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Environmental Conservation of Wetlands in Pakistan

By

Engr. Dr. Izhar-ul-Haq
Engr. Muhammad Arshad
Javaid Zaheer Iqbal

ENVIRONMENTAL CONSERVATION OF WETLAND IN PAKISTAN

Engr. Dr. Izhar-ul-Haq[1] Engr. Muhammad Arshad Javaid[2] Zaheer Iqbal[3]

ABSTRACT

Wetlands of Pakistan play vital role in providing the productive ecosystem having discrete range of biodiversity, and habitat of ecological significance. They provide considerable economic benefits like hydrological changes, and establish equilibrium between terrestrial and aquatic ecosystem. Importance of wetlands was first identified in 1967 during Ramsar convention. It was realized that wetlands in Pakistan, particularly in the Indus plain area are under serious threat. These lands are being degraded because of the agricultural runoff, drainage disposal, and domestic effluents. Many governmental and non-governmental organizations in collaboration with the international agencies are working for the conservation of these wetlands. Different strategies have been formulated to preserve their ecological potential. In view of the fast degrading wetlands, concrete measures are needed to be taken to effectively conserve their potential benefits. These may include, formulation of national wetlands management committee, survey of most threatened wetlands, and projection of awareness among the public. These measures would certainly help conserving these wetlands regarding biodiversity, water quality and aquatic ecosystem.

INTRODUCTION

The topography of Pakistan varies from the highest snow covered mountains in the north to rolling lands and flat plains to Arabian Sea. Pakistan has the world's hottest plains with some of the coldest regions. The country thus possesses many of the world's major climatic and vegetational zones or biomes within a relatively small area. Wetlands of Pakistan form a part of its natural resources and have the most vulnerable and endangered habitat types. They have diverse varieties varying from lakes in high mountains to coastal swamp and mangroves forests. Wetlands not only provide water for agriculture, Industrial and domestic uses but also play an important role in flood protection and sediment trap. They also provide habitat for birds, fish, Indus Dolphin and crocodiles etc.

The wetlands are undergoing a process of decline and degradation primarily due to increasing population, Industrial/domestic pollution, pesticide runoff and lack of awareness about the wetlands. A major threat to wetlands has been ignorances of the ecological services provided by them. Due to wetland's importance in productive ecosystem, serious steps need to be taken with special emphasis to the potential of their conservation, productivity, and degradation. The paper describes the existing wetlands in Pakistan with emphasis on Indus plain. It also addresses the factors for conservation and degradation of wetlands regarding the biodiversity, water quality, and aquatic ecosystem. Suggestions to effectively conserve the existing wetlands are also presented.

[1] Chief Engineer Dams Safety Organization WAPDA.
[2] Senior Engineer DSO, WAPDA.
[3] Environmental Scientist DSO WAPDA.

REALIZATION OF THE PROBLEM

The importance of Pakistan's wetlands was first realized in RAMSAR convention by the international community at a technical meeting on wetlands conservation at Ankara, Turkey in October 1967. Between 1971 and 1976, the International Waterfowl and Wetlands Research Bureau (IWRB) sponsored series of annual and winter waterfowl counts at many of the major wetlands in Pakistan. These counts revealed that Indus valley was a major wintering ground for a wide variety of waterfowl breeding in central and northern Asia. In July 1976, Pakistan became a contracting party in the Ramsar Convention. In 1978, an Indus flyway committee was established to coordinate the collection of information on waterfowl population. In early 1990, there were fifty two (52) signatories to the Ramsar convention including Pakistan to agree for wetland's conservation in their national planning. Wetlands were first defined during the convention as "*these are areas of marsh, fen, wetlands or water, whether natural or artificial, permanent or temporary with water static or flowing, fresh, brackish or salt including areas of marine water, the depth of which at low tide does not exceed six meters*".

Values and Functions of the Wetland Ecosystem

Wetlands are among the world's most productive ecosystems. They provide tremendous economic benefits to mankind. Some of these include transportation, energy generation, irrigation, and natural purifiers of waste water. Fish and water birds are the most important elements of marshes and wetlands maintaining the equilibrium of their ecosystem. Following are some of the important functions of the wetland ecosystem.

1. It brings climatic changes such as rainfall/humidity and Carbon dioxide fixation reducing global warming.
2. It provides a linkage between terrestrial and aquatic ecosystem producing variety of biodiversity regarding their genetic pool and assemblage of diverse species.
3. It results in hydrological changes in the water system.

Wetland biodiversity (fauna and flora) indicates the health of habitats and reveals changes in ecological parameters, such as: carbon cycle, concentration and recycling of nutrients, air, water quality, and status of pollutant loads.

NATIONAL CONSERVATION STRATEGY FOR WETLANDS

Realizing the importance of conserving the wetlands, International workshop was held in collaboration with Canadian International Development Agency (CIDA), and International Union for Conservation of Natural resources (IUCN) in Islamabad during 1986. A National Conservation Strategy for Pakistan's wetlands was formulated. Following the recommendations and proceedings of the workshop, World Wild Fund (WWF) of Pakistan launched a Wetlands Conservation programme with the help of WWF International. First phase of this programme was to plan a National Conservation Strategy for Pakistan's Wetland, while the second phase was to convince Government of Pakistan (GOP) to undertake a number of measures to protect wetland resources.

National Wetland's Management has also been proposed during the implementation of National Drainage Programme (NDP) to ensure that ecologically important wetlands are not destroyed or diminished as a result of drainage activities. No doubt we have to reclaim more land to grow more food.

The scope of management studies was proposed to describe the followings:

a) Ecological and socioeconomic significance and ranking of wetlands according to human and biotic use.
b) Preparation of plan for the protection and development of wetlands.
c) Impacts of drainage disposal on the aquatic environment of wetlands.
d) National benefits from the conservation of wetlands.

WETLANDS RESOURCES IN PAKISTAN

Pakistan has diverse range of wetlands, predominantly arid and semi-arid, covering a total area of about 7.8 million hectares. Table 1 presents the important wetlands in Pakistan, covered area, and average population of waterfowl from 1972 to 1989. The area is distributed throughout the country from coastal mangrove and mud flat on the Indus delta to the glacial lake of high Himalayas (Fig.1). The total area of inland water in Pakistan includes the following major water resources.

1.	Rivers and major tributaries	3,109,000 hectares
2.	Canals 54,400	"
3.	Waterlogged area	4,046,460 "
4.	Natural lakes	111,700 "
5.	Water storage reservoirs	95,800 "
6.	Pond Dhands, Abandoned canals	114,680 "
7.	Intertidal delta	385,000 "

ENVIRONMENTAL CONSERVATION AND PROTECTION OF WETLANDS

Wetlands are under serious threat in Pakistan. Each year, many hectares of wetlands are destroyed or severely degraded due to drainage of industrial and sewage disposal. Siltation, eutrophication and hydrological changes are also encountered.

Many of the natural wetlands disappeared as a result of irrigation and drainage projects intended to provide more land for food production and housing. Several new lakes and marshes were created on most of the big rivers. A number of wetlands were also created as a result of poor drainage system and seepage. Some of these now provide excellent habitat biodiversity and ecological ecosystem. Over the time, a proportion of cultivable lands also developed into saline waterlogged wetlands. Though some new wetlands were created, the ratio of new wetlands remained comparatively lesser than those of the destroyed wetlands.

CONSERVATION OF WETLANDS IN SINDH AREA

The environmental impact assessment on the Left Bank Outfall Drain (LBOD) was made by Mott McDonald of Pakistan (MMP), and Hunting Technical Services (HTS) in 1988. MMP also assessed the Right Bank Outfall Drain (RBOD) during Right Bank Master Plan (RBMP) study in

1991. Based on these studies, many Wetlands were identified having economics and social significance in the Sindh area. Major areas of Wetlands included open water lying outside the western flood bund, and meandering channels (dhoros) in old course of river Indus. Figure 2 shows these wetlands in the Right Bank Master Plan Area.

WETLANDS IN THE RIGHT BANK OUTFALL DRAIN (RBOD) AREA

Wetlands in this area were identified during RBMP studies in 1991. These wetlands included Manchar, Hamal, Drigh, Pugri, Golimar and Neekar, Birwari-chungro, sind dhoro lakes, and Dhuong block. Among these wetlands, Manchar and Hamal lakes require environmental management regarding the potential of their conservation, productivity, and degradation. These lakes are particularly important from wildlife and fisheries standpoint. The impact of drainage disposal of RBOD on these wetlands is also a considerable factor for their conservation.

Manchar Lake

This is the largest single wetland unit in the RBOD area. Water enters the Manchar system from three sources; a) through surface run-off from hills notably from the Gaj Nai; b) from Indus, mainly via the Aral Wah and to a lesser extent by reversible flows through the Aral Lakhi; and c) from the Main Nara Valley Drain. Figure 3 shows location of Manchar Lake and the sources feeding water to the lake. Lake level varies in the total area. At an elevation of 113 ft, (above mean sea level), it is about 100 square miles, or nearly 26,000 ha. The open water area also varies with lake level and typically occupies about 9,000 ha.

Plant Ecology:

There is no previously recorded information on the plant ecology of Manchar Lake. There are extensive belts of emergent reeds around the open water area. The most widespread plant appeared to be the reed mace (Typha angustata), used as a source material for constructing temporary houses and shelter. Other emergents included Juncus articulatus, Scirpus literalism, and small patches of the true reed Phragmites karka. Emergent and bottom-rooted plants spreading on the water surface include Nymphaea lotus, water lilies, and Potamogeton pectinatus. Submerged aquatic vegetation dominates the open water area filling the whole water profile from bottom to surface.

Ecosystem:

The ecosystem of Manchar seems to be an extremely resilient one. The submerged vegetation survive and regenerate quickly after the lake dries out completely. Scattered phreatophytic trees mainly Tamarix dioica and Acacia nilotica occur in some places within the overall wetland complex. Manchar Lake also supports a major fishing industry in addition to feeding/resting area for waterfowl.

Hamal Lake and Associated Wetlands

Hamal Lake is the second largest of the wetlands, and is the most important of all in relation to water birds and fishing. It comprises a series of open water bodies, the largest of which gets its name from the Hamal village to the west of lake. Figure 4 shows plan of the Hamal Lake area. It lies partially in an old Indus branch channel or meander scar developed in the past as surface run-off from

the west. North side is ponded up against the Flood Protective Bund (FPB) constructed between the Indus Alluvial plain and the piedmont fans lying to its West. There are evidences of substantial and comparatively recent changes both in the extent of the wetlands and the wetlands vegetation in the northern part of the complex. This vegetation is probably the result of additional inflow from the drainage system. Much of this northern system seems to have existed seasonally or more sporadically inundated open woodland of Tamarix and Prosopis cinerarea. This valuable grazing area is now almost occupied by Typha, with some tamarix quite dense in places. The previous stands of Prosopis are now represented only by a few dead or dying trees.

In addition to receiving run off from Kirther hills, Hamal lake gets less saline drainage effluent from Miro Khan outfall pumping station. This drainage effluent gets mixed with some highly saline effluent from shaded kot drain and minimizes the environmental impacts.

Hub Reservoir

Hub reservoir located 35 miles North East of Karachi conserves the seasonal waters of Hub river. It occupies a broad undulating valley between the western slopes of Kirthar and eastern Pub ranges of mountains. Reservoir covers an area of 38 sq. miles at maximum water level of ± 347 ft. At present about 100 cusecs of water is being supplied to Karachi for domestic use. Hub reservoir is moderately important for migratory water fowls, and waders such as Black Tailed Godvit and Little Stint. It also has considerable range of fisheries species.

Drigh Lake

This lake near Warah in Larkana District was gazetted as a wildlife sanctuary in 1972. It has been a favoured site for duck shooting for a long time. The sanctuary occupies an area of about 180 ha, of which much is open water surrounded by a belt of Tamarix and Typha. No submerged vegetation exists in the lake. There are evidences of diminishing its importance as wild life because it is becoming more a resting place for birds rather than a feeding area. Positive management including improved water supplies can possibly improve the situation.

Pugri Lake

It is about 19 km from Larkana lying between the Larkana-Wagan road and the Wagan Main drain. This is an important site occupying fringing reed beds in an area of 300 ha.

Golimar and Neekar Lakes

These lakes lie astride the main road from Dadu to Larkana just north and east of Mehar. The Golimar produces large fish populations and represent an important local fishery. These lakes have become permanent features and have developed a productive ecosystem over the past 25 years.

Birwari-Chungro Lake

This is a shallow brackish lake about 11 km long, the western part referred to Birwari and the eastern part as Chungro. It is situated south-west of Qambar, in Larkana district. The lake has some

fringing beds of Typha and Juncus. Vegetation includes Suaeda, stunted Tamarix and few large trees of Salvadora.

WETLANDS OF LEFT BANK OUTFALL DRAIN (LBOD) AREA

The LBOD environmental study (1989) stated that the wetlands of the Indus delta were a crucial winter feeding grounds particularly for waterfowl and waders. The main wetlands listed in the Inventory of Asian Wetlands include Nara canal area (Soonhari sadhori, and sanghiaro lakes), Khipro, Tando Bago, Phoosna, Charwo, Mehboob shah lakes, and Badin Kadhan Lagoons. In addition, Makhi Dhand and Chotiari lakes are also very important regarding their ecological significance and biodiversity. Among all these, Nara canal and kipro lakes bear paramount importance from ecological standpoint and are therefore addressed here.

Nara Canal Area

Nara Canal Area is extensive and probably the most important wetland area in Sindh (Indus Left Bank). The wetlands comprise large number of open water lakes and reed beds. Water is mostly saline and does not support fisheries. The whole area is of great interest as an example of multiple, integrated land and water use. Left Bank Outfall Drain will play an important role in the integrity of this area regarding the agriculture, aquaculture and ecological biodiversity.

Dhands - As Wetlands Areas

Left Bank Outfall Drain (LBOD) branches into Dhoro Puran Outfall Drain (DPOD) and Kadhan Pateji Outfall Drain (KPOD). KPOD drains into 26 miles long tidal link channel which ultimately falls into Shah Samando creek. On northern side of the tidal link exists the Mchro, Sanhro, Pateji and Cholri Dhands, whereas Rann of Kutch covers a wide range of seasonal wetlands, salt pans and tidal mud flats. Figure 5 shows the location of these dhands and seasonal wetlands.

Since these dhands were likely to be drained under low tide condition, a control structure was required to regulate dhand flows into the tidal link channel. To avoid draining the dhands but allowing some inflow at high tide, an overflow weir has been provided in the tidal link embankment at Cholri Dhand. The dhands mentioned above mostly contain sweet water however occasionally they receive the saline water from tidal link during high tide and peak water levels. These dhands provide excellent winter feeding ground for waterfowls.

Khipro Lakes

Kipro lakes (South East of Sanghar) fall within the Mirpur Khas drainage area of LBOD. The lakes may dry out as a result of lowering of the water table subsequent to drainage.

CONSERVATION OF MOST THREATENED WETLANDS

The major threats to the wetlands are pollution, over exploitation of the mangroves and wildlife habitat. The increasing salinity potential is a serious concern for the wetland ecosystem. The following wetlands are currently considered as the most threatened wetlands.

The Outer Indus Delta

It stretches South East of Karachi to the Indian borders. Total area 300,000 ha is covered by mangroves. A vast complex of river channels and creeks, low-lying sandy islands, mangrove swamps and intertidal mudflats covers about 150 km of the outer edge of delta. In the south-east, mangrove forest borders the vast salt flats at the western edge of Rann of Kutch. The Indus river and its tributaries bring an immense load of urban, industrial and agricultural effluents into the coastal wetlands. The declining water level and increasing salinity level due to effluent disposal are major concerns for conservation of these wetlands.

Khabeki, Ucchali, Jahlar System

This system consists of shallow brackish lakes situated in the Salt Range. It is fed by the local rainfall and several intermittent streams rising in the surrounding hills. Little aquatic vegetation is present and there are no extensive reed beds. The increasing salinity level is effecting the herbivorous fish species which invariably is responsible for decline in the waterfowl number.

Bund Khushdil Khan

It is a water storage reservoir about 50 Km north west of Quetta, Baluchistan Province. It is being silted up resulting the decrease in habitat. It is very important staging area for migrating black stork, common crane, and breeding area of Spotbilled duck and common Shelduc.

Lungh Lake

It is 15 km southwest of Larkana, in Sindh province. A small freshwater lake in an ancient arm of the Indus fed by surplus water from the surrounding rice paddies. The wetland has almost disappeared because of overgrown vegetation and has ceased to be much of any attraction for migratory birds.

Kheshki Reservoir

It is a small water storage reservoir just 40 km east of Peshawar in N.W.F.P. containing fringing reed beds on the Kabul river. It was listed as one of the wetlands of International importance under the Ramsar Convention in July 1976. It is being polluted with effluents from a nearby paper mill and sugar refinery. Disposal of domestic wastes in the area is another factor of degradation.

WATERLOGGED WETLANDS

The wetlands under this item are waterlogged areas comprising over 5% of the total area; the bulk of it falls in the Province of Sindh. These waterlogged wetlands are created either by seepage from the reservoirs, canals, overspillage from rivers/canals, and water spreading over the ground from the faulty drains. The Neekar and Golimar, lakes have highly saline water (6000 ppm) and therefore not suitable for fisheries. Water logged wetlands include Beroon Kirthar, Panjnad Abbasia, Budh Mahiwala, and Nara canal areas.

CONSERVATION PLAN FOR PAKISTAN'S WETLANDS

In view of the enormous threat to wetlands, WWF-Pakistan has launched a frame work for wetland conservation with the help of WWF-International. The features of this framework aim at the following action plans.

i). Conservation measures in the light of Government of Pakistan's wildlife laws be taken for the improvement of wetlands regarding their habitat, species, and infrastructure.

ii). The collaboration with international agencies should be enhanced to minimize the trends of landuse practices causing changes in the ecological characters of the surrounding habitat.

iii). Industries should be stopped from disposal of untreated effluent into near wetlands to avoid deterioration in water quality. Agriculturists should also be educated to avoid indiscriminate use of pesticides and agrochemicals to protect the ground water quality, and any outflows into the wetlands.

iv). Degraded wetlands be quantified regarding their restoration and reinstatement of their valuable functions.

v). Opportunities should be provided to post graduate students to carry out survey, monitoring and research programme.

vi). Concrete measures should be taken to educate and provoke public awareness about preventing wetlands degradation. Since most threatened lands fall in rural areas, rural awareness programme can be quite helpful.

vii). A natural heritage programme should be launched to encourage and help landowners wishing to protect wetlands and wildlife. This objective can be achieved through coordinated efforts of the provincial departments and WWF-Pakistan with the partnership of the landowners.

CONCLUSIONS AND SUGGESTIONS

The available information and studies on the conservation of Pakistan's wetlands describe the ecological significance and natural functions of wetlands in the ecosystem. These wetlands have provided highly productive ecosystem for the assemblage of wide variety of biodiverisity on the Indus flyway and coastal areas. Assessment of drainage effluent impact particularly on the existing wetlands of right and left bank of Indus river requires due attention from further degradation. Ignorance and lack of awareness about the ecological services has been a major threat to the conservation of the wetlands. A practical attitude is required towards the integrity of such life sustaining ecosystem, if they are to survive. Governmental and non-governmental agencies should plan conservation strategies for their multiple uses. In the writer's opinion, following suggestions can help conserving the potential and productivity of wetlands in Pakistan:

i). Formulation of National wetlands management committee comprising wetland experts, Pakistan Environment Protection Agency (PEPA), department of fisheries and wild life/National Council of conservation of wild life.

ii) Approval of proposed National Wetlands Management Plan as described during National Drainage Programme.

iii) Preparation and initiation of a model wetland project by involving non-Governmental and Community based Organizations.

iv) Restoration of degraded wetlands and re-instatement of their valuable natural functions.

v) Socioeconomic surveys of most threatened wetlands using participatory methodology including identified need and priorities of local communities of such areas.

vi. Conducting of seminars and workshops to project the National benefits of wetlands and create awareness among the public.

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TABLE - 1: IMPORTANT WETLANDS IN PAKISTAN ACCORDING TO THEIR AVERAGE POPULATION OF WATERFOWL (1972 THROUGH 1989)

No.	SITE	PROVINCE	SURFACE AREA (HA)	AVERAGE POPULATION	HIGHEST AVG. COUNT
1.	Keenjhar Lake	Sindh	13468	101454	207541
2.	Haleji Lake	"	1704	75282	013161
3.	Nur-ri	"	-	72322	114752
4.	Hamal Katchri Lake	"	-	47745	48744
5.	Hub dam	"	27219	39842	53502
6.	Shah bander salt bed	"	20000	39517	66805
7.	Pagri Lake	"	-	38236	49136
8.	Jubho/Kur	"	-	33947	51136
9.	Hadero Lake	"	1321	29724	64440
10.	Rup Lake	"	600	26193	49565
11.	Clifton beach	"	8(km)	18044	20508
12.	Soonhari or Dogriun Lake	"	245	17759	38067
13.	Kalanger Lake	"	-	17075	30143
14.	Sanghryaro Lake	"	380	15610	27239
15.	Drigh Lake	"	182	13898	34284
16.	Manchar Lake	"	6000	13733	26792
17.	Phoosna Lake	"	160	13049	20301
18.	Mahboob Lake Shah	"	100	11227	33388
1.	Chashma Barrage	Punjab	33109	61720	213441
2.	Mangla Reservoir	"	26500	38120	44545
3.	Head Marala	"	1620	22415	66704
4.	Taunsa Barrage	"	6567	20110	28255
5.	Rasul Barrage	"	1138	18531	25419
6.	Head Qadirabad	"	2850	17345	45422
7.	Lal Sohanra Lake	"	1935	14283	30960
8.	Ucchali Lake	"	943	8592	29197

FIG. I

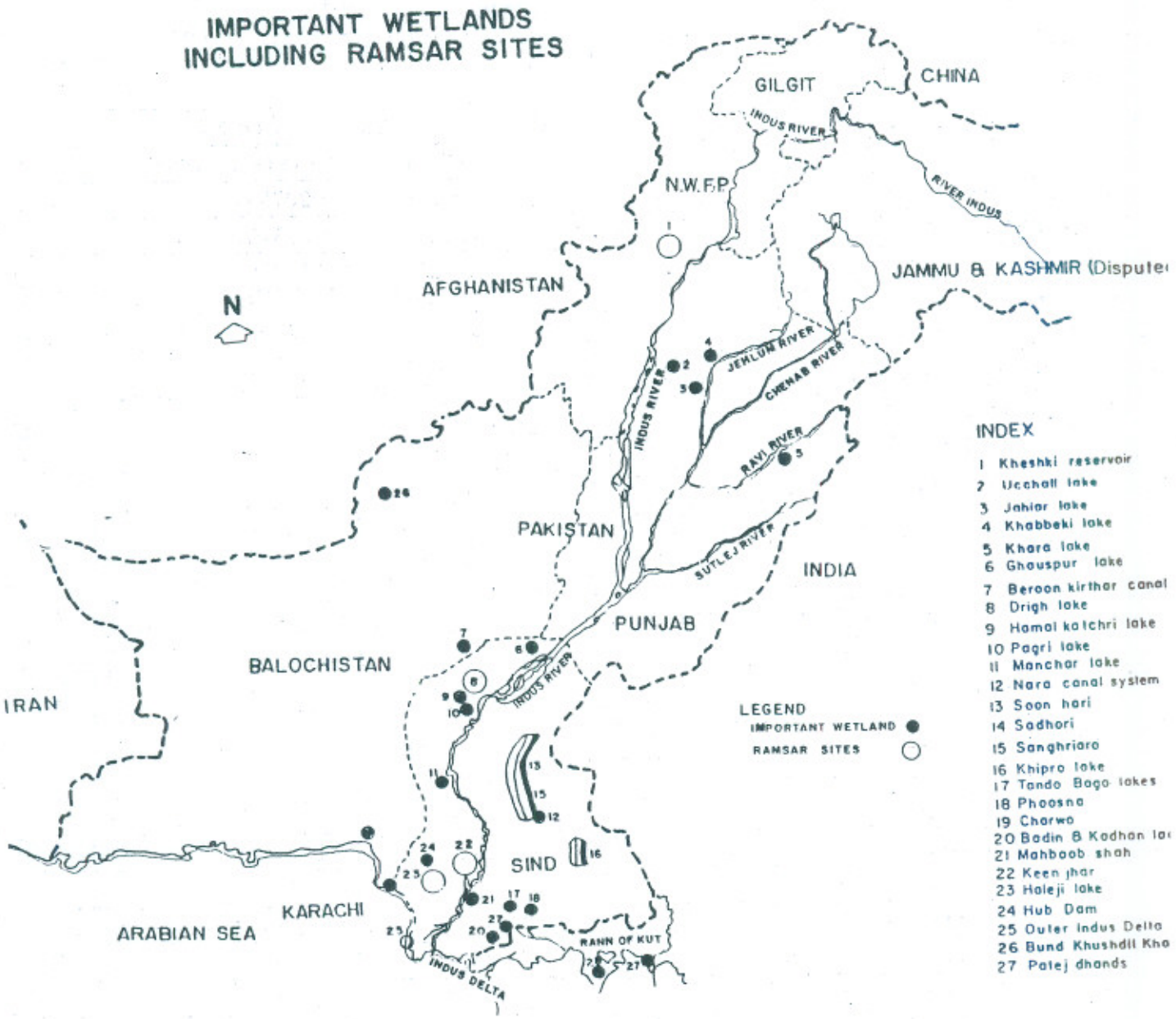
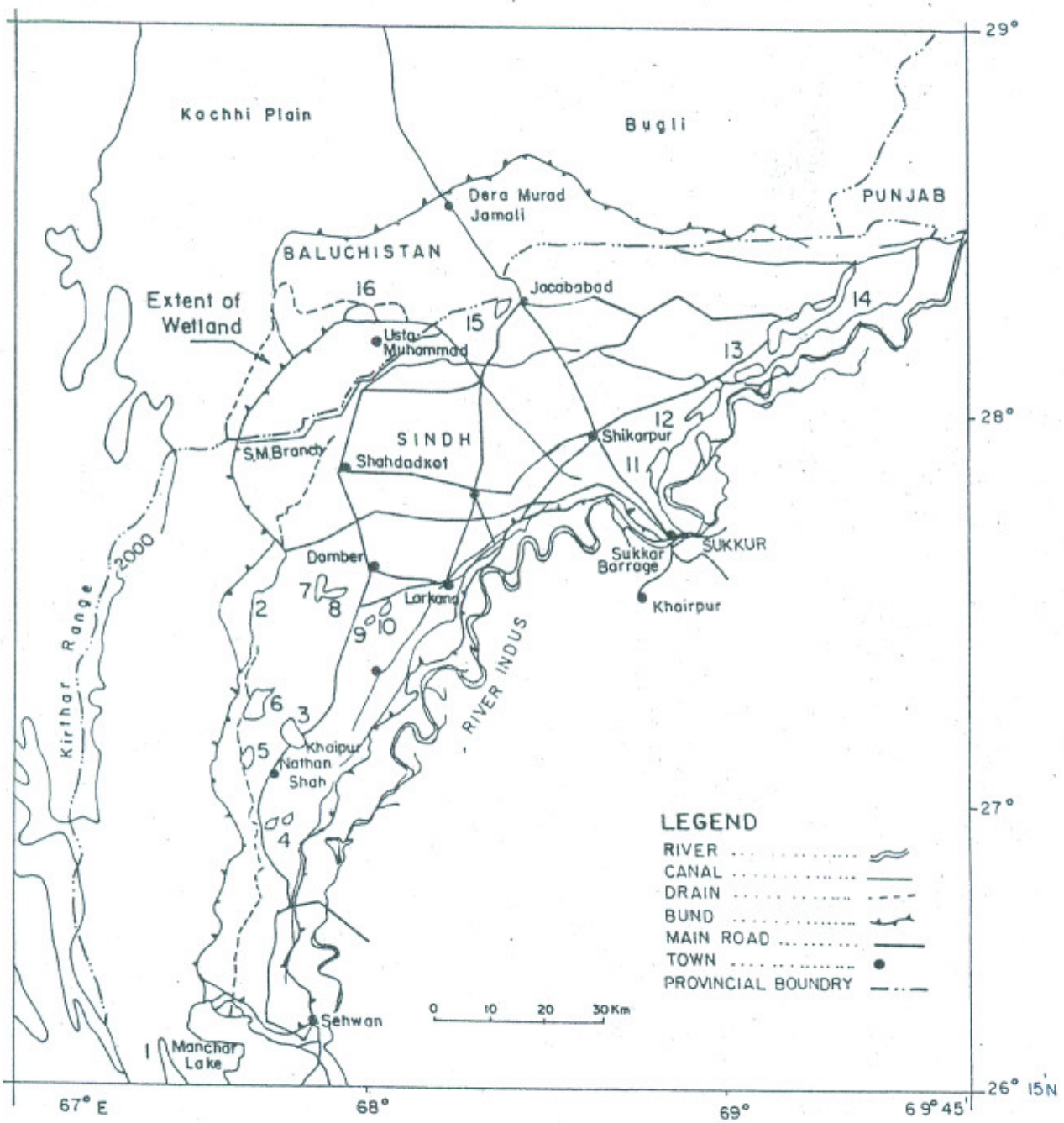

IMPORTANT WETLANDS
INCLUDING RAMSAR SITES
GILGIT
CHINA
INDUS RIVER
N.W.F.P
RIVER INDUS
JAMMU & KASHMIR (Dispute
AFGHANISTAN
N
JEHLUM RIVER
CHENAB RIVER
INDUS RIVER
RAVI RIVER
PAKISTAN
SUTLEJ RIVER
INDIA
PUNJAB
BALOCHISTAN
IRAN
INDUS RIVER
SIND
KARACHI
ARABIAN SEA
RANN OF KUT
INDUS DELTA
LEGEND
IMPORTANT WETLAND
RAMSAR SITES
INDEX
1 Kheshki reservoir
2 Uchall lake
3 Jahlar lake
4 Khabbeki lake
5 Khara lake
6 Ghauspur lake
7 Beroon kirthar canal
8 Drigh lake
9 Hamal kalchri lake
10 Pagri lake
11 Manchar lake
12 Nara canal system
13 Soon hari
14 Sadhori
15 Sanghriaro
16 Khipro lake
17 Tando Bago lakes
18 Phoosna
19 Charwo
20 Badin & Kadhan la
21 Mahboob shah
22 Keen jhar
23 Haleji lake
24 Hub Dam
25 Outer Indus Delta
26 Bund Khushdil Kha
27 Patej dhands

FIG. 2

MAJOR WETLANDS IN THE RIGHT BANK OUTFALL DRAIN AREA



KEY WETLANDS

1. Manchar Lake
2 Hamal Lake
3 Gollmar Neekar
4 Jakohari Sultani Dhands
5 Sunhari Dhand
6 Unbari Dhand
7 Drigh Lake
8 Birwari
9 Lungh
10 Pugri
11 Chak
12 Dhoung Block
13 Rup Lake
14 Sindh Dhoro
15 Mamal Dhoro
16 Beroon Khirthar (Inc. Kabula River)

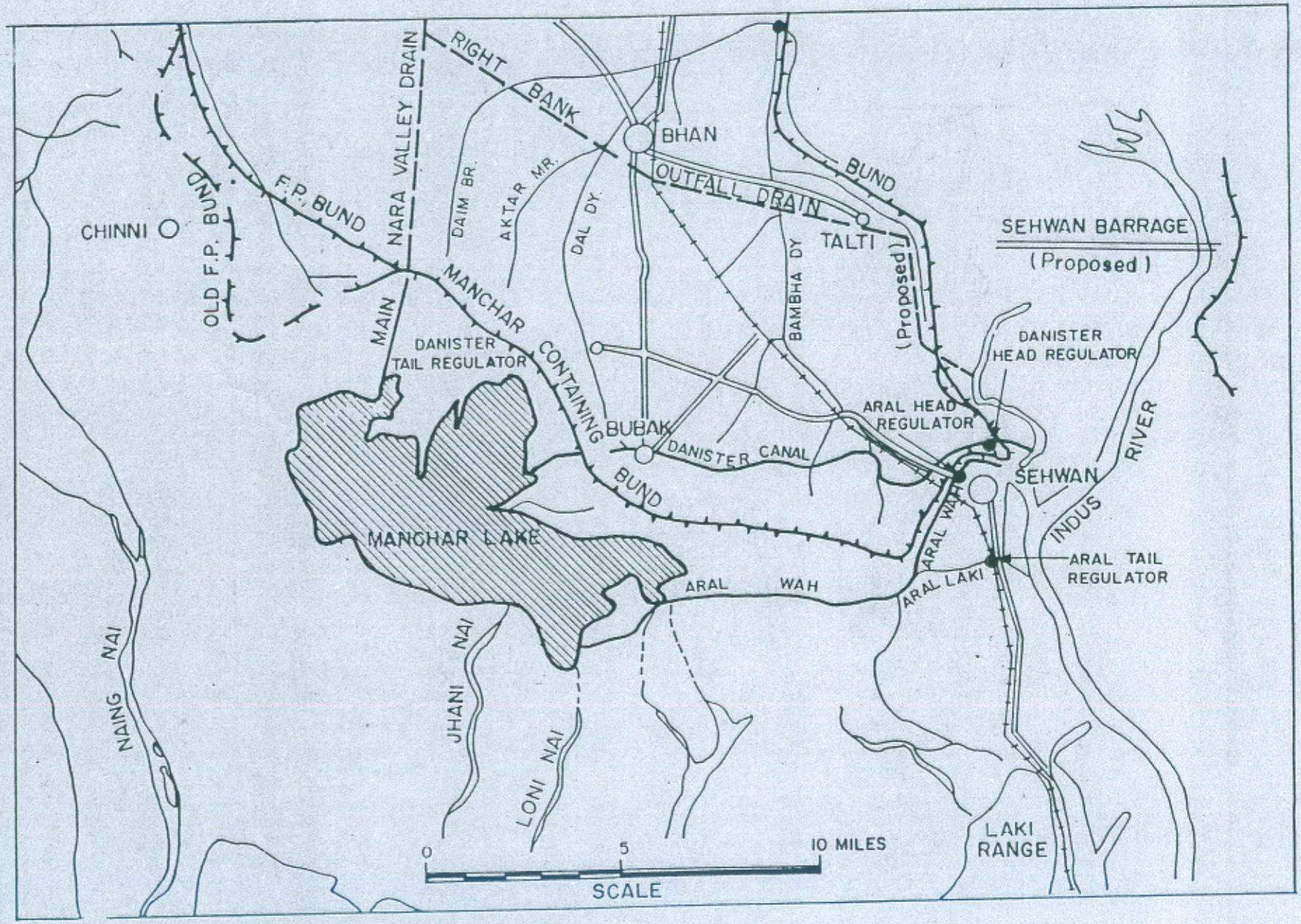
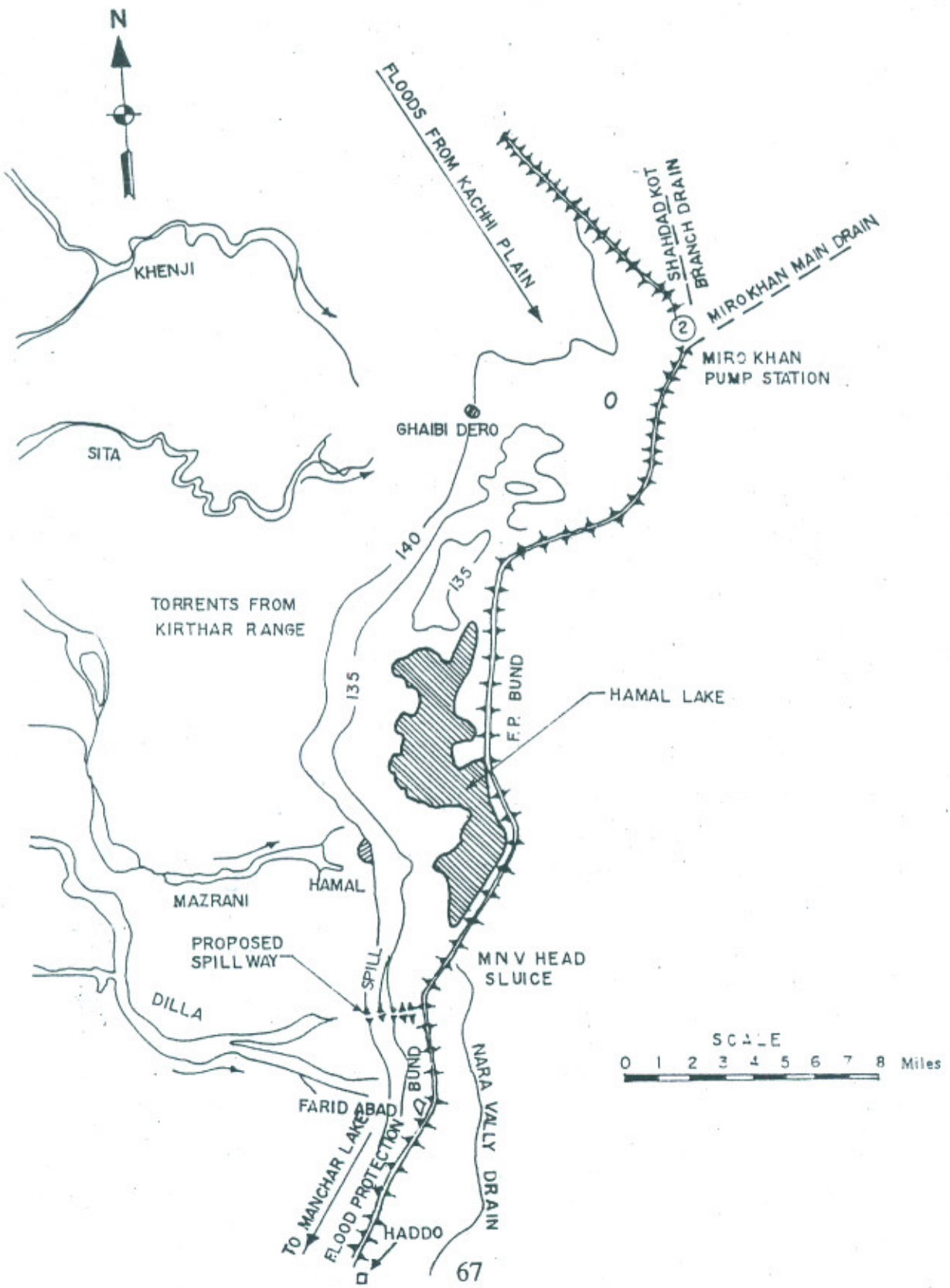


FIG.-3 MANCHAR LAKE AREA

FIG. 4

HAMAL LAKE AREA



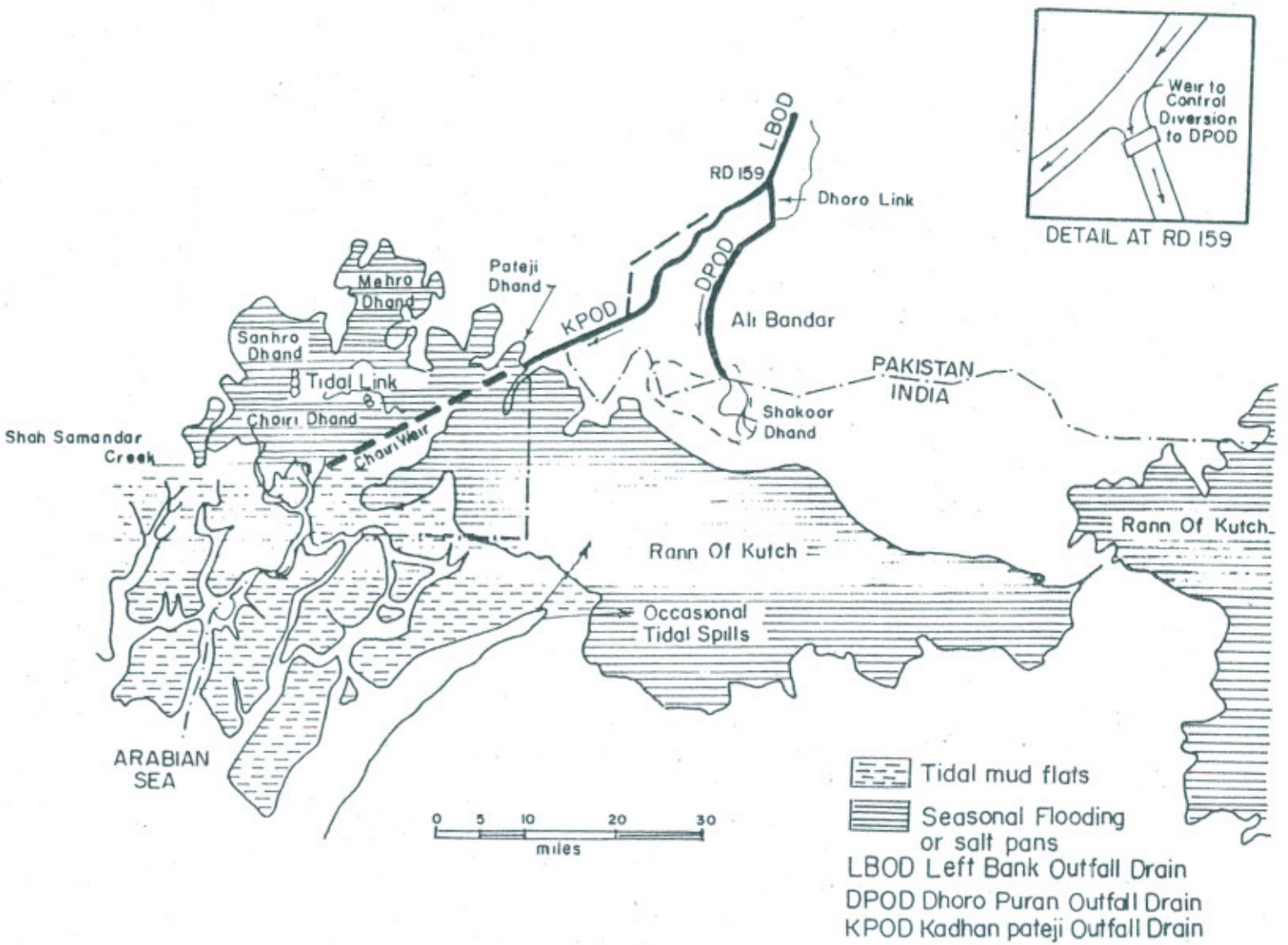


FIG. 5

LEFT BANK DRAIN OUTFALL ARRANGEMENTS
DHANDS AND SEASIONAL WETLANDS