in the socio-economy of the country and particularly in the province of Sindh.

It provides a historical perceptive to the issues surrounding the wetlands of Pakistan in general and Sindh in particular. Further it discusses the variety of wetlands of Sindh : marine, brackish, freshwater and man-made, and the various associated socio-economic issues. Brief case studies of the six RAMSAR sites identified that are internationally recognised and are important have also included in the paper.

In role of the stakeholders and the line of action, leading to an integrated and participatory approach is proposed and the various strategies discussed.

INTRODUCTION

Pakistan has a growing number of recognised and unrecognised wetlands in the arid and semi-arid zones, that are spread over all the four provinces of Sindh, Balochistan, NWFP ,Punjab and Azad Kashmir. In 1976, at the time Pakistan became a signatory to the RAMSAR the covered area of these wetlands is approximately 7,800 sq.km. This area represents 9.7% of the landmass of Pakistan. The recognised numbers and covered areas have increased considerably since.

In 1971, the Conference of Contracting Parties to Convention on Wetlands, more commonly known as the RAMSAR Convention in their Article 1.1, adopted an international definition for wetlands that was acceptable to one hundred signatory countries. A broader approach followed, and wetlands were defined 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 does not exceed six meters". Additionally, the Convention also in its Article 2.1 states that wetlands "may incorporate riparian and coastal zones adjacent to wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands".

Scott (1989), defined 30 groups of natural and nine man-made wetlands. The RAMSAR Convention categorises broadly classify wetland into three main groups, each with its own sub-group:

Marine

- *Subtidal*- un-vegetated shallow waters less than 6m depth at low tide, for example, sea bays and straits, and sub-tidal aquatic vegetation.
- *Intertidal* -Rocky marine shores, intertidal mud, sand and salt flats and vegetated sediments including mangroves.

Estuarine

- *Subtidal*- permanent estuarine waters, and estuarine delta systems.
- *Intertidal* -intertidal mud, sand and salt flats, intertidal marshes and forested wetlands (mangroves).
- *Lagoon*- Brackish or saline lagoons with a narrow connection to the sea.
- *Salt Lake*- Brackish, saline or alkaline lakes and marshes.

Freshwater

- *Riverine*
- *Perennial*- permanent rivers and streams, waterfalls and inland deltas.
- *Temporary* -seasonal and irregular rivers, streams, floodplains, river flats.

- *Lacustrine*
- *Permanent*- permanent freshwater lakes and shores subject to irregular innundation, and freshwater ponds.
- *Seasonal* -seasonal freshwater lakes and floodplain lakes.

- *Palustrine*
- *Emergent*- freshwater marshes and swamps with inorganic soils, with emergent vegetation with bases below water table during growing season; peat-forming freshwater swamps; seasonal marshes; peat-lands; alpine and polar wetlands; springs and oases; and volcanic fumaroles moistened by water vapour.
- *Forested* -shrub swamps, freshwater swamp forests and forested peat-lands.

Man-Made Wetlands

- *Aquaculture / Mariculture* - **Aquaculture ponds including fish and shrimp ponds.**

- *Agriculture* - Ponds, irrigated land and channels including canals and rice fields, and seasonally flooded arable land.

- *Salt Exploitation* - Salt pans and salines.

- *Urban / Industrial* - Excavations, for example, gravel pits and mining pools; wastewater treatment areas such as sewage farms and settling ponds.

- *Water-storage Areas* - Reservoirs for irrigation or human consumption with gradual/seasonal decline of water levels; hydro dams with regular fluctuation of water levels.

Importance of Wetlands

The importance of wetlands has changed with time. As scientific understanding of these dynamic systems has increased, so have their functions. Wetlands are amongst the most productive ecosystems in the world, often referred to as “biological supermarkets” because of the extensive food webs and rich bio-diversity they support (Mitsch and Gosselink, 1993). Wetland ecosystems are important because they, supply water for drinking, recharge groundwater systems, maintain water quality by trapping sediments, retain and recycle nutrients, and remove toxins. They oxygenate the water and release clean water into the environment. Wetlands act as vast sponges for holding water, thus reducing flood pressure. They prevent saline intrusion in coastal areas, and stabilise microclimates by variations in rainfall and temperature, Wetlands serve as a gene pool, and are regarded as an important sources of fish and other foods. They are known to produce and export biomass, thus nourishing fisheries downstream, They provide transportation network, that are especially important in rural areas that have a poor network of roads, wetlands provide for a wide range of housing materials. They serve as valuable educational and act as enclosed experimental areas, and act as valuable wildlife refuges, providing over-wintering facilities, along with feeding, nesting and resting grounds for migratory and resident birds. Wetlands often have profound cultural and spiritual significance for the local communities, They support local economy and cottage industries, sustain agriculture, industry, tourism and commerce, and provide exceptional sources of recreation for both residents and visitors, (Barbier 1989, 1994; Scodari, 1990, Barbier *et al*., 1996;)

CURRENT SITUATION

The Convention of Wetlands was signed at Ramsar, Iran in 1971. It provides a framework for national action and international co-operation for conservation and sustainable use of wetlands and their resources. There are presently 124 countries that are parties to the convention with 1069 wetland sites totalling 81.2 million hectares (313,432 square miles), that are included in the RAMSAR list of Wetlands of International Importance.

The importance of Pakistan’s wetlands was first brought to the notice of the international community at the technical meeting on Wetland Conservation held in Ankara Turkey in October 1967 (Savage, 1968). In 1987 the total number of wetlands in Pakistan were listed to be 119 (Ghalib *et al*., 1987). At the time Pakistan ratified the RAMSAR Convention in 1976, eight wetlands of international importance were included in the list and the total area cover approximated 9.7% (7,800 km2) (Scott, 1989). In 2001, the country designated eight new Wetlands of International Importance, bringing the total number to 16.

Although predominantly arid to semi-arid, Pakistan possesses a great variety of wetlands, generally classified under: marine, brackish, freshwater and man-made.

WETLANDS OF SINDH

The six sites listed in the RAMSAR list of Wetlands of International Importance (Table 1). Previously this number was three (Scott, 1989). There are many more that at some point could be defined wetland areas or that could very easily be categorised under the definition of potential wetlands (Table 2) .

Table 1. RAMSAR list of Wetlands of International Importance in the province of Sindh (1= website ; 2= Scott, 1989)

Name of Site	Location	District	Surface Area (hectare)	Wetland Type	Recognition RAMSAR Site No. (RS#)
Keenjahar (Kalri) Lake	24° 56′ N 68° 03′ E	Thatta	13468[2]	freshwater lake	1976 RS# 99
Drigh Lake	27° 34′ N 68° 06′ E	Larkana	164[1] 182[2]	Slightly brackish lake	1976 RS# 100
Haleji Lake	24° 47′ N 67° 46′ E	Thatta	1704	Artificial freshwater lake	1976 RS# 101
Indus Dolphin Reserve	28° 01′ N 69° 15′ E	Between Guddu and Sukkur Barrages	125,000[1] 44200[2]	River	2001 RS#1065
Jubho Lagoon	24° 20′ N 68° 40′ E	Thatta	706	Brackish lagoon, mudflats, marshes	2001 RS# 1067
Nurri Lagoon	24° 30′ N 68° 47′ E	Badin	2540	Brackish lagoon, mudflats	2001 RS# 1069

Table 2. List of other wetlands in the province of Sindh
(Source: Scott, 1989)

Name of Site	Location	District	Surface Area (hectare)	Wetland Type
Ghauspur (Rup) Jheel	28° 08′ N 69° 06′ E	Jacobabad	Combined with SDL 600[2]	Freshwater lake
Sindhi Dhoro Lake (SDL)	28° 09′ N 69° 04′ E	Jacobabad		Freshwater lake
Hamal Katchri Lake	c. 27° 23′ N 67° 55′ E	Larkana	unknown	Shallow lake, associated marshes
Pugri Lake	27° 18′ N 68° 03′ E	Larkana	unknown	Shallow brackish lake
Manchar Lake	26° 25′ N 67° 39′ E	Dadu	ca. 6000 ha	Freshwater lake and marshes
Nara Canal Area	26°00′-27°15′N 68°47′-69°18′E	Khairpur and Sanghar	ca. 300000	200 small, freshwater, brackish and saline lakes and marshes
Soonhari Lake	26° 10′N 69° 04′ E	Sanghar	245	Small saline lake and brackish marshes
Sadhori Lake	26° 12′ N 69° 07′ E	Sanghar	unknown	Shallow freshwater lake
Sanghriaro Lake	26° 07′ N 69° 12′ E	Sanghar	380	Shallow brackish lake
Khipro Lakes	25°32′-25°49′N 69°29′-69°38′E	Sanghar	ca. 30000	30 small brackish and saline lakes
The Tando Bago Lakes	24°45′-24°50′N 68°50′-69°05′E	Badin	unknown	11 shallow fresh and slight brackish lakes and marshes
Phoosna Lakes	24° 48′ N 68° 54′ E	Badin	160 ha	2 shallow slightly brackish lakes
Charwo Lake	24° 50′ N 69° 00′ E	Badin	100 ha	Shallow freshwater lake and marshes
Khanjo (Khowaja Lake)	24° 47′ N 69° 05′ E	Badin	ca. 500	Freshwater lake and associated marshes
The Badin and Kadhan Lagoons	24°15′-24° 30′N 68°35′-69°05′E	Badin	unknown	Very shallow brackish lagoons and wet mudflats
Shahbundar Salt	24°06′- 24°12′N	Thatta	ca. 20000 ha	Salt waste and

Waste and Jafri Lake	67°54′-68°15′E			large brackish to saline lake
Mahboob Shah Lake	24° 30′ N 68° 03′ E	Sujawal	100 ha	Small fresh to brackish lake and marshes (small lakes in the region: Karo, Karajo, Chatch and Ghungri)
Hadero Lake	24° 49′ N 67° 52′ E	Thatta	1321	Brackish lake
Hawkes Bay/ Sandspit and adjacent creeks	24°47′-24°52′N 66°50′-66°59′E	Karachi	20 km beaches ca. 2000 tidal creeks	Sandy beaches, complex creeks and shallow tidal lagoons, inter tidal mudflats and mangrove swamps
Clifton Beach	24° 47′ N 67° 05′ E	Karachi	8 km beach	Sandy beach, tidal mudflats, sand dunes
Korangi (KC) and Gharo (GC) Creeks	24° 47′N 67° 11′ E	Karachi	KC 48386 GC 64370	Tidal creeks, mangrove swamps, tidal mudflats
Outer Indus Delta	23°45′-24°45′N 67°10′-68°15′E	Karachi to Indian border	ca. 300000 200000 mangroves	Tidal river channels, creeks, sandy islands, mangrove swamps, inter tidal flats
Langh (Lungh) Lake	27° 30′ N 68° 05′ E	Larkana	19	Formerly a freshwater lake fed by rice paddies, now water diverted else where. Wetland has completely disappear-ed

SURVEYS CONDUCTED IN THE WETLANDS OF SINDH

Over the past several years, many wetlands have been degraded and have lost their significance due to unsustainable exploitation, increase levels of urban and domestic effluents being discharged into the aquatic environment along with the draught like conditions. On the other hand, new marshes, man-made lakes and reservoirs are also been created. In the case of the wetlands of Sindh, some sites have received more attention than others, depending upon their overall significance. Three new wetlands were recognised as RAMSAR site of International Importance in 2001, and results of the surveys of these sites are available.

Waterfowl census of over-wintering birds is available with the Sindh Wildlife Management Board, Sindh Wildlife Department, Zoological Survey Department, these organisations have the mandate to conduct survey operations. Early records of the waterfowl census is from the early seventies, in some cases, there has been regular monitoring since, in others only periodically (Scott, 1989).

With the development of several large scale projects in the province of Sindh, such as the construction of the Left Bank Outfall Drain (LBOD). Base-line surveys in connection with the Environmental Impact Assessment Studies carried out at different stages of the adjoining areas including the “dhands”, freshwater, brackish and saline lakes is also available from the early nineties (LBOD report).

More recently, remote sensing techniques have been applied on the monitoring of wetland monitoring. SUPARCO has obtained satellite imageries that it is using to obtain relatively precise information on the estimates of spatial extents, surface area etc. that could very effectively be linked to attribute data on seasonal variation, weed cover, vegetation cover, environmental degradation etc. and the development of a GIS base evaluation (per. communication: Nasir, A. *et al*. 2002). Mathrani *et al*., (2002) have also used similar techniques to observe the changes that have taken place on some of the “dhands” around the Tidal Link, their observations through the satellite images analysis has been that the boundaries of some of the water bodies has changed over the years to form a single source with the same boundary. The area at times also decreases due to over exploitation of the wetland resources by the local nomadic communities that live in and around the wetlands. These simple folk would live off any nearby wetland resources that provide fish and birds for their protein source. They use trees as fuel wood and plantation as fodder for their domestic animals. Often the wetlands are un-sustainable exploited and biodegraded by the local communities, when a section of the wetland is unable to support the needs of the community, they simply move on to another location that caters to their requirements. As the human population continues to grow, it will contribute significantly towards the process of wetland biodegradation. Although, as of recent much attention has been given to the ecological and environmental surveys of the wetlands, than in the past. In most cases, however there is no baseline information available. Regular Waterfowl Census is available for some locations. There is an urgent need to conduct more qualitative and

quantitative surveys. Accessibility of information and reliable tools would make the monitoring job more meaningful and useful.

ISSUES AND TRENDS

Wetlands are dynamic systems, continually undergoing natural changes due to subsidence, drought, sea-level rise or in-filling with sediment or organic material. Many wetlands are only temporary feature of the landscape and are expected to change sometimes they even vanish, whilst new wetlands are created.

In the province of the Sindh, the local communities that live near the wetlands have used this resource for centuries, in a sustainable manner. Nevertheless, in recent times a combination of increased population pressure has subsequently resulted in the usage of the resource that is no longer sustainable. Increased demands from urban areas for water resources have led to the construction of dams, barrages, irrigation systems, etc, creating additional burdens. Wetland ecosystems provide-a wide range of services, many of which are taken for granted in government planning and development processes, and are thus undervalued.

The number and area of wetland lost are difficult to quantify, and the total area lost is uncertain till a complete and consolidated study is available that is specifically focused in that direction. However, a wetland does not need to be entirely lost to reduce its value. The idea is to develop wetland policies that include conservation within the national framework of land use planning, and holistically adopt and implement the “Wise Use Concept”.

Pakistan has a population of 140 million people, out of which 71.7% are directly or indirectly engaged in agriculture that earns two thirds of the country's foreign exchange and contributes more than 20% to the GDP. The extensive irrigation system consists of 1.6 million km of unlined water channels, with high seepage losses (about 40 % of the water is lost before it reaches the farm gate). This continuously augments the saline groundwater thus raising the water table in the Indus Basin. Prior to the construction of the Kotri barrage in the 1950’s, approximately 100 MAF of water and 400 tons of sediment were discharged annually. After the damming of the Indus River now as low as 9.68-10.98 MAF of water below Kotri has been observed during dry season (Keerio and Bhatti 1999), and much of it is lost due to evaporation, infiltration and abstraction. Approximately, 100 million tons per year of sediments are discharged (IUCN 1991, Keerio and Bhatti 1999) as compared to 400 million tons of sediment discharge prior to damming the Indus. The low discharge of both sediment and water have had a negative impact, especially on the coastal wetlands as no sediment nourishment takes place and because of that the rate of erosion coupled with less water events of saline water intrusion has increased. At present 60% of the total arable land is water-logged. Due to the rise in the water table, a number of localised low lying productive areas have been converted into seasonal or permanent wetlands found, for example, in Badin and Thatta districts of Sindh. Unfortunately, salinity and water-logging have become a severe problem for

much of the agricultural lands in the Indus Basin, and many areas have become so saline that they are unable to support any bird or plant life, much less migratory birds.

There is an inextricable link between agriculture, irrigation and wetlands in Pakistan. Some of the prominent wetland sites are reservoirs and dams; they have become an important for waterfowl habitats. However, these wetlands are now suffering because of ineffective management in the catchment areas, where forests are being harvested at an unsustainable rate (current rate of deforestation is 7-9 km2/year). Loose topsoil is washed into the river systems resulting in siltation of catchment areas, thereby reducing the life span of dams and reservoirs. Natural wetlands are also suffering because of unsustainable use of water for sustaining the required levels. The water is being diverted to fulfil the demands of agricultural crops. The water that does reach the natural wetlands that are located inland are generally laden with silt, fertiliser and pesticide runoff, causing additional problems of siltation and eutrophication.

Coastal and estuarine wetlands are of great value to man and environment. Coastal zones and wetlands are important national assets where socio-economics activities are highly concentrated. The shallow and inter-tidal areas of the estuaries and the margins of land are typically marine environments. Coastal vegetation is a very important component in this system. These habitats serve as spawning, rearing, and nursery grounds for the production of shrimps, lobsters and fish. They are of great significance as they serve as critical breeding, rearing, staging and wintering grounds for a number of globally important fish and shellfish species. During the migration season, over one million waterfowl from 108 species use the extensive deltas.

THREATS TO WETLAND HABITATS

The major threats to wetlands are expressed as percentage of sites by the World Conservation Monitoring Centre (1992), and the activities that contribute towards the loss of the resources are: hunting and allied activities, human settlement, drainage of agriculture, disturbance from recreation, reclamation for urban and industrial development, pollution, catchment degradation, diversion of water, soil erosion and siltation etc.

Wetlands in Pakistan, Sindh, face a variety of threats, some of them identified above. Nevertheless, primary among which is the lack of proper management and ignorance of the importance of healthy wetlands. However, the view that the crisis of the aquatic environment is basically an economic issue, this has been widely recognised by many international fora and organisations. The UNCED held in 1992, to which Pakistan is a signatory, recognised the environment crisis at two levels; at the Global level resulting from green house effects, warming of the climate/seas, sea level rise, and other localized perturbations resulting from indiscriminate destruction of natural wetland resources and the negative feedback from unplanned development process, leading towards deterioration of the aquatic resources. Despite Pakistan's great reliance on wetlands, these are still being degraded at an alarming rate, more specifically in the Indus Basin. Potable water supply to communities is provided by some of the wetlands. Example, lakes such as Haleji Lake that is harnessed for the freshwater resource in order to supply water to the city of Karachi. Other wetlands like dams also provide similar services. The discharge of sewage, effluent, irrigation and industrial waste into the aquatic ecosystems in Pakistan has become a common phenomenon. The organic sewage load depletes oxygen levels in enclosed water bodies and so reduces the diversity of animal and plant life. The Left Bank Outfall Drain (LBOD), that was partly damaged by a severe tropical cyclone “2A” in May 1999, and the planned mega drainage project on the Right Bank of the River Indus (RBOD), that would discharge saline underground water into the Gharo creek, would deteriorate and impair the water quality and ultimately put a physiological stress on the wetland habitat.

LINE OF ACTION- PAST AND PRESENT

The importance of wetlands of Pakistan was first brought to the notice of the international community (Savage, 1968). Pakistan ratified the RAMSAR convention in 1976. There is currently no domestic strategy or legislation exclusively pertaining to wetland conservation in Pakistan. Wetlands and waterfowl conservation is a provincial subject in Pakistan and is looked after by the respective provincial wildlife or forest departments.

Non-Governmental Organisations (NGOs) play a major role in supporting and directing government efforts to improve wetland conservation. The WWF-Pakistan initiated its current Wetland Conservation Programme in 1989. The WWF- Pakistan Wetlands Conservation Programme has been working towards

the conservation of important wetlands for the past eight years. They have also been instrumental in developing the National Wetland Programme a *"Wetland Action Plan"* was developed in 1991.

IUCN – The World Conservation Union, has been active in wetlands conservation since its establishment in 1984 and has played a key role in the development of wetland programs in Pakistan. With the financial support of different donors wetland conservation activities were initiated, including the designation of wetlands to new Ramsar Sites as part of IUCNP general objective to safeguard habitats and protect the biodiversity.

IUCN Pakistan has also been involved in the implementation of a number of mangrove conservation projects since 1987-88. The IUCN Pakistan has jointly with its national member formulated a National Conservation Strategy, that would be implemented jointly by the Government, NGOs and the civil society.

CASE STUDIES OF THE WETLANDS OF INTERNATIONAL IMPORTANCE IN THE PROVINCE OF SINDH

The major RAMSAR recognised sites of international importance in Sindh, are discussed briefly:

Indus Dolphin Reserve (RAMSAR SITE NO. 1065)

The area of the reserve spreads over 135 km, from the Sukkur Barrage upstream to the Guddu Barrage. During winter the area is reduced considerably due to the shortage of water in the river and the area available to the endangered species, Blind Indus Dolphin *Platanista indi*. The blind Indus dolphin has been classified as an endangered species (IUCN Red Data Book). In 1974, the entire area was declared as a sanctuary. And more recently (2001), the area was declared as a RAMSAR site. The major threats include: split populations of the dolphins due to dams and barrages on the River Indus, reduction in habitat size during dry season, high turbidity, pollution and hunting.

The ecological and economic value of the site is unknown. Studies on the census have been carried out by the Sindh Wildlife Management Board and more recently by the WWF-Pakistan. (Table 3) WWF-P plans to further its dolphin conservation efforts by raising community and public awareness, enhancing the government's capacity for better management, highlighting policy issues and developing and implementing a trans-regional river dolphin conservation programme.

Table 3. Number of individuals of *Platanista indi,* Blind Indus Dolphin.

YEAR	NO. OF INDIVIDUAL
1974-75	150
1977	300
1979	292
1986	429
2001	Total= 1100 Sindh= 602+18

Since the declaration of the dolphin habitat site as a protected area, the number of individuals has increased. Some Management plan exists for conserving the Indus dolphins.

Keenjhar (Kalri) Lake (RAMSAR SITE NO. 99)

The lake is a large freshwater lake of Pakistan, located in the province of Sindh, in the district of Thatta, it was declared a RAMSAR site in 1976, and was later declared a Wildlife sanctuary, under the Sindh Wildlife Protection Ordinance.

The lake has provides drinking water to Karachi, and provides livelihood to the adjoining villages. An annual Waterfowl Census are carried out since 1971. Some base-line information is also available on the fauna; sixty-five species are recorded from the Lake (Scott, 1989; Table 4).

Table 4. Number of birds recorded from Keenjhar (Kalri) Lake

YEAR	TOTAL NO. OF INDIVIDUAL RECORDED
1970s	50,000-150,000
1987	135,000
1988	205,000

Major threats to the lake include illegal fishing operations including excessive number of fishing boats, and use of nets in the lake, grazing domestic animals and unchecked recreational activities. A management plan exists but it is not fully implemented.

Drigh Lake (RAMSAR SITE NO. 100)

This is a small slightly brackish lake with extensive marshland. The lake was declared a Wildlife sanctuary in 1972, and became a RAMSAR site in 1976. Threats include diversion of water; overgrown *Typha* and *Tamarix* resulting in increased grazing pressure. The number of wintering birds visiting the site has decreased over the years (Table 6, Scott, 1989). Regular Waterfowl Census was carried out in mid-winter each year since 1971. A management plan for the lake was approved but not implemented.

Table 5. Number of birds recorded from Drigh Lake

YEAR	TOTAL NO. OF INDIVIDUAL RECORDED
1973	32,000
1975-76	> 7000
1987	820
1987-88	17,400

Haleji Lake (RAMSAR SITE NO. 101)

This is a perennial freshwater lake with associated marshes and adjacent brackish seepage lagoon. The lake became a Game reserve in 1971, in 1977, it was declared a Wildlife sanctuary. In 1976, the lake was declared a RAMSAR site. Haleji is an important source of water to the city of Karachi, and serves for flood control, besides being a popular recreational destination.

Threats include not only by overlapping of the management by Karachi Water Sewage Board (KWSB) and the Sindh Wildlife, but also from un-authorised and illegal fishing, hunting and cutting of trees, siltation, eutrophication, construction of the drainage canal close to the lake has deteriorated the lake environment.

A management plan for Haleji has been approved but has not been fully implemented. The avian fauna observed from the site, has documented several species, other aquatic species such as tortoises, crocodiles are also present and the number of birds recorded are summarised in table 7. (Scott, 1989). Regular waterfowl census is carried out every year since 1971.

Table 6. Number of birds recorded from Haleji Lake

YEAR	TOTAL NO. OF INDIVIDUAL RECORDED
1970s	60,000-100,000
1987	53,000
1988	103,000

Jubho Lagoon (RAMSAR SITE NO. 1067)

A shallow, small brackish water lagoon with mudflats and marshes, that supports a large concentration of migratory birds including flamingos and endangered Dalmation pelicans, one of rarest pelicans in the world and one of the largest bird species in the world. This is a privately owned site, and was declared a RAMSAR site with major efforts of IUCN Pakistan.

Nurri Lagoon (RAMSAR SITE NO. 1069)

A brackish lagoon with barren mudflats that are visited by large concentrations of migratory water birds. The site is privately owned. Increased salinity and sea intrusion are the major threats to the site; other threats include invasive species, population pressures, and agricultural and industrial pollution.

Manchaar Lake

The Manchaar Lake is one of the largest freshwater lakes not only in the province of Sindh but in the whole of the subcontinent It is located on the right bank approximately 140 km north of the Arabian Sea. This is a shallow depression lake that is about 10 ft deep. The southern part is the high ground of Sindh Kohistan and is fed by the Nara, Manchaar Lake is about 17ft lower than the Indus River bed, and the lake after inundation expands to over 200 sq miles with out flow to the Indus. During the dry monsoons the lake shrinks to about 14 sq. miles. The Manchaar Lake is considered a safety valve for the Indus. However, it has been observed as of lately that the lake is getting shallower each year due silt deposition and accumulation of decomposed vegetation, that may lead to eutrophication in shallower parts of the lake, that in turn may cause anoxic conditions thereby destroying the benthic habitats. Manchaar Lake has become a large resting site for the exotic migratory birds that fly in from the north during the northeast monsoon period (December – March).

PAST, PRESENT AND PLANNED INTERVENTIONS

All the wetlands in Pakistan can support varying densities and diversity of fauna and flora. Although, massive deforestation of woody vegetation has occurred over millennia when the area was occupied by successive civilizations dependant on grazing and cultivation. The plains in the main Indus valley, water sheds and wetlands fell under the jurisdiction of conquerors, the vanquished were pushed further inland or on to mountains where the forest were cleared for sustenance agriculture and grazing. Conservation of hunting species for the elite in wetlands and game reserves was a common tradition.

With the occupation of the British in the mid 19th century, the timber that grew along side the wetland and the mountain region came under the pressure as large-sized timber was needed for construction of cantonments and railways tracks. Large-scale canal irrigation in the Indus plain started the demise of the diverse forest and associated fauna. Later in the 20th century the conservation efforts for preserving

approach, without involving the local inhabitants in the management of the natural resources including the wetlands.

CURRENT CONSERVATION POLICES

The current conservation policies on natural resources are framed by the Government of Pakistan in the Ministry of Environment, Local Government and Rural Development. The most recent conservation policies of the Government of Pakistan with respect to the management of natural resources are:

- Conserving biological diversity and maintaining ecological balance.
- Containing environmental degradation in the watersheds.
- Promoting income generation and self-employment in rural areas.
- Promoting NGOs and private voluntary organisations to create public awareness.
- Integrated and participatory management of natural resources.
- The National Conservation Strategy (NCS 1992) further emphasised the need for:
- Maintaining essential ecological processes.
- To preserve the bio-diversity of natural resources to restore degraded natural resources cost-effectively.
- Ensure sustainable use of natural resources
- To ensure balanced and diversified development that maintains, if not increase the sum of options available to future generations.
- To improve the efficiencies with which natural resources are used.
- To give priority to preventing deterioration of the fragile ecosystems with large down stream effects.

All these policies are very ambitious and will require tremendous resources and a great deal of time for implementation. The implementation of NCS is proposed to be initiated through launching programmes for protecting water-sheds, forestry and plantations, restoring range-lands and improving livestock, protecting bio-diversity and supporting capacity building both at the institutional as well as at the professional level. These efforts can only be achieved with sustained funding from donor agencies and through the participation of community based conservation (CBC) groups.

OPTIONS FOR FUTURE ACTION

In the under-developed world, where basics such as health and education also receive less than necessary funding, it is difficult for governments to justify spending on the environment. Generally, wetland conservation receives little monetary support from the government because it is viewed as a low priority area. The value that is placed on wetland resources by the government or local communities living in and around such sites is based upon the immediate benefit they derive in terms of income and livelihood. But this evaluation tends to be viewed from a short-term perspective with no thought being given to what will happen once the resources have been depleted.

Development of Management Plan

Unfortunately, attempts to develop a proper economic evaluation system for wetlands are still far from complete, especially for the South Asian region (Dugan, 1990). Evaluating the socio-economic implications of wetland resources must therefore become a top priority for action by government and by national and international NGOs if wetland sites are to survive.

Sometimes local communities may be aware of the value and functions of the wetland, as well as the dangers of over-exploitation, but they are unable to change to sustainable patterns of resource use because of a lack of information and knowledge. For communities that have their livelihood depending on the wetlands, it is imperative that initiatives be designed to assist them in trying to create innovative methods of resource management.

There is a crucial need for governments and NGOs to explore the possibilities of diverse funding mechanisms, such as fees, special taxes and returning profits from the exploitation of the environment, to make up the funding base for conservation (Dugan, 1990). The plight of the environment, and especially of the degradation of wetlands is often ignored. The ignorance about environmental issues, which affects millions of people, stems from the Government's inability to impart quality education to the masses. It is only through a concerted effort on the part of the government and NGO sector, that society will realize the true value of wetlands and work towards conserving and protecting this vital resource.

Management plans were also produced in conjunction with the relevant government organisations and wildlife departments. The Hub Dam Management Plan (WWF-P, Sindh Wildlife Department, Balochistan Forest and Wildlife Department, Zoological Survey Department and Water and Power Development Authority).

Conservation Education

With regard to wetlands in general, peoples' attitudes have been shaped by their use of wetland resources. Communities living in and around a wetland area depend directly or indirectly upon the resources it offers. Some of the time this use is sustainable. More often than not, people use this resource in an unsustainable manner. The reason being that people are generally ignorant of the value of

such an ecosystem not only to them, but also to the many species of plant and animal life which depend upon the continued and unchanged existence of such an ecosystem.

"People will only adopt the ethic for (environmentally) sustainable living when they are persuaded that it is right and necessary to do so, when they have sufficient incentives, and when they are enabled to obtain the required knowledge and skills. " (Caring for the Earth: A Strategy for Sustainable Living, pg52.)

It is only through education, and specifically conservation education, that people will understand the importance of the natural world and the urgent need for our sustainable use of its resources. Conservation education is any type of education that brings about improved natural resource management and reduces environmental damage. It is essential to build this approach into both formal and non-formal education in order to reach the maximum number of people. The power of non-formal education must be harnessed, especially in a country like Pakistan, where over 70% of the population are illiterate. Both children and adults must be schooled in the knowledge values that will allow them to live in sustainable harmony with the environment.
In Pakistan, conservation education and awareness could be conducted through the following channels:

- *Schools* -the formal and non-formal education sectors can be utilized by integrating conservation and environment issues into the general curriculum.

- *The Formal Sector:* This involves all government and private schools that follow the national curriculum and have proper school infrastructure and school hours. It is the responsibility of the Board of Education to ensure that the national curriculum includes conservation education as part of its course work. However, NGOs and the public need to lobby and convince the government of the importance of such holistic education.

- *The Informal Sector:* By the informal sector, we mean all education that is not conducted through recognised and registered schools. This includes street schools, home schools, adult education etc. It is up to those providing such services to ensure, with the help of NGOs and the government, that they can provide conservation education to their target audiences.

- *Non-Governmental Organisations/CBOs* / *Societies* / *Clubs* -through projects and programmes which focus specifically on the needs of low-income and under-privileged communities; by raising awareness among their target audience; by lobbying government and working with government agencies such as the EPA, Forestry Department, etc.

- *Mass Media* -using electronic mass media such as television, radio and the print media for informal campaigns which target both rural and urban populations and provide alternatives to unsustainable resource use.

- *Travelling Road Shows* -using local and traditional fables and stories to raise awareness and educate the general public about environmental degradation and the benefits of sustainable living.

It is only "through giving the utmost priority to the actions described above that we can even hope to achieve a small reversal in the damage that has already been caused. Many of today's natural disasters are the direct result of our unsustainable use of the environment, whether it be massive deforestation, reclamation of wetland sites for agriculture purposes, or the building of dams and reservoirs. It is only through conservation education that we can hope to stop such destruction and allow future generations to experience what we currently take for granted.

Over-utilisation of Wetland Resource and Participatory Effort?

"The resources of many wetlands are in the process of being irreversibly destroyed usually as a consequence of the unsustainable use by local communities, demographic changes, increases in demand for agricultural land, for pasture and fishing have broken traditional systems of resource use. These pressures, along with man made changes in wetlands, have decreased the wetland's capacity to sustain itself".

Many view the elimination of wetlands as a small price to pay for the benefit expected from wetland conversion (Dugan, 1990). However, much of this conversion of resource use has resulted in great hardship to populations dependent upon such sites in their day to day living. In fact, dams and other river basin schemes have fallen far short (their predicted benefits).

Over the years, seepage from agricultural lands and the canal irrigation network has formed many artificial wetlands that have become very important for migratory birds such as cranes and ducks. Examples of them include the lakes, ponds and dhands of Sindh. Unfortunately, salinity and water-logging have become a severe problem for much of the agricultural lands in the Indus Basin, and many areas have become so saline that they are unable to support any bird or plant life, much less migratory birds.

Community participation ensures that the decisions are sound with support from all sides. To ensure their participation, it is important to involve them in the entire process, from the design and planning to the implementation stages. This will not only help towards better planning but also imbue a sense of confidence and ownership. This participatory process will safeguard the resources not only for current users but also for future generations.

However, each wetland has a different class or group of communities living in its surroundings. This may have lead to a distinct socio-economic situation in each wetland. Therefore, it is necessary to understand

the socio-economic and cultural factors operating within any area before planning community involvement.

Participation of Women in Sustainable Use

When seeking co-operation with local communities, special attention should be given to ensure the role of women in the effort. Women often play major role in resource use. However, their status generally does not allow them to benefit from the necessary legal and financial means, nor participate fully in household and community decision-making. If the participation of women is to become a reality it is important that their role in the actions is specifically addressed.
In recent years, remarkable advances have been made world wide in participatory learning in research and extension, planning, management and monitoring. The common approaches are Participatory Rural Appraisal (PRA) and Participatory Learning and Actions (PLA).

The idea of PRA /PLA is to:
a) Identify the diversity within the persons living within a community, and their perception to the environment and the key issues concerning them.
b) To establish the human resource use pattern.
c) Identifying the problems and finding ways to resolve these, as suggested by the communities themselves, and with their participation.

Community mobilisation is another systematic approach aimed towards the conservation of natural resources. The expected outcome of this process will be:
a) Identification of priority needs with the community's participation;
b) Establishment of a self-sustaining system to solve issues at the local level.
c) Participation of communities in conservation of natural resources on self- help basis.

Improving Socio-Economic Valuations of Wetlands

Following is a whole host of reasons as to why wetlands must be evaluated as economic, and not just environmental sites. Many wetland species of fauna and flora are harvested by the local communities for food and for economic gain. Wetlands provide people with mangrove foliage as fodder, e.g. in the Indus delta, camels graze on mangrove and suitable for agriculture.

Excessive Use of Resources

Wetlands are currently being used and abused. In Pakistan, agriculture is very important to the economy. The whole Indus Basin is comprised of wetlands and fertile areas, which apart from supporting an ever burgeoning population and providing food, also support a huge dependent population of wetland species,

both plants and animals. If wetlands suffer, then the people dependent on them are also affected as well as the entire interconnected ecosystem.

Measures to Minimise the Excessive Use of Resources

* Sustainable use of resources

  To promote the practice of sustainable use of wetland resources, and to prevent over-exploitation and degradation of habitat, the government and NGOs need to undertake three measures:
* Ecological research on wetlands

  In order to understand the specific resource management problems, it is necessary to undertake ecological studies of wetland sites which can focus on the specific problems and issues pertaining to wetlands (Dugan, 1990).
* Socio-economic study or local communities

  Studies need to be initiated into the ways and means by which local communities utilise natural resources. Where it is shown that this use is leading to the degradation of the environment, practices and projects must be developed which assist communities in developing sustainable methods of resource use (Dugan, 1990).

Inclusive Management

The essential training of all personnel who manage government owned wetlands must include the involvement of local communities. The management of wetland sites must also be based on the results obtained from both ecological and socio-economic studies pertaining to the particular wetland site. Such training and management measures must be provided institutional and legislative support. and must also be undertaken in consultation with NGOs.

Government Actions

- *Legislation and Control Policies*

There is a need to develop a policy for the conservation and sustainable use of wetland resources.

There is a clear need to resolve overlaps and conflicting issues between the various Government and Non-Government agencies, review the location of responsibilities and recommend measures that will benefit management of wetland resources. Ensure the effective mechanism of existing Wildlife Acts for safeguard of species and habitats. There is a need to formulate rules and regulations for wetland habitats, because the existing Wildlife Acts are for the protection of species only. The existing National Wetland Management Committee should be made functional. Implement the recommendations as made in NEQS to avoid the use of wetlands as dumping sites. Review hunting legislation and ensure proper implementation.

- *Steps Toward Implementation*

In order to simplify the steps towards implementation of conservation legislation and regulations, the recommendations are as follows:

- *Information Dissemination*

This document must be adopted by the federal government.

The document must be circulated among all the Provincial departments and priority must be given for the implementation of the research for development of management plans.

Initiatives required for the development of wetland strategy/policy.

- *Activate NWMC*

The National Wetland Management Committee was established by the Ministry of Environment in 1995. This committee must be activated immediately and a meeting held to introduce the mandate of the NWMC to all concerned parties. The implementation of the NWMC objectives must be initiated with the first step being the establishment of Provincial NWMCs.

- *Provincial Governments*

Provincial WMCs must be established with the participation from all relevant government departments, NGOs, and CBOs.

Action plans for wetland conservation should be developed and stepwise implementation plan. A wetland management plan must be developed for each important wetland site under the jurisdiction of the respective provincial governments.

Wetland management plans that have already been developed must be revised keeping in mind the Wetland Action Plan. The revised plans must then have funding secured towards their implementation.

Provincial departments must begin data collection on important wetland species, starting with those in the RAMSAR sites.

There must also be a committee set up to review current wetland legislation and to provide recommendations for improvement and change in the legislation.

STAKEHOLDERS

Role of Government

- *Government Policies*

Wetland conservation is on the agenda of various government (federal/provincial) and non-Governmental organisations, however a comprehensive strategy or legislation exclusively pertaining to wetland conservation in Pakistan is lacking. Wetlands and waterfowl conservation is a provincial subject in Pakistan and is looked after by the respective provincial wildlife or forest departments.

The provinces have their own Wildlife Conservation Board that addresses issues pertaining to the management, preservation and protection Acts/Ordinances. Most provincial wildlife Acts/Ordinances are species oriented and relate to the generation of revenue for the departments and government. Research and management for the sake of conservation of natural species and habitats for the future is a low priority. There are insufficient trained personnel in the provincial Wildlife departments with little or no specialised training needed for wetland management.

The Ministry of the Environment, Local Government, and the Department for Rural Development in the Federal Government, are responsible for formulating and implementing Federal policies relating to bio-diversity. These departments/bodies are also the focal point of the various conventions, relating to bio-diversity or the environment, to which Pakistan is a signatory .The Government of Pakistan has promulgated the "Pakistan Environmental Protection Ordinance 1997", which replaces the 1983 ordinance. Provincial. wildlife departments are Pakistan's implementing bodies for such environmental legislation or policies.

Government Bodies and their responsibilities

- *National Council for the Conservation of Wildlife (NCCW)*

The NCCW is an attached department of the Ministry of Environment, Local Government and Rural Development. It has the mandate to represent the government and present the country report to the RAMSAR Convention and liase with other Conventions and International agencies. It also co-ordinates with the Provincial governments in Wildlife matters. In 1996, the NCCW formed a Wetland Management Committee on behalf of the Government of Pakistan with the participation of all Provincial Wildlife Departments, the Zoological Survey Department and NGOs.

- *Zoological Survey Department (ZSD)*

ZSD is a federal department under the Ministry of Environment, Local Government and Rural Development. It is responsible for conducting surveys and research on wildlife, wetlands and waterfowl. The department undertakes annual bird counts at important wetland sites.

- *Sindh Wildlife Department*

The Sindh Wildlife Department are the custodians of wildlife in the province of Sindh and are thus responsible for the management of habitats including wetlands. They manage the RAMSAR sites located in their provinces and implement the decisions taken by the Federal Government for the management of these sites.

- *Wetland Legislation*

Each Province has its own provincial Wildlife Protection Acts. For the province of Sindh: “The Sindh Wildlife Protection Act” 1972, revised in 1996.

- *Water and Power Development Authority (W APDA).*

WAPDA, within the Ministry of Water and Power, is responsible for development of water resources and supply of irrigation water; prevention and reclamation of waterlogged and saline lands and drainage; flood control; generation, transmission, and distribution of power, and land navigation. It implements policies in related areas as a federal government agency, and oversees and manages reservoirs and link canals. As WAPDA owns and manages many important man-made and natural wetlands, their role is significant for wetland management and conservation.

- *National Wetland Management Committee. (NWMC)*

One of the major achievements during this time was the formation of the National Wetland Management Committee in February of 1996, by the National Council for the Conservation of Wildlife within the Ministry of Environment, Local Government and Rural Development. This committee includes the relevant government departments, provincial wildlife departments and NGOs. The primary idea behind its formation was to provide a focal point for networking between relevant federal and provincial departments and NGOs, as well as the need to develop a National Wetland Strategy/Policy. It also deals with local wetland issues and problems pertaining to these. WWF-Pakistan works in close partnership with government departments especially where the development of management plans is concerned.

- *National Conservation Strategy.*

The National Conservation Strategy (NCS) was launched in 1992 by the Ministry of the Environment and has achieved some initial success. It in being implemented jointly by the Government, certain NGOs and civil society. Certain provincial governments are in the process of implementing the NCS.

The NCS analyses Pakistan's environmental problems and offers recommendations for the successful implementation of the policy. The goals of NCS are: conservation of natural resources, the Sustainable Development, Greater efficiency in use and management of resources.

- *Role of Non-Governmental Organisations*

Non-Governmental Organisations (NGOs) can play a major role in supporting and directing government efforts to improve wetland conservation. They have the capacity to conduct research, gather and document information on wetlands, and impart training on wetland management, although they do not have the government's mandate to actually manage wetlands. It is important that environmental NGOs carry out their own research and review of the needs of wetland conservation, as well as identify actions which need to be taken by Government, by NGOs and by other institutions at the national level. NGOs can be very effective in the following areas:

- Building public support for conservation action.
- Protecting and managing wetland sites -as well as developing management plans in collaboration with the relevant government departments and local communities.
- Disseminating information through public awareness campaigns.
- Strengthening local communities by establishing community based organizations for sustainable conservation efforts.

Currently, there are two main NGOs that are working in the field of wetland conservation in Pakistan:
World Wide Fund for Nature -Pakistan (WWF-Pakistan) has a wetlands conservation programme targeting freshwater and coastal ecosystems throughout the country. WWF-Pakistan initiated its current Wetland Conservation Programme in 1989. The WWF- Pakistan Wetlands Conservation Programme
The World Conservation Union -Pakistan (IUCN) is working on wetland conservation on the coastal areas of Sindh and Balochistan, and along the Indus Delta.

- *WWF- Pakistan and Wetland Conservation*

WWF-Pakistan initiated its current Wetland Conservation Programme in 1989. The WWF- Pakistan Wetlands Conservation Programme has been working towards the conservation of important wetlands for the past eight years. Since that time, in conjunction with provincial and federal government agencies, a great deal of useful work has been achieved.
Under the National Wetland Programme a *"Wetland Action Plan"* was developed in 1991. The action plan is aimed to summarise the threats faced by wetlands in Pakistan to government agencies and highlight the impact of loss of various functions that the wetlands provide. A revision of the 1991 action plan was deemed necessary to bring facts and figures up to date and to incorporate the changes which have taken place since then.

- *IUCN and Wetland Conservation.*

IUCN Pakistan has been involved in the implementation of a number of conservation projects in the efforts to manage the natural resources; the authorities have tried to accelerate efforts towards a sustainable yet active conservation policy. IUCN – The World Conservation Union, has been active in wetlands conservation since its establishment in 1984 and has played a key role in the development of wetland programs in Pakistan. With the financial support of different donors wetland conservation activities were initiated, including the designation of wetlands to new Ramsar Sites as part of IUCNP general objective to safeguard habitats and protect the biodiversity.

These include rehabilitation of mangrove forests in the northern Indus delta; the Korangi ecosystem project in collaboration with the Sindh Forest IUCN Pakistan is also involved in the National Conservation Strategy, which is being implemented jointly by the Government, NGOs and civil society.

Flyways/ Indus Flyway Committee

The routes along which the birds travel during annual migration are called flyways. Pakistan is on the flyway to Central Asia and Northern India. The migration occurs in a North-South direction. The birds breeding in Central and Northern Asia migrate via Afghanistan as well as across the higher ranges of the Himalayas. After entering into Pakistan, they usually follow the Indus valley route that provides plenty of food, and offers a mild and hospitable climate for them. The Indus valley and more particularly the wetlands of southern Sindh are the major wintering ground of the migratory waterfowl.

The Indus Flyway Committee, established in 1978 and no more functional, acted in a consultative capacity for the research and management of migratory waterfowl. The objectives of the committee were:

Research and co-ordination; waterfowl counts and migration studies, liaison and collaboration with international agencies such as IWRB, IUCN and WWF.

Wildfowl harvesting and husbandry -improvement of harvest and sustained yield, protection of rare species.

Rationalise hunting laws to improve the quantity of the harvest and to react to changing conditions of climate and of breeding patterns.

To establish a chain of wetland sanctuaries along the river Indus.

Public education -such as by publication and through the development of hunter associations.

International Obligations

Pakistan is a party to the following international conventions, that are directly or indirectly related to wetlands:

Convention on Wetlands (RAMSAR).
Bonn International Conventions and Treaties
International Convention on Migratory Species (CMS).
Convention on Biological Diversity (CBD).
Convention on International Trade on Endangered Species of Flora and Fauna (CITES).

CROSS CUTTING AREAS

The main aim towards planning a strategy for wetland management is to promote the sustainable use of the resource and an integrated participatory approach towards sustenance. Restricted use approach can never be effective in sustainability issues. Alternate strategies that examine various ways of human use of the area can be a start when planning. The first and foremost concern should be to address the issue of poverty reduction. It is often observed that hardly ever does the actual benefits of development flow down to the people's level

Good governance plays a key role in management issues. Implementation often is a problem. The responsibilities for implementation when clearly defined with the help of supportive policies, rules, legislation and institutional reform may be able to render results. A monitoring system with a feedback system can provide indicators that determine the success/failure of the management strategy.

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