

International Bank for Reconstruction and Development
International Development Association

MANAGEMENT REPORT AND RECOMMENDATION
IN RESPONSE TO THE
INSPECTION PANEL INVESTIGATION REPORT

PAKISTAN: NATIONAL DRAINAGE PROGRAM PROJECT
(CREDIT NO. 2999-PK)

September 18, 2006

**MANAGEMENT REPORT AND RECOMMENDATION
IN RESPONSE TO THE INSPECTION PANEL INVESTIGATION REPORT
OF THE
PAKISTAN NATIONAL DRAINAGE PROGRAM
PROJECT (CREDIT NO. 2999-PK)**

Pursuant to paragraph 23 of the Resolution Establishing the Inspection Panel (IBRD Resolution 93-10 and IDA Resolution 93-6), attached for consideration by Executive Directors is Management's Report and Recommendation in response to the findings set out in the Investigation Report of the Inspection Panel (No. 36382-PK, dated July 6, 2006) on the captioned Project (Pakistan: National Drainage Program Project, Credit No. 2999-PK).

**MANAGEMENT REPORT AND RECOMMENDATION
IN RESPONSE TO THE
INSPECTION PANEL INVESTIGATION REPORT NO. 36382-PK
PAKISTAN: NATIONAL DRAINAGE PROGRAM PROJECT
(CREDIT NO. 2999-PK)**

CONTENTS

ABBREVIATIONS AND ACRONYMS	i
LIST OF OPERATIONAL POLICIES, OPERATIONAL DIRECTIVES, AND OPERATIONAL POLICY NOTES	ii
EXECUTIVE SUMMARY OF MANAGEMENT RESPONSE	iii
I. INTRODUCTION	1
II. BACKGROUND	2
III. DESCRIPTION OF THE PROJECTS	8
IV. FINDINGS AND OBSERVATIONS OF THE PANEL	10
V. KEY ISSUES	13
VI. LESSONS LEARNED.....	33
VII. MANAGEMENT ACTION PLAN	36
VIII. RISKS	42
IX. CONCLUSION.....	44

FIGURES

Executive Summary

Figure 1. Left Bank of Indus River in Southern Sindh	vi
--	----

Main Text

Figure 1. Salinity Levels in Pakistan.....	4
Figure 2. Left Bank of Indus River in Southern Sindh	17

PICTURES

Executive Summary

Picture 1. Indus River	iv
Picture 2. Salt encrusted agricultural land in Sindh	vii
Picture 3. Cholri Weir in 1998	xi
Picture 4. Mud flats and landscape in the vicinity of the dhands and southern Badin.....	xii

Main Text

Picture 1. Kadhan Pateji Outfall Drain.....	14
Picture 2. Salt encrusted agricultural land in Sindh	18
Picture 3. Tidal Link	21
Picture 4. Cholri Weir in 1998	24
Picture 5. Mud flats and landscape in the vicinity of the dhands and Badin	27

TABLES

Executive Summary

Table 1. Action Plan.....	xv
---------------------------	----

Main Text

Table 1. Action Plan.....	37
---------------------------	----

ANNEXES

Annex 1. Panel Findings, Management Comments and Actions	45
Annex 2. LBOD and NDP Project Description.....	71
Annex 3. Livelihood Support Programs for Coastal Area of Badin District and Sindh.....	77
Annex 4. Review of Performance of Left Bank Outfall Drain Stage I.....	86
Annex 5. IPOE Report: Environment Studies, Summary of Findings	93
Annex 6. Country Water Resources Assistance Strategy.....	96
Annex 7. Drainage Master Plan--International Panel of Experts	115
Annex 8. July 2003 Floods Fatal Casualties in Sindh.....	121
Annex 9. Chronology of Key Events.....	122
Annex 10. Schedule of Supervision Missions for LBOD and NDP	124
Annex 11. Documents and References	131

MAPS

Map 1. IBRD No. 34984 – National Drainage Program Project (NDP) – Sindh Province	
Map 2. IBRD No. 34988 – National Drainage Program (NDP) Project – Sindh Province. Detail of the LBOD Outfall System	

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank	IRSA	Indus River System Authority
AWB	Area Water Boards	IsDB	Islamic Development Bank
BP	Bank Procedures	IUCN	International Union for the Conservation of Nature
CAS	Country Assistance Strategy	JBIC	Japan Bank for International Cooperation
CBO	Community-based Organization	KPOD	Kadhan Pateji Outfall Drain
CCA	Cultivable Command Area	LBOD	Left Bank Outfall Drain
CIDA	Canadian International Development Agency	MTR	Mid-Term Review
CWRAS	Country Water Resources Assistance Strategy	NGO	Nongovernmental Organization
DERA	Drought Emergency Recovery Assistance	NDP	National Drainage Program
DMP	Drainage Master Plan	NSDS	National Surface Drainage System
DPOD	Dhoro Puran Outfall Drain	NWFP	North West Frontier Province
DSEA	Drainage Sector Environmental Assessment	OD	Operational Directive
EIA	Environmental Impact Assessment	ODA	Overseas Development Administration (United Kingdom)
EMMP	Environmental Management and Monitoring Plan	OFWM	On-Farm Water Management
EPA	Sindh Environmental Protection Agency	O&M	Operations and Maintenance
FLAR	Framework for Land Acquisition and Resettlement	OP	Operational Policy
FGW	Fresh groundwater	OPEC	Organization of Petroleum Exporting Countries Fund for Development
FO	Farmers' Organization	PO	Partner Organization
GCA	Gross Command Area	POE	Panel of Experts
GDP	Gross Domestic Product	PPAF	Pakistan Poverty Alleviation Fund
GOP	Government of Pakistan	RAP	Resettlement Action Plan
GOS	Government of Sindh	SAR	Staff Appraisal Report
IBDF	Indus Basin Development Fund	SCARP	Salinity Control and Reclamation Program
IBRD	International Bank for Reconstruction and Development	SDC	Swiss Development Cooperation
ICR	Implementation Completion Report	SEA	Strategic Environmental Assessment
IDA	International Development Association	SFD	Saudi Fund for Development
IEE	Initial Environmental Examination	SIDA	Sindh Irrigation and Drainage Authority
IES	Initial Environmental Scoping	TBOD	Trans-Basin Outfall Drains
IPOE	International Panel of Experts	TDF	Tarbela Development Fund
		TL	Tidal Link
		TOR	Terms of Reference
		TWs	Tubewells
		WAPDA	Water and Power Development Authority
		WSIP	Water Sector Improvement Project
		WWF	Worldwide Fund for Nature

CURRENCY EQUIVALENTS

(Exchange Rate Effective September 15, 2006)

Currency Unit = Pakistani Rupee

USD 1.00 = PKR 60.6 / PKR 1.00 = USD 0.0165

WEIGHTS AND MEASURES

Metric System

1 meter (m)	=	3.280 feet	1 hectare (ha)	=	2.470 acres
1 Kilometer (km)	=	0.620 miles	1 cubic meter (m ³)	=	35.310 cubic feet
1 million acre feet (MAF)	=	1.234 billion cubic meters	1 cubic foot/second (cfs, cusec)	=	0.0283 cubic meters/second (m ³ /sec, cumec)

**LIST OF OPERATIONAL POLICIES, OPERATIONAL DIRECTIVES, AND
OPERATIONAL POLICY NOTES**

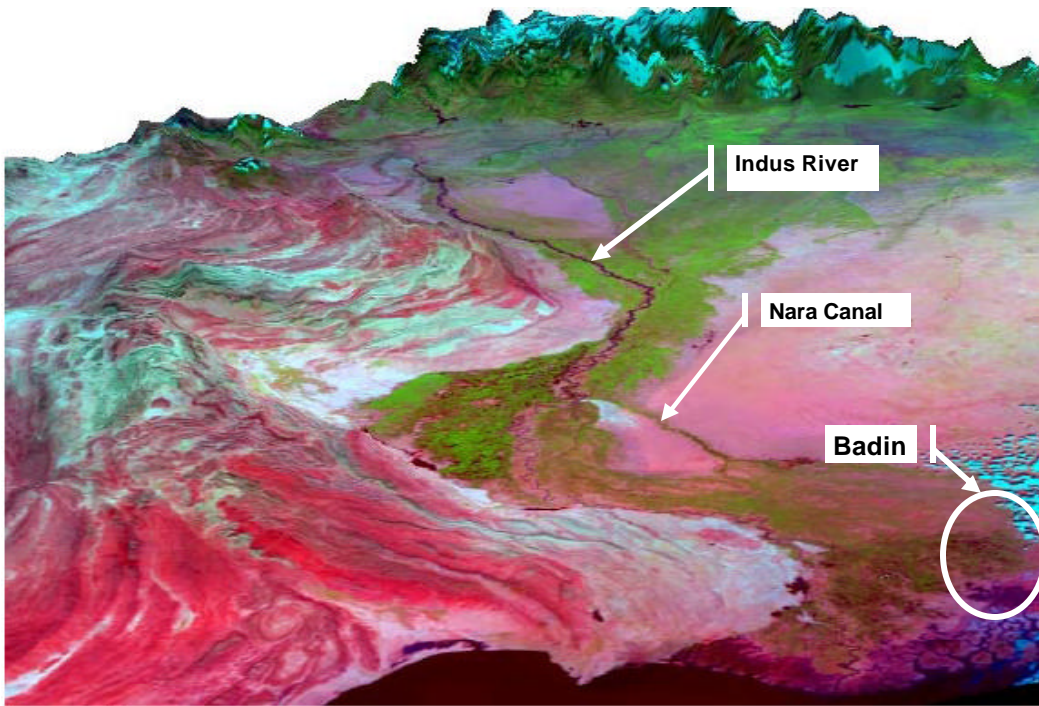
OP/BP 4.01	Environmental Assessment, January 1999
OP/BP 4.04	Natural Habitats, September 1995
OD 4.20	Indigenous Peoples, September 1991
OD 4.30	Involuntary Resettlement, June 1990
BP 13.05	Project Supervision, March 1989 and July 1991
BP 17.50	Disclosure of Information, March 1994 and June 2002
OP 8.50	Emergency Recovery Assistance, August 1995
OPN 11.03	Management of Cultural Property, September 1986

EXECUTIVE SUMMARY OF MANAGEMENT RESPONSE

THE REQUEST AND THE INSPECTION

1. In response to a Request for Inspection of the National Drainage Program (NDP) Project filed by residents of the Badin District in southern Sindh Province of Pakistan on September 10, 2004, the Inspection Panel submitted its report on July 6, 2006.
2. What follows is a description of the Request, the findings of the subsequent investigation and the Bank's response, including plans to address the issues raised and the much wider issue of Pakistan's challenge to manage its scarce water resources. Presented briefly at the outset is the context in which to understand this challenge.
3. *The Wider Context.* Pakistan is sometimes described as a desert with a river running through it. The Indus River is Pakistan's only river system and its nature and development present great contrasts: contrasts between the abundant waters of the kharif summer season and the dry rabi or winter season; between the fresh waters of the monsoon rainfall and snow melt, and the destructive salts leached from the soil and left behind by evaporation of fresh water; and between farmers closer to the source of river or canal flows and those at the tail end. In this context, Pakistan has over the years harnessed the Indus River to bring 35.7 million acres under irrigation—the world's largest irrigation system, one of great technical, institutional and social complexity—to create an irrigated agriculture system that accounts for a quarter of its GDP, two thirds of employment and about 80 percent of exports. Pakistan's economic and social wellbeing is built on this water system despite the scant average annual rainfall of just 240 millimeters.
4. In sharp contrast to the peaks of the Hindu Kush and the Himalayas at the headwaters of the Indus River, the Indus valley plain flattens out dramatically as it runs to the sea (Picture 1). The Indus River valley is unique in that the very low rainfall, poor drainage, ancient marine deposits, saline groundwater, and evaporation and transpiration combine to create a vast salt sink. The steady expansion of irrigation and agriculture added greatly to this process of accumulating salt, to the extent that over time waterlogging and soil salinity have emerged to threaten the sustainability of Pakistan's agricultural system. This challenge is perhaps greatest in the province of Sindh, particularly in Badin District of southern Sindh near the coastal zone.
5. Badin District is one of the two coastal districts in southern Sindh at the very tail end of the Indus River system where the river sprawls into the delta and a series of shifting lakes and tidal creeks. Badin is a flat, flood prone land. Where fresh canal water does not regularly reach, the land and groundwater are generally saline. Livelihoods in the coastal areas of Badin and its neighboring district of Thatta are vulnerable and poverty is widespread. Repeated shocks brought on by monsoon cyclones and heavy

rainfall (recently in 1994, 1999, 2003), earthquakes (2001), and drought (1999-2004) have resulted in relentless and severe hardship for the people living in this area.



Picture 1. Indus River

6. The Bank has been engaged with Pakistan for nearly 50 years. Prior to the 1990s, Pakistan achieved two major breakthroughs with Bank assistance: the first was the Indus Waters Treaty with India, which guaranteed Pakistan a well defined and reliable source of water supply; the second was the construction of the Indus replacement works and several storage reservoirs, which put the essential infrastructure in place to enable Pakistan to utilize the Indus River's bounty. In the 1990s, greater emphasis was given to governance and policy reform, and management of the Indus Basin and its precious water resource. In the 1990s, expert opinion in Pakistan shifted sharply to place efficient water management systems and governance, policy and institutional reforms at the core of the challenge. It was clear that Pakistan needed its vast existing infrastructure as well as new investment, but how it was managed and run—and most importantly who was involved in that management—came to dominate the approach. The NDP emerged from this new thinking and its important legacy remains the stress it placed on institutional reform and its support for the concept of Farmer Organizations (FOs), which empower farmers across the economic spectrum and gives them a say in water allocation and management.

7. ***The Request for Inspection.*** The Request for Inspection addressed the National Drainage Project (NDP), but indeed most of the issues raised concerned an earlier closed project, the Left Bank Outfall Drain (LBOD) Project in Badin District of southern Sindh Province, Pakistan. The Requesters alleged that the Project adversely affected the

wetlands and interconnected lakes, known as dhands, which are environmentally sensitive and the source of livelihood for 12,000 to 15,000 people. They alleged material harm and loss of livelihood as a result of the design of the outfall system of LBOD and its subsequent breakdown during extreme monsoon storms in 1999 and 2003. They also alleged that more than fifty villages would suffer permanent threat of flooding if the existing LBOD system was extended.

8. ***The Inspection Panel Report.*** The Panel found that the NDP Project established the “groundwork for construction of a major northward extension of the LBOD,” and inherited the related task of responding to the environmental and social implications of LBOD. This was based in turn on the Panel’s finding that NDP depended on the functionality of LBOD because certain elements of the LBOD were completed under NDP. The Panel found shortcomings in the NDP environmental assessment (EA) and that NDP supervision failed to respond with timely corrective measures to the emerging problems of LBOD and its socio-economic impacts. The Panel found that the LBOD project failed and that its design was faulty, underestimating inherent and extreme meteorological risks. This contributed to the breakdown of the LBOD outfall system and the suffering of local people in lower Badin District. The Panel also found that the LBOD project paid little attention to impacts on the environmentally important coastal dhands. The Panel Report suggested that the Bank took only sporadic notice of these issues in its supervision reports, and was slow to respond to the eventual damage to the LBOD system and its impacts in part because it failed to assign appropriate expertise.

9. The Panel found that the Bank was not in compliance with several of its policies and procedures during the preparation and implementation of NDP, including Environmental Assessment (OD 4.01), Natural Habitats (OP/BP 4.04), Indigenous Peoples (OD 4.20), Involuntary Resettlement (OD 4.30), and Project Supervision (OD/OP/BP 13.05).

MANAGEMENT’S RESPONSE

10. ***Summary of Management’s Response.*** In Management’s view the Bank was diligent in the application of its policies and procedures during implementation of NDP. The Bank has endeavored to assist the Borrower to address two distinct problems with specific inherent complexities: the technical challenges of an outfall system in southern Sindh presented by LBOD, and the national reform process challenges taken up by NDP. Management has responded to the concerns of the Requesters, incorporating these concerns into its dialogue with Government of Sindh (GOS), formulating a comprehensive Action Plan and identifying suitable strategies and instruments through which timely implementation of the Action Plan can be undertaken. The lessons from the Bank’s long experience in the sector in Pakistan, and the LBOD and NDP projects, together with the strategic directions of the current Country Assistance Strategy (CAS), have been incorporated into the Action Plan.

11. **Content of this Report.** Management’s response and proposed actions with regard to the Inspection Panel’s detailed findings can be found in Annex 1. Management’s response includes an Action Plan (Section VII) that has been discussed and agreed with the Government of Pakistan (GOP) and the GOS. Lessons learned are discussed in Section VI, and Risks in Section VIII. Several key points in Management’s response, discussed in Section V, are summarized below.

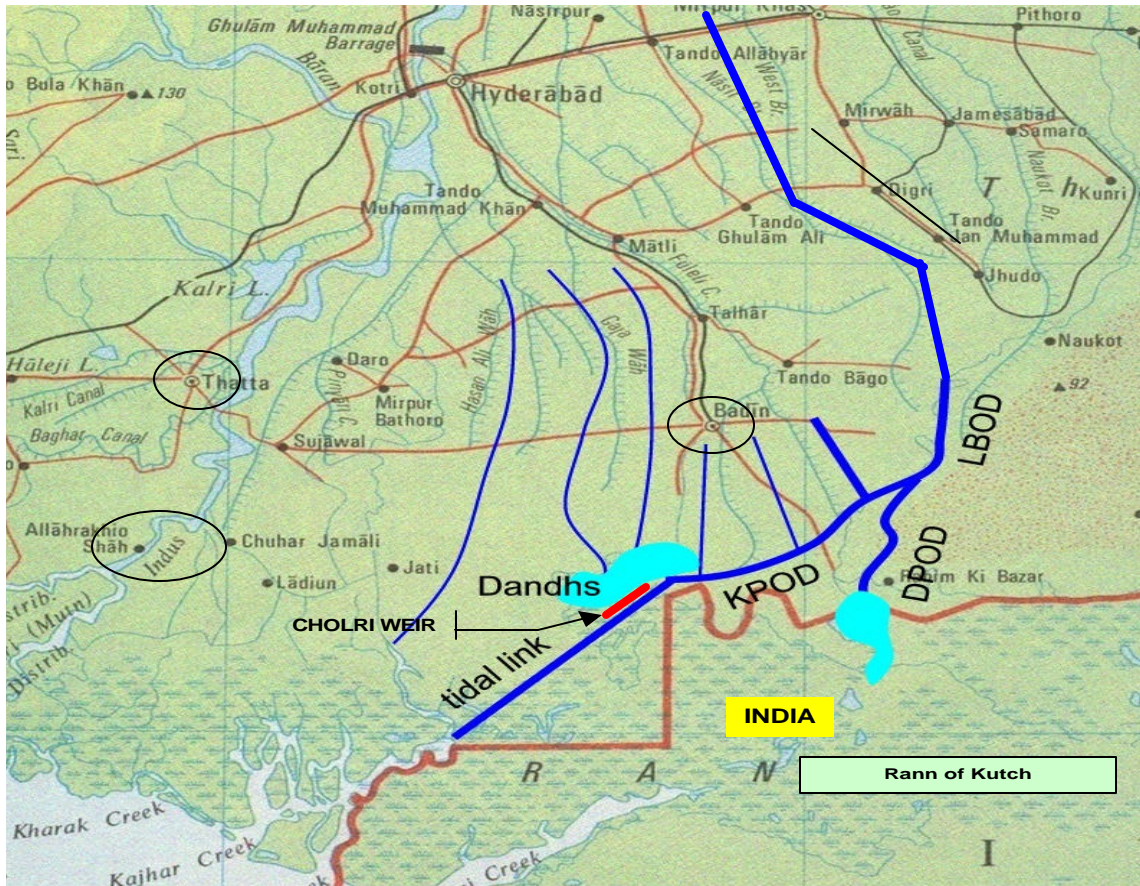


Figure 1. Left Bank of Indus River in Southern Sindh
(Source: POE Drainage Master Plan)

12. **Southern Sindh.** Figure 1 shows the left bank of the Indus River in southern Sindh. Two districts, Thatta to the west and Badin to the east, encompass this large flat plain which blends seamlessly into the salt encrusted mud flats of the coastal zone. The LBOD system runs from the north or middle Sindh along the eastern edge of Badin District, collecting the constructed small drains that serve the Badin area until it reaches the coastal zone and the dhandhs (in close proximity to India at this point). From there the drain is connected to the sea by a Tidal Link (TL) canal. Where the TL passes through the dhandhs (shallow lakes and wetlands) the 1800 ft. Cholri Weir was constructed to protect this valuable wetland and fishery.

13. **Why LBOD?-- Sindh's Development Imperatives and Dilemmas.** At the time when key choices were made about LBOD project design in the early 1980s, the Sindh authorities took the position that it was imperative to act to prevent the progressive abandonment of land and deterioration of agriculture caused by salinity (Picture 2) and waterlogging that the province had been experiencing for many years, especially in areas with high production potential such as the Nara Canal sub-basin (Map 34984). Its hopes for sustainable rural economic growth and poverty alleviation rested to a large extent on improving its agricultural systems and increasing farmer income.



Picture 2. Salt encrusted agricultural land in Sindh

14. Sindh's options were limited by two important constraints: first, the pervasive groundwater and soil salinity would yield very saline drainage water that could not be put into the irrigation canals or returned to the river;¹ second, disposing of the saline drainage base flows² into the Rann of Kutch would create riparian problems with India (Figure 1). The choice of a main collector drain was costly, risky in the harsh and dynamic environment of the coastal zone, would not eliminate all flood risks, and could have large operation and maintenance costs. Nevertheless, after careful consideration of many options, the main collector drain was chosen since it fit within these important constraints, relieved the critical salinity and waterlogging constraint to agricultural productivity and growth, and was the most cost-effective option among the alternatives studied (Annex 1, Item 3).

15. **Genesis of NDP.** In the early 1990s as LBOD was nearing completion, new ideas emerged that emphasized water management over purely infrastructure solutions to the drainage problem, and that were to lead to radical changes in Pakistan's irrigation and drainage strategy. These new ideas had their genesis in the recommendations of the Bank financed *Pakistan Water Sector Investment Planning Study* (1991), Pakistan's Eighth Five-Year Plan (1993-1998), and the Bank's paper on the irrigation and drainage sector, *Pakistan Irrigation and Drainage: Issues and Options* (March 1994). The NDP project was formulated to implement the changes in governance and policy that were at the heart of this new approach.

¹ The Indus plain along the left bank of the Indus River in southern Sindh slopes southwestward away from the river (Figure 1).

² The base flows are the water drained from the soil which are saline and may contain other pollutants. The drains also carry excess rainfall or runoff during rain storms, which would generally not be saline but may be polluted.

16. ***NDP Relationship to LBOD.*** NDP was a national program covering the entire Indus Basin irrigation system that, unlike the infrastructure-building LBOD project, focused primarily on governance, policy and institutional reforms and capacity building (Annex 2). NDP was designed to begin the transformation of a century-old irrigation governance system to help Pakistan to create the capacity and institutional framework needed to address the country's strategic water challenges. NDP's investment plan also addressed the backlog of deferred maintenance that was degrading the existing irrigation and drainage system.

17. ***NDP Investment in LBOD.*** While NDP initiated this process of change, achievement of its objectives did not depend on the efficacy of LBOD, which serves about 3.5 percent of the 35.7 million acres of irrigated land in the Indus Basin. A few ongoing contracts not completed during implementation of LBOD (about 3.3 percent of LBOD's total cost) were funded by NDP.³ These works did not alter or expand the capacity or service area of LBOD. At the time NDP was presented to the Board in 1997 (Annex 9), LBOD's drainage benefits and restoration of abandoned agricultural land to production were widely recognized and the outfall system was functioning as designed.

18. ***NDP Investment in Rethinking Pakistan's Drainage Sector Strategy.*** NDP did not invest in new drainage infrastructure for two reasons: first, the Sindh authorities did not want to expand or extend LBOD; and second, there were disagreements about the best options to improve the drainage system and how much drainage capacity was really needed. For this reason, NDP supported a pre-feasibility study of a national surface drainage system (NSDS), and the preparation of a national Drainage Master Plan (DMP, 2002-2005) that, among other things, resulted in a new approach and strategy for managing drainage and the rejection of the option to extend and expand LBOD (Annex 7).

19. ***Supervision of NDP as it Relates to LBOD.*** The NDP project team was diligent in carrying out its supervision obligations. The Project was co-financed and jointly supervised by the International Development Association (IDA), Asian Development Bank (ADB), and Japan Bank for International Cooperation (JBIC). Supervision included monitoring progress on all substantive aspects of NDP implementation, procurement and disbursement, and the risks to successful implementation and to sustainability of NDP outcomes (Annex 10).

20. Financing and supervision of LBOD was complex and cumbersome. The eight donors⁴ each financed and supervised separate components of the project sometimes in

³ NDP provided funds to complete ongoing contracts for the last few elements of the LBOD project (not part of the outfall system) including completion of the remodeling of portions of the Nara Canal irrigation network, the completion of the last drainage tubewells, and implementation of performance-based O&M contracts for drainage tubewells. These works, partly financed by NDP, did not alter or expand the capacity or service area of LBOD.

⁴ The project was financed by IDA, ADB, Canadian International Development Agency (CIDA), the UK's Overseas Development Administration (ODA), Saudi Fund for Development (SFD), Swiss Agency for Development and Cooperation (SDC), Organization of Petroleum Exporting Countries Fund for Development (OPEC Fund), and Islamic Development Bank (IsDB).

combination with different partners.⁵ Division of responsibility and co-supervision arrangements were not sufficiently detailed to ensure timely treatment of emerging issues or timely completion of all elements of the project.

21. In accordance with standard Bank practice, formal LBOD supervision did not continue after the project was closed in 1997. However, given the comprehensive nature of the Bank's partnership with Sindh and the GOP in the water sector and the broad level of NDP coverage of the irrigation and drainage sector, in the normal course of events Bank supervision teams naturally continued to apprise themselves of certain aspects of LBOD. As a result, while not carrying out LBOD supervision per se, Bank supervision teams incorporated these issues into their dialogue with government as outlined in paragraph 26 below. Thus, during the course of implementation of the NDP Project, the supervision team took a pragmatic approach to water sector issues as they arose. This approach included supervision of the completion of the limited number of activities that were ongoing when LBOD closed (see paragraph 17).

22. ***Environmental Classification of NDP.*** Management agrees that a Category "A" classification and a full environmental assessment during the period 1994-1995 could have provided an added framework within which to consider the potential cumulative environmental impacts of the continued development of the drainage system.

23. ***NDP's Protection of Environmental Values and Mitigation of Social Impacts.*** All of NDP's investments in deferred maintenance underwent an environmental and social scoping and screening assessment that took account of Bank policies at that time on natural habitats and involuntary resettlement, and reflected prevailing Bank environmental assessment policy as well as related federal and provincial regulations. Sub-projects involving land acquisition that did not adhere to the guidelines or had unacceptable environmental impacts especially in wetland areas were removed from the portfolio of potential investments.

24. ***The Bank's Response to Emerging Issues.*** Heavy monsoon storms struck the LBOD outfall system in 1998 and 1999, causing severe damage to the TL canal and the Cholri Weir (Figure 1), and in 2003 a cyclone and the largest rainstorm on record struck southern Sindh and Badin causing extensive flooding. The TL continues to function but the Weir has been destroyed. These events reignited the longstanding controversy over the effectiveness and the potential impacts of LBOD, and led to the Request for Inspection in 2004.

25. The Bank has responded quickly to emerging issues, including those raised by the Requesters. Naturally of greatest concern is the plight of poor people in Badin; a USD18.0 million Program implemented by the Pakistan Poverty Alleviation Fund (PPAF) with Bank financing has been launched to strengthen livelihoods in this area following a Bank-initiated socio-economic study in 2005 (Annex 3).

⁵ IDA financed irrigation and canal remodeling, electrification (of tubewells), and consultancy.

26. Long before this, however, the Bank repeatedly raised many of the issues subsequently pointed out by the Requesters and the Panel in its sector dialogue with the Sindh authorities and the GOP. In 1996 the Bank noted the continuing controversy among local people concerning the potential impacts of LBOD and requested the GOP and GOS to meet with stakeholders and resolve any outstanding problems. The federal and provincial Ministers of Water and Power did carry out the consultation and measures were undertaken by the Water and Power Development Authority (WAPDA) to allay these concerns. In 1998, the Bank asked the government to take urgent action to deal with damages to the Cholri Weir, to which WAPDA responded positively, but its initial actions to mitigate damages were undone by the severe monsoon cyclone in 1999.

27. In 2001, a Bank Panel of Experts (POE) collaborated with the GOS/GOP High-Level Technical Committee to assess the 1999 cyclone damages to the TL and Cholri Weir. Both the Committee and the Bank POE recommended that immediate repairs not be undertaken; their recommendation to extend the term and expand the scope of the monitoring program was implemented by the GOS and GOP. During the NDP Mid-Term Review (MTR) in 2001 the Bank and the GOP agreed to undertake the preparation of the DMP which was begun in 2002 and completed in 2005.

28. After the cyclone of 2003, and the completion of the GOS's post-flood relief and recovery operations, the Bank sent a POE mission at the request of the GOS to assess the problems (Annex 4) and to review the results of damage assessments and proposals for remedial measures. The POE report has resulted in the incorporation of planning studies within the proposed Sindh Water Sector Improvement Project (WSIP) to determine the best options.

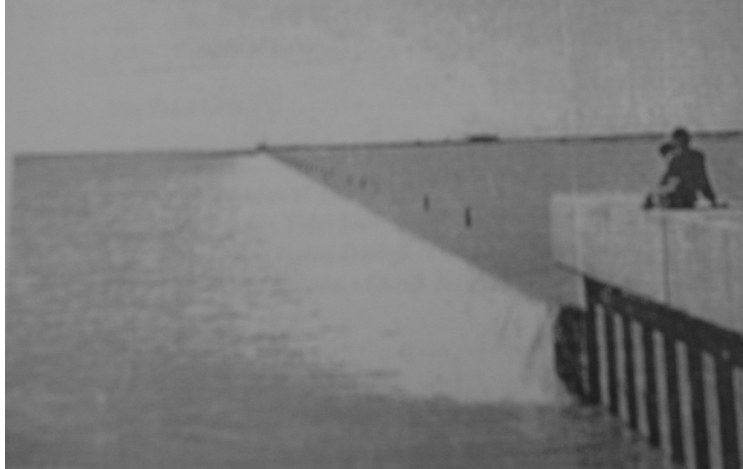
29. The issues raised by the Requesters and the Panel were consistently part of the dialogue during numerous missions to Sindh throughout the intervening years. The Bank also offered access on several occasions to the NDP Credit and to the Drought Emergency Recovery Assistance (DERA) Project Credit to enable the Sindh Government and WAPDA to respond to emergencies in the area and to undertake corrective and preventive measures in the LBOD outfall system and the dhands.

30. ***Environmental and Social Impacts on the Coastal Dhands.*** The Panel found that LBOD paid little attention to impacts on the environmentally important coastal dhands. The design of the outfall system under LBOD (Figure 1) incorporated substantial measures to prevent harm to the ecosystems and fisherfolk livelihoods in and around the dhands (Map 34988). The 1989 LBOD Environmental Impact Assessment (EIA) identified several potential adverse physical impacts that the TL⁶ could have on the ecosystem and habitat of the dhands. Physical and mathematical model studies of the TL were used to determine how to mitigate these impacts and protect the dhands. The adopted solution involved several measures, including a 1,800 foot weir in the northern

⁶ The alignment of the Tidal Link canal passed through a cluster of shallow lakes and wetlands, called dhands in Sindh, whose extent and character varied seasonally. These dhands were recognized as important environmental resources for fisheries and valuable to migratory waterfowl.

TL canal embankment where it passed through Cholri Dhand (Figure 1). These measures were reported to be functioning as designed until 1998.

31. The weir was damaged in the 1998 monsoon (Picture 3). Despite the efforts of WAPDA to isolate the damaged weir and undertake repairs, a monsoon cyclone in early 1999 destroyed the weir,⁷ leaving Cholri Dhand openly connected to the TL canal. While the TL continues to function as an effective drain to convey saline drainage water to the sea under normal conditions, the destruction of the Cholri Weir has led to changes and adverse impacts. The magnitude and reversibility of the impacts on the ecosystem of the dhands, changes in salinity pattern and the productivity of the fishery and fisherfolk livelihoods are unclear at present



Picture 3. Cholri Weir in 1998—Picture shows water flowing through the breached section of the Cholri Weir from the dhand (right side) to the TL canal (left side)

because of the paucity of recent data (see Short-term Actions, Section VII). The fisherfolk report a decline in fish catch in some areas of the dhands, but they are also now more intensively fishing the TL canal than they had in the past.

32. ***Flooding in Badin Area.*** The monsoon storm of 2003 produced the highest monthly rainfall recorded in the 67 year period of record in Badin. The loss of life and damage to property and ecosystems caused by flooding across an extensive area of southern Sindh far beyond that influenced by LBOD was a tragedy that had deep impact on poor communities across the region (Annex 8). A storm of this magnitude in the adverse physical setting of Badin (Picture 4), with its extremely flat terrain, limited natural drainage capacity and high natural flood vulnerability, would be expected to result in widespread flooding and damages as had happened in the past with large storms. In addition, over 344 cuts and breaches in the spinal and internal drains and canals were made by farmers to relieve the flooding in their fields, which overloaded the drainage system and exacerbated the flooding downstream. While water also spilled from LBOD through 12 cuts, it is not possible to directly attribute all of the storm damages that occurred throughout Badin to LBOD.

⁷ The cause of this severe damage is still the subject of intense technical debate in Pakistan, but it appears that wave action, higher than expected flow velocity in the Tidal Link canal, scour around the foundation of the weir, undermining of the weir apron by flow coming from the dhands—or a combination of these factors—led to its destruction before major remedial measures could be undertaken.



Picture 4. Mud flats and landscape in the vicinity of the dhands and southern Badin

LESSONS LEARNED

33. The Action Plan is based on lessons learned from the Bank’s long history of involvement in Pakistan’s water sector, and in particular from the LBOD development, from preparation of the DMP and related stakeholder consultations, from the 2005 POE review of LBOD, from implementation of NDP, and from the directions recommended by the socio-economic and livelihoods study of the coastal areas of Badin and Thatta Districts in southern Sindh. These lessons are outlined in Section VI of this report.

34. Significant among the many lessons is the recognition that institutions that will ultimately be responsible for the operation and maintenance of infrastructure must be the ones to manage its planning and design – and this includes the voice of local stakeholders, even the poorest of farmers. Also significant is the adoption of a wide vision of comprehensive flood management and environmental protection rather than a narrow focus on agricultural drainage that can obscure the bigger picture. Pervasive poverty too needs specialized attention and ambitious policy and reform agendas such as those initiated under NDP mix poorly with an infrastructure focus.

35. The TL and Cholri Weir did not perform as designed during the extreme storm event⁸ in 1999. Whether this was a failure of design is still a matter of intense technical debate in Pakistan as is the precise cause of the failure. The design of long-term remedial measures requires considerably more data and a deeper understanding of the channel processes and conditions, hence the GOS and GOP have intensified monitoring and research. If the Bank were engaged in a similar project today, however, much greater attention would be given to quality assurance, utilizing external peer review, and to better mitigation of risks,⁹ particularly for projects located in such a high risk environment. It is

⁸ While the probability of extreme conditions occurring may be very small (e.g., extreme tides, wind or rainfall) they can occur at any time or in any year following the completion of construction.

⁹ The design of any infrastructure necessarily involves balancing costs, benefits and risks, and different options commonly give rise to distinct tradeoffs among these considerations. There is no entirely risk free water infrastructure – the challenge is to manage risks to ensure socially acceptable and sustainable outcomes.

possible that such an intensive peer review process would have resulted in a stronger or more secure design in this case.

36. The inability of the irrigation department to control the behavior of upstream farmers in breaching the drains and canals to allow more water to flow out of their fields during flooding could have been predicted or more proactively addressed. This, and the long standing controversy between the GOS, GOP and local stakeholders over the potential impacts of the scheme underscore the importance of utilizing a systematic consultation process and effective communication strategies at the earliest stages of planning and design. These important lessons have been incorporated into the region's overall work program and the Action Plan.

MANAGEMENT ACTION PLAN

37. Table 1 outlines the responsibility and time table for the proposed short-, medium- and long-term actions that are summarized below. The Action Plan agreed with the GOS responds directly to the issues raised by the Requesters and is an integral part of the Country Water Resources Assistance Strategy (CWRAS, 2005) and the CAS which was endorsed by the Board in 2006. The GOS is committed to the mitigation of the problems of the people in the area and implementation of the Action Plan, as expressed in recent correspondence. The scale of Bank support for Sindh's irrigation development program will be determined by this continued commitment.

38. Since the Request for Inspection was made in September 2004, the Bank has taken two important actions that established the foundation for the Action Plan:

- First, implementation of a USD18.0 million program to strengthen livelihoods in the coastal talukas of Badin and Thatta Districts has been launched through the PPAF, based on a Bank diagnostic study of livelihoods in the coastal areas of Sindh; and
- Second, at the request of the GOS, the Bank sent a POE mission to assess the various proposals and options to improve the security and performance of LBOD. This resulted in agreement with the GOS on a program of comprehensive flood and drainage management planning and feasibility studies that would lead to programs and projects suitable for support by the Bank and Sindh's other donor partners.

39. ***Immediate and Short-Term Actions.*** The core issue in the Panel's report is the continued vulnerability of and the adverse impacts on the population and livelihoods in lower Badin, particularly the poor and most vulnerable people in and near the dhands. The Bank's short-term actions (Table 1) are selected to provide an immediate response to the plight of these people and to address the related issues.

- One of the actions under the PPAF livelihoods program is to review the social profile of the population in Badin and Thatta districts, with the aim of identi-

fyng specific nomadic and other vulnerable groups and addressing additional livelihood support issues.

- The Bank and Sindh authorities have discussed and agreed that the scope of the new WSIP¹⁰ will include a comprehensive flood and drainage management plan for the left bank of the Indus River in southern Sindh. Since the WSIP project will be the primary instrument for developing a specific flood management plan for the area of concern to the Requesters, completion of the processing of the WSIP project has been made a high priority.
- A third immediate response is a socio-economic and environmental diagnostic study of the dhands area during the next dry season, similar to the socio-economic study in Badin and Thatta Districts. The aim will be to better understand the impacts on the dhands, and determine how the ongoing PPAF livelihoods program or other new interventions can be deployed to benefit the people and ecosystems in and near the dhands.

40. **Medium-Term Actions.** These include preparation of a comprehensive flood risk management and drainage plan for the left bank of the Indus River in Sindh encompassing Badin District, and planning studies leading to a program for the sustainable management of the coastal zone and Indus Delta, which face special problems ranging from sea water intrusion to global climate change and accelerated sea level rise. The delta is at the very tail end of the entire Indus system and modification of upstream flows, extractions for agriculture and urban supply, maintenance of flows for environmental purposes, inflows of drainage water and industrial and agricultural pollution have all had negative impacts on this sensitive area and its populations. These technical planning studies are intended to lead to specific projects and programs that are suitable for support by the Bank and Sindh's other donor partners.

41. **Long-Term Actions – Strategic Partnership with Pakistan in the Water Sector.** The Bank's strategic partnership with Pakistan in the water sector stretches back nearly 50 years. Both the CAS (2006-2009) and the CWRAS (2009-2016) (Annex 6) provide guidance for the Bank's ongoing engagement. The Bank's CWRAS articulates the major challenges for Pakistan if it is to achieve sustainable development in the water sector. These include developing a world-class knowledge-based capacity for adaptive resource management and service delivery; a financially feasible approach to maintaining and modernizing existing infrastructure and building needed new water infrastructure; establishing a modern institutional framework; and plotting a principled and pragmatic path for implementing this reform agenda over the coming decades.

¹⁰ This project would improve water productivity and water use efficiency by deepening and strengthening the reform program, particularly the Farmers' Organizations (FOs) and Area Water Boards (AWBs); undertake investments to rehabilitate and remodel irrigation and drainage facilities down to the watercourse level; build capacity; support the development of a knowledge base for water and flood management; and prepare a comprehensive flood management plan for the left bank of the Indus River in Sindh.

Table 1. Action Plan

Activities & Projects	A	B	C	Responsibility	Schedule
Immediate and Short Term					
<ul style="list-style-type: none"> Implementation of Livelihood Improvement Program in Badin and Thatta Districts <ul style="list-style-type: none"> Phase I (USD2 million) Phase II (USD16 million) 	✓			Pakistan Poverty Alleviation Fund (PPAF)	2006-2007 2007-2009
<ul style="list-style-type: none"> Sindh WSIP <ul style="list-style-type: none"> Appraisal Board Presentation Effectiveness 	✓	✓	✓	GOS/GOP/SIDA WB GOS/GOP/SIDA	Nov. 2006 Jan. 2007 July 2007
<ul style="list-style-type: none"> Socio-economic and environmental diagnostic study of the dhands and surrounding areas 	✓		✓	WB/SIDA	July 2007
Medium Term					
<ul style="list-style-type: none"> Flood Management Master Plan for the left bank of the Indus River in southern Sindh 	✓	✓	✓	SIDA	2007-2009
<ul style="list-style-type: none"> Coastal Development Program <ul style="list-style-type: none"> Project Concept Note 	✓		✓	WB	July 2007
Long Term Outcomes					
<ul style="list-style-type: none"> Improved management (O&M) of irrigation and drainage infrastructure; improved service delivery and governance; and transparent and more equitable water allocation and distribution 	✓	✓	✓	GOP/GOS/WB	2006-2009
<ul style="list-style-type: none"> Modern institutional framework for Indus Basin water resources management 		✓	✓	GOP/GOS/WB	2009-2016
<ul style="list-style-type: none"> Sustained governance reform agenda 	✓	✓	✓	GOP/GOS/WB	2009-2016
KEY:					
A: Poverty and livelihoods					
B: Flood Risk					
C: Threatened ecosystems					

CONCLUSION

42. In Management's view the Bank was diligent in the application of its policies and procedures during implementation of NDP. The Bank has endeavored to assist the Borrower to address two distinct problems with specific inherent complexities: the technical challenges of an outfall system in southern Sindh presented by LBOD, and the national reform process challenges taken up by NDP. NDP succeeded in initiating a

process of critical governance reforms, changing the direction and strategy in the sector towards decentralization, participatory management, and empowerment of farmers. This was a critical step in transforming a governance system that was over 100 years old. This process will continue for some time, but the foundation has been securely established. In regard to LBOD (Section V), with hindsight, the Bank could have made some judgments differently, especially by calling for more explicit consideration of risks and tradeoffs in the context of a participatory planning process during the LBOD design stage, by finding a way to support the implementation of the LBOD Environmental Management and Monitoring Plan (EMMP) at a much earlier stage, and by encouraging and supporting Sindh to undertake a livelihood diagnostic study in the coastal areas of Badin that were not benefited directly by LBOD.

43. Management has responded to the concerns of the Requesters, incorporating these concerns into its dialogue with the GOS, formulating a comprehensive Action Plan, and identifying suitable strategies and instruments through which timely implementation of the Action Plan can be undertaken. The lessons from the Bank's long experience in the sector in Pakistan, and the LBOD and NDP projects, together with the strategic directions of the current CAS have been incorporated into the Action Plan.

44. There are risks of delay in implementation of the Action Plan as well as risks arising from technical factors, difficulties in reaching a consensus among stakeholders, and institutional capacity that will require diligent management. However, because water resources management is central to the development of Pakistan and Sindh, the Bank has been, and needs to remain, engaged despite these risks. Management proposes to report to the Board in 12 months on the progress and status of follow-up actions.

I. INTRODUCTION

1. On September 10, 2004, the Inspection Panel received a Request for Inspection, IPN Request RQ04/5 (hereafter referred to as “the Request”), related to the Pakistan National Drainage Program Project (the “Project”), Credit No. 2999-PK, financed by the International Development Association (IDA). The Request was submitted by Khadim Talpur, Mohammad Ali Shah, Mustafar Talpur, Munawar Hassan Memon, Iqbal Hyder, Mir Mohammad Buledi, and Najma Junejo on their own behalf and on behalf of “others who live in the area known as District Badin, Sindh Pakistan” in the Indus River Basin,¹¹ (hereafter referred to as the “Requesters”).
2. The Executive Directors and the President of IDA were notified by the Panel of the receipt of the Request on September 17, 2004. Management responded to the claims in the Request on October 19, 2004. In its Report to the Board, the Panel found the Request eligible and recommended that the Executive Directors authorize an investigation. The investigation was authorized by the Executive Directors on November 24, 2004.
3. On July 6, 2006, the Panel issued its report outlining the findings of the investigation. Management appreciates the Panel’s comprehensive presentation of its findings. This report, for ease of presentation, is organized in several sections. Section II is an overview of the present situation of the water sector in Pakistan. Section III provides a description of NDP Project. The Left Bank Outfall Drainage (LBOD) Project is also described in Section III, as most of the issues raised by the Requesters concerned it. Section IV contains the findings and observations of the Panel. Section V outlines the key issues in preparing and implementing the Project. Lessons learned are presented in Section VI and Management’s Action Plan is provided in Section VII. Section VIII discusses risks and Section IX contains the conclusion. The Panel’s findings, along with Management’s responses, are described in detail in Annex 1. Annexes 2-8 provide additional supporting documentation.

¹¹ The Request was received electronically. Prior to Registration, the Panel received a hard copy of the Request with over 2000 signatures.

II. BACKGROUND

4. Pakistan is one of the world's most arid countries, with an average rainfall of under 240 millimeters a year. It has often been referred to as "a desert with a river flowing through it." It is also virtually flat: the terrain from Lahore (in the extreme northeast of the country), 700 feet above sea level, descends to the sea, 700 miles away, at a slope of only one foot per mile. The population and the economy are heavily dependent on the Indus River system, which is mainly fed by snow melt from the Himalayas. Throughout history, people have adapted to the low and poorly distributed rainfall by either living along river banks or by careful management of local water resources.

5. ***Importance of Water Development and Irrigated Agriculture in Pakistan.*** Water is scarce in Pakistan and irrigation is critical to agriculture and rural livelihoods. Despite the intense aridity, nearly 90 percent of all agricultural output is produced from irrigated agriculture. Agriculture accounts for a quarter of GDP, two thirds of employment and about 80 percent of the exports; it is the base of Pakistan's industrial sector, producing essential raw material and other inputs, including cotton, leather, edible oils and sugar.

6. ***Pakistan has a long history of irrigation development.*** Major development of the Indus River basin for irrigation began in the 19th century. After independence, the country faced serious challenges to produce sufficient food and meet the basic economic and social needs of its rapidly expanding population. In response, Pakistan embarked on a program to expand the diversion of the Indus River and its tributaries in order to nearly double the area under irrigation by 1980. This program secured water for previously existing irrigated areas, expanded the Indus Basin irrigation system, increased hydropower generation capacity, enhanced cropping intensity on the Indus plain and made it possible for Pakistan to benefit from the green revolution. The World Bank has been a major partner in the planning and financing of this program.

7. ***Strategic Threats to the Indus Basin Irrigation System.*** The decision to develop the water resources of the Indus Basin for irrigated agriculture brought enormous benefit to the nation and to millions of people. Nevertheless poverty today remains high at about 24 percent, and overcoming the socio-economic challenges of reducing poverty is a major priority for the country. At the same time, Pakistan is now beginning to recognize that along with this beneficial development have come adverse consequences and threats that must be managed and mitigated if development is to be sustainable and equitable. These threats include:

- (i) Growing water demand due to increased population, urbanization, and industrialization, and depletion of storage capacity due to gradual silting up of existing reservoirs, has resulted in a steady decline in water availability per capita, and a future dominated by water scarcity;
- (ii) Waterlogging and salinity together pose serious threats to the sustainability of the irrigation system, and especially to the critical usable groundwater resource on which both current irrigated agriculture and drinking water supplies depend;

- (iii) There is an increasing risk of flooding, particularly in the lower Indus Basin, due to a rise in river beds within flood protection embankments caused by gradual accumulation of silt deposits;
- (iv) Sea intrusion and environmental degradation of the Indus Delta and coastal areas have resulted from the decline in Indus River water flow and sediments; and
- (v) Governance and the financial health of the irrigation system have seriously weakened, and the institutions needed to meet these water management challenges have not been strengthened.

8. **Sindh Province.** Sindh Province occupies nearly all of the Indus River Basin in southern Pakistan, which is the terminus of the Indus plain as it reaches the sea. The terrain is nearly level with a slope southwards towards the Rann of Kutch and the sea that ranges from 1 in 15,000 to 1 in 20,000. Groundwater tables are high and commonly saline. Only about 30 percent of the groundwater in Sindh is usable for agriculture or drinking water. Three barrages on the Indus River supply Sindh's canal systems that irrigate about 5.5 million ha (about 25 percent of Pakistan's total irrigated area).

9. Drainage is critical for the success of Sindh's agriculture and for livelihoods, but drainage problems are severe. The Indus River is located on a ridge in the extreme west of the province and the flat terrain slopes very gradually southeastward away from the river. Hence the Indus River does not function as a natural drain, and the little natural surface drainage that does exist is impeded by roads, irrigation bunds and canals. Without strenuous efforts to improve and maintain both surface and sub-surface drainage capacity and functionality, agriculture in southern Sindh is under constant threat of deterioration and livelihoods are vulnerable.

10. Southern Sindh's essentially flat terrain, limited drainage capacity, and proximity to the sea make the risk of flooding from high intensity rainfall in the monsoon season very high.¹² Since 1959 at least 14 heavy rain fall events (with at least three accompanied by cyclones) have been recorded. Moreover, Sindh's irrigation canals are typically very long, in some cases several hundred kilometers. During storm events, even when water diversions from the barrages are stopped, the water already present in these long canals is discharged invariably into drains that are already laden with storm runoff (there is no demand for irrigation and flood retention arrangements are not in place).

11. **The Badin District of Southern Sindh.** Despite the discovery of oil and gas resources in Badin District, unemployment in Badin is high and it is one of the poorest districts in the country in terms of human development. The lower Badin area that is the spatial focus of the Request for Inspection is subject to extreme environmental risks, precarious livelihoods and vulnerability to natural disasters. Extreme weather events and natural disasters have persistently plagued the districts in the coastal areas of Sindh, especially Badin and Thatta. In addition to natural disasters, these two districts have also suffered as

¹² Although average annual rainfall in Sindh is very low, the southern parts of Sindh, particularly the coastal areas, are prone to intense monsoon rainfall and cyclone events, with rainfall amounts greater than the average annual total rainfall occasionally occurring in the span of a few days.

a result of inequity in water distribution and inability of existing infrastructure to drain surplus water during heavy rainstorms. Reports prepared by UN Agencies suggest that the impact of these natural calamities has been severe for the low income and vulnerable groups and resulted in a general disruption in livelihoods, increased their vulnerability and, in some cases, led to out-migration.

12. Only about 58 percent of the more than 1.7 million ha of arable land in Badin District is cultivated because of the lack of irrigation water. Rice is the principle crop and is grown wherever water and salinity conditions are suitable. In the two coastal talukas of Badin District (a taluka is the administrative tier below the District level), only 26 percent of people had access to drinking water within their village. The decrease in water availability, and increased salinity of both soils and groundwater have increased pressure on livelihoods by diminishing choices in what were once diverse livelihood systems (that included agriculture, crop production, fisheries, wood cutting, etc). About 10 percent of the value of Pakistan’s fish exports and 17.5 percent of Sindh’s fishery production comes from Badin’s coastal waters (2002).

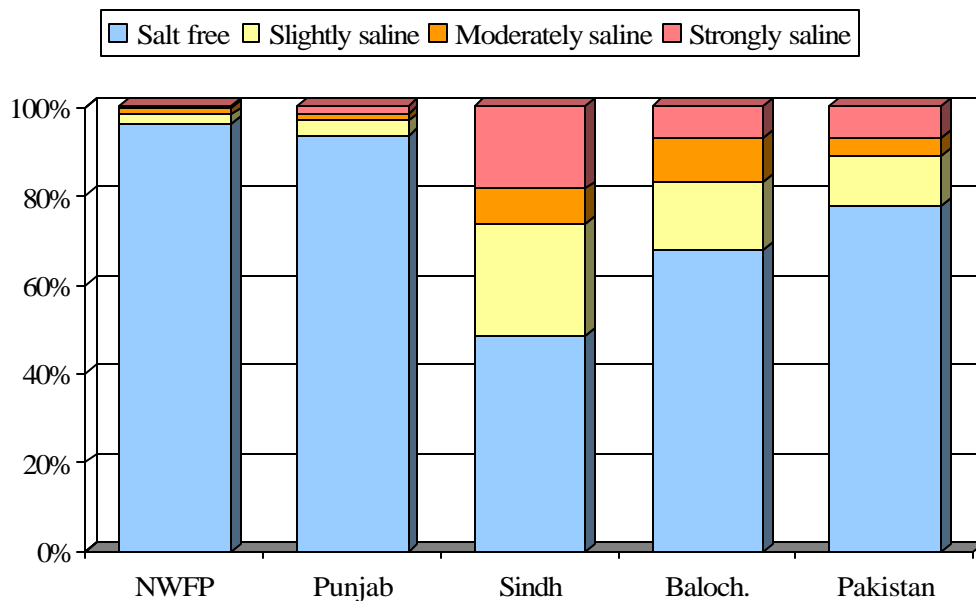


Figure 2. Salinity Levels in Pakistan
(Source: Bhutto and Smedema, 2005)

13. **Coping with the Threat of Salinity and Waterlogging.** The Indus River basin is unique in that the very low rainfall, poor drainage, ancient marine deposits, saline groundwater, and evaporation and transpiration combine to create a vast salt sink (Figure 1). The steady expansion of irrigation and agriculture added greatly to this process of accumulating salt, to the extent that over time waterlogging and soil salinity have emerged, particularly in Sindh, to threaten the sustainability of Pakistan’s agricultural system.

14. The risk of this eventuality was recognized early and in response the Salinity Control and Reclamation Program (SCARP) was initiated in the middle 1960s to lower water tables and remove salt using tubewells. These worked very well in fresh groundwater areas where the pumped groundwater could be returned to the canals and readily used for irrigation. But the groundwater in Sindh is mostly saline,¹³ and the pumped water from these drainage tubewells had to be evacuated from the basin.¹⁴ The view that drainage water in Sindh and many other parts of the Indus Basin would need to be collected and evacuated out of the basin to the sea was strongly held by Pakistani water professionals and policy makers.

15. Until a few years ago, it was believed that the only way of maintaining a safe salt balance in the basin would be to construct a national surface drainage system (NSDS), often referred to as a “drainage superhighway,” to transport salts from Punjab, North West Frontier Province (NWFP) and Sindh to the sea. However, as a result of the Bank supported preparation of the Pakistan Drainage Master Plan (DMP) in 2002-2005, the need for this infrastructure and approach has been reconsidered. The general consensus among both Pakistani and international experts is that extension of the existing drains further up the plains will not be necessary. While large drains (such as the LBOD) are necessary in the salt-plagued lower Basin in Sindh, the fundamental approach should be to reduce the “drainable surplus” through more efficient water use and local use of saline drainage effluent.

16. During the 1970s, Sindh—where the salinity problem was the most serious—began construction of a spinal drain¹⁵ to collect drainage water from a portion of the Nara Canal basin (Map 34984) and convey it about 100 miles southwestward to the Dhoro Puran, an ancient, moribund Indus River channel near the Thar desert that empties into the coastal area. In 1980, design studies were initiated for a complete spinal drain and outfall system that could serve about 1.25 million acres of the Nara Canal basin and convey the saline drainage water to the sea. This system was referred to as the LBOD.

17. ***The Indus Delta and the Sindh Coastal Zone.*** While salinity may be the biggest challenge, other important threats to development benefits in the Indus Basin are growing in importance and urgency—management of the coastal zone and the delta, conservation of wetlands and related environmental services, and management of pollution and water quality. In Sindh, and Badin District in particular, the major changes in the Indus Delta that have occurred since the development of the Indus Basin’s water resources have resulted in sea water intrusion, increased salinity and loss of mangrove forest diversity and extent, and reduced productivity of the estuary. The extreme 1999-2004 drought exacerbated this deterioration greatly.

¹³ Over half of the groundwater in Sindh is strongly to slightly saline, the largest proportion of saline groundwater among all of Pakistan’s provinces.

¹⁴ The terrain throughout much of the left bank of the Indus River slopes gently southwestward so surface runoff from heavy rainfall and agricultural drainage flows away from the Indus River towards the coastal zone.

¹⁵ The term “spinal drain” refers to a canal that collects drainage water from secondary and other drains. It typically has very few inlets and is not connected, except through the drainage network, to farmers’ fields.

18. These changes are in part an inevitable consequence of the massive diversion of Indus River flow for agriculture, and construction of the enabling storage reservoirs and barrages. The diversion of Indus River flow drastically reduced the amount of sediment that once flowed to the delta and coastal areas, thus exposing these areas to sea intrusion. In reviewing the draft DMP for Pakistan, The Bank supported Panel of Experts (POE) summarized this issue in its report:

“...A special problem concerns the coastal erosion at various places along the coastal zone. There are several reasons for this erosion. First of all, due to the construction of the barrages in the Indus River the sediment supply to the coastal area reportedly has gone down from about 400 million tons per year to about 35 million tons per year. In addition there may be other reasons like: storm surges, currents induced by the tidal fluctuations, the rise of the mean sea level and the disappearance of mangroves... The impression exists that a new equilibrium is developing. However, additional coastal erosion will have to be expected, at least in the forthcoming decades.”

19. How much fresh water flow in the Indus River is needed to manage the delta, and even whether any water should be allocated for this purpose, has been a matter of long discussion and dispute among the provinces. In 1991, the provinces agreed on an apportionment of Indus River water and created a set of rules and an institutional implementation mechanism in a document that became known as the Accord (this was incorporated in legislation adopted in 1992). Under the Accord it was agreed that flow from the Indus River into the delta was needed, the amount of which would be determined by specific studies. With Bank support, the Government was able to undertake a series of studies in 2004 and 2005. These studies, which were overseen by an international panel of experts to ensure neutrality and rigor, have recently determined the quantity and timing of managed flows in the delta in order to meet environmental needs, and to prevent salinity encroachment upstream in the Indus River. Once a final agreement is legally incorporated into the framework of the Accord, it will remain for Sindh to develop a plan and the means to manage these allocated flows to ensure maximum environmental, social and economic benefits for the province and the country.

BANK INVOLVEMENT IN THE SECTOR

20. The Bank’s partnership with Pakistan in the water sector began in 1952 when the first loan was approved for a water project in then East Pakistan. The Bank also was instrumental in the successful negotiations of the Indus Waters Treaty. After the treaty was signed, the Bank helped to mobilize funds and administered the Indus Basin Development Fund (IBDF) during 1960-1967, which financed the physical works to implement treaty provisions, also known as the Indus Basin Development Project (IBDP). From 1968 onward, the Bank administered the Tarbela Development Fund (TDF) for the Tarbela Dam, which was extended to the post-construction period in order to implement extensive remedial works following reservoir impoundment. Thereafter, the Bank played a catalytic role in periodic major reviews of the country’s irrigation and power strategies and funded parts of the resulting investment programs. The NDP Project was one of the first attempts at the national level to build Pakistan’s institutional base to meet future

challenges (see below), particularly with regard to improving irrigation service delivery through decentralization, and greater user empowerment and participation.

21. Ongoing Bank engagement in Pakistan's water sector includes: (i) support for institutional reforms and on-farm productivity through On-Farm Water Management Projects, one each in NWFP and Sindh, which, inter alia, provide continuity to the institutional reforms initiated under the now closed NDP Project, and seek to improve water management and irrigation service delivery through increased farmer participation; (ii) support for rehabilitation and modernization of vital irrigation infrastructure to safeguard its integrity and reduce risks of failure (Taunsa Barrage Emergency Rehabilitation and Modernization Project in Punjab; Irrigation Development Policy Loan in Punjab); and (iii) provision of just-in-time technical assistance and analytical and advisory assistance to Government, on strategic and policy issues, through trust funds and other sources of funding. To date, the Board has approved more than forty operations in irrigation, drainage and water resources development, as well as one water sector development policy loan.

III. DESCRIPTION OF THE PROJECTS

22. The Panel's Report concerns two projects, the LBOD Project, closed in 1997, and the NDP closed in 2004. These two projects are described in detail in Annex 2.

23. ***The National Drainage Project (NDP)***. In the early 1990s, based on the recommendations of Pakistan's *Water Sector Investment Planning Study* (1991) and Eighth Five-Year Plan (1993-1998), and the Bank's paper on the irrigation and drainage sector, *Pakistan Irrigation and Drainage: Issues and Options* (March 1994), new ideas emerged that were to radically change Pakistan's irrigation and drainage strategy. The Bank's sector paper and the LBOD Mid-Term Review (MTR) concluded that physical interventions alone, while necessary, were not sufficient to cope with the challenges of more productive and efficient irrigation and the disposal of saline drainage water, and that these two issues could not be addressed separately or in a piecemeal manner. In 1992, IDA halted new lending to the sector pending formulation of an agreement with the Government of Pakistan (GOP) on a new strategy. IDA and the GOP eventually closed eight water related projects between fiscal years 1992 and 1994 and restructured a number of others. The new strategy that emerged focused on reform in the governance of the irrigation sector that would empower farmers to participate in water management more effectively. The Bank meeting on the Initial Executive Project Summary for the NDP Project was held in January 1994 and the Project was presented to the Board in 1997.¹⁶ NDP was designed as a national program. Through better water management, it aimed to reduce drainable surplus and thus diminish effluent flows and the drainage infrastructure burden downstream. NDP focused on policy reform and institutional capacity building with all physical investments "back loaded." These investments were essentially limited to deferred maintenance and rehabilitation of irrigation and drainage facilities in the existing system, without change in the respective outfalls, including on-farm and off-farm drainage. Sub-projects were individually subject to specific environmental and social screening and assessment.

24. ***The Left Bank Outfall Drain (LBOD) Project***. The LBOD project (Map 34984), which was implemented from 1987 to 1997 and financed by eight donors¹⁷ and the GOP, greatly expanded the drainage network in Sindh, including surface drains and tubewells; remodeled portions of the irrigation water delivery system; and constructed an outfall system that increased the capacity and extended the spinal drain that the Government of Sindh (GOS) began in the 1970s by another 300 kilometers. The remodeled spinal drain also was connected to the Kotri Canal basin drains that serve most of Badin District¹⁸ to enhance drainage in this area. LBOD's outfall system consisted of the spinal drain (which

¹⁶ The Project was co-financed and jointly supervised by IDA, Asian Development Bank (ADB), and Japan Bank for International Cooperation (JBIC).

¹⁷ The LBOD project was financed by IDA, ADB, Canadian International Development Agency (CIDA), the UK's Overseas Development Administration (ODA), Saudi Fund for Development (SFD), Swiss Development Cooperation (SDC), Organization of Petroleum Exporting Countries Fund for Development (OPEC Fund), and Islamic Development Bank (IsDB).

¹⁸ Three of these Kotri drains, Karo Ghungro, Fuleli Guni, and Ahmad Rajo, were constructed in the 1960s and 1970s; they flow into the dhands and are said to have significantly benefited the ecology and fishery of these coastal lakes because their salinity is much lower than the prevailing salinity, seasonally attracting fisherfolk from throughout the Sindh coastal zone, including Badin (Map 34984).

incorporates two older drains¹⁹) and a Tidal Link (TL) canal to convey saline drainage water from the spinal drain to the sea (Map 34988). The project brought significant benefits to about 4 million people, including increased income, and restored the agricultural productivity of 1.25 million acres in the upper areas of Sindh (Map 34984). The water table was lowered (thus solving the waterlogging issue), salinity was reduced, and the combination of the two brought many lands back to productive agriculture. The project also greatly reduced the impact of periodic flooding in the upper reaches of Sindh by evacuating water more quickly from farmers' lands.

¹⁹ The Kadhan Pateji Outfall drain (KPOD) that was originally one of the main collector drains for the area irrigated from Kotri Barrage and which emptied into Pateji Dhand; and the Dhoru Puran Outfall Drain (DPOD), an ancient remnant channel of the Indus River that emptied into the Rann of Kutch through the Shakoor Dhand (Map 34988).

IV. FINDINGS AND OBSERVATIONS OF THE PANEL

25. The Panel made the following findings regarding Bank compliance with its policies and procedures in relation to the issues raised by the Requesters. Responses to the findings are contained in Annex 1 in the form of a matrix that lists each of the Panel’s findings and observations along with Management’s comments and clarifications. Section V provides additional information and context for the issues raised by the Panel.

OD 4.01 – Environmental Assessment	
NOT IN COMPLIANCE	<ul style="list-style-type: none"> - Neither the potential environmental nor the potential social impacts of the Project in the area of concern to Requesters were considered in a meaningful way until the submission of the Request. - The decision of the Bank to categorize the Project as “Category B,” rather than “Category A,” did not comply with OD 4.01. - Drainage Sector Environmental Assessment (DSEA) analysis of alternatives did not provide an adequate basis to inform decision-making for the NDP Project on the core question of available alternatives, as required under OD 4.01. The DSEA analysis failed to identify and assess adequately critical environmental concerns of relevance to the affected areas in southern Sindh province. - Project documents did not assess how the Project might affect wetlands or identify required mitigation measures at the critical stage of Project design and appraisal, as called for under OD 4.01. - There was a failure to develop and, in particular, to implement adequately an EMP for the Project, which does not comply with OD 4.01. - The development of the DMP merited a Category “A” designation under OD 4.01, and its designation as Category “B” did not comply with Bank policy. - As a result of shortcomings in the EA, decision making on environmentally crucial elements under the Project became less systematic, less informed, and more ad hoc. As a consequence, the Bank missed important opportunities to address concerns raised by the Requesters, and to consider possible compensation for harms that could not otherwise be mitigated. This did not comply with OD 4.01. - The Bank did not comply with policy provisions on consultation and participation with regard to persons affected by the drainage systems investments under LBOD and NDP.
IN COMPLIANCE	<ul style="list-style-type: none"> - Within the boundaries of the pilot projects and the areas covered by effective Farmers’ Organizations (FOs) and Area Water Boards (AWBs), the Project complied with Bank policies that require consultation and participation.
OP/BP 4.04 – NATURAL HABITATS	
NOT IN COMPLIANCE	<ul style="list-style-type: none"> - The Project focused on ensuring the evacuation of LBOD effluents, and paid little attention to impacts on, or means to rehabilitate, the dhands as a habitat and ecosystem. This was not consistent with OD 4.04. - The negative effects on the dhands amount to a “significant conversion or degradation” within the meaning of OP 4.04. Although it is difficult to separate impacts of the LBOD system from those of investments financed under the NDP Project, the evidence indicates that the two, in combination, have contributed to significant adverse impacts on these internationally recognized sites. - The Bank did not adequately consider the risks of further degradation of the Jubho Lagoon, a critical natural habitat. This is not consistent with OP 4.04. - The Bank did not meet the provisions of OP 4.04 to take action not only to conserve, but also rehabilitate degraded natural habitats.

OD 4.20 – INDIGENOUS PEOPLES	
NOT IN COMPLIANCE	- Management did not initiate a process to determine whether the NDP Project would affect any group of people that would qualify as Indigenous Peoples under OD 4.20. The Bank needed to consult with local anthropological and/or sociological experts to determine whether or not any of the ethnic groups living within or near the Project area would qualify as Indigenous Peoples under OD 4.20. The failure to do so does not comply with OD 4.20.
IN COMPLIANCE	- The Mallahs in Badin are not so distinct or separate – whether culturally, socially, or economically – as to be considered a tribal group under the provisions of OMS 2.34 during the preparation of the LBOD project.
OD 4.30 – INVOLUNTARY RESETTLEMENT	
NOT IN COMPLIANCE	- The Bank failed to take the necessary actions under OD 4.30 to identify and prepare for the possibility of displacement of people by floods, and to assess the extent to which it has occurred.
IN COMPLIANCE	- The Framework for Land Acquisition and Resettlement (FLAR) is an appropriate document consistent with the requirements of OD 4.30. The preparation of the FLAR, the initial agreement with the Borrower, and its acceptance as part of project appraisal, were consistent with Bank policy requirements. Following the Borrower's rejection of the FLAR, the Bank decided to withdraw funding from project components which, in Management's view, required resettlement.
OPN 11.03 – CULTURAL PROPERTY	
NOT IN COMPLIANCE	- The Panel was not able to find any evidence to substantiate the claim of the Requesters that the Project has affected cultural property. However, by not undertaking even a brief reconnaissance survey of cultural heritage in areas potentially affected by the Project, and by assuming no important cultural sites would be adversely affected, Management did not comply with the requirements of OPN 11.03.

OD/OP/BP 13.05 – PROJECT SUPERVISION	
NOT IN COMPLIANCE	<ul style="list-style-type: none"> - The record of supervision indicates that one source of the problems with the Tidal Link was the failure to give sufficient attention to technical problems that arose during its construction. - The lack of response to the floods is not in compliance with OD 13.05. - Management did not adequately identify and take adequate corrective actions with regard to the negative environmental and social impacts of the Projects. This does not comply with OD 13.05. - From late 1998 until the Panel's reception of the Request in September 2004, Management's supervision reports demonstrate sporadic concern for the physical damage to the TL. Management was slow to visit the site of the TL failure, and did not have a consistent approach to interacting with the local population to understand and address the social and environmental implications of that failure. Management's failure to consult with downstream affected people for over half a decade following the breaches in the TL is of great concern to the Panel. This does not comply with OD 13.05. - Management failed to assign the appropriate expertise for the supervision of technical aspects of the design and construction work. As a result, Management failed to identify serious flaws in the design and implementation of the Project, and to initiate corrective measures in a timely manner. This does not comply with OD 13.05. - The Cholri Weir collapsed only one week after the publication of the Implementation Completion Report (ICR). The ICR that was circulated to the Board was insufficiently transparent on important shortcomings in the Project. The Panel cannot explain why Management's internal checks and balances did not detect the discrepancies between the final report and supervision reports, and why the final ICR was not amended once it was shown to have been misleading in its assessment of the Project's outcomes.
GENERAL FINDINGS	
	<ul style="list-style-type: none"> - The LBOD project closed in 1997, but completion of the LBOD system and Chotiari Reservoir were carried forward into NDP Project. Analysis of compliance and harm relating to NDP Project requires consideration of inter-related elements of LBOD system and, as relevant to present circumstances, Chotiari Reservoir Project included task of completing LBOD system, and advanced proposals to expand it significantly. This work depended on functioning of LBOD TL. As a result, Project inherited related task of responding to environmental and social implications of breakdowns in LBOD TL that occurred during the course of the Project. - The designers did not evaluate the likelihood that, under prevailing meteorological conditions, high surface water run-off from upstream areas would coincide with high water levels in the Arabian Sea. - The main drain of the TL should have been designed with a higher safety margin. - The LBOD designers underestimated the risk of extreme meteorological events and made insufficient arrangements to deal with storms of higher intensity. - The TL structures were critical to the performance of the system but the design had substantial inherent risks. The design and construction went ahead without adequate provisions to minimize the risk that the structures would give way and to mitigate possible harms. The underestimation of risk and lack of appropriate technical measures have contributed to suffering of local people in lower Badin.

V. KEY ISSUES

26. The Panel commended the Bank’s involvement in the water sector and recognized staff dedication and risks they took in assisting the GOP to achieve its development objectives. This section reviews the key issues raised in the Panel’s report, including socio-economic and environmental impacts and longer-term delta and drainage management issues. As noted earlier, the attached matrix (Annex 1) lists the Panel’s specific observations or findings along with Management’s comments, clarifications and actions. This section does not, therefore, cover all of the issues raised in the Panel’s report. The two projects of concern, NDP and LBOD, were briefly described in Section III, and are covered in more detail in Annex 2.

KEY ISSUES CONCERNING THE NATIONAL DRAINAGE PROGRAM (NDP) PROJECT

27. As described in its report, the Panel found that the NDP Project established the “groundwork for construction of a major northward extension of the Left Bank Outfall Drain (LBOD),” and inherited the related task of responding to the environmental and social implications of LBOD because NDP depended on the functionality of LBOD and because certain elements of the LBOD system were completed under NDP. The Panel also found that there were shortcomings in the NDP environmental assessment (EA) approach, including misclassification that resulted in inadequate consideration of alternatives and failure to identify and assess adequately critical environmental concerns of relevance to the affected areas of southern Sindh. The Panel also found that NDP supervision failed to respond to the emerging problems of LBOD and their socio-economic impacts and to identify and undertake timely corrective measures.

28. **Genesis of NDP.** In the early 1990s as LBOD was nearing completion, new ideas emerged that emphasized water management over purely infrastructure solutions to the drainage problem and that were to lead to radical changes in Pakistan’s irrigation and drainage strategy. These new ideas had their genesis in the recommendations of the Bank financed *Pakistan Water Sector Investment Planning Study* (1991), Pakistan’s Eighth Five-Year Plan (1993-1998), and the Bank’s paper on the irrigation and drainage sector, *Pakistan Irrigation and Drainage: Issues and Options* (March 1994). The NDP project was formulated to implement the changes in governance and policy that were at the heart of this new approach.

29. **NDP Relationship to LBOD.** NDP was a national program that, as noted in Section III, aimed to transform a century-old irrigation governance system in Pakistan in order to address the country’s strategic challenges. The approach of NDP to this transformation was to mobilize and organize farmers and empower them through Farmer Organizations (FOs) to participate more effectively in water management. In the medium to long term, this new approach to water management requires a functioning and sustainable irrigation and drainage system (Picture 1); hence, NDP’s investment plan addressed the problems of deferred maintenance.

30. This transformation is a vast undertaking that covers the entire 35.7 million acres of irrigated agriculture in the Indus Basin. NDP initiated this process of change but achievement of its objectives did not depend on the efficacy of LBOD which only serves 1.25 million acres (about one-half of the Nara Canal command area and about 3.5 percent of the total irrigated area in the Indus Basin) (Map 34984). In order to begin the process of improving the performance of the Indus Basin irrigation and drainage system, NDP provided for substantial investment to address deferred maintenance that was degrading the existing irrigation and drainage systems. NDP also supported national planning studies that were to be the basis for the development of a sustainable system.



Picture 1. Kadhan Pateji Outfall Drain

31. **NDP Investment in LBOD.** While NDP initiated this process of change, achievement of its objectives did not depend on the efficacy of LBOD, which serves about 3.5 percent of the 35.7 million acres of irrigated land in the Indus Basin. When the LBOD project closed, the Bank agreed to provide funds from NDP to finish a small number of ongoing construction and operations and maintenance contracts. These activities included completion of the remodeling of portions of the Nara Canal irrigation network, completion of the last few drainage tubewells, and implementation of performance-based operations and maintenance contracts for drainage tubewells. These works, which totaled about 4.3 percent of total NDP financing and about 3.3 percent of the cost of the LBOD project, did not alter or expand or extend the capacity or service area of LBOD. At the time NDP was presented to the Board in 1997, LBOD was a part of the existing drainage system in the Indus Basin serving a portion of one canal area in Sindh and disposing of saline drainage water from its service area under normal conditions (a chronology of key events is given in Annex 9). Its agricultural drainage benefits, especially in terms of the return of abandoned agricultural land to production, were widely recognized.

32. **Sector Policy Dialogue and the DMP.** NDP did not invest in new drainage infrastructure including extension or expansion of LBOD for two reasons: first, the Sindh authorities did not want to expand or extend LBOD; and second, there were disagreements about the best options to improve the drainage system, how much drainage capacity was really needed, and what the disposal options were. Instead, NDP provided support for a pre-feasibility study of an integrated national surface drainage system (referred to as NSDS) that, among other options, would consider the extension of LBOD northward to encompass the upper basin provinces. It is important to note in this regard that no funds were provided in NDP to support the construction of such infrastructure. During the NDP

MTR, the Government and the Bank stepped away from this massive infrastructure proposal and decided to prepare a DMP that would examine the issue from a broader perspective, taking into account environmental, socio-economic and other factors (Annex 7).

33. The DMP (2002-2005) was prepared by multi-disciplinary teams that reassessed the salt balance of the Indus Basin under different scenarios and looked at drainage issues in an integrated way, including environmental and social dimensions. The planning process also involved significant consultation with local stakeholders and an external POE. The DMP process resulted in agreement not to further expand the LBOD system or to develop a so called drainage superhighway to serve the Indus Basin. The DMP did recommend that Sindh take a fresh look at the LBOD outfall system and the overall approach to effluent disposal. The DMP also found that reducing the drainable surplus was feasible and significant, and would eliminate the need to convey all of the saline drainage water from the Basin to the sea. The DMP strategy involved a combination of improved water use efficiency and water management, reuse of drainage water, and regional disposal options.

34. ***Application of the DMP Approach in Southern Sindh.*** At the Bank's recommendation, the first regional or sub-basin level consultation on the DMP was held in September 2004 in the Indus River left bank area of Sindh, specifically in the Kotri Canal sub-basin that serves much of Badin District. Local stakeholders, DMP study staff, and the Bank's POE agreed during these consultations to develop a comprehensive drainage and flood management plan for the entire left bank of the Indus River in Sindh, which includes the coastal districts of Badin and Thatta (see Action Plan-Medium-Term, Section VII).

35. ***Supervision of NDP as it Relates to LBOD.*** The NDP project team was diligent in carrying out its supervision obligations. The Project was co-financed and jointly supervised by IDA, Asian Development Bank (ADB), and the Japan Bank for International Cooperation. Supervision included monitoring progress on all substantive aspects of NDP implementation, procurement and disbursement, and the risks to successful implementation and to sustainability of NDP outcomes (Annex 10).

36. ***Financing and Supervision of LBOD Complex and Cumbersome.*** The eight donors each financed and supervised separate components of the project sometimes in combination with different partners.²⁰ Division of responsibility and co-supervision arrangements were not sufficiently detailed to ensure timely treatment of emerging issues or timely completion of all elements of the project.

37. In accordance with standard Bank practice, formal LBOD supervision did not continue after the project was closed in 1997. However, given the comprehensive nature of the Bank's partnership with Sindh and the GOP in the water sector and the broad level of NDP coverage of the irrigation and drainage sector, in the normal course of events Bank supervision teams naturally continued to apprise themselves of certain aspects of LBOD. As a result, while not carrying out LBOD supervision per se, Bank supervision

²⁰ IDA financed irrigation canal remodeling, electrification (of tubewells) and consultancy.

teams incorporated these issues into their dialogue with government as outlined in paragraph 46 below. Thus, during the course of implementation of the NDP Project, the supervision team took a pragmatic approach to water sector issues as they arose. This approach included supervision of the completion of the limited number of activities that were ongoing when LBOD closed (see paragraph 31).

38. ***Environmental Classification of NDP.*** With the value of hindsight, the formal classification as a Category “A” as suggested by the Panel would have been more suitable for NDP, given the complex issues and potential cumulative impacts. The Panel suggested that the EA would have brought increased attention to the risks associated with various aspects of the LBOD outfall system. Management agrees with the Panel that a Category “A” classification and a full environmental assessment during the period 1994-1995, even with the Drainage Sector Environmental Assessment (DSEA) framework (1993) in hand, could have provided an added framework within which to consider the potential cumulative impacts of the continued development of the drainage system, and possibly given a higher profile to and placed greater emphasis on implementation of the LBOD Environmental Management and Monitoring Plan (EMMP).

39. ***NDP’s Protection of Environmental Values and Mitigation of Social Impacts.*** All of NDP’s investments in deferred maintenance underwent an environmental and social scoping and screening assessment that took account of Bank policies at the time on natural habitats and involuntary resettlement, and reflected prevailing Bank environmental assessment policy as well as related federal and provincial regulations. Sub-projects involving land acquisition that did not adhere to the guidelines or had unacceptable environmental impacts, especially in wetland areas, were removed from the portfolio of potential investments.

KEY ISSUES CONCERNING THE LBOD PROJECT

40. The Panel found that the design of the LBOD project was faulty, and that the breakdown of the LBOD outfall system contributed to the suffering of local people in lower Badin District of Sindh Province. The Panel also found that the LBOD project paid little attention to impacts on or the means to rehabilitate the environmentally important dhands as a habitat and ecosystem, and the Bank did not consider the risk of degradation. The Panel Report suggests that the Bank took only sporadic notice of these and other issues in its supervision reports, and was slow to respond to the eventual damage to the LBOD outfall system and its impacts in part because it failed to assign appropriate expertise.

41. **Southern Sindh.** Figure 2 shows the left bank of the Indus River in southern Sindh. Two districts, Thatta to the west and Badin to the east, encompass this large flat plain which blends seamlessly into the salt encrusted mud flats of the coastal zone. The LBOD system runs from the north or middle Sindh along the eastern edge of Badin District, collecting the constructed small drains that serve the Badin area until it reaches the coastal zone and the dhands (in close proximity to India at this point). From there the drain is connected to the sea by the TL canal. Where the TL passes through the dhands (shallow lakes and wetlands) the 1800 ft. Cholri Weir was constructed to protect this valuable wetland and fishery.

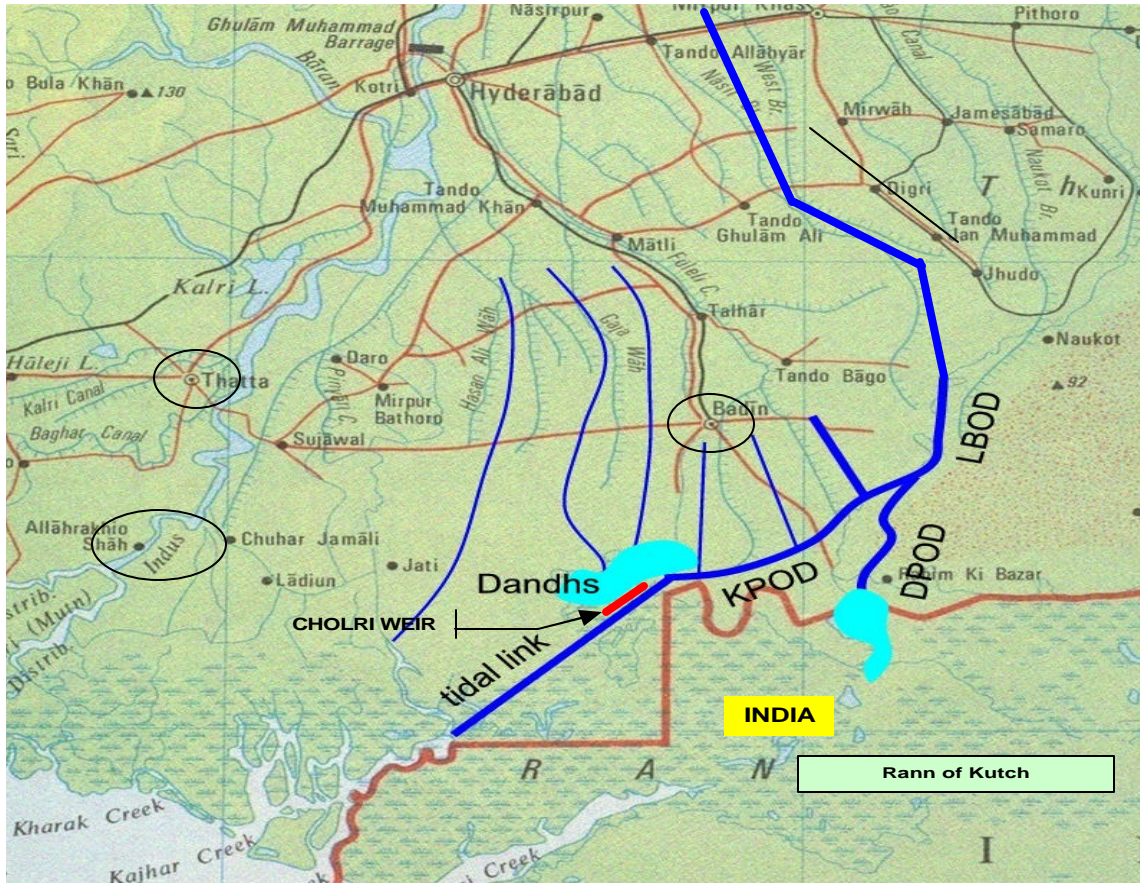


Figure 2. Left Bank of Indus River in Southern Sindh
(Source: POE Drainage Master Plan)

42. **Why LBOD? - Sindh's Development Imperative and Dilemmas.** At the time when key choices were made about LBOD project design, the Sindh authorities took the position that it was imperative to take action to prevent the progressive abandonment of land and deterioration of agriculture caused by salinity (Picture 2) and waterlogging that the province had been experiencing for many years, especially in areas with high production potential, such as the Nara Canal sub-basin (Map 39484). Sindh's hopes for sustainable rural economic growth and poverty alleviation rested to a large extent on improving its agricultural systems and increasing farmer income.

43. Sindh's options were limited by two important constraints: first, the pervasive groundwater and soil salinity would yield very saline drainage water that could not be put into the irrigation canals or returned to the river;²¹ second, disposing of the saline drainage base flows²² into the Rann of Kutch would create riparian problems with India (Figure 1). The choice of a main collector drain was



Picture 2. Salt encrusted agricultural land in Sindh

costly, risky in the harsh and dynamic environment of the coastal zone, would not eliminate all flood risks, and could have large operation and maintenance costs. Nevertheless, after careful consideration of many options, the main collector drain was chosen since it fit within these important constraints, relieved the critical salinity and waterlogging constraint to agricultural productivity and growth, and was the most cost-effective option among the alternatives studied (Annex 1, Item 3).

44. ***LBOD Project Design and Construction Supervision.*** The Bank exercised due diligence in its supervision of LBOD design and construction, ensuring that experienced international consultants were employed for these tasks, and that the work of WAPDA and the consultants was conducted in a manner consistent with international standards and practice.²³ The GOP and GOS responded to the complexity and technical challenges of this scheme by placing their leading and most experienced technical organization, WAPDA,²⁴ in charge of project design, construction and supervision on behalf of the Governments, and recruiting an experienced international consulting firm with experience in Sindh, Mott MacDonald of the United Kingdom, to design the system and supervise its construction as the “engineer.” For the most difficult part of the design, the TL canal and Cholri Weir, physical model studies were carried out at the Delft Hydraulics Laboratory in the Netherlands, a global leader in this technology, and an experienced physical modeling laboratory in Pakistan. The consultant also utilized state of the art mathematical modeling.

45. ***The Bank's Response to Emerging Issues.*** Notwithstanding the absence of a Category “A” EA, the Bank and its donor partners have responded quickly to emerging

²¹ The Indus plain along the left bank of the Indus River in southern Sindh slopes southwestward away from the river (Figure 1).

²² The base flows are the water drained from the soil which are saline and may contain other pollutants. The drains also carry excess rainfall or runoff during rain storms which would not generally be saline.

²³ The project, financed by eight donors (see Section VI), was difficult to supervise because of its complexity and large number of donors.

²⁴ WAPDA had been in charge of the planning, design and construction of Tarbela and Mangla Dams, the Indus Replacement Works, and most of the major drainage projects in the country.

issues, including those raised by the Requesters. Naturally of greatest concern is the plight of the vulnerable poor people in Badin; a USD18.0 million Program implemented by the Pakistan Poverty Alleviation Fund (PPAF) with Bank financing has been launched to strengthen livelihoods in this area following a Bank initiated socio-economic study in 2005 (Annex 3).

46. Long before this, however, the Bank repeatedly raised many of the issues subsequently pointed out by the Requesters and the Panel in its sector dialogue with the Sindh authorities and the GOP. In 1996 the Bank noted the continuing controversy among local people concerning the potential impacts of LBOD and requested the GOP and GOS to meet with stakeholders and resolve any outstanding problems. The federal and provincial Ministers of Water and Power did carry out the consultation and measures were undertaken by WAPDA to allay these concerns. In 1998, the Bank asked the government to take urgent action to deal with damages to the Cholri Weir, to which WAPDA responded positively, but its initial actions to mitigate damages were undone by the severe monsoon cyclone in 1999.

47. In 2001 the Bank's POE collaborated with the GOS/GOP High-Level Technical Committee to assess the 1999 cyclone damages to the TL and Cholri Weir. Both the Committee and the Bank POE recommended that immediate repairs not be undertaken; their recommendation to extend the term and to expand the scope of the monitoring program was implemented by the GOS and GOP. During the NDP MTR in 2001 the Bank and the GOP agreed to undertake the preparation of a DMP which was begun in 2002 and completed in 2005.

48. After the cyclone of 2003, and the completion of the GOS's post-flood relief and recovery operations, the Bank sent a Panel of Expert (POE) mission at the request of the GOS to assess the problems (Annex 4) and to review the results of damage assessments and proposals for remedial measures. The POE report has resulted in the incorporation of planning studies within the proposed Sindh Water Sector Improvement Project (WSIP) to determine the best options.

49. The issues raised by the Requesters and the Panel were consistently part of the dialogue during numerous missions to Sindh throughout the intervening years. The Bank also offered access on several occasions to the NDP Credit and to the Drought Emergency Recovery Project (DERA) Credit to enable the Sindh Government and WAPDA to respond to emergencies in the area and to undertake corrective and preventive measures in the LBOD outfall system and the dhands.

50. ***The Evolution of Planning in Pakistan.*** Given the evolution of modern planning globally and in Pakistan, the approach today would be different towards the design of an outfall system such as LBOD. The assessment of alternatives and tradeoffs including risks would go through a process that would be more participatory, include stakeholder views and address weaknesses in governance and management capacity on the ground. The approach to EA, for example, has evolved from the footprint driven approach (i.e., analysis limited to project specific impacts) in practice in 1989, to a broader systems approach that incorporates the views of stakeholders.

51. The difficulty of WAPDA and the Government to explain the technical aspects of the TL to farmers and local officials, to dispel misconceptions, and to create local ownership during the 1996-1999 consultations underscores the importance of communications and a participatory approach at the earliest stages of project planning and design. The Bank has already adopted approaches that benefit from the lessons of that era. In preparing the DMP under NDP, a consultative and participatory approach has been used. In Sindh, the DMP POE and study staff met with a wide range of local stakeholders and local officials to discuss the findings and alternative strategies being considered in the DMP. They have agreed with stakeholders to continue these consultations and prepare a sub-basin specific drainage master plan for the left bank of the Indus River in Sindh that seeks to provide the widest possible benefit in a manner that does not leave vulnerable and poor groups behind.

52. ***The Tidal Link (TL) Canal.*** A major feature of the LBOD project was the design and construction of an outfall system²⁵ that avoided creating a riparian issue with India (Map 34988). The outfall system (Figure 1) included lengthening and strengthening the main collector or spinal drain, dividing the flow in the spinal drain between the Dhoro Puran Outfall Drain (DPOD) and an enlarged and strengthened Kadhan Pateji Outfall Drain (KPOD),²⁶ and connecting KPOD to the TL canal (completed in 1995) which ran 26 miles across the Rann of Kutch to Shah Samando Creek to discharge the drainage water into the sea. The TL was designed to avoid discharging saline drainage water into India, which would have been the natural path of drainage.

53. The TL was located in a harsh physical environment (Picture 3) that included strong tides from the Arabian Sea, monsoon winds, high water levels during the monsoon season in the Rann of Kutch to the south, and occasional overland storm water flows from the north. Physical model studies in Pakistan and in the Netherlands, and state of the art mathematical modeling studies by international experts, were carried out to refine and test the design of the TL for a wide range of conditions and contingencies. These designs were subject to intensive technical review particularly by senior Pakistani experts with long experience in the design, construction and management of large earthen canals. All of the vast Indus Basin irrigation system consists of earthen canals including the massive link canals built to implement the Indus Waters Treaty.

²⁵ The Tidal Link Canal and Cholri Weir were constructed in the period 1991-1995 and financed by the Saudi Development Fund.

²⁶ Two existing collector drains remodeled and incorporated into the LBOD spinal drain.



Picture 3. Tidal Link

54. As could be expected during the early years of such a large earthen canal, particularly one with a dynamic tidal flow regime in a harsh environment, there were immediate localized problems of erosion and bank sloughing. Unlike a concrete or steel structure, a large earthen canal takes some time to stabilize after it has been constructed and water begins flowing in the canal because of natural variation in construction materials and the environment. So long as key design parameters such as velocity or the characteristics of the soil used to build the canal remain within the limits and properties assumed in the design, these early difficulties are a normal part of the adjustment or stabilization process. Between 1995 and 1999, the Operations and Maintenance (O&M) Department of WAPDA (South) undertook remedial measures to protect and restore the canal banks and channel section, intensified monitoring to improve understanding of the channel processes causing the problems, and began studies of longer-term remedial measures that could be implemented.

55. ***Bank Response to Emerging Issues Regarding the Tidal Link.*** In 1996 the Bank and the other LBOD donors noted the continuing controversy among local stakeholders, the GOS and WAPDA over the possible benefits and impacts of the TL, and advised in their supervision mission aide memoire that the GOP and GOS undertake an intensive process of consultation with farmers and officials in Badin and the LBOD project area. The subsequent process led by the federal and provincial Ministers of Water and Power lasted until 1999. The aim of these consultations, which included numerous joint field visits, was to allay misconceptions about the design and potential effects of the TL, to identify problems including corrective and preventive measures that required attention, and to initiate necessary actions by WAPDA and the GOS. The absence of this type of consultative and participatory process during the LBOD design and construction periods had prevented greater accommodation of stakeholder views, the development of strong local ownership of the project and exacerbated the inter-institutional disputes that had begun to emerge over O&M responsibility for LBOD. Even though it came late and was perhaps not as inclusive as it might have been, the process served to explain and document the project's many and substantial benefits, increase local support, and promote timely responses by WAPDA to the problems that were emerging on the ground.

56. In 1999 a cyclone struck the coastal zone of Sindh causing extensive damage to the TL. Fifty four breaches were identified in the TL canal banks, and there was evidence of canal bed scour, erosion of the protective berm, and widening of the channel in several places. Assessment of the condition and operation of the TL and the dhands by a GOS/GOP High-Level Technical Committee²⁷ (2000) and a subsequent Bank POE Fact Finding Mission²⁸ (2001) concluded that the TL continues to function and is discharging the drainage flow to the sea with a good gradient.²⁹

57. The Bank POE concluded that scour of the TL canal bed and erosion of the canal embankments are still active under the influence of uncontrolled tidal flow through the TL canal and flow to and from the Rann of Kutch and the dhands. Implicit in both the High-Level Technical Committee and Bank POE findings is the observation that velocities in the TL canal during the extreme storm in 1999 must have been higher than were estimated at the time of their design. The POE also concluded that no further repairs should be carried out for the time being because the damages were beyond repair by conventional methods, that the TL canal was continuing to evolve and would likely stabilize in the future, and that monitoring should be intensified and expanded to support the identification and assessment of future options for remedial and mitigation measures both in the TL and the dhands. The GOS and GOP acted on the POE and High-Level Technical Committee recommendations by extending the term and expanding the scope of the ongoing monitoring contract with the National Institute of Oceanography (NIO).

58. **The Cholri Weir.** The alignment of the TL passed through a cluster of small, shallow interconnected coastal lakes,³⁰ or dhands, whose extent and character varied seasonally, with an average area of about 700 km² (Map 34988). At low water levels, the flow between the dhands and the Rann of Kutch is limited and sometimes prevented by low ridges, but at high water, particularly during the monsoon season or a wet year, they form a shallow, large and continuous wetland with the Rann of Kutch.

²⁷ GOS also appointed an inter-agency Committee (2001) to formulate an environmental package for the rehabilitation of the affected areas of the TL, particularly the dhands and the people whose livelihoods depend on them. The Committee recommended that a permanent institution be set up under the Managing Director of SIDA, staffed by multi-disciplinary specialists, and charged with carrying out analysis of the monitoring data, formulating mitigation and management actions, and coordinating activities of cooperating agencies. Establishment of this unit is currently underway in collaboration with ADB, and it represents the first effort to implement the LBOD EMMP since the limited activities of the Environment Unit of WAPDA (South) in 1997. The GOS Committee recommended that roads and communications in this area be improved to enable more rapid and effective disaster response, and that future actions be planned in a manner to ensure social acceptance and be subject to an EIA consistent with Sindh EPA regulations.

²⁸ This Mission included a joint field visit to the TL and the dhands with the GOS High-Level Technical Committee.

²⁹ WAPDA field experiments earlier during the 1996-1999 consultation had shown that flow towards the sea occurred 20 of the 24 hours of the tidal cycle.

³⁰ Report of the World Bank Panel of Experts Fact Finding Mission, March 2001. This mission report summarized the findings of the inventory reports prepared in 1997 and 1998, including *Survey of Avifauna of the Tidal Link and Adjoining Areas*, Zoological Survey Department, May-December, 1997; *Fisheries Survey of Chotiari Reservoir and Tidal Link Lakes*, University of Sindh, Jamshoro, December 1997; *Comparative Land Use Assessment Pre and Post Construction*, Left Bank Outfall Drain Stage I Project (Study ENV/1), Mott MacDonald Ltd., April 1998 as well as numerous environmental reports prepared by the LBOD consultants, Mott MacDonald, between 1989 and 1997.

59. The dhands are generally oligotrophic,³¹ with highly variable salinity (depending on storm water and drainage inflows) ranging from 15 parts per thousand (ppt) to 45 ppt³² or higher depending on the amount of mixing with drainage inflows³³ (principally from the Kotri sub-basin drains in Badin) that generally have a salinity concentration of less than 10 ppt. The dhands and surrounding lands are nearly devoid of vegetation except along the margins that are less saline, for example, near a drain outfall. Biodiversity is nevertheless high in the dhands, which constitute a high quality waterfowl habitat and a productive fishery, with numerous species of crustaceans, mollusks and fish.

60. Nearly all the settlements near the dhands depend on the fishery since the saline soils support almost no agriculture except where water from the irrigation system is available (generally at a considerable distance upstream). Since the connection of the dhands to the Kotri sub-basin drains in the 1960s and 1970s, which enhanced the fishery, the settlements have attracted a seasonally varying population of transient fisherfolk. About thirty small temporary settlements have been identified around the four dhands and Serani Drain (which used to flow into Pateji Dhand but is now connected to KPOD). Only one of the settlements, Karo Ghungro, which is located on Sanhro Dhand, is permanent and consists of about 250-300 huts, but most of the population of this settlement is reported to migrate to the surrounding upland areas during the monsoon season when the weather is risky and fishing declines. The remaining settlements are temporary, occupied seasonally when fishing in the immediate vicinity is productive. The 1997 inventory estimated this transient population to be about 5,000-6,000, but the number varies from year to year.

61. ***Measures to Protect the Environmental Values of the Dhands.*** During the design of the TL, these dhands were considered important environmental resources for their fisheries, as well as their value as wintering, nesting, and resting sites for migratory waterfowl. The 1989 LBOD EIA identified several potential adverse physical impacts that the TL could have on the ecosystem and habitat of the dhands, including excessive tidal drainage, changes in salinity, and excessive increases in water level (that might cause flooding of adjacent lands—an issue of considerable local concern during the 1996-1999 consultations described above). The physical and mathematical model studies of the TL (noted above) were used to determine how to mitigate these impacts and protect the dhands. The adopted solution was to incorporate a 1,800 foot weir into the northern TL canal embankment where it passed through Cholri Dhand. In addition, the southern embankment of the TL was topped by a high berm to protect the TL and the dhands from high water levels and high salinity in the Rann of Kutch during the monsoon months. Analysis at the time showed that the existence of the north embankment and high berm of the TL would not significantly impede drainage from upland Badin and exacerbate flooding there. Moreover, while model studies predicted that tides would influence the flow and water level in the TL up to the dhands, sea water was predicted to penetrate to an area about 12 miles downstream of the dhands.

³¹ An oligotrophic body of water is one containing relatively little plant life and nutrients in its waters but rich in dissolved oxygen.

³² The salinity of the sea water averages about 35 ppt.

³³ The 2005 POE mission observed heavy organic pollution in the Karo Ghungro drain flowing into Sanhro Dhand apparently coming from upstream sugar mills.

62. **Damages to the Cholri Weir.** In the first few years of operation the weir is reported to have functioned well as designed, controlling water levels in the dhands below the level in the drains, preventing excessive drainage during low and falling tides and preventing significant changes in salinity. In the 1998 monsoon season, 250 feet of the weir were damaged (Picture 4). Despite the efforts of WAPDA to isolate the damaged weir and undertake repairs, a monsoon cyclone in early 1999 destroyed the weir,³⁴ leaving Cholri Dhand openly connected to the TL canal.



Picture 4. Cholri Weir in 1998

63. A letter from Bank Management in August 1998 advised the GOP and WAPDA to take urgent action to address this situation. The Bank also offered to finance under the NDP Credit short-term remedial measures and a panel of experts to take stock of the situation and guide further action. In its reply, WAPDA indicated that it had prepared a detailed plan to repair the TL and Cholri Weir and had already initiated efforts to construct a coffer dam³⁵ to protect the site from further damage, and that it planned to take the remaining actions suggested by the Bank to enable it to utilize the NDP Credit to implement its plan. However, WAPDA was unable to complete construction of the coffer dam because of tide and flow conditions (by late 1998 the damage had lengthened to about 450 feet and repair work was stopped). In May 1999, a major cyclone struck the Sindh coastal zone and the already damaged section and remaining section of the weir were destroyed. This was the same storm that resulted in the damage to the TL canal.

64. **Consequence of the Damages to the Cholri Weir.** While the TL continues to function as an effective mechanism to convey drainage water to the sea under normal conditions, the destruction of the Cholri Weir has led to apparent changes in salinity and water balance of the Cholri and Pateji³⁶ Dhands, which in turn has had a negative impact on the environment and most likely the biodiversity and productivity of these dhands. Anecdotal evidence suggests that it has also affected the magnitude and species composition of the local fish catch. The other two larger dhands, Sanhro and Mehro, do not appear as yet to be strongly affected, except possibly from increased salinity (though

³⁴ The cause of this severe damage is still the subject of intense technical debate in Pakistan, but it appears that either wave action, higher than expected flow velocity in the Tidal Link canal, scour around the foundation of the weir, or undermining of the weir apron by flow coming from the dhands—or a combination of these factors—led to its destruction before major remedial measures could be undertaken.

³⁵ An earthen embankment surrounding the damaged section to protect it from further damage by the flow in the TL and drainage from the dhands.

³⁶ Complex and dynamic changes appear to have taken place. Initially at least Pateji Dhand became hypersaline because of its poor circulation and its disconnection from KPOD. In the absence of systematic salinity measurements over time it will be difficult to determine how the salinity patterns are changing, and which changes have adverse effects.

this may also be caused by drought³⁷ that reduced the inflow from the Kotri drains directly connected to them). The magnitude and reversibility of the impacts on the ecosystem of the dhands, changes in salinity pattern, and the productivity of the fishery and fisherfolk livelihoods are unclear at present because of the paucity of recent time series data (see Action Plan, short-term measures, Section VII). The fisherfolk report a decline in fish catch in some areas of the dhands, but they are also now more intensively fishing the TL than they had in the past.

65. **Review of Remedial Options for the Tidal Link and the Cholri Weir.** A Bank POE review mission in 2005 reviewed the proposals for remedial measures prepared by GOS agencies and WAPDA after the second severe storm in 2003. Several potential options to stabilize and possibly improve the situation in the dhands³⁸ were identified by the POE, even in the absence of agreement on long-term remedial measures for the TL. However, a rapid response that could begin to address the adverse livelihood impacts was greatly hindered by the lack of baseline and current data (both socio-economic and physical and environmental data) because the EMMP for LBOD, proposed in the 1989 EIA and later revised and updated in 1997, was not implemented. Without this baseline and time series data it is difficult to fully assess the current situation and understand the dynamic ecological and hydrologic processes that exist in the dhands today and hence to choose which alternative win-win curative measures to test. Stabilizing and improving the ecology of the dhands is likely to be a long-term adaptive process. The Bank stressed the importance of implementing the EMMP to the GOS in the Bank's POE Fact Finding Report in 2001 and again in the POE Report in 2005. In 2005, the GOS established a cell within SIDA to implement the EMMP, agreed with ADB on a program of capacity building and related activities to implement the EMMP for the dhands and the larger coastal zone, and submitted a request to the GOS to finance the activities of the SIDA environment cell. The establishment of this cell is ongoing at present.

66. **The July 2003 Cyclone.** In July 2003, very heavy rainfall—the highest recorded monthly rainfall in 67 years—led to widespread flooding all over southern Sindh (an area of high flood vulnerability), and resulted in significant damage to property and loss of life. However, about 84 percent of this record rainfall occurred in a 7 day period, July 24-30, and within that seven day period, 96 percent of the rain occurred on three days with two slightly rainy days between the second and third peak days. Not only was the storm of great magnitude and extent, but it was also extremely intense. Moreover, it can be assumed that very early in that critical seven day period the irrigation and drainage canals which serve most of Badin were full (as were depressions and low lying areas where excess rainfall is normally stored) since there was a delay in halting diversion of water at the Kotri Barrage into the irrigation canals that serve the Badin area and farmers were cutting canal and drain banks to release water from their fields (SIDA reported a total of

³⁷ From about 1999 to 2004 Pakistan experienced an extreme drought in the Indus Basin that reduced the annual flow and canal diversions for irrigation.

³⁸ The POE report also analyzed measures to strengthen the spinal drain and improve its performance under such extreme events. It is noteworthy that the 2005 POE concurred in the findings of the GOS Technical Committee (2000) and the Bank POE (2001) on the need to base possible improvements and long-term remedial measures in the TL on additional monitoring, investigation and study.

340 cuts and breaches in the drains and canals). Hence the surface drainage system had no capacity to absorb and carry away the extraordinary excess rainfall due to the storm.

67. ***LBOD and the July 2003 Cyclone.*** The LBOD design included several measures to accommodate and mitigate the risk of higher than design flows in LBOD that might occur during an extreme rainfall event (Figure 1): KPOD was enlarged and strengthened; about half the KPOD flow was to be diverted into the DPOD channel through an uncontrolled weir; and the number of inlets was limited to ensure that outflows from the LBOD area were limited during exceptional rainfall. During the 2003 storm event, 12 cuts and breaches occurred in the spinal drain upstream of the TL, spilling water into areas of Badin close to the spinal drain and possibly contributing to localized flooding. The large increase in outflow from LBOD to the TL was due to some extent to the inability to prevent farmers from releasing the excess rainfall standing in their fields through cuts in the drains, including the spinal drain. The discharge in KPOD was twice the design flow, in part because the diversion of a part of the flow into DPOD was not as effective as planned, and in part because the enlarged KPOD had been connected to many Kotri Basin drains in Badin to improve drainage there and these drains were running full during the storm (Figure 1).

68. ***Flooding in Badin in July 2003.*** The tragic loss of life and the damages to property and ecosystems due to the 2003 storm have had a deep impact on the poor communities of the area (Annex 8). In the aftermath of the flood, the Bank offered support to emergency relief operations, but the GOS responded that it would mobilize relief using its own resources and contributions from the federal government and other provinces. In the end, the GOS did utilize the Bank financed DERA Project to finance a portion of the reconstruction and restoration of infrastructure in the flood affected area (Pakistan experienced one of the worst droughts in its history over the period 1999-2004).

69. As noted above, the flooding in lower Badin due to this record storm was extensive. A storm of this magnitude in the adverse physical setting of Badin, with its flat terrain, extremely limited natural drainage capacity due to the scant slope and proximity to the coastal area (Picture 5), would be expected to result in widespread flooding and damages as had happened in the past with large storms. The contribution of flood waters spilling from cuts or breaches in the LBOD embankments (12 cuts and breaches were identified by SIDA) is very difficult to separate from the natural flooding and cannot be determined, particularly in the absence of detailed topographical information, and detailed technical observations and data on the evolution of the flooding.

70. The opinion that flooding and poor drainage in Badin would not be mitigated by LBOD, and might be adversely affected by the design of the TL, was the source of much local concern and the subject of intense debate and discussion during the consultations that were held between 1996 and 1999 (see above). Among other concerns, local people were fearful that the high TL embankments would impede drainage during large storms and thereby raise water levels in the dhands and across the nearby coastal area and slow natural post-storm drainage from their lands. Technically WAPDA was able to show that the TL with the Cholri Weir in place would actually benefit the area by controlling the water level in the dhands and surrounding area to levels below the drains and would not

impede drainage. Even after the Cholri Weir was destroyed and the TL breached, the outflow from the area during low and falling tides appears to be very strong, making it unlikely that these breakdowns had significant impact during the July 2003 storm. The controversy remains, however, since there is no data available on water levels and flooding in this area.



Picture 5. Mud flats and landscape in the vicinity of the dhands and Badin

71. ***Flood Vulnerability in Badin.*** The LBOD spinal drain passes along the eastern border of Badin District (Map 34988). This region was not the target service area of LBOD, but in an effort to provide some drainage benefits to the farmers in the area, the design did incorporate the Kotri sub-basin drains that terminated in the old KPOD before it empties into the TL. Nevertheless, the Panel noted that having embarked on the implementation of LBOD, the GOS and the Bank might well have turned their attention to developing and implementing flood and drainage management plans for Badin that focused on the issues of vulnerability and social and economic development for this disadvantaged region. Such a new intervention would have required another project altogether, since this was not the objective or outcome sought by NDP. NDP was instead focused on water sector governance reforms, both nationally and in Sindh, with the aim to improve the management and efficiency of irrigation water use, and solve problems caused by deferred maintenance of the irrigation and drainage network. After the Inspection Panel Request, the Bank undertook the socio-economic and livelihood study of the coastal areas of Badin and Thatta Districts, which are the most vulnerable and poor areas, and the follow up of the DMP was targeted on the Kotri Basin, which encompasses Badin. The former study resulted in a new USD18.0 million operation to strengthen livelihoods in the Badin and Thatta Districts that is being implemented by the PPAF, and the latter study resulted in a proposal to prepare a comprehensive flood management plan for the left bank of the Indus River in Sindh, which will be supported under the Sindh WSIP to be appraised in the second quarter of fiscal year 2007.

72. ***Bank POE Studies of Options to Improve the Safety and Performance of the Outfall System.*** The Bank's 2005 POE identified a number of options (Annex 4) that

could in combination improve the performance of the outfall system during extreme events, increase safety, and begin the process of stabilizing and improving the dhands. Preliminary simulation model studies were carried out by the POE of different combinations of options to strengthen and secure KPOD, which is a critical link in the outfall system (discussed in Attachment 1 of the POE report). These preliminary studies showed that a combination of higher KPOD embankments, diversion of the Kotri drains towards Pateji Dhand through a parallel drain (as they originally were), enhanced capacity to divert flow into DPOD, and the use of temporary retention storage in the spinal drain and KPOD left bank area would prevent any failure in KPOD during a 1 in 10 year event (not as severe as 2003 but much more severe than the original design storm) but at substantial cost. While not conclusive, the Bank POE studies show that with more data and analysis an acceptable solution, the risks of which are explicitly known, may be possible. The residual flood risks could possibly be mitigated through other local structural and non-structural measures implemented in conjunction with the improvements to the outfall system. The intent of the Bank in undertaking these studies to supplement the POE main report was to show GOS authorities the value of and potential for systematic analysis to find the most cost effective solution acceptable to local stakeholders and to demonstrate the value of good data to support such an approach. The studies to prepare a flood management plan to be carried out under the Sindh WSIP will include a detailed analysis and estimate the cost of various alternatives for different levels of risk and protection.

GOVERNMENT OF SINDH RESPONSE TO DAMAGES TO THE OUTFALL SYSTEM

73. Since 2004, both the GOP and GOS have undertaken a number of actions based on the damage reports, including: (i) drafting terms of reference (TOR) and obtaining financing for several studies, including one for alternative disposal locations for LBOD in the Thar desert (east of the LBOD spinal drain), and another for construction of a gated structure on the spinal drain and DPOD; (ii) completing repairs and improvement of structures, including: reducing the crest of the fixed weir on DPOD; reinforcing at least 10 kilometers of the right bank of Serani Drain; redesigning the LBOD spinal drain for a 50 year return period of 150 millimeters rainfall; and monitoring high tide in the TL and other geographical changes; and (iii) strengthening institutions, namely, the Irrigation and Power Department and SIDA; improving coordination among concerned departments; and ensuring farmer participation both up- and downstream of LBOD.

74. To mitigate the flood losses suffered by the population in southern Sindh (including Badin District), the Government undertook a number of actions. In addition to repairs to infrastructure affected by floods and cyclone, the GOP and GOS provided funds for relief operations, waived land taxes, postponed recovery of loans, provided subsidized food, mobilized medical and veterinary teams to the areas, and paid compensation to those who lost lives and property. The GOP and GOS have compensated legal heirs of deceased persons at the rate of PRs. 100,000 for heads of families and PRs. 50,000 for family members in a household. In total, compensation of PRs. 20.7 million was paid for persons who died and PRs. 183.4 million for families whose houses were damaged or destroyed during the 2003 flood. Short- and medium-term measures, such as the construction of roads, installation of pipeline water schemes, electrification,

and public work programs, were implemented by the GOS. These were immediate relief measures. Most affected households feel that the Government has done little to ameliorate their prolonged suffering or provide basic services. It was not possible to change the difficult environment in which people live through a one-time provision of funds.

SOCIO-ECONOMIC ISSUES IN BADIN AND THE COASTAL ZONE

75. Numerous past studies, including the most recent Bank Socio-economic and Livelihoods Study (2005), show that vulnerability in the coastal areas of Badin is caused by several factors, the most important of which is poverty. It is those groups without alternative income sources or assets that are driven to reside in such adverse habitats. Data on incomes of surveyed households in the coastal talukas of Badin shows that 27 percent of the households were earning less than PRs. 1,000 per month (USD0.55 per day) and 48 percent were earning between PRs. 1,100 and PRs. 4,000 per month (USD0.60–2.20 per day), below the poverty line for Pakistan (PRs. 6954). The numerous shocks, such as the cyclone in 1999, drought in 2000, earthquake in 2001, and drought and floods in July 2003, brought about relentless and severe hardship for the people living in the coastal areas.

76. The July 2003 storm was a particularly severe event among the many natural disasters that are endemic to Badin and the coastal zone. The high risk of negative impacts from flooding to which Badin is susceptible is exacerbated by the generally very poor and environmentally challenging conditions of the area. The households that participated in the focus group discussions in the Bank study reported lack of health and educational facilities and a dire need for drinking water as important problems. The participants also reported major inequities in the distribution of rights for fishing between large contractors and local fishermen; they referred as well to the inequitable pattern of land distribution and water allocation which has caused extreme hardship and affected their livelihoods.

77. The 2003 flood caused loss of lives and damages to properties and infrastructure in southern Sindh. A total of 318 people died in the province, 86 of whom were from Badin District. Damages and loss of life were not limited to or disproportionate in the areas around the LBOD system. Badin's population is about 1.33 million divided among four talukas (sub-districts). Two of these, Badin and Golarchi, are close to the sea coast and have a population of about 475,000 people (85,000 households). The two talukas are crisscrossed by most of the Kotri Basin drainage system, which empties effluent into the dhands, and into the LBOD spinal drain; the LBOD outfall systems run along their extreme eastern side (Map 34988). Of the households in these talukas, about 29,000 are estimated to have been affected by the 2003 flood in one way or another (loss of life, injury, damage to property, loss of livestock);³⁹ about 2 percent of the population of

³⁹ Sindh Irrigation and Drainage Authority, Report on 2003 Rainfall Damages, February 2006. Recently the Bank received an official letter dated July 22, 2006 from the GOS, which contains information that estimates the number of people affected at 29,000.

Badin was badly affected by the flood. Many others beyond the area of influence of LBOD were also affected by the flood in southern Sindh.

78. ***Salinity and Drinking Water.*** The Panel has noted the serious problem of drinking water and the impact of increased salinity on agricultural and grazing lands. Management notes that the lands in the vicinity of LBOD are generally saline and there is very little grazing or agriculture. This generally saline condition stems from a combination of factors: poor irrigation supplies; high evapotranspiration; naturally poor and saline soils; lack of drainage; and groundwater of marine origin. These conditions preceded the construction of LBOD.

79. Availability of drinking water has been a problem for some time. Groundwater in the area is of marine origin and thus highly saline. Canal water is the main source of drinking water in the area. If canal water is not available due to shortages—which has been the case for the last several years now—hand pumps are used along canal banks to tap water that has seeped from canals. In areas served by non-perennial canals (canals that receive water only in the wet season), water is stored in ponds for later use. The performance of the outfall structures has had little impact on drinking water availability.

MANAGEMENT RESPONSES TO FLOOD AND DROUGHT

80. The Bank's quick responses offering assistance to the GOS in 1999 and in 2003 have been noted above. Management has supported the Government in addressing problems in the area, both before and after the cyclone and flood. In 1998, when the Cholri Weir was damaged, the Bank offered to help in undertaking remedial measures. Similarly, in 2003, soon after the flood, the Bank offered to support with relief measures. In both cases, the GOP indicated that it preferred to use its own resources.

81. The 1999 cyclone coincided with a severe drought in the Indus Basin that lasted from 1999 to 2004. Lower Sindh, particularly Badin and Thatta Districts, was the area most affected by the drought. The Government was concerned about the widespread and prolonged impact of the drought and approached the Bank to assist in rehabilitation of drought affected lands. The Board approved the Government's request and reallocated USD135 million for this purpose from ongoing Bank operations in Pakistan, one of which was NDP. The districts of Badin and Thatta were covered under the DERA program, and about USD1.8 million was used for water supply and road rehabilitation works.

82. After the Inspection Panel Request, Management undertook a socio-economic study of the coastal areas focusing on livelihood improvements for the population affected by the natural disasters. The study's main conclusion is that vulnerability in the coastal areas is a result of several factors, the most important of which is poverty—even a slight shock from natural or man-made disasters, which are very frequent, disrupts the livelihoods of entire communities and households. The report went on to recommend a livelihood improvement program aimed at: (i) improving access to basic services and infrastructure; (ii) raising incomes through improved production and marketing of agricultural crops, fisheries and livestock; (iii) securing access to, and better management

of, the coastal area natural resources; and, (iv) improving access to high quality education, information, training and better nutrition and health (Annex 3).

83. Based on the recommendations of the study, Management has prepared a USD18.0 million livelihood support program that will be implemented over the next three years. Management considered alternative options for implementing the interventions proposed in the study and decided to use the ongoing PPAF to implement some of the critical interventions, since PPAF already has a presence on the ground and was working with civil society, thus avoiding delays in start up. The PPAF project management agreed to this proposal and its Board recently approved the first phase (USD2.0 million) of the program, which is now being implemented.

84. In addition, other ongoing Bank operations will provide support to people in the coastal areas of Badin and Thatta Districts. The Sindh On-Farm Water Management Project contributes to efforts in Pakistan and in Sindh to improve irrigation water distribution equity and efficiency through water conservation. There are about 43,000 watercourses in Sindh Province. About 5,160 (13 percent) are in Badin of which only 84 (1.6 percent) have been improved to date.

85. Management is collaborating with the ADB to broaden and strengthen the livelihood interventions identified in the 2005 study through an ADB Project that will cover the eight coastal talukas and include a community development component. The aim is to closely coordinate the scope and interventions under the two projects to maximize the impacts on the ground. The ADB project includes livestock development interventions; social “uplift” interventions facilitated through small grants; provision of basic services such as small-scale infrastructure, health, education and skills development, and interventions to rehabilitate the ecology, and institutional development activities to ensure a more responsive and supportive institutional and policy environment.

MANAGEMENT OF THE INDUS DELTA

86. In 2004, the GOP carried out three studies aimed at reaching a consensus on the minimum required flow, referred to as “escapages” in the Water Apportionment Accord (WAA) in the Indus River below Kotri Barrage. This is the main outstanding item in the WAA between the provinces. This is a widely debated issue as it affects the Indus Delta. The studies include:

- Study I: Water escapages below Kotri Barrage to check seawater intrusion;
- Study II: Water escapages downstream of Kotri Barrage to address environmental concerns; and
- Study III: Environmental concerns of all four provinces.

87. These studies were reviewed by an independent international POE. The POE recommended to the GOP (Annex 5) a required release downstream of Kotri Barrage for each month of the year. Two basic findings were identified: (i) a continued base flow of 5,000 cusecs to manage sea water intrusion; and (ii) a peak discharge during the rainy

flood season following the historical pattern in order to supply the sediment and flows required to control sea erosion and provide conditions for mangrove vegetation.

VI. LESSONS LEARNED

88. Management has reflected on its experience with the implementation of the LBOD and NDP projects and identified lessons that will be important in the Bank's future water sector dialogue with the GOP and GOS. The lessons outlined in this Section are based on the Bank's long history of involvement in Pakistan's water sector, and in particular on the lessons learned from the LBOD development and NDP preparation and implementation, from preparation of the DMP and related stakeholder consultations, from the 2005 POE review of LBOD, and from the findings and directions recommended by the Livelihoods Diagnostic Study.

89. The TL and Cholri Weir did not perform as designed⁴⁰ during the extreme storm event in 1999. Whether this was a failure of design is still a matter of intense technical debate in Pakistan as is the precise cause of the failure. The design of long-term remedial measures requires considerably more data and a deeper understanding of the channel processes and conditions, hence the GOS and GOP have intensified monitoring and research. If the Bank were engaged in a similar project today, however, much greater attention would be given to quality assurance utilizing external peer review and to better mitigation of risks,⁴¹ particularly for projects located in such a high risk environment. It is possible that such an intensive peer review process would have resulted in a stronger or more secure design in this case.

90. The inability of the irrigation department to control the behavior of upstream farmers in breaching the drains and canals to allow more water to flow out of their fields during flooding could have been predicted or more proactively addressed. This, and the long standing controversy between the GOS, GOP and local stakeholders over the potential impacts of the scheme underscore the importance of utilizing a systematic consultation process and effective communication strategies at the earliest stages of planning and design. These important lessons have been incorporated into the region's overall work program and the Action Plan.

91. Among the key lesson are:

Lessons from experience on implementing major drainage projects in Sindh:

- The institutions that will ultimately own the infrastructure and be responsible for its operation and maintenance must be the ones who manage the planning and design of the infrastructure;
- Drainage improvements in flood prone areas, or upstream of flood prone areas, cannot be planned and designed for agricultural drainage alone—such areas require a flood management plan that encompasses agricultural drainage

⁴⁰ While the probability of extreme conditions occurring may be very small (e.g., extreme tides, wind or rainfall) they can occur at any time or in any year following the completion of construction.

⁴¹ The design of any infrastructure necessarily involves balancing costs, benefits and risks, and different options commonly give rise to distinct tradeoffs among these considerations. There is no entirely risk free water infrastructure – the challenge is to manage risks to ensure socially acceptable and sustainable outcomes.

needs while providing both structural and non-structural measures to reduce flood risk, strengthen livelihoods and enable more broad-based economic development that is widely shared;

- Planning processes must utilize a more consultative and participatory process in which all risks and options as well as tradeoffs are made explicit and considered by stakeholders and policy makers jointly. A broad planning framework that includes direct beneficiaries and those who could be potentially impacted by a project, or series of projects, should be the basis for both consultation and plan formulation;
- Environmental objectives and the intrinsic and human environmental values that are important for the livelihoods of direct and indirect beneficiaries need to be an integral part of the framework for formulating plans, designing projects and evaluating tradeoffs and risks;
- Both planning and subsequent operation and maintenance of drainage and flood management programs must be knowledge-based, with the acquisition and use of data, research and study central to the entire development process; and
- Plans, and the resulting infrastructure schemes, must be consistent with the capacity to manage and maintain the infrastructure; possible potential adverse impacts of the risks accepted by stakeholders and policy makers must be mitigated to the extent possible, and provision made for timely building of appropriate capacity—the empowerment of beneficiaries to participate in the planning process and in subsequent operation and maintenance is essential.

Lessons from implementing complex projects financed by multiple donors:

- *Need to harmonize supervision roles among donors.* Complex, multi-donor funded projects require explicit arrangements for supervision responsibility and accountability among donors. Such arrangements enable donors to focus on areas of their comparative advantage and obligate them to share their experiences with other donors. These arrangements should make adequate provision for implementation support;
- *Responsibility among donors for safeguards compliance.* Where livelihood and environmental issues arise, notwithstanding funding arrangements, the Bank, with its rigorous safeguard requirements, should play a leading role in supervising implementation and ensuring compliance. Such an arrangement, however, requires express agreement with all donors involved and with the client; and
- *Maintaining a shared vision with stakeholders.* In projects where impacts cannot be accurately predicted at design stage, the Bank should maintain a structured consultative process throughout the project and, if need be, for a few years beyond project closing. This would help maintain a shared vision and continuous engagement with project stakeholders.

The principal purpose of NDP was reform of irrigation and drainage system governance, and project implementation suggests additional important lessons:

- *Choice of instrument.* In retrospect, a drainage project covering all the provinces and envisaging substantial institutional change followed by a major civil works component was not the right vehicle for implementing reforms.
- Improving irrigation service delivery through participatory management and water entitlements is better pursued through a development policy loan. Major infrastructure improvement is better done in a more focused irrigation and drainage project.

92. These lessons were echoed in the recent Pakistan Country Assistance Strategy (CAS, fiscal years 2006-2009). The CAS noted that projects need to be focused and scaled to fit the capacity of the implementing agency, in terms of scope, pace of implementation and capacity to cope with risks. It noted that in particular, governance reforms (which will remain a central issue in Pakistan's water sector for some time) often take longer than planned. Hence a realistic assessment of technical and political implementation challenges (ownership, champions, and political economy, etc.) need to be reflected in project design, which should exhibit a strong bias towards simplicity.

VII. MANAGEMENT ACTION PLAN

93. ***Actions Already Taken in Response to the Requesters and the GOS.*** Following the Request for Inspection in 2004, the Regional Vice President and concerned Directors and Managers visited the LBOD, the outfall structures, the delta and other sites in the Indus Basin. They had discussions with affected people in the area, civil society organizations, local government and officials of the GOS. This allowed Management to articulate broad areas of intervention to address the most pressing problems as well as future development and management strategies. Management also formed a Team made up of Directors and sector specialists to follow up on the actions that Management promised to carry out in its response to the Inspection Panel Request. Among the actions already taken by Management are:

- Completion of a Country Water Resources Assistance Strategy (CWRAS), distributed to the Board in November 2005;
- A review of remedial options by an independent POE whose report (2005) was discussed with the GOS;
- Completion of a Livelihoods Diagnostic Study (2005) of coastal Badin and Thatta Districts resulting in a livelihoods strengthening program that is being implemented through the PPAF; and
- Launch of preparation of the WSIP in 2006, in coordination with the GOS.

94. Table 1 outlines the responsibility and time table for the proposed short-, medium, and long-term actions that are summarized below. The Action Plan agreed with the GOS responds directly to the issues raised by the Requesters and is an integral part of the CWRAS (2005) and the CAS that was endorsed by the Board in 2006. The GOS is committed to the mitigation of the problems of the people in the area and implementation of the Action Plan as expressed in recent correspondence. The scale of Bank support for Sindh's irrigation development program will be determined by this continued commitment.

Table 2. Action Plan

Activities & Projects	A	B	C	Responsibility	Schedule
Immediate and Short Term					
<ul style="list-style-type: none"> Implementation of Livelihood Improvement Program in Badin and Thatta Districts <ul style="list-style-type: none"> Phase I (USD2 million) Phase II (USD16 million) 	✓			Pakistan Poverty Alleviation Fund (PPAF)	2006-2007 2007-2009
<ul style="list-style-type: none"> Sindh WSIP <ul style="list-style-type: none"> Appraisal Board Presentation Effectiveness 	✓	✓	✓	GOS/GOP/SIDA WB GOS/GOP/SIDA	Nov. 2006 Jan. 2007 July 2007
<ul style="list-style-type: none"> Socio-economic and environmental diagnostic study of the dhands and surrounding areas 	✓		✓	WB/SIDA	July 2007
Medium Term					
<ul style="list-style-type: none"> Flood Management Master Plan for the left bank of the Indus River in southern Sindh 	✓	✓	✓	SIDA	2007-2009
<ul style="list-style-type: none"> Coastal Development Program <ul style="list-style-type: none"> Project Concept Note 	✓		✓	WB	July 2007
Long Term Outcomes					
<ul style="list-style-type: none"> Improved management (O&M) of irrigation and drainage infrastructure; improved service delivery and governance; and transparent and more equitable water allocation and distribution 	✓	✓	✓	GOP/GOS/WB	2006-2009
<ul style="list-style-type: none"> Modern institutional framework for Indus Basin water resources management 		✓	✓	GOP/GOS/WB	2009-2016
<ul style="list-style-type: none"> Sustained governance reform agenda 	✓	✓	✓	GOP/GOS/WB	2009-2016
KEY:					
A: Poverty and livelihoods					
B: Flood Risk					
C: Threatened ecosystems					

95. **Short-Term Actions.** The core issue in the Panel's report is the continued vulnerability of and the adverse impacts on the population and livelihoods in lower Badin, particularly the poor and most vulnerable people in and near the dhands. The Bank's short-term actions are selected to provide an immediate response to the plight of these people and to address the related issues:

- First, a USD18.0 million program to strengthen livelihoods in the highly vulnerable coastal talukas of Badin and Thatta Districts is begin implemented by the PPAF based on the Bank's Socio-economic and Livelihoods Study completed in 2005. One of the actions under the ongoing livelihood support program will review the social profile of the population in Badin and Thatta districts, with the aim of identifying specific nomadic and other vulnerable groups and addressing additional livelihood support issues;
- Second, the Bank and Sindh Authorities have discussed and agreed that the scope of the new WSIP⁴² will include the preparation of a comprehensive flood management plan for the left bank of the Indus River that will encompass the flooding and drainage problems of this coastal region. While the flood management plan will address broadly the flooding and drainage problems associated with the breakdown of LBOD, the Bank will ensure that a special and immediate focus is placed on the options identified by the Bank's 2005 POE review and other potential early actions to mitigate the adverse affects on the ecosystems and livelihoods in and near the dhands, as was urged by the Bank's 2001 and 2005 POE reports. Since the WSIP will be the primary instrument for developing a specific flood management plan for the area of concern to the Requesters, completion of the processing of the WSIP has been made a high priority; and
- Third, the Bank will undertake a socio-economic and environmental diagnostic study of the dhands to better understand the impacts on the dhands, to identify early opportunities to implement mitigation measures, to determine ways in which the ongoing PPAF Livelihoods Program can be deployed to benefit the people in and near the dhands, to identify additional actions that could be taken by the GOS, and to provide important input into the larger flood management planning studies under WSIP and the proposed Coastal and Indus Delta Development Program (see below). This study will be similar to the socio-economic study completed in 2005 for the Badin and Thatta Districts. The new study will assess the effects of the damage of the TL on the dhands and surrounding areas, and assess the current status and potential adverse impacts on the ecosystem, the fishery of the dhands and the livelihoods of the transient fisherfolk population. The study will recommend both short- and longer-term actions that can be taken, including TOR for further research and monitoring, and the use of such new data. The study will be carried out during the next dry season (to capture the status of migratory water fowl) and monsoon season; it will be undertaken in collaboration with the SIDA Environment Unit, and the provincial and national agencies who participated in the initial inventory studies of the dhands in 1997.

⁴² This project would improve water productivity and water use efficiency by deepening and strengthening the reform program, particularly the farmers' organizations (FOs) and Area Water Boards (AWBs); undertake investments to rehabilitate and remodel irrigation and drainage facilities down to the watercourse level; build capacity; support the development of a knowledge base for water and flood management; and prepare a comprehensive flood management plan for the left bank of the Indus River in Sindh.

96. **Medium Term Actions.** The Bank also proposes to undertake planning studies of the flood and drainage problems of the left bank of the Indus River in Sindh encompassing Badin District, and the long-term management of the coastal zone and Indus Delta. These technical planning studies are intended to lead to specific projects and programs that are suitable for support by the Bank and Sindh's other donor partners.

- (i) *Comprehensive Flood Management Master Plan for the Left Bank of the Indus River.* The Sindh WSIP will support the preparation of a comprehensive flood management plan for the left bank of the Indus River in Sindh, including the Indus Delta and coastal areas (including Badin District and the dhands). This Flood and Drainage Management Plan, agreed with local stakeholders during preparation of the national DMP, will encompass surface and sub-surface drainage, waterlogging and salinity control and flood risk management.
- This comprehensive Flood and Drainage Management Plan, agreed with local stakeholders during preparation of the national DMP, will encompass surface drainage, sub-surface drainage, waterlogging and salinity control and flood risk management, and will include appropriate structural and non-structural options (e.g., flood warning and communications, flood proofing and improved preparedness and response systems). Planning will be participatory and multi-objective with a strong socio-economic and livelihoods focus and based on up-to-date ground data and thorough analysis of technical options.
 - Planning will encompass the Indus Delta and coastal zone, including the wetlands near the TL of LBOD and similar environmental and fishery resources found elsewhere in this zone, that could affect or be affected by upland storm and agricultural drainage measures, and will evaluate the options for conservation, rehabilitation and enhancement identified by the Bank's 2005 POE, as well as other options to be identified.
 - Planning and infrastructure management capacity will be built and the capacity of local authorities will be strengthened.
 - A modern, world-class knowledge base will be developed with appropriate analytical tools and information management systems to support planning, operations and management, including flood warning, preparedness and response by local authorities and communities.
 - Optimal phasing of the program will be determined and detailed designs of the highest priority works will be prepared, making them ready for implementation by the GOS, with support from its development partners, including the Bank.
- (ii) *Coastal and Indus Delta Development Program.* The coastal lowland Indus Delta areas face special problems ranging from sea water intrusion, to vulnerability, to global climate change and accelerated sea level rise. The modification of upstream flows, extractions for agriculture and urban supply, maintenance of flows for environmental purposes, and inflow of drain-

age water have had negative impacts on the populations living in the delta, and on the health of the delta itself. Moreover, the delta is increasingly at risk of habitat loss due to excessive cutting of mangrove and riverine forests, high salinity levels in the water and unchecked industrial and agriculture pollution. With further development in the Indus Basin, a serious examination of the challenges in the delta, drawing upon international experience, is needed to identify and assess management options. The Bank has prepared a background and strategy note for a development program for the coastal zone and Indus Delta region in Sindh. Particular attention will be given to developing a strategy that recognizes the environmental importance of the region and its considerable economic potential. A series of workshops and seminars will be organized to interact with professionals, civil society and other key stakeholders leading to the formulation of programs suitable for support by Sindh's donor partners, including the Bank.

97. *Long Term Actions – Strategic Partnership with Pakistan in the Water Sector.*

The Bank's strategic partnership with Pakistan in the water sector stretches back nearly 50 years to the time of the preparation and implementation of the Indus Basin Program and the implementation of the Indus Waters Treaty. As outlined in the CWRAS, Pakistan faces four major challenges to continue on a sustainable development path in the water sector:

- To develop a world-class knowledge-based capacity for adaptive resource management and service delivery;
- To develop a financially feasible approach to maintaining and modernizing existing infrastructure and building needed new water infrastructure;
- To put in place a modern institutional framework, with the key task being the development and application of instruments that will motivate sustainable, flexible and productive use of water; and
- To trace a principles and pragmatic path for implementing this reform agenda over the coming decades.

98. Pakistan must overcome extraordinary obstacles in implementing its water strategy, among which are the increasing water stress; the limited amount of additional water that can be made available; the high risks associated with Pakistan's dependence on a single river basin; the low productivity of water; the overexploitation of groundwater in many areas, the large scale degradation of Pakistan's natural resource base that has human and environmental consequences, including degradation due to salinity, an inadequate knowledge base; and the threats associated with climate change. Flooding and drainage problems will worsen, especially in the lower Indus Basin. To compound these problems, water entitlements are unclear, administration of water allocation is not transparent, much of the water infrastructure is in poor repair and the quality of project implementation is poor.

99. As described in the Pakistan CAS (fiscal years 2006-2009, discussed with the Board in June 2006) the Bank plans to strengthen and deepen its partnership with

Pakistan in the water sector in the coming years. At the heart of many of the issues associated with these pillars is poor governance (the second pillar of Pakistan's PRSP), especially the lack of accountability and transparency in water management organizations and water entitlements, and the lack of farmer empowerment. NDP made significant progress in moving forward on these vital governance reforms—a process that will eventually transform a system in place for over 100 years. These reforms will be strengthened and deepened under the ongoing Development Policy Loan in Punjab, and under the WSIP, the appraisal of which is scheduled for second quarter of fiscal year 2007. Key elements of Management's proposed Action Plan will also be implemented under WSIP.

100. The Bank's long-term partnership with Pakistan in the water sector has recently been strengthened, with the preparation of a CWRAS⁴³ (Annex 6). The Bank will continue its dialogue with the federal and provincial governments to improve the management of irrigation and drainage infrastructure and irrigation service delivery, and to promote more transparent and equitable water allocation and distribution. The Bank will continue to support a combination of institutional reforms and investments throughout the system. This includes major investments in rehabilitation of critical assets and deepening of the reforms already underway to decentralize irrigation management and empower farmers, in order to improve the quality, efficiency and accountability with which irrigation and drainage services are delivered. In Sindh, implementation of this program is being carried out under the Sindh On-Farm Water Management Project, and this will be consolidated and broadened under the proposed WSIP planned for approval in 2007.

⁴³ Distributed to the Board in 2005.

VIII. RISKS

101. Management's proposed Action Plan is ambitious, practical and focused on the key issues. It does not deploy technologies or approaches unfamiliar in Pakistan, nor is it inconsistent with the Bank's global experience. However, capacity is weak in the GOS. Moreover, the institutional changes required to improve water management, reduce salinity and address drainage issues affect powerful vested interests in Sindh and in Pakistan overall. This will limit the speed with which reforms take hold. Expectations need to be managed to match realistic progress expectations. The key risks to the implementation of Management's Action Plan are outlined below.

102. ***Flood Management Plan for the Left Bank of the Indus River.*** Several important risks will require pro-active management, including:

- *Failure to reach consensus on a Plan and its implementation.* The many competing interests in the target area, from well off farmers in the irrigated areas to extremely poor and vulnerable people including transient fisherfolk in the near coastal zone, will present challenges in building consensus and ownership among all stakeholders. The use of innovative communications strategies well targeted to these different groups and interests, and a responsive and open planning approach that is able to identify options to meet varying needs will need to be implemented to mitigate this risk.
- *Failure to build sufficient capacity and adequate knowledge base.* Building a world class knowledge base to support planning, design, operations and management is critical. One of the most important constraints to a more timely and effective response to the events of 1999 and 2003 has been the lack of good data and knowledge about what actually occurred, the lack of a comprehensive baseline, and the lack of continued monitoring and research to identify, test and evaluate options. Even so, a good knowledge base is of little value without the capacity to utilize it. In the early stages of the Sindh WSIP implementation, emphasis will be placed on building both the knowledge base and capacity, in order to mitigate this risk.

103. ***Coastal and Indus Delta Development Program.*** This program is in an early stage of dialogue with the GOS and donor partners, including ADB. The Bank has prepared a strategy note and the dialogue has proceeded well, with keen interest on the part of the GOS, although it will take time to reach the Concept Note stage when detailed preparation can begin. Two important risks could seriously undermine these efforts:

- *First, the required downstream release of water below Kotri Barrage to meet environmental flow requirements in the Indus Delta has not yet been allocated for this purpose.* It was agreed among the provinces in the 1991 WAA that water would be allocated for this purpose but the amount was to be determined later. The Bank's POE review of the three studies carried out by the federal and provincial governments led to recommendations on both a level and pattern of flow to be allocated. However it remains to be seen whether the

provinces can agree within Indus River System Authority⁴⁴ (IRSA) to make this allocation especially in the dry season. The Bank will monitor this process diligently and make this issue a central part of its dialogue with the federal government and IRSA.

- *Second, the GOS may not be able to decide on a satisfactory plan to utilize the flow allocated to the delta.* It will be extremely difficult from a political perspective for IRSA to make the required water allocation if the GOS cannot prepare and adopt a realistic plan to use the flow effectively to address the problems of the delta (salinity encroachment, coastal stability, maintenance of natural habitats and fisheries, and prevention of salinity accumulation), local drinking water supply and pollution control. Sustained allocations depend on the effective implementation of such a plan. This issue will be incorporated into the Bank's dialogue with the GOS, and the Bank will seek the most appropriate instrument to assist the Government in this regard.

104. **Poverty Reduction Program.** This ongoing program is being implemented through the private, non-governmental foundation, the PPAF, which has an outstanding record of implementing community-based livelihood and poverty reduction programs. Nevertheless, the harsh and poor environment of the coastal talukas of Badin and Thatta Districts will present important challenges to be overcome.

- *Options to alleviate poverty and improve livelihoods are limited.* Options will be limited if solutions are not found for two issues: additional freshwater supply for drinking and irrigation, and sustainable improvement and development of fisheries in the coastal and upland areas. Livelihood and poverty alleviation constraints such as this will be an important focus of the planning for the flood management plan for the left bank of the Indus River.

⁴⁴ IRSA was created in 1992 by statute to implement the 1991 Water Apportionment Accord agreed among the four provinces.

IX. CONCLUSION

105. In Management's view the Bank was diligent in the application of its policies and procedures. The Bank has done its best to help the Borrower to address two distinct problems with specific inherent complexities: the technical challenges of an outfall system in southern Sindh presented by LBOD, and the national reform process challenges taken up by NDP. NDP succeeded in initiating a process of critical governance reforms, changing the direction and strategy in the sector towards decentralization, participatory management and the empowerment of farmers. This was a critical step in transforming a governance system that was over 100 years old. This process will continue for some time, but the foundation has been securely established. In regard to LBOD (Section V), with hindsight, the Bank could have made some judgments differently, especially by calling for more explicit consideration of risks and tradeoffs in the context of a participatory planning process during the LBOD design stage, by finding a way to support the implementation of the LBOD EMMP at a much earlier stage, and by encouraging and supporting Sindh to undertake the livelihood diagnostic study in the coastal areas of Badin that were not benefited directly by LBOD.

106. Management has responded to the concerns of the Requesters, incorporating these concerns into its dialogue with the GOS, formulating a comprehensive Action Plan, and identifying suitable strategies and instruments through which timely implementation of the Action Plan can be undertaken. The lessons from the Bank's long experience in the sector in Pakistan, and the LBOD and NDP projects together with the strategic directions of the current CAS have been incorporated into the Action Plan.

107. There are risks of delay in implementation of the Action Plan as well as risks arising from technical factors, difficulties in reaching a consensus among stakeholders, and institutional capacity that will require diligent management. However, because water resource management is central to the development of Pakistan and Sindh, the Bank has been, and needs to remain, engaged despite these risks. Management proposes to report to the Board in 12 months on the progress and status of follow-up actions.

**MANAGEMENT REPORT AND RECOMMENDATION
IN RESPONSE TO THE INSPECTION PANEL INVESTIGATION REPORT ON
PAKISTAN – NATIONAL DRAINAGE PROJECT**

Annex 1

Panel Findings, Management Comments and Actions

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
Background and Context: Irrigation, Drainage and Conditions in Southern Sindh			
1.	<p>Relationship Between LBOD and NDP</p> <p>The NDP Project continues the irrigation and drainage work in the Basin. The Project evolved during implementation. Actions were taken to reinforce local institutional capacity with the important goal of improving and making more equitable and efficient the overall water delivery and distribution system. Progress on this front, however, was slower than hoped. A decision was made not to attempt to repair the breakdown of the Tidal Link, but rather to carry out related mitigation and monitoring actions. Many of these, however, appear not to have been implemented.</p> <p>The LBOD <i>project</i> closed in 1997, but completion of LBOD <i>system</i> and Chotiari Reservoir were carried forward into NDP Project. Analysis of compliance and harm relating to NDP Project requires consideration of inter-related elements of LBOD system and, as relevant to present circumstances, Chotiari Reservoir. Project included task of completing LBOD system, and has advanced proposals to expand it significantly. This work depended on functioning of LBOD Tidal Link. As a result, Project inherited related task of responding to environmental and social implications of breakdowns in LBOD Tidal Link that have occurred during the course of the Project.</p>	48, 49, 73	<p>Comment: The LBOD and NDP projects have different development objectives and outcomes. The NDP Project is a national program focusing on institutional reforms while the LBOD project was intended to improve drainage in three districts in Sindh Province (see also Annex 2).</p> <p>NDP's focus on policy and institutional reforms and capacity building aimed at transforming a century-old irrigation governance system in order to help Pakistan to create the capacity and institutional framework needed to address the country's strategic challenges. The aim was to mobilize and organize farmers and empower them through Farmers' Organizations (FOs) to participate more effectively in water management.</p> <p>In the medium to long term, this new approach to water management requires a functioning and sustainable irrigation and drainage system. This is a vast undertaking that covers the entire 35.7 million acres of irrigated agriculture in the Indus Basin. NDP initiated this process of change but achievement of its objectives did not depend on the efficacy of LBOD which only serves 1.25 million acres (less than 3 percent of the total irrigated area in the Indus Basin) of the 2.5 million acres in the Nara Canal command area (Map 34984).</p> <p>Completion of a limited number of works from the LBOD project were financed under the NDP Project after the closing of the LBOD loan, notably the remodeling of the Nara irrigation canal, some drainage tubewells and performance-based tubewell operation and maintenance contracts for which there were ongoing incomplete contracts without a source of funding. These works did not expand the drainage area of LBOD, were not part of the outfall system, and no new works were financed under NDP in the Badin District area. Total funding from NDP to complete the LBOD works was about 4.3 percent of the total cost of NDP, and about 3.3 percent of the cost of LBOD.</p> <p>NDP provided for substantial investment that was limited to deferred maintenance. The NDP investment component was designed as a program. Specific sub-projects were to be identified, appraised, and those meeting the specified technical, environmental and social criteria would be incorporated into the investment program on a rolling basis.</p> <p>When LBOD was completed there were important and significant differences of opinion on how the existing Indus Basin drainage system should evolve and develop, especially in regard to the capacity required and the disposal options, As a consequence, NDP did support national planning studies that were to be the basis for the develop-</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>ment of a sustainable system.</p> <p>NDP did not include the construction of an LBOD extension to the north as part of its investment program. NDP provided support for a pre-feasibility study of a national surface drainage system (NSDS). After reviewing the draft NSDS study, the Government of Pakistan (GOP) and the Bank stepped away from this massive infrastructure proposal and decided to prepare a Drainage Master Plan (DMP, 2002-2005). Based on the DMP study and reviews by two international Panels of Experts (POE) the NSDS approach of expanding LBOD was rejected.</p> <p>The Bank as part of its continuous dialogue in the water sector regularly brought issues related to the outfall to the attention of the GOS and GOP.</p> <p>For more details on the DMP see Item 2.</p> <p>For more details on mitigation measures, see Items 6 and 8.</p> <p>For discussion on the Tidal Link (TL) and Cholri Weir see also Items 3 to 8.</p> <p>With regard to the Chotiari Reservoir, see Items 21 and 25.</p> <p>Action: See Action Plan for activities related to livelihood improvements in the coastal regions of Badin and Thatta Districts in Sindh, initiative to identify ecological and socio-economic mitigation and development actions in the dhands, and development of a flood management plan for the left bank of the Indus River including Badin.</p>
2.	<p>Northward Extension of LBOD</p> <p>Panel notes important development that NDP Project did not implement NSDS and did not extend LBOD spinal drain any further north.</p> <p>The final DMP, released as the Panel was finalizing this Report, proposes regionalized solutions to drainage management and appears to make significant changes from the draft DMP. Of particular relevance to this Report, the final DMP makes little reference to a northward extension of the LBOD along the lines of the TBOD or NSDS. The Panel understands this to mean that such proposals are no longer being planned. On the other hand, an annex refers to “<i>construction of the TBOD</i>” and another part of the DMP states that the situation for the earlier NSDS proposal has become more environmentally “<i>promising</i>”. The Panel considers that clarification as to the meaning of these references and the status of these proposals is of</p>	50-52	<p>Comment: Based on the DMP studies and the recommendations of two separate Panels of Experts (POEs)—one of which reviewed the NSDS pre-feasibility study and the second which reviewed the draft DMP—WAPDA and the GOP have ruled out the northward extension of the LBOD and the concept of the trans-basin mega drain and NSDS.</p> <p>The DMP and the POEs found that reducing the drainable surplus was feasible and significant, and would eliminate the need to convey saline drainage water to the sea. The adopted DMP strategy involved a combination of improved water use efficiency and water management, reuse of drainage water, and regional disposal options.</p> <p>In revising the earlier drafts of the DMP, some old text may have remained unchanged. WAPDA has recently issued a clarification that the Trans-Basin Outfall Drain (TBOD)/NSDS is no longer envisaged.</p> <p>Action: No action is required.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	high importance in light of the concerns of the Requesters.		
PROJECT HISTORY, DESIGN AND IMPACTS			
LBOD Design and Performance			
3.	<p>Alternative Alignments of the Outfall Tidal Link</p> <p>Selected alignment was politically attractive because it minimized discharge of water across international boundary, but it was technically and environmentally risky.</p> <p>The Panel acknowledges from the record that it was politically difficult to dispose of the drainage water through the Shakoor Dhand.</p> <p>It could be said that the dhands originally had benefited from the moderately saline inflow of drainage water which created a sort of artificial wetland of high biological productivity.</p>	122, 112, 123	<p>Comment: The selection of alignment of the TL was made after consideration of a number of factors, including GOP policy not to dispose of saline drainage water in India so as not to create a riparian issue (Map 34988).</p> <p>The risks of the chosen alignment were substantial because of the harsh physical environment that included strong tides, monsoon winds, and high water levels during the monsoon season in the Rann of Kutch, and occasional overland storm water flow from the north.</p> <p>During the design phase of the project, various alternatives for disposal of the LBOD saline effluent were identified:</p> <ul style="list-style-type: none"> (a) Return flows to the Indus River; (b) Return flows to irrigation canals; (c) Route flows to evaporation ponds in the Thar Desert; (d) Route flows via Dhoro Puran and Shakoor Dhand to the Rann of Kutch; and (e) Route flows to the active Tidal Creek. <p>Alternatives (a) and (b) were unacceptable as the extremely saline effluent would affect the downstream area. The third alternative would also have adverse effects, and it was doubtful whether the evaporation ponds would have sufficient capacity to absorb planned volumes of effluent in the long term. Discharge of highly saline effluent to Shakoor Dhand (a fresh water lake), alternative (d), would have an unacceptable environmental impact; further, Shakoor Dhand's lack of capacity to receive drainage waters was a factor (water in the dhand sometimes rises to levels that make drainage into it impossible and even result in reverse flows).</p> <p>Alternative (e) was therefore selected as it avoided discharging saline and polluted drainage effluent across international boundaries into the Shakoor Dhand, which overflows into the Rann of Kutch—later declared a Ramsar site—shared with India.</p> <p>In paragraph 122, the Panel notes another possible option to dispose of the LBOD drainage outflow carried by the Kadhan Pateji Outfall Drain (KPOD) directly into Pateji and Cholri Dhands allowing any excess water to spill onto the coastal mud flats and into the Rann of Kutch. As noted above, this approach would have created a riparian issue with India which the Government did not want to occur. Although the TL canal continues to function today as a drain carrying a significant portion of the LBOD outflow to the sea, because of the breaches in the canal banks and the destruction of the Cholri Weir in 1999, the Panel's suggested alternative at least partly describes the prevailing condition today. With the TL in place in its present condition there are two differences: on the one hand, the outcome of the Panel's alterna-</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>tive would be improved because the low lying areas near the dhands are draining through the openings in the TL (WAPDA found that flow is occurring towards the sea about 75 percent of the time during each tide cycle); on the other hand stronger tides now reach all the way to the lower end of the KPOD drain, causing excessive drainage of Cholri Dhand and the flow into and out of the dhands from the TL during the tide cycle is said to be more saline than the LBOD drainage water.</p> <p>Action: Studies of the options that have been identified to restore the integrity of the outfall system and improve its safety and performance under extreme conditions, to restore the dhands, and to mitigate flood risk in Badin have been included in the Action Plan (see also Annex 4).</p>
4.	<p>Design Criteria</p> <p>The Panel found that the LBOD designers made insufficient arrangements in the design to deal with storms of higher intensity. There were no provisions for emergency plans, controlled flooding of dedicated areas or flood control gates. In particular, the designers did not consider that the drainage system would convey the flood water down to the low lying areas of Badin District much more rapidly than in the past.</p> <p>Designers did not evaluate the likelihood that under prevailing meteorological conditions, high surface water runoff from upstream areas would coincide with high water levels in the Arabian Sea.</p> <p>The Panel finds that the main drain should have been designed with a higher safety margin. The design assumption that people in region would not release water from inundated lands failed during July 2003 rainfall.</p>	151, 132	<p>Comment: WAPDA had overall responsibility for the planning, design and construction of LBOD and the outfall system on behalf of the Government, and it retained the services of an international consulting firm (Mott MacDonald of the United Kingdom) to carry out the design and supervise the construction as the “engineer.” The design was executed in the period 1980-1984, and construction took place in the period 1987-1997. For the most difficult part of the design, the TL canal and Cholri Weir, physical model studies were carried out at Delft Hydraulics Laboratory in the Netherlands, a global leader in this technology, and the leading physical modeling laboratory in Pakistan. The consultant also utilized state of the art mathematical modeling of the operation of the spinal drain and the TL under a range of conditions, including increase high tide levels due to monsoon storms. International best practices and standards were used in the design studies.</p> <p>The Bank exercised due diligence in its supervision of LBOD design and construction, ensuring that the work was conducted in a manner consistent with international standards and practice.</p> <p>The LBOD designers made several provisions to enhance safety and performance, including limiting the number of drainage inlets to the spinal drain, constructing a bifurcation in the flow of KPOD to enable about half of the flow to be diverted into Dhoro Puran Outfall Drain (DPOD) through an uncontrolled weir, stopping the pumping of drainage tubewells, and strengthening and enlarging the KPOD. This combination proved inadequate during the July 2003 storm because the diversion of flood waters into DPOD was not as effective as planned, the Kotri Basin drains connected to KOPD conveyed very high flow into KPOD, and several cuts and breaches occurred in the spinal drain and KPOD. The flow in KPOD where it enters the TL was estimated to be about 10,000 cusecs, about two and one-half times the design flow.</p> <p>Emergency flood management plans for Badin were not included in LBOD because the purpose of LBOD’s outfall system was to convey surface and sub-surface drainage water from its service area around Badin town and agricultural areas to the coastal zone and the sea.</p> <p>Badin is one of the most flood vulnerable regions of Pakistan. The region has few natural drains and the terrain has a very scant slope generally away from the Indus River and southwestward towards the sea, Flooding is frequent during the monsoon season and the period of flood inundation is typically very long.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>The flood in Badin in July 2003 was extensive and encompassed areas well beyond the area that could be potentially influenced by LBOD. The total July 2003 rainfall in Badin was 303.9 millimeters. Perhaps more importantly, 84 percent of that total fell in a 7 day period, July 24-30, and within that seven day period, 96 percent of the rain occurred on three days with two slightly rainy days between the second and third peak days. The total rain that occurred in this critical five day period, 243.1 millimeters, represents the fourth highest <i>monthly</i> rainfall total for the period of record and taken as a monthly total would have just slightly less than a 5 percent probability of being equaled or exceeded (1 in 20 years). In comparison, the LBOD design criteria (consistent with international design standards for agricultural drainage at the time) were based on a storm of 125 millimeters in 24 hours (1 in 5 years) to be drained over a period of five days. In the 1980s, when the LBOD studies were prepared, the storm design assumptions were considered reasonable. The Bank POE that reviewed the outfall system of LBOD in March 2005 identified the following combination of factors that produced the extensive floods in lower Badin: (a) the sequence and magnitude of rain events in July 2003 overwhelmed the system (see the sub-section on LBOD and the July 2003 storm in Section V of the main report for a description of this rainfall event); (b) farmer refusal to retain irrigation water in the fields during the storm; (c) breaching and cutting of irrigation canals and drains throughout the region (344 cuts and breaches were reported by the Sindh Irrigation and Drainage Authority (SIDA) in the spinal and internal drains); and (d) the intensity and extent of the rain was such that widespread damages/losses occurred in several districts of Sindh, including those outside the influence of the LBOD and the TL.</p> <p>The LBOD system was designed according to the standards of safety for drains prevalent in the country at that time, which also reflected international practice (return period of five years for agricultural land).</p> <p>Action: Technical issues on drain capacity, safety standards, and flood protection measures, combined with non-structural measures such as flood alerts, dissemination of flood risk information, strengthening emergency preparedness, and flood proofing standards will be reviewed as part of the studies to be carried out under the proposed Sindh Water Sector Improvement Project (WSIP). Also, the new governance structure of FOs and Area Water Boards (AWBs) offers a vehicle to overcome these capacity and institutional problems experienced by the LBOD project and would be strengthened under the WSIP.</p>
Analysis of the Technical Design			
5.	<p>Design of TL Embankments and Cholri Weir</p> <p>The Panel observed that significant technical mistakes were made during design of Tidal Link embankments and Cholri Weir. These included hydraulic calculations and model test results were not sufficiently incorporated into the design, contradictions in the geo-</p>	142	<p>Comment: See Item 4.</p> <p>Action: The Bank will assist the GOS to prepare and Implement a Flood Management Plan for the Left Bank of the Indus River, including structural and non structural measures. This action has already started following stakeholders consultation of the DMP POE mission to Pakistan in September 2004.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	technical testing were not reflected in the design, and the Cholri Weir did not have proper bed protection.		
6.	<p>Control Structures Meteorological Risk Risk Assessment</p> <p>The Panel found that the Tidal Link structures were critical to the performance of the system but the design had substantial inherent risk. The Panel also found that the LBOD designers underestimated the risk of extreme meteorological events.</p> <p>.Among the design and risk issues identified by the panel were embankment designs based on insufficient geotechnical data, no provision for emergency closure of the Tidal Link, or facilities to warn the population and mitigate flood impact, and there were no "fail-safe" provisions in the design</p> <p>The Panel considered that the design and construction went ahead without adequate provision to minimize the risk that the structures would give way and to mitigate possible harm.</p>	152-153	<p>Comment: The areas under the direct influence of the TL and the lower KPOD where it joins the TL have little or no population, with the exception of the transient fisherfolk located near the dhands who normally move upland during severe weather. The land in the vicinity is predominately barren saline soils with little or no agriculture. As with all infrastructure projects, there are risks and costs criteria that determine "fail safe" conditions. In this case non-structural measures such as flood warning would have been more appropriate.</p> <p>The flooding in lower Badin due to this record storm was extensive, and damages and tragic loss of life occurred across the region, including areas far beyond that influenced by LBOD. A storm of this magnitude in the adverse physical setting of Badin, with extremely limited natural drainage capacity due to the scant slope and proximity to the coastal area, would be expected to result in widespread flooding and damages as had happened in the past with large storms. The contribution of the waters spilling from the LBOD and its outfall system to the overall flood in Badin is difficult to separate from the natural flood flows and the role of LBOD in the disaster is debatable, particularly in the absence of detailed topographical data, and detailed technical observations and data on the evolution of the flooding.</p> <p>Both the GOS/GOP High-Level Technical Committee (2000) and the Bank's 2001 POE Fact Finding Mission agreed that after the 1999 cyclone the TL continues to function and is discharging the drainage flow to the sea with a good gradient, and would likely with time stabilize. Water from the dhands and from surface flow from upland areas was draining through the TL breaches (WAPDA reported that flow towards the sea occurs in 20 out of 24 hours in the tidal cycle). Hence, even though damage to the TL was extensive in 1999, including the Cholri Weir intended to protect the dhands, the overall outfall system continued to function.</p> <p>For the manner in which the design was carried out and the related technical responsibilities, see Item 4.</p> <p>Action: Management proposes to:</p> <p>(a) Assist the GOS in carrying out detailed studies to secure the functioning of the LBOD outfall system as part of the WSIP; and</p> <p>(b) Assist the GOS to finalize the Flood Management Plan following the stakeholders' consultation for Kotri Basin based on participatory planning and multi-drainage functionality for the various landscapes identified in the basin and the upper-catchment area served by LBOD.</p>
Performance of the LBOD			
7.	<p>Development Objectives</p> <p>Management contends that overall the Project has reached its development objectives—namely lowering the water table in three districts, reducing soil</p>	154-156	<p>Comment: The benefits derived from the LBOD project at the national, provincial and district levels are significant. With regard to the lowering of the water table in the project area, even with the end of the drought and despite heavy rains in some years, the water table has continued to remain below the root zone in the areas drained by the LBOD sys-</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>salinity and increasing agricultural production. The Panel reviewed salinity and water table monitoring data of MOS and agricultural census data of the Sindh Department of Agricultural Extension and confirmed the claim that the water table is on average considerably lower than before the Project and that the agricultural production has substantially increased, although it was not clear to the Panel whether the lowering of the water table is due to the Project or to decreased water supply in the past four years, resulting from drought and increases in agricultural intensification and production. It is difficult to separate the effects of the many intervening factors</p> <p>The Panel concludes that at the time of appraisal the development objectives were plausible. The selection of the routing of the outfall drain could be justified; however, alternatives should have been evaluated in proper depth. The inherent risk of the selected option has not been properly evaluated and little had been done to minimize the risk through appropriate design and water management procedures. The underestimation of risk and the lack of appropriate technical measures have contributed to suffering of people in lower Badin.</p>		<p>tem. A significant positive impact of the LBOD is the early evacuation of storm waters. Before the system was built, large areas had standing water in fields and towns for long periods (up to 30 days); now evacuation takes place within a week, with much lower crop and other infrastructure losses (March 2005 POE report).</p> <p>Risks were foreseen, monitoring was carried out for the TL, the O&M Unit of WAPDA (South) undertook timely repair measures up until the calamity in 1999, and had also begun developing a plan for remedial measures including possible redesign. The failures in 1999 have caused changes in the dhands and in the livelihoods of the transient fisherfolk (see Section V). The magnitude and reversibility of the impacts on the ecosystem of the dhands, changes in salinity patterns, and productivity of the fishery and fisherfolk livelihoods is unclear at present because of the paucity of recent data. The fisherfolk report a decline in fish catch in some areas of the dhands, but they are also now more intensively fishing the TL than they had in the past.</p> <p>Numerous past studies, including the most recent Bank socio-economic study of livelihoods (2005), show that vulnerability in the coastal areas of Badin is caused by several factors, the most important of which is poverty (Annex 3). It is those groups without alternative income sources or assets that are driven to reside in such harsh habitats. Data on incomes of surveyed households in the coastal talukas of Badin shows that 27 percent of the households were earning less than PRs. 1,000 per month (USD0.55 per day) and 48 percent were earning between PRs. 1,100 and PRs. 4,000 per month (USD0.60–2.20 per day) below the poverty line for Pakistan (PRs. 6954). The numerous shocks, such as the cyclone in 1999, drought from 1999 to 2004, earthquake in 2001, and floods in July 2003, brought about relentless and severe hardship and suffering for the people living in the coastal areas of Badin and Thatta Districts.</p> <p>The study recommended a poverty targeted program for the region to address the combination of these issues regardless of the causes; the GOS agreed, and implementation has begun. Implementation partners (mainly local NGOs) have been identified and proposals developed for a USD18.0 million program being implemented through the Pakistan Poverty Alleviation Fund (PPAF) to support programs in rural water supply, rural roads, and rural electrification, community services (health, education and agricultural extension services). The Bank will support the GOS/GOP to deepen and expand these interventions, and will closely monitor the progress and effectiveness of interventions in the coastal zone of Badin and in the area of the dhands.</p> <p>For the relationship of LBOD and the TL to the floods of 2003 see Item 6.</p> <p>For alternatives in routing the outfall drain, see discussion in Item 3.</p> <p>Action: Management proposes to:</p> <p>(a) Assist the GOP/GOS to implement the recommendations of the POE on the LBOD system (see Annex 4);</p> <p>(b) Continue the implementation of the Livelihood Improvement Program being implemented through the PPAF to mitigate the harsh conditions existing in Lower Badin (See Action Plan, Section VII, and An-</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>nex 3); and</p> <p>(c) Undertake a new socio-economic and ecological survey and study of the impacts, current condition and trends, and future directions for conservation of the dhands (See Action Plan, Section VII).</p>
8.	<p>Performance of Structures, including Cholri Weir</p> <p>Design of the LBOD outfall system was not in harmony with the winds and natural flow of water and that, even while structures were still holding, gradual changes to ecosystem occurred.</p> <p>LBOD system combined with partial destruction of Tidal Link has heightened risks to local people from storm-water as well as from sea-water flooding. Situation is particularly bad when heavy rainfall inland and high tides and storm at sea coincide. The 2003 floods led to loss of many lives.</p>	157-158	<p>Comment: See Items 3 and 6.</p> <p>Under normal pre-project conditions overland or surface flow during and after storms in the lower Badin area would be exceedingly slow and would commonly be blocked by high water in the Rann of Kutch. This is why, in addition to the scant slope and lack of natural drainage capacity, the region has traditionally suffered from long periods of flood inundation after heavy storms.</p> <p>The TL alignment crosses the natural path of overland flow from the north in lower Badin and with its high embankment it represents an apparent barrier to this flow. However, model studies showed that the TL as designed, with the Cholri Weir in place, would maintain water levels north of the TL and in the dhands below the elevation of the drains entering the dhands and would not cause the surface area of the dhands to increase (which would cause inundation and impede drainage in some areas that border this broad, flat, barren region). Before 1999 this system is reported to have functioned well. After 1999, the destruction of the Cholri Weir adversely affected the dhands, but the numerous breaches in the TL embankment removed the possibility that the TL would be a surface drainage barrier even though strong tides now were being experienced all the way up the TL to KPOD.</p> <p>The magnitude, direction and long path of typical monsoon wind over the flooded Rann of Kutch were of considerable concern to the TL designers, and a major topic of discussion in the consultations among the Government, WAPDA and local stakeholders in 1996-1999 (see Section V). To protect against the damaging effects of wind driven wave action against the TL embankments, high berms were constructed atop the embankments. Soon after completion this became a major annual maintenance requirement.</p> <p>The overall impact of the LBOD outfall system on the flood risk of local people has been positive. Two review panels have agreed that the TL continues to function after the storm damage, conveying drainage flows towards the sea with good gradient. WAPDA reports indicate that the direction of drainage is towards the sea during 20 out of 24 hrs of two tide cycles. Overland storm runoff from lower Badin enters the TL through the numerous breaches and is carried to the sea.</p> <p>With respect to the tragedy and aftermath of the exceptional July 2003 storm and flood, The GOP and GOS acted quickly during the emergency. The Army provided emergency relief and protective shelter during the July 2003 storm and continued relief efforts during August. The Chief Minister of Sindh, Prime Minister and President visited Sindh to supervise relief and recovery operations. The GOP has also implemented additional measures to reduce the risk of flooding in lower</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>Badin, as well as measures to repair damage and restore LBOD:</p> <p>(a) Rehabilitated the DPOD, enabling it to carry additional flows; lowered the weir at the RD +159¹ KPOD–DPOD bifurcation; and completed the rehabilitation of the infrastructure damaged in the July 2003 floods (repair of earthwork and pipe inlets along KPOD, repairs of bridges in KPOD at RD 27, 58, 77 and 84);</p> <p>(b) Constructed new pipe inlets from RD 0 to RD 84 in KPOD, together with stone pitching along the outside berm of KPOD and Serani drain; and</p> <p>(c) Approved a feasibility study and designs for remedial works in the outfall system of LBOD.</p> <p>Action: See Action Plan.</p>
9.	<p>On 21 May 1999, tropical Cyclone 2A hit the tidal areas of Thatta and Badin Districts. As a result, seawater over-ran the Tidal Link. The structure suffered badly and 54 breaches in the embankments occurred at different locations, bringing devastation and loss of life to the adjacent communities.</p>	167	<p>Comment: The TL was affected by breaches due to the 1999 cyclone, but the cause of devastation and loss of life was the direct impact of Cyclone 2A, not the breaches of the TL. For example, Thatta district, which is well outside the influence of the TL, was also badly affected. The 1999 cyclone led to widespread damages in the Sindh coastal area as a whole and it is impossible to attribute individual casualties to breaches of structures that are located well downstream of the affected zone.</p> <p>Action: See Item 7 for livelihood improvements in lower Badin and Thatta districts.</p>
10.	<p>In addition, increased salinity has affected large tracts of agricultural lands and the Tidal Link failure has led to major harm to the dhands ecosystem, wildlife and fisheries, upon which many people depend for their livelihoods. People in these areas also face serious problems of drinking water, and have lost grazing lands. The overall morphology of the region is being changed.</p>	Exec Sum, 170	<p>Comment: Salinity in agricultural lands in lower Badin results from a combination of factors: poor irrigation supplies; high evapotranspiration; naturally poor soils; lack of drainage; and groundwater of marine origin. The land adjacent to the TL and the dhands is of little use for either agriculture or grazing.</p> <p>While the TL continues to function as an effective mechanism to convey saline drainage water to the sea under normal conditions, the destruction of the Cholri Weir has led to excessive drainage of Cholri Dhand, and to apparent changes in salinity and water balance of the Cholri and Pateji Dhands which in turn has had a negative impact on the environment and most likely the biodiversity and productivity of these dhands. Anecdotal evidence suggests that it has also affected the magnitude and species composition of the local fish catch. The other two larger dhands, Sanhro and Mehro, do not appear as yet to be strongly affected, except possibly from increased salinity (though this may also be caused by drought that reduced the inflow from the Kotri drains directly connected to them). The magnitude and reversibility of the impacts on the ecosystem of the dhands, changes in salinity patterns, and the productivity of the fishery and fisherfolk livelihoods is unclear at present because of the paucity of recent data. The fisherfolk report a decline in fish catch in some areas of the dhands, but they are also now more intensively fishing the TL than they had in the past. (see Action Plan Section VII).</p> <p>Groundwater in the region is generally of marine origin and thus highly</p>

¹ The zero station starts near the confluence between KPOD and Serani Drain; RD is equivalent to 1000 ft.

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>saline. The primary source of drinking water is usually the freshwater from the canal system. Besides direct use of canal water for drinking, hand pumps are used along canal banks to tap water seeping from canals. In areas served by non-perennial canals, water is stored in ponds for later use.</p> <p>The major changes in the morphology and ecosystems of the coastal zone near Badin has been taking place for many years and these changes have been well documented in studies by IUCN and WWF and local researchers in Sindh. The coastal zone near Badin is an integral part of the Indus Delta which has undergone extraordinary changes that are a product of major evolution in the hydrologic and sediment regime of the Indus River as a consequence of more than a century of accelerated irrigation and water use development. These changes have resulted in severe ecological changes to the many lagoons and lakes in the coastal zone (salinization, desiccation, etc.) and to estuarine areas; in erosion; and in seawater intrusion and changes in salinity that have, for example, devastated the mangrove forests.</p> <p>Action: See Item 7 for more information on livelihood improvement actions.</p>
11.	<p>The construction of the Tidal Link and the embankments had cut-off and diverted the surface flow and consequently destroyed the grazing areas. The Panel was informed that originally there were seven villages in the area but five had to be abandoned leaving only two with a shrinking population.</p>	185	<p>Comment: The areas to the south and immediately to the north of the TL are in general mud/salt flats with little value as grazing areas.</p> <p>Nearly all the settlements near the dhands depend on the fishery since the saline soils support almost no agriculture except where water from the irrigation system is available. Since the connection of the dhands to the Kotri Basin drains in the 1960s and 1970s, which enhanced the fishery, the settlements have attracted a seasonally varying population of transient fisherfolk. About thirty small temporary settlements have been identified around the four dhands and Serani Drain (which used to flow into Pateji Dhand but is now connected to KPOD). Only one of the settlements, Karo Ghungro, which is located on Sanhro Dhand, is permanent and consists of about 250-300 huts, but most of the population of this settlement is reported to migrate to the surrounding upland areas during the monsoon season when the weather is risky and fishing declines. The remaining settlements are temporary, occupied seasonally when fishing in the immediate vicinity is productive. The 1997 inventory estimated this transient population to be about 5,000-6,000, but the number varies from year to year.</p> <p>Data on population in lower Badin shows a net increase of 2.2 percent per annum (see Annex 3). Furthermore, the findings of the POE on the LBOD Outfall system shows that the net area under settlement increased between 1992 and 2005, from about 2430 acres to 3050 acres, or an increase of about 38 percent.</p> <p>Changes in land use including agricultural activity and grazing areas are likely an outcome of persistent drought conditions from 1999 to 2004 and reduced amounts of water reaching the tail end of the canal system in lower Badin (IMTA report Appendix 1, June 2005).</p> <p>Action: See Item 7.</p>
12.	<p>It is the Panel's opinion that the con-</p>	188,	<p>Comment: With respect to flooding risks, see Items 4, 6 and 8.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>struction of the LBOD and the Tidal link has increased the risk of flooding in the lower Badin area.</p> <p>At present there are some signs that the situation is gradually stabilizing. Nevertheless, [National Institute of Oceanography (NIO)] data show a continuation of the bed erosion in the Tidal Link. The Panel observes that interpretation of the larger picture of the enormous amount of data available is still lacking.</p>	194	<p>Management acknowledges that the regular collection and interpretation of data to enable better management and more timely response to shocks and issues in this ecologically and socio-economically vulnerable region has been seriously deficient. The exception has been the long period of observation and data collection by the NIO in the TL. But the lack of follow up to the 1997 inventory studies of the dhands (avifauna, water quality, fisheries and land use), and failure to implement the LBOD Environmental Management and Monitoring Plan (EMMP) is more typical of the prevailing situation. Data even when collected is often not used to gain an understanding of the larger picture as the Panel points out. This is certainly true of the environmental issues in the delta, which are a consequence of the broader evolution that has been taking place in the Indus Delta of Pakistan over the last 50 years. In the design of the WSIP, the GOS and the Bank plan to place greater emphasis on capacity building and the collection and analysis of data to better understand this complex and dynamic environment.</p> <p>With respect to flooding risks, see Items 6, 8 and 9.</p> <p>Action: The Bank will support capacity building for the NIO and GOS through the proposed WSIP.</p>
NDP PROJECT COMPONENTS AND IMPLEMENTATION			
Environmental Compliance – Environmental Assessment, OD 4.01			
13.	<p>Project Area of Influence</p> <p>Despite [some] references in the Drainage Sector Environmental Assessment (DSEA), there did not appear to be any further study of the possible impacts of the drainage program on the people who depended upon the dhands for at least part of their livelihood, nor of any possible impact of increased drainage waters flowing through the Tidal Link.</p> <p>Under NDP Project neither potential environmental nor potential social impacts of Project in area of concern to Requesters were considered in a meaningful way until submission of Request.</p> <p>By comparison, environmental and to some extent social issues relevant to area of Request were given consideration under the LBOD project during the design and implementation of Tidal Link. However, once system began to break down, Management focused on technical problems (e.g., the erosion of the Tidal Link channel bed and embankments) but did not suc-</p>	266-268	<p>Comment: With respect to the environmental aspects of NDP, see Item 14.</p> <p>The NDP DSEA explicitly refers to the assessment of impacts of drainage effluent disposal to the sea that was undertaken for the Environmental Impact Assessment (EIA) of the LBOD. This detailed EIA, with particular reference to LBOD's potential effects on coastal ecology, was completed in February 1989.</p> <p>The 1989 LBOD EIA identified several potential adverse physical impacts that the TL could have on the ecosystem and habitat of the dhands, including excessive tidal drainage, changes in salinity and excessive increases in water level (that might cause flooding of adjacent lands—an issue of considerable local concern during the 1996-1999 consultations described above). The physical and mathematical model studies of the TL were used to determine how to mitigate these impacts and protect the dhands. The adopted solution was to incorporate a 1,800 foot weir into the northern TL canal embankment where it passed through Cholri Dhand. In addition, the southern embankment of the TL was topped by a high berm to protect the TL and the dhands from high water levels and high salinity in the Rann of Kutch during the monsoon months. Analysis at the time showed that the existence of the north embankment and high berm of the TL would not significantly impede drainage from upland Badin and exacerbate flooding there. Moreover, while model studies predicted that tides would influence the flow and water level in the TL up to the dhands, sea water was predicted to penetrate to a point about 12 miles downstream of the dhands.</p> <p>Issues related to the functioning of the outfall system were raised on</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>ceed in bringing necessary attention to social impact of failing structures.</p>		<p>several occasions at high levels including the Management letter of August 19, 1998 to the Federal Secretary of Ministry of Water and Power about scouring problems in the Cholri Weir and TL. The 2001 Bank POE Fact Finding Mission reviewed at length the studies of the dhands carried out by the LBOD project, focusing in particular on the possible environmental and social impacts, and strongly recommended to the GOS that the LBOD EMMP be implemented. The Bank offered assistance to the GOS to implement the POE recommendations under the NDP Credit. The 2003 POE reviewed the NSDS study; the 2004 POE reviewed the DMP; and the 2005 POE mission reviewed the LBOD outfall system in light of what had occurred since 2001.</p> <p>The GOS also appointed an inter-agency Committee (2001) to formulate an environmental package for the rehabilitation of the affected areas of the TL particularly the dhands and the people whose livelihoods depend on them. The Committee recommended that a permanent institution be set up under the Managing Director of SIDA, staffed by multi-disciplinary specialists, and charged with carrying out analysis of the monitoring data, formulating mitigation and management actions, and coordination of activities of cooperating agencies. Establishment of this unit is currently underway in collaboration with ADB, and it represents the first effort to implement the LBOD EMMP since the difficulties in organizing the Environment Unit in WAPDA (South) in 1997. The Committee recommended that roads and communications in this area be improved to enable more rapid and effective disaster response, and that future actions be planned in a manner to ensure social acceptance and be subject to an EIA consistent with Sindh EPA regulations.</p> <p>The 2005 POE report noted that progress was finally being made. The GOS established a cell within SIDA to implement the EMMP, agreed with ADB on a program of capacity building and related activities to implement the EMMP for the dhands and the larger coastal zone, and submitted a request to the GOS to finance the activities of the SIDA environment cell.</p> <p>Action: See Action Plan, Section VII.</p>
14.	<p>Environmental Screening and Level of Analysis</p> <p>Further development of LBOD was intended to improve drainage but had and has potential to intensify significantly harms to people and environment generated by the existing system, especially in southern Sindh.</p> <p>NDP was designed to lay foundation for long-term approach to drainage. This could help to resolve existing problems, but could also create possibility of significant, irreversible environmental harms and cumulative impacts.</p>	273-275	<p>Comment: On issues concerning extension of LBOD see Item 2</p> <p>In 1993 the Bank prepared the DSEA, a major innovation at the time. The DSEA was intended to provide a framework for managing environmental risks under NDP and any future investments in the drainage system. This framework provided that all subsequent investments would be subject to an EIA. The donor partners collaborating on preparation of NDP conducted a detailed review of the DSEA, agreed to classify the Project as a "B," and decided based on the limited scope of NDP investments that NDP would focus on developing a robust environmental screening and assessment tool and process for NDP sub-project investments (which were limited to deferred maintenance).</p> <p>The Panel found that NDP should have been subject to a category "A" EA. The Panel suggested that the EA would have brought increased attention to the risks associated with various aspects of the LBOD outfall system. Notwithstanding the absence of an EA, the Bank and</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>Bank assigned the NDP as “Category B” under OD 4.01, but acknowledged that “Category A” would have been more appropriate. Panel notes this acknowledgment, finds that decision of the Bank to categorize the Project as “Category B,” rather than “Category A,” did not comply with OD 4.01.</p>		<p>its donor partners did make an effort to raise the profile of these issues. In 1996, at the urging of the Bank and the other LBOD donors, GOP, GOS and the Water and Power Development Authority (WAPDA) began intensive consultations with local stakeholders in Badin concerning risks and potential problems and adverse impacts associated with the design of the outfall system. These consultations, involving many site visits, lasted until 1999. In 1997 at the urging of the Bank, the LBOD consultants updated and revised the EMMP for LBOD, and the environment unit of WAPDA (South) undertook the first environmental inventory studies of the dhands (covering avifauna, fisheries, water quality and comparative land use). Hence, not only was there follow through on the environmental and socio-economic risks identified in the 1989 LBOD EIA that had been mitigated in the TL design, but the overall the risks were reexamined in detail by policy makers and local stakeholders, albeit after completion of the outfall construction.</p> <p>With the value of hindsight, the classification as a Category “A” would have been more suitable for NDP, given the complex issues and potential impact of some of the sub-projects. Management agrees with the Panel that a Category “A” classification and a full EIA, even with the DSEA framework (1993) in hand, might have provided an added framework within which to consider the potential cumulative impacts of the continued development of the drainage system, and possibly given a higher profile to and placed greater emphasis on implementation of the LBOD.</p> <p>Action: See Section VI on lessons learned.</p>
15.	<p>Analysis of Alternatives</p> <p>Panel commends efforts and analysis that went into elements of 1993 DSEA. In the context of its time, the 1993 DSEA suggested that there would be no appreciable environmental effects from the expansion of the LBOD.</p> <p>Panel finds, however, that certain problems arise in relying on its analysis of alternatives. The 1993 DSEA analysis of alternatives rapidly became out of touch with situation on ground. Analysis underestimated potential negative environmental effects in southern Sindh of relying upon and expanding LBOD. It did not provide an adequate basis to inform decision-making for NDP Project on core question of available alternatives, as required under OD 4.01.</p>	279-280, 283, 285	<p>Comment: The DSEA recommended further studies to assess the feasibility of extension and enlargement of the LBOD system, which would include reconsideration of related environmental and social issues and potential risks.</p> <p>In this regard, NDP provided support for a pre-feasibility study of an integrated NSDS that would consider the extension of LBOD northward to encompass the upper basin provinces (although no funds were provided in NDP to support the construction of such infrastructure). During the NDP Mid-Term Review (MTR), the Government and the Bank stepped away from this massive infrastructure proposal and decided to prepare a DMP that would examine the issue from a broader perspective, taking into account environmental, socio-economic and other factors.</p> <p>The DMP (2002-2005) was prepared by multi-disciplinary teams that reassessed the salt balance of the Indus Basin under different scenarios and looked at drainage issues in an integrated way, including environmental and social dimensions – an entirely new approach in Pakistan. The planning process also involved consultation with local stakeholders and an external Panel of Experts (POE). The DMP planning process reexamined all the alternatives and sought new ways of thinking about the problem. Its analysis showed that reducing the drainable surplus was feasible and significant, and would eliminate the need to convey saline drainage water to the sea. The DMP strategy involved a combination of improved water use efficiency and water management, reuse of drainage water, and regional disposal</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>options.</p> <p>At the Bank's recommendation, the first regional or sub-basin level consultation on the DMP was held in September 2004 in the left bank area of the Indus River in Sindh, specifically in the Kotri Canal sub-basin that serves much of Badin District. Local stakeholders, DMP study staff, and the Bank's POE agreed during these consultations to develop a comprehensive drainage and flood management plan for the entire left bank of the Indus River in Sindh, which includes the coastal districts of Badin and Thatta.</p> <p>Action: See the Action Plan, Section VII, which reflects the lessons learned (Section VI) from both LBOD and NDP.</p>
16.	<p>Analysis of Potential Impacts</p> <p>For the present purposes, the Panel finds that the 1993 DSEA analysis failed to identify and assess adequately critical environmental concerns of relevance to the affected areas in southern Sindh Province.</p> <p>Project documents noted issue of potential impacts upon wetlands in southern Sindh, but did not assess how Project might affect wetlands or identify required mitigation measures at critical stage of Project design and appraisal, as called for under OD 4.01.</p>	288, 290	<p>Comment: The DSEA provided a strategic overview at the time in line with the scope of the NDP, in compliance with OD 4.01. The DSEA referred to the analysis of potential impacts in the 1989 LBOD EIA. By the time the DSEA was completed, the design of the TL had been modified to incorporate a separation bund along the northeastern side of the drain, with a connecting weir to provide tidal exchange. These modifications were intended to address the potential impacts on the dhands identified in the LBOD EIA, and consequently the DSEA concluded that no appreciable environmental effects of the LBOD were anticipated.</p> <p>Action: No action is required.</p>
17.	<p>Environmental Management Plan, Mitigation and Compensation</p> <p>DSEA and other Project documents discuss or note important actions to be further developed and implemented. There has been, however, failure to adequately develop and, in particular, implement an EMP for Project. This does not comply with OD 4.01. EMP and its implementation are crucial to an Environmental Assessment.</p> <p>The Panel notes the concerns expressed by Management that the institutional framework for an EMP was not in place, and recognizes the challenges under the Project in developing and implement such a Plan. Nevertheless, the failure to do so in line with OD 4.01 has been a major obstacle to the ability of the Bank to respond to the concerns of the Requesters in this Project.</p>	294, 299, 302-307	<p>Comment: The design of the NDP, as described in the Staff Appraisal Report (SAR) and Implementation Volume, is consistent with OD 4.01.</p> <p>The NDP Project required that: (a) an Initial Environmental Scoping (IES) be carried out for all investment projects; and (b) full environmental impact assessments (EIAs) be prepared, to the satisfaction of IDA, for investment projects for which the IES indicated that they could have significant environmental impacts. Such projects would only be approved for funding under the NDP Project if their EIAs indicated that the adverse environmental impacts would be mitigated or avoided. Further, Environmental Action Plans (EAPs) based on the EIAs would be agreed with IDA before such investment projects were approved for funding. WAPDA's Environment Cell and Provincial EPAs would have the lead role in preparation, review, approval, and implementation of environmental aspects of the Project, including IESs, EIAs, and EAPs. These provisions were followed during implementation of each sub-project supported by the NDP.</p> <p>Given the nature of investments supported under the NDP (essentially deferred maintenance), an overall EMP covering the overall project was not warranted. However, in addition to the provisions for investment-specific IESs and EIAs, a Water Sector EMP – Framework for Action, funded by ADB, also was developed under the NDP Project in February 2002. It outlined a basin-wide Wetland Conservation Strategy, as well as capacity and institution building for addressing social</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>The Panel notes Management's suggestion in June 2004 to make NDP funds available to mitigate flood damages to people. As Panel was finalizing Report, Management informed Panel that Government had provided funds to some individuals and families affected by the floods, including "death compensation" (318 people; 125 in Badin and Thatta) and compensation for houses fully damaged (tens of thousands) and partially damaged. Management did not provide further information on what had been considered and done with respect to compensation in relation to Project, including whether these payments referred to compensation for losses and/or income restoration. The Panel notes that significant Project funds seem to have been available, and were re-allocated under the Project to address other needs, including more than USD135 million for drought relief actions not related to Project.</p> <p>Panel notes Management action to carry out socio-economic study of livelihood of people living in the affected area, and related planning actions. Panel observes that this could yield new action in line with Bank policy.</p> <p>Several recommendations of IPOE, established after Request to review performance of LBOD, are designed to respond to the many problems facing the local communities living near the Tidal Link and dhands, including problems of sea water intrusion, flood risk, damage to the dhands, and negative impacts on livelihoods.</p>		<p>and environmental issues within organizations dealing with water (e.g., establishing environmental management units in each province).</p> <p>Sub-project interventions supported under NDP did not include lower Badin area, therefore the concerns of the Requesters could not be addressed directly under this project. However, these concerns were duly recognized and addressed under the DMP.</p> <p>After the July 2003 events, the Bank's Country Director called the Chief Secretary, Sindh and offered emergency assistance. However, the GOS decided to use its own resources. The compensation program for people affected by the July 2003 floods was funded by the GOP as part its own emergency response measures and covered all areas affected by the 2003 floods. The compensation included payments for loss of property, loss of lives, and community assets. See Item 30.</p> <p>Part of the NDP funds, reallocated for Drought Emergency Recovery Assistance (DERA), was used for water supply and other local schemes in Badin and Thatta.</p> <p>In June 2004, the GOS requested, and the Bank agreed, to offer assistance for repairs of LBOD damages cause by the July 2003 rains.</p> <p>Management notes the acknowledgement by the Panel, and intends to move forward with the program for livelihood support, and for addressing issues of sea water intrusion, flood risk, damage to the dhands, and negative impacts on livelihoods.</p> <p>Action: See Item 8 for PPAF activities in Badin and Thatta districts.</p>
18.	<p>Monitoring Plan</p> <p>Panel commends Management for supporting NIO monitoring program activities but notes that comprehensive analysis and interpretation of data still absent.</p>	310	<p>Comment: The GOP has recently concluded environmental studies on the delta and environmental flows below Kotri Basin. The Bank has supported the review of these studies through a POE. Management agrees with the Panel in the need to improve the data interpretation and ownership of the delta issues by broader audiences. Monitoring and collecting basic data is presently supported by the Bank.</p> <p>Action: Management intends to support capacity building (e.g., for the NIO and other organizations) and comprehensive analysis and interpretation of monitoring data under the proposed WSIP.</p>
19.	<p>The Drainage Master Plan (DMP)</p>	314, 318-	<p>Comment: The DMP is meant to provide a framework and guide/assist planning of future drainage interventions in the country. It</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>DMP is likely to have major environmental and social implications for a long time. Development of DMP merited a "Category A" designation under OD 4.01. Bank's designation of it as Category B did not comply with Bank policy.</p> <p>Final DMP includes provisional Environmental Assessment and framework for environmental management, and there are plans for "<i>detailed environmental study</i>" on the DMP's effects on minority groups or tribal minorities.</p> <p>Panel is concerned about process through which DMP was elaborated. Far-reaching impacts to be expected, Bank's assignment of "Category A" for each basin, and large budget proposed for implementing DMP, should have triggered a "Category A" designation for DMP.</p>	320, 321	<p>is not a project and as such does not require an environmental categorization. The categorization mentioned in the document has been proposed by WAPDA and is not endorsed by the Bank.</p> <p>In preparation of the DMP, the Bank proposed and WAPDA and the GOP accepted the use of DRAINFRAME methodology endorsed by the Bank, which provides a comprehensive framework for participatory planning of drainage interventions.</p> <p>Action: See Item 1.</p>
20.	<p>Environmental Advisory Panels (EAP)</p> <p>Panel makes note that in the first Management Response, the issue was not raised.</p> <p>Failure to put in place an EAP for NDP Project until 2004 is inconsistent with what was intended under OD 4.01.</p>	327	<p>Comment: Management notes the Panel's finding that an EAP was put in place late during project implementation as required under OD 4.01 for Category "A" projects. Given the nature of investments supported under the NDP, the Bank did not consider necessary the establishment of the EAP. However, as noted by the Panel, several International Panels of Experts were organized under the NDP, and these POEs covered functions equivalent to an EAP.</p> <p>Action: No action is required.</p>
21.	<p>The Chotiari Reservoir</p> <p>Panel makes note that in the first Management Response, the issue was not raised.</p> <p>Reservoir inundation area covers and inundates large area of rare, unique and important habitat and wildlife. Appropriate EA for NDP Project would have properly assessed impacts before appraisal, when critical decisions regarding Project were being made. Assessment could have built upon previous analysis to extent available.</p>	331	<p>Comment: The Chotiari Reservoir (supported by the Saudi Development Fund) was completed by WAPDA and the GOP with funding provided by the Government's public sector development program (PSDP) as a distinct and separate project.</p> <p>The MTR of the LBOD in June 1993 identified the need for an EA of Chotiari Reservoir and Management notes that the EA for Chotiari Reservoir was carried out under the LBOD project. The studies were conducted in 1994 and resulted in revisions to the alignment of the reservoir embankment specifically to exclude from inundation an area of relatively productive and populated land and to protect other areas of particular ecological value.</p> <p>Action: See Item 25.</p>
22.	<p>The Panel finds that as a result of shortcomings in the Environmental Assessment, decision-making on environmentally-crucial elements under the Project became less systematic,</p>	333-335	<p>Comment: The Bank has systematically followed up on the environmental issues of NDP and applied the environmental criteria in accordance with OD 4.01 (see Item 1).</p> <p>It was acceptable practice under OD 4.01 in 1997 to incorporate the results of the EIA of LBOD into the DSEA. Decision making during the</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>less informed, and more <i>ad hoc</i>. As a consequence, the Bank and the Project missed important opportunities to address concerns raised by Requesters, and to consider providing compensation for harms that could not otherwise be mitigated. This did not comply with OD 4.01.</p> <p>With the collapse of sections of the LBOD system, environmental and social conditions in southern Sindh have worsened. There is presently the growing prospect of profound and irreversible harms to the biological integrity of the dhands and, by extension, the livelihoods of the people and villages who depend on them. The basic Project environmental documentation, however, fails to provide an adequate basis to assess alternatives to address this situation, reduce impacts, and restore damaged ecological systems and livelihoods. The failure to carry out an appropriate Category A EA for the newly finalized DMP is of particular concern in this regard.</p> <p>The Panel notes, at the same time, the significant efforts to support institutional and policy reforms, the attention to environmental issues in implementation, and the use of independent Panels of Experts to review Project documents. The Panel also commends Management for putting a focus on the urgent need to make progress on environmental management and monitoring plans, and for the recently initiated study of socio-economic conditions in the coastal areas of Badin and Thatta Districts and related follow up. The records suggest, moreover, that investment was scaled-back compared to original plan, at least in part due to changing conditions on the ground and related environmental concerns. The Panel finds that Management has taken important steps to adjust the NDP Project trajectory during implementation to address potential environmental harms</p>		<p>project carefully considered environmental impacts of the project. On the process for assessment and mitigation of social impacts in NDP, see Item 13. See also Item 17 on assistance provided to affected people.</p> <p>The POEs for NSDS, DMP, LBOD Outfall System as well as the environmental studies undertaken concluded that flood damages in the lower Badin area could not be attributed to the failure of the Cholri Weir or breaches in the TL and that the overall dynamic transformation of the Indus Delta had an important role in this regard. The Bank financed a POE in 2005 to review environmental flows required for the Indus Delta, which is under continuous stress from episodes of drought, floods, cyclones and earthquakes.</p> <p>For DMP, see also Items 2 and 19.</p> <p>Management notes the Panel's acknowledgement of adjustments made in the project scope during implementation to reflect changing conditions on the ground and related environmental concerns.</p> <p>Action: See Item 1.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
Natural Habitats, OP 4.04			
23.	<p>The Dhands</p> <p>Project focused on ensuring evacuation of LBOD effluents, and paid little attention to impacts on, or means to rehabilitate, dhands as a habitat and ecosystem. This was not consistent with OP 4.04.</p>	346	<p>Comment: The LBOD design paid due attention to impacts on dhands as a habitat and ecosystem. The 1989 LBOD EIA examined in detail potential impacts on: (a) the dhands; (b) the saline mudflats between the dhands and the outfall point; (c) the tidal creeks and mudflats; and (d) the mangroves. In particular, the EIA described the fish and bird populations of the dhands, noting that, “the dhand system therefore represents an extremely important winter feeding ground.” The EIA identified a number of potentially significant impacts of the LBOD on the dhands, and concluded that: “[p]revention or limiting of drainage of the dhands requires a degree of hydraulic isolation of the TL as it passes Pateji and Cholri dhands.”</p> <p>The Cholri Weir was designed and built primarily to regulate flow between the TL and the dhands, consistent with the requirements of OP 4.04. See also comments under Item 13.</p> <p>The DSEA prepared for the NDP Project design recognized the importance of wetlands (SAR, Section 4.19) and included a process of environmental screening and assessment to take into consideration impacts on natural habitats. The DSEA noted that an EIA had been prepared for LBOD, and with the planned construction of the Cholri Weir, no significant environmental impacts were anticipated.</p> <p>Following the collapse of the Cholri Weir in 1999, the Tidal Link Fact Finding mission of 2001 recommended systemic collection of information not only on the hydraulic functioning of the outfall system but also on environmental and social data to help understand this dynamic and complex environment.</p> <p>Action: See Item 1.</p>
24.	<p>The Ramsar Convention and Ramsar Sites</p> <p>Negative effects on dhands amount to a “<i>significant conversion or degradation</i>” within meaning of OP 4.04.</p> <p>Although difficult to separate impacts of LBOD system from NDP Project, evidence indicates the two, in combination, have contributed to significant adverse impacts on internationally recognized sites.</p> <p>Project did not adequately consider risks of further degradation of critical natural habitat Jubho Lagoon. This is not consistent with OP 4.04. In light of further work on the LBOD system, and in planning for implementation of DMP, it will be crucial for Management to be aware that other critical natural habitats in region are under a similar threat, including Rann of Kutch</p>	354, 356-357	<p>Comment: Management recognizes the importance of the Rann of Kutch, Nurri and Jubho lagoons as Ramsar sites, as mentioned in the Kotri Basin DMP report.</p> <p>The NDP Project has not supported investments that directly affect the two dhands designated as Ramsar sites or any other sensitive wetland areas.</p> <p>The 1989 LBOD EIA noted that the Siberia-Kazakhstan-Indus Valley route is recognized as one of six major world migration routes by IUCN and the International Waterfowl Research Bureau (IWRB), and that at the request of IWRB, the GOS had assumed administrative responsibility for the route in Pakistani territory. The EIA also reported that the GOP had ratified the Ramsar Convention on Wetlands of International Importance, and had designated Kinjhad, Haleji and Drigh Lakes as reserve areas. While the dhands had not been recognized as being of equal importance at the time of preparation of the EIA, the report stated that “...it is important to preserve wetland areas wherever this is reasonably possible, and any practicable means of limiting the effects of the TL on the area of the dhands should be considered.”</p> <p>Nurri (2,540 ha in Fuleli Guni Drain) and Jubho (700 ha Mehro Dhand) Lagoons were designated as Ramsar sites in October 2001, about four years after the NDP Project was approved.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	and Nurri Lagoon.		Action: Management will continue to support strengthening the SIDA Environmental Management Unit (EMU).
25.	<p>Chotiari Reservoir</p> <p>Panel makes note that in the first Management Response, the issue was not raised.</p> <p>Bank withdrew from funding the Chotiari Reservoir following the Borrower's rejection of Framework for Land Acquisition and Resettlement (FLAR). Bank retained supervisory responsibility in relation to project. Taking into account Management's changing role, and potentially profound impacts on important and even possibly critical natural habitat in area affected by reservoir, Management continues responsibility to monitor activity and its effects on sensitive areas of natural habitat.</p>	365	<p>Comment: While the Chotiari Reservoir is mentioned in the NDP SAR, the Bank did not commit to finance it under the NDP Project. It was funded by another donor under the LBOD. In 1998, well before the GOP's rejection of the FLAR in April 2001, the GOP asked the Bank to finance construction of the Chotiari Reservoir under NDP, but the Bank declined because: (a) major contracts had been awarded without having followed Bank procurement guidelines; and (b) the implementation of the Chotiari Resettlement Action Plan (RAP) was not proceeding smoothly. However, because of the Bank's concern for the welfare of affected people, the Bank chose to retain supervision responsibility for RAP implementation, which continued until 2002 as a separate task, not under NDP. The remaining work on Chotiari was continued by the GOP under its Public Sector Development Program.</p> <p>Action: No actions proposed.</p>
26.	<p>Rehabilitation of Degraded Natural Habitat</p> <p>Project in combination with inter-related LBOD system have produced significant negative effects on natural habitats, including dhands. Bank did not meet provisions of OP 4.04 to take action not only to conserve, but also to rehabilitate, these habitats.</p>	369	<p>Comment: Two years after the approval of NDP, the Cholri Weir collapsed. This collapse exposed the dhands to a mixture of drainage, sea water and tidal influx leading to the range of environmental impacts anticipated in the 1989 LBOD EIA. The recommendations of the Tidal Link Fact Finding Mission were that no repairs be undertaken (as also recommended by the GOS's High-Level Technical Committee) for the following reasons: the outfall was properly evacuating flows, damage was beyond the limits of possible repair, and the channel was continuing to actively evolve.</p> <p>The 2005 Report of the POE on the Outfall System discusses a number of alternative measures that might contribute to the recovery of the dhands: (a) construction of a low embankment separating Cholri Dhand from Sanhro Dhand; (ii) diversion of additional water into Kotri canals and drains to the dhands; (iii) non-structural natural measures to attenuate the influence of the TL on the dhands. Because of the delicate nature of the dhands, detailed studies are required to meet the provisions of OP 4.04.</p> <p>As a part of the Action Plan, the Bank will undertake a socio-economic and environmental diagnostic study of the dhands similar to the socio-economic study of livelihoods in Badin and Thatta Districts. The new study will encompass both the current status and potential adverse impacts on the ecosystem and the fishery of the dhands; and assess the affects the TL breakdowns have had on the dhands, and on the people and livelihood systems in and near the dhands. The study will recommend both short- and longer-term actions that can be taken, including terms of reference (TOR) for further research and monitoring, and the use of such new data. The study will be carried out during the next dry season (to capture the status of migratory water fowl) and monsoon season; it will be undertaken in collaboration with the SIDA Environment Unit, and the provincial and national agencies who par-</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>ticipated in the initial inventory studies of the dhands in 1997. The aim will be to identify early opportunities to implement mitigation measures, ways in which the ongoing PPAF Livelihoods Program can be deployed to benefit the people in and near the dhands, and additional actions that could be taken by the GOS; and to provide important input into the larger planning studies under WSIP and the proposed Coastal and Indus Delta Development Program.</p> <p>Action: As part of the WSIP, the GOS will carry out studies for the rehabilitation of the dhands (see also Item 1).</p>
<p>Social Compliance – Tribal People in Bank-Financed Projects, OMS 2.34; Indigenous Peoples Policy, OD 4.20; Involuntary Resettlement, OD 4.30; Management of Cultural Property in Bank-Financed Projects, OPN 11.03</p>			
27.	<p>Tribal People in Bank-Financed Projects (OMS 2.34) and the LBOD Project</p> <p>Panel makes note that in the first Management Response, the issue was not raised.</p> <p>Mallah in Badin are not so distinct or separate – whether culturally, socially, or economically – to be considered tribal group under provisions of OMS 2.34 during preparation of LBOD project.</p>	407	<p>Comment: Management takes note of the Panel’s observation on the status of the Mallah community in regard to the applicability of OMS 2.34.</p> <p>Action: No action is proposed.</p>
28.	<p>Indigenous Peoples Policy (OD 4.20) and the NDP Project</p> <p>OD 4.20 criteria applied during the preparation of the NDP Project. The Panel notes that the criteria to identify indigenous peoples listed under OD 4.20 are more inclusive than those contained in the earlier OMS 2.34.</p> <p>Mallah seem to fit more, but not all, of the criteria of OD 4.20.</p> <p><i>Mohana</i> of Manchhar Lake who have migrated to Badin and Thatta appear to fit criteria of OD 4.20 more. The 1993 DSEA also mentions certain nomadic groups, likely referring to the <i>Kuchi</i> or the <i>Cholistani</i> nomads.</p> <p>Management did not initiate a process to determine whether NDP Project would affect any group of people which would qualify as indigenous peoples under OD 4.20. Management needed to consult with local anthropological and/or sociological experts to determine whether or not any of ethnic groups living within or near Project</p>	410, 412, 413	<p>Comment: Management takes note of the Panel’s conclusions that the Mallah do not satisfy all of the criteria specified in OD 4.20 on Indigenous Peoples.</p> <p>In accordance with the guidelines agreed in the NDP Project, all physical interventions had to meet strict environmental, technical and social criteria. Any new infrastructure interventions within the Project area would have been preceded by such analysis. Such studies would have identified applicability of OD 4.20 and prepared necessary documentation. However, no such interventions were proposed in Badin. See Item 15.</p> <p>The 1993 DSEA, Vol I, Section 4, highlighted concerns about the nomadic peoples’ needs and possible adverse impacts in terms of access to land for grazing purposes. The study also identified possible adverse impacts on the health of “herders” and “uplanders.”</p> <p>Action: Additional work is recommended, under the ongoing livelihood support program, to define the social profile of the population in Badin and Thatta districts, with an aim to identify specific nomadic and other vulnerable groups and issues and problems faced by them.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>area would qualify as indigenous peoples under OD 4.20. Failure to do so does not comply with OD 4.20. At least some of these groups may have required Indigenous Peoples Development Plan (IPDP) under OD 4.20 during Project preparation. Such document, or similar document, could have identified potential Project impacts on these people and set forth measures to mitigate risks and potential harm.</p>		
29.	<p>Cultural Property</p> <p>The Panel was not able to substantiate claims of Requesters that Project has affected cultural property. However, Management should have consulted with local archeological and historical experts to determine whether or not any sites of national, regional or local cultural heritage might be adversely affected by project. Such an expert assessment could have helped determine if any potentially important sites were threatened by waterlogging and salinity and, conversely, if sites might benefit from effective drainage.</p> <p>By not undertaking even a brief reconnaissance survey of cultural heritage in areas potentially affected by Project, and by <u>assuming</u> no important cultural sites would be adversely affected by project, Management did not comply with requirements of policy on Management of Cultural Property in Bank-Financed Projects, OPN 11.03.</p>	446, 444-445	<p>Comment: Management notes the observations by the Panel that the Project did not cause any adverse impact on cultural properties. Management also acknowledges that comprehensive field investigations to identify archeological and historical sites of national, regional and local importance should have been conducted and potential impacts assessed during project preparation.</p> <p>The 1993 DSEA did not attempt to locate all known sites of archeological importance, graveyards, ancient monuments, temples or other religious and secular buildings which might be at risk from high water tables within the study area. However, it did highlight concerns over serious hazards faced by the ancient city of Mohenjo Daro and suggested the need for drainage of such sites.</p> <p>The pre-feasibility study conducted for the NSDS (2002) covered archeological sites in Sindh including, among others, Buddhist stupas and fort in Mirpurkhas and the Shah Jehan Mosque at Thatta.</p> <p>Action: No further actions in this regard are recommended. However, investigations of cultural sites and appropriate measures to be taken will be incorporated in the ongoing studies for the Badin and Thatta districts and for any other initiatives proposed for coastal area development by the GOS.</p>
30.	<p>Involuntary Resettlement</p> <p>Project Induced Displacement. Panel considered whether Bank should reasonably have anticipated that Project could lead to such displacement. OD 4.30 would be applicable if appropriate risk analysis under Project indicates a significant possibility that Project will cause or substantially contribute to involuntary relocation.</p> <p>Panel recognizes that the Tidal Link</p>	483-487, 465, 471, 496, 495	<p>Comment: The loss of life and damages to property and ecosystems due to the 2003 storm were clearly a tragedy that has had deep impact on the poor communities of the area. It would be very difficult if not impossible to attribute the storm damages that occurred throughout Badin to the breaches in the TL. Because it is difficult to separate the natural flood flows from water coming from LBOD, one cannot conclude that the water spilling from the LBOD added significantly to the overall flooding in Badin, particularly in the absence of detailed topographical data, and detailed technical observations and data on the evolution of the flooding.</p> <p>Extensive damage and loss of livelihood was reported in many districts in Sindh well beyond the influence of LBOD (see Annex 8).</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>situation was in flux at appraisal, but signs of major risk were present. The Panel observes that the Bank, at appraisal, failed to identify emerging risks that LBOD/Tidal Link problems could lead to significant harms and even displacement of local people, even though the Project had plans to complete and expand LBOD.</p> <p>Just a few months after appraisal, in June 1998, a large section of the weir collapsed. The situation worsened with the near total collapse of the weir in the cyclone of 1999. The damage was widespread and included the loss of families and the deaths of many men, women and children. When 2001 Bank Fact-Finding Mission determined that repair of the weir and embankments was not feasible, Bank staff acknowledged “major risk” of loss of livelihood. Panel found no evidence, however, of planning for protective resettlement.</p> <p>Great risks faced by the people came to pass with the floods of 2003, and are ongoing. Bank failed to take the necessary actions under OD 4.30 to identify and prepare for the possibility of such displacement, and to assess the extent to which it has occurred.</p> <p>Given that NDP Project is closed, the Panel is concerned about what may be done to redress harms, protect against possible ongoing displacement and support livelihoods.</p> <p>Emergency Recovery Assistance. While the GOP requested Bank assistance for emergency repairs to the LBOD system, the Panel did not find evidence that Project funds were used to redress damages to the affected people, although such financing would have been available under OP 8.50. This is in contrast with the more than USD135 million transferred for relief from drought.</p> <p>Dislocation due to Land Acquisition for Civil Works. Aside from the unresolved issues of Chotiari Reservoir (see below), the Panel found no</p>		<p>The NDP Project did not consider “protective resettlement” of people at potential risk from cyclones and flooding in lower Badin. However, as pointed out earlier, NDP did not support extension of LBOD and did not contribute to increasing the drainage effluent.</p> <p>Management notes that appraisal of NDP was carried out in October 1995 at which time there were no apparent problems with the functioning of the TL.</p> <p>Given that natural calamities, poverty and livelihood issues affect the coastal areas of Sindh in general, and not only lower Badin, in 2005, the Bank supported a detailed livelihood diagnostic study and prepared a proposal for a livelihood improvement program now under implementation. See comments under Item 8.</p> <p>Emergency Recovery Assistance. In June 2004, when the Bank made NDP funds available for repair of damages to LBOD, KPOD and DPOD, it agreed to allow use of simplified procurement procedures (shopping instead of NCB procedures), in order to quickly award contracts for these repairs, given the urgency of the situation.</p> <p>As mentioned earlier (Item 17) DERA resources were used for drinking water supply and other local schemes in Badin and Thatta.</p> <p>Also as noted earlier (Item 8), the Government used its own resources to support mitigation measures after the 2003 floods. SIDA carried out emergency restoration works for the irrigation and drainage networks in the command area. In the outfall area, because of the remoteness and security conditions, most of the emergency repairs were carried out by the Pakistan Army Corps of Engineers.</p> <p>The Bank suggested that the GOS use project funds to mitigate “possible flood damages to affected people, livestock, farms and farm structures and to develop and implement non-structural mitigation measures...” (June 16, 2004 letter to the GOS). In response, the GOS informed the Bank that it already had relief measures in place under the grant funds provided by the Federal and State governments. The Bank requested the GOS to keep it informed on the compensation and other relief provided by the governments, and the GOS did so.</p> <p>Dislocation due to Land Acquisition. Management confirms that no land was acquired for any IDA funded NDP Project. Also as mentioned earlier, the GOP and WAPDA do not plan to extend LBOD (see Item 2).</p> <p>Framework for Land Acquisition and Resettlement (FLAR): Management acknowledges the Panel comments on the FLAR and the decision not to support sub-projects that require land acquisition or resettlement.</p> <p>Action: The Bank will support preparation of the Flood Management Plan including land use risk assessment, and issues regarding protective resettlement and displacement. See Item 7.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>evidence of dislocation of people due to civil works during the NDP Project. Assurances that the LBOD will not be extended are, however, met with skepticism.</p> <p>Framework for Land Acquisition and Resettlement (FLAR). FLAR is an appropriate document which was consistent with the requirements of OD 4.30. The preparation of the FLAR, the initial agreement with the Borrower, and its acceptance as part of Project appraisal, were consistent with Bank policy requirements. The Panel notes that following Borrower's rejection of FLAR, Management decided to withdraw funding from those Project components which, in its view, required resettlement. This was also consistent with OD 4.30.</p>		
31.	<p>Consultation and Community Participation</p> <p>During NDP Project implementation, Management insisted that Borrower abide by the condition that the agreed-to institutional reforms first be implemented before physical works could be carried out. The Panel notes that Management made efforts during NDP Project preparation to try to consult with and solicit the participation of a wide range of stakeholders and beneficiaries involved in this complex project covering much of the country.</p> <p>Within the boundaries of the pilot projects and the areas covered by effective FOs and AWBs, the NDP Project complied with Bank policies that require consultation and participation.</p> <p>The Panel identified, however, serious problems with consultation and participation for the people living downstream of LBOD, including those closest to the Tidal Link. Unfortunately, the people of southern Sindh, whose lives were already recognized as being affected by the Tidal Link, fell outside the field of vision of those who designed and appraised the Project.</p> <p>The Panel finds that an even more important consequence of this failure</p>	537, 535, 540-541	<p>Comment: As part of the DSEA preparation, field visits were made in all provinces, including Sindh, and consultations were carried out with landowners, laborers and veterinary field workers (Volume I, Section 4.2).</p> <p>The LBOD MTR Mission of June 1993 recommended establishment of a Directorate of Economic Coordination (DEC) to encourage public participation.</p> <p>As a national program, NDP was a vehicle to bring together concerned government agencies and nongovernmental and community-based organizations (NGOs/CBOs) in all provinces, including Sindh, for open and transparent discussions. During 1997-1998, the NDP Project facilitated engagement with NGOs throughout the country. In Sindh, consultations were held with a number of NGOs/intermediaries including Dharti Dost, Oxfam, Strengthening Participatory Organization (SPO); Sindh Agricultural and Forestry Workers Organization (SAF-WCO); IIMI (now IWMI-International Water Management Institute); Worldwide Fund For Nature (WWF); Trust For Voluntary Organizations (TVO); Non-Government Organization Resource Center (NGORC); Sindh Ngo Forum (SINGOF); International Union for the Conservation of Nature (IUCN); Sindh Goth Sudhar Sangath (SGSS), Water Users Federations, Thar Rural Development Program and others.</p> <p>In October 2002, for preparation of the NSDS pre-feasibility study, wide ranging consultations with communities were carried out, covering several districts of Punjab, Sindh and Balochistan, including Badin in Sindh.</p> <p>The Bank team also visited local communities in Badin and other areas. The team met with local community groups and farmers and obtained feedback. The team also interacted with local intermediary organizations in the field and invited them to join on these visits.</p> <p>In September 2003, the Task Team participated in a detailed review of</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
	<p>to implement the EMMP was an apparent lack of attention to the impacts of the structural failure of the Tidal Link on the local people at the tail end of the LBOD and KPOD, until the floods, death, and devastation of 2003.</p> <p>While the Bank complied with policy provisions on consultation and participation, with regard to the direct irrigation beneficiaries under the NDP, it did not comply with them with regard to those adversely affected by the drainage systems investments under the LBOD and the NDP.</p>		<p>the July 2003 floods as part of the Sindh On-farm appraisal mission. As a result of this meeting the Kotri Basin was proposed as a pilot case for the DMP.</p> <p>In March 2004, the Task Team Leader had a meeting with the Forum for Conflict Resolution and the Sindh Agricultural Forum. In September 2004, the POE of the DMP held stakeholder consultations in Badin and Hyderabad, which representatives of Action Aid attended. They also participated in the final workshop in Islamabad with the GOP and representatives of the provinces.</p> <p>In Sindh, all on-farm investments were/are being implemented through farmer participation. On water distribution issues, consultations were held with about 200 FOs, of which about half have taken on legal responsibility for operation and management of the tertiary irrigation system and for collection of water charges.</p> <p>In November 2004, a Stakeholder Consultative Workshop on the EMMP for LBOD was conducted and meetings were held with stakeholders at Bahadami Town near the TL in Badin. Management notes that the proposed AWB includes full stakeholder participation in water management including non-farming communities.</p> <p>Action: For the preparation of the proposed WSIP, extensive consultations have taken place and will take place in the three AWB included in the project.</p>
Bank Policy on Disclosure of Information, BP 17.50			
32.	<p>Disclosure of Information</p> <p>Management has acknowledged that the NDP Project did not comply with BP 17.50 with respect to disclosure of the EA, since 1993 DSEA was not disclosed in-country to affected stakeholders. The Panel notes this acknowledgement.</p> <p>Panel also observes that Management actively ensured that Project information was provided to farmer beneficiaries, but did not apply same efforts for other affected people in southern Sindh. This is not consistent with objectives of applicable Bank Policy on Disclosure of Information.</p> <p>Panel recognizes that information disclosure in region involves significant logistical difficulties. At same time, local people affected by Project face major obstacles in gaining access to Project-related information of vital significance to them.</p>	552-553	<p>Comment: Management agrees with the Panel's observations on information disclosure and also the difficulties involved with such a task.</p> <p>Action: See Item 31 and Section VI on lessons learned.</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
Supervision, OD 13.05			
33.	<p>Problem Identification and Corrective Measures</p> <p>The Panel recognizes complexities of supervision and follow up in a large-scale multi-donor effort such as LBOD. The Panel finds, nevertheless, that record of supervision indicates that one source of problems with Tidal Link was failure to give sufficient attention to technical problems that arose during its construction.</p> <p>From late 1998 until the Panel received the Request in September 2004, Management's supervision reports demonstrate inadequate concern for the socio-economic damage to the people in Badin and Thatta which resulted from the Tidal Link's failure, with the exception of the March 2001 Fact-Finding Mission. The Panel finds that lack of response to the failure of the Tidal Link does not comply with OD 13.05.</p> <p>Management was slow to visit site of the Tidal Link failure, and did not have a consistent approach to interacting with local population to understand and address social and environmental implications of this failure. Management's failure to consult with downstream affected people for over half a decade following breaches in Tidal Link is of great concern to Panel. This does not comply with OD 13.05.</p> <p>The Panel observes that Management failed to assign appropriate expertise for supervision of technical aspects of construction work. As a result, Management failed to identify serious flaws in design and implementation of Project, and to initiate corrective measures in a timely manner. This does not comply with OD 13.05.</p> <p>Despite recognition of the problems and attempts to find a solution, Management did not succeed in adequately addressing problems regarding the Tidal Link before its failure.</p>	565, 580, 567, 611, 586, 581, 591	<p>Comment: Management notes the Panel's recognition of the complexity of supervising multi-donor funded projects like LBOD (8 donors) and NDP (3 donors, 4 Provincial Governments, WAPDA and Federal Government).</p> <p>The NDP Project as such did not supervise the LBOD and TL structures because it was not part of its responsibility. LBOD closed in 1997, and Bank supervision of NDP began in 1998. Nevertheless, the Bank remained concerned about the social and environmental impact of the LBOD project and the extreme storm events that occurred in the Badin area and in southern Sindh. The Bank has tried to be responsive to these events and to address the various issues related to LBOD structures and impacts as they occurred through its sector dialogue with the federal and provincial governments.</p> <p>In 1998 when damage to the Cholri Weir first occurred, Management wrote a strong letter to the GOP advising quick action to prevent further damage and offering to support remedial work and a panel of experts using the NDP Project. In 2001, after the damage from the 1999 cyclone and the completion of the work of the GOS/GOP High-Level Technical Committee that assessed the damages and the way forward, the Bank sent a POE on a Fact Finding Mission to review the situation and advise the GOS on what could be done. After both the 1999 cyclone and the 2003 storm, the Bank offered to provide assistance to Sindh to support its emergency relief operations, and in 2003 offered the use of the ongoing DERA Project to restore damaged infrastructure. In 2005, after the GOS had been able to complete its damage assessment, and provincial and federal agencies had completed preliminary proposals on emergency and remedial works to be undertaken, the Bank sent another POE to review the status of LBOD and the many proposals received by the GOS for remedial action. Also in 2005 the Bank undertook a socio-economic assessment of livelihoods in the coastal areas of Badin and Thatta Districts to identify and prepare a livelihood support program.</p> <p>With regard to LBOD supervision, the GOP and GOS responded to the potential risks by placing their leading and most experienced technical organization, WAPDA, in charge of project design, construction and supervision on behalf of the Governments, and recruited a leading international consulting firm with experience in Sindh to design the system and supervise its construction as the "engineer." For the most difficult part of the design, the TL canal and Cholri Weir, physical model studies were carried out at the Delft Hydraulics Laboratory in the Netherlands, a global leader in this technology, and the leading physical modeling laboratory in Pakistan. The consultant also utilized state of the art mathematical modeling. The Bank exercised due diligence in its supervision of LBOD design and construction, ensuring that the work was conducted in a manner consistent with international standards and practice.</p> <p>While preparing this response, the Bank received a request from the Chief Minister of the GOS for additional actions to rehabilitate the people of the area and to provide a sustainable source of income in order to reduce the current level of poverty in lower Badin district. The</p>

No.	ISSUES / FINDINGS	Para No.	COMMENT / ACTION
			<p>Bank responded on August 17, 2006 to this request and offered to assist the GOS in implementing a comprehensive program aimed at minimizing risks from natural disasters in three interrelated areas: improving water resources management; developing and implementing a flood management plan for the left bank of the Indus River in southern Sindh; and tackling the socio-economic problems of the Indus Delta and the coastal areas.</p> <p>Actions: See Section VI on lessons learned.</p>
34.	<p>Conclusions</p> <p>Down-stream effects, including those on the local populations of southern Badin, did not feature in any significant way either in the design or supervision of the Project. To a very large degree, the damages suffered by people in the Project-affected areas have not been redressed, and many of the same conditions that led to these harms are still in place.</p> <p>The Panel notes that Bank has recently become engaged in preparing a Sindh Coastal Areas Development Program. If carried out successfully, this has the potential to bring some form of support to the areas and people affected by the events described in this Report.</p> <p>Panel also appreciates recent initial actions by the Government to address the structural problems causing harms to the affected population. Panel notes importance of implementing effectively actions addressing needs of affected populations.</p>	619, Exec Sum, 620-621	<p>Comment: Management remains concerned about adverse impacts on the livelihood of the affected population. Management has initiated several actions that are intended to improve conditions for those affected.</p> <p>Management recognizes the crucial importance of the Indus Delta in the sustainable development of water resources in Pakistan. The Left Bank AWB was included as part of NDP activities and the Kotri Basin was selected as the first pilot of the DMP. The Bank supported the Government in reviewing studies of water flows below Kotri to check sea water intrusion and address environmental concerns. The Bank has continuously provided resources to help define solutions to the outfall area of LBOD, including lower Badin.</p> <p>Management recognizes the need for poverty targeted interventions in the lower Badin area and notes that a livelihood program has been defined (see Annex 3 and Action Plan).</p> <p>Action: The Bank has taken the following actions:</p> <p>The Board has approved the Country Water Resources Assistance Strategy (CWRAS), which puts special emphasis on irrigation and drainage improvements in Sindh;</p> <p>The WSIP includes: (i) the implementation of the Kotri Basin drainage plan as part of DMP; (ii) the detailed studies and designs of remedial measures for the outfall system of LBOD; (iii) implementation of the flood management plan for the left bank of the Indus River in Sindh; (iv) strengthening of the Left Bank AWB and strong capacity building program for FOs and SIDA;</p> <p>The livelihood program is under operation: (i) PPAF livelihood actions with a total cost of USD18.0 million to benefit lower Badin and Thatta districts; USD2.0 million already approved; (ii) USD2.0 million from DERA for water supply and other livelihood interventions in the area; and (iii) Improvement of 1000 watercourses in Badin and Thatta districts; and</p> <p>Coastal development: (i) ADB Coastal Project currently in final stages of preparation; and (ii) preparation by the Bank of a comprehensive strategy to address the multiple and interrelated aspects of coastal zone development as acknowledged in the Panel's report.</p>

Annex 2

LBOD and NDP Project Description

Left Bank Outfall Drainage (LBOD)

1. **Project Objectives and Description.** The LBOD project was prepared over a four year period (1980-1984) and was approved by the International Development Association (IDA) Board in December 1984. The project was closed in December 1997 after a four year extension. The LBOD project had the following objectives: (a) provide surface drainage for about 516,000 ha of Cultivable Command Area (CCA); (b) provide sub-surface drainage relief for about 392,000 ha of CCA; and (c) transport excess water and salt out of the area, thus reversing deterioration of the land resource base due to waterlogging and salinity. It was the first stage of a large drainage program in Sindh that comprised a comprehensive drainage system including an outfall for saline drainage effluent to the Arabian Sea. Technical assistance was provided in the preparation of detailed designs and tender documents and the planning and supervision of construction. The project covered three districts: Nawabshah, Sanghar, and Mirpurkhas. It was the first such project to dispose of saline drainage effluent completely outside the area serviced. Both rural and urban areas benefited from surface drains extending to the sub-areas. The project also expanded irrigation in Sanghar and Mirpurkhas by increasing the capacity of the Nara and Jamrao Canals and by developing Chotiari Reservoir to regulate additional water available from the river (see detailed description below).

Project Components

2. The LBOD-Stage I project included the following works:

- *Spinal Drain System*
 - (a) Completion of main outfall drain; (b) Construction of a bifurcation weir at the junction of the Kadhan Pateji Outfall Drain (KPOD) and the Dhoro Puran Outfall Drain (DPOD) to limit the flow in DPOD to 57 cumecs (2,000 cusecs) and exclude all ultra-saline effluent; (c) Remodeling of DPOD to a capacity of 57 cumecs (2,000 cusecs); (d) Remodeling of KPOD to a capacity of 85 cumecs (3,000 cusecs) to carry drainage flows from the spinal drain and the existing Kotri drain; (e) Construction of an 85 cumec-capacity (3,000 cusecs) tidal link from Pateji Dhand to Shah Samando tidal creek; and, (f) Provision of maintenance equipment for both the upper and lower reaches of LBOD-Stage I, and the construction of workshops and depots at Khoski and Mirpurkhas.
- *Drainage Component*
 - (a) Construction of a surface drainage network covering about 578,000 ha of Gross Command Area (GCA); (b) Installation of about 1,400 drainage tubewells (TWs) of a capacity of 14-57 liters per second (l/s) (.5-2.0 cusecs) for sub-surface drainage of about 286,000 ha of CCA; (c) Subject to site-specific experimentation, installation of about 850 scavenger TWs of about 42 l/s-capacity (1.5 cusec) to provide sub-surface drainage of about 84,000 ha of CCA. About 70 per-

cent of the discharge would be fresh groundwater (FGW), which would be introduced into the irrigation system to supplement existing supplies; (d) Installation of interceptor drains, designed to recover about 30 percent of present seepage losses from 480 kilometers of major canals, and provision of about 160 pumping stations to lift the recovered fresh water to smaller canals and watercourses off-taking from the main canals; (e) Installation of a tile drainage system and associated pumping stations for sub-surface drainage of about 22,000 ha of CCA in the Mirpurkhas area; (f) Construction of about 4,400 kilometers of 11 kilovolt (kV) distribution line and enlargement of four grid stations (132/11 kV and 66/11 kV) to provide power for drainage TWs, scavenger TWs, and tile and interceptor drain pumping stations; and, (g) Provision of maintenance equipment for surface drains, TWs, pumps, tile and interceptor drains, and construction of workshops and depots at Nawabshah, Sanghar, and Mirpurkhas.

- *Irrigation Works*

(a) Remodeling of Nara Canal to increase the effective capacity from 365 cumecs (13,000 cusecs) to about 560 cumecs (20,000 cusecs); (b) Rehabilitation of the Jamrao Canal head works, construction of silt extractors, and remodeling of the Jamrao Canal network; (c) Construction of Chotiari Reservoir to provide essential storage of about 864 million m³ (700,000 acre feet), thus allowing regulation and use of part of the excess flow available in the Indus River; and, (d) Improvement of about 920 watercourses to standards established under ongoing On-Farm Water Management (OFWM) programs, including precision land levelling of about 26,000 ha of CCA.

- *Consulting Services and Training*

(a) Provision of approximately 878 man-months of internationally selected consulting services for overall project assistance; and up to 264 man-months of local consultants for assistance in OFWM, as required; and, (b) Provision of appropriate in-service and mid-career training programs for professional staff of agencies concerned with project implementation and subsequent O&M.

- *Monitoring and Evaluation (M&E)*

(a) A program to monitor the project's physical progress and the main physical (non-crop) parameters; and (b) Evaluation study to assess the project's impact.

Project Financing:

3. The project, estimated to cost about USD636 million at appraisal, was co-financed by the World Bank (IDA), Asian Development Bank (ADB), the Canadian International Development Agency (CIDA), the United Kingdom's Overseas Development Administration (ODA), the Saudi Fund for Development (SFD), the Swiss Development Cooperation (SDC), the Organization of Petroleum Exporting Countries Fund for Development (OPEC Fund) and the Islamic Development Bank. At completion, the total costs had risen to USD1.021 billion. Table A2.1 below summarizes the project financing plan. The agreed financing plan provided for parallel financing of most components; and joint financing for the OFWM, electrification (partial), technical assistance and training, and M&E components.

Table A2.1. LBOD STAGE I FINANCING PLAN (USD Million)

<i>Source</i>	<i>Total Cost Appraisal</i>	<i>% of Total Cost</i>	<i>Total Cost Completion</i>	<i>% of Total Cost</i>
IDA	150.0	23.6	185.1	18.1
ADB	122.0	19.2	209.9	20.6
CIDA	37.5	5.9	11.9	1.2
ODA/DFID	35.6	5.6	35.6	3.5
SFD	52.0	8.2	63.8	6.2
IsDB	0.0	0	10	1.0
OPEC	10.0	1.6	10	1.0
SDC	10.0	1.6	15.5	1.5
Monitoring and Evaluation Trust Fund	0	0	5.3	0.5
GOP/GOS	218.6	34.3	473.9	46.4
Total	635.7	100.0	1,021.0	100.0

4. The LBOD project faced several major implementation hurdles. There were frequent and sometimes prolonged law and order episodes in the interior Sindh including the project area that led to construction delays and cost overruns. Widespread flooding in 1988, 1992 and 1994 delayed some contracts for several months at a time. The construction of the Chotiari Reservoir was also delayed at the request of the Bank to enable the GOS and the Bank to reach agreement on a Resettlement Action Plan (RAP) and thereafter the reservoir was redesigned to reduce displacement, conserve flora and fauna, protect grazing lands for nomadic pastoralists, and improve safety.

5. The project was rated satisfactory overall at the time of the Implementation Completion Report (ICR). The project expanded the area cultivated by reducing waterlogging and salinity and increasing cropping intensity and area cultivated. The project also provided flood relief even though it was not designed to carry storm runoff, and greatly reduced inundation time.

National Drainage Program Project (NDP)

6. **Background:** The NDP Project originated as a result of the new strategy for water resources development formulated by the GOP and IDA in 1994 (Pakistan Irrigation and Drainage: Issues and Options, March 1994) and other recommendations, including the Borrower's Water Sector Investment Planning Study, the Eighth Five-Year Plan (1993-1998) and lessons of experience from projects in Pakistan and the reform experience in Chile, Mexico, Turkey and elsewhere. The GOP and IDA commissioned a Drainage Sector Environmental Assessment (DSEA), which was completed in 1993, in response to the deterioration of drainage and environmental status of the Indus Basin Irrigation System. The lack of an effective drainage system for the Indus Basin Irrigation System was considered a princi-

pal threat to the sustainability of agriculture in the basin. In 1992, IDA had stopped all new lending to the sector pending formulation and agreement with the GOP on a new strategy. As part of the new direction, IDA and the GOP closed eight water related projects between fiscal years 1992 and 1994 and restructured a number of others. The Bank meeting on the Initial Executive Project Summary for the NDP Project was held in January 1994 and the Project was prepared over a period of almost four years. The project's complexity is dictated by its challenging context—the irrigation system of Pakistan is one of the largest integrated irrigation networks in the world.

7. The IDA Credit 2999-PAK for USD285 million for the NDP Project was approved by the Board of Executive Directors on November 4, 1997. Two legal agreements, both signed on December 16, 1997, pertain to the Project: the Development Credit Agreement between the Islamic Republic of Pakistan and IDA, and the Project Agreement among the Pakistan Water and Power Development Authority (WAPDA), the Provinces of Punjab, Sindh, North West Frontier and Balochistan and IDA. The project became effective on February 25, 1998. It was implemented by WAPDA and the Provinces of Punjab, Sindh, North West Frontier, and Balochistan on behalf of the Government of Pakistan (GOP).

8. **Project Objectives.** The NDP Project covered a six year time slice of the GOP's 25-year national irrigation and drainage program. It spanned all four provinces of Pakistan, with a total irrigated area of 18 million ha. The objective of the Project, as noted in the Staff Appraisal Report (SAR), was to improve the efficiency of the irrigation and drainage system in Pakistan, and ensure its sustainability, by: (a) establishing an appropriate policy environment and institutional framework, and strengthening the capacity of sector institutions (to carry out the first phase of policy and institutional reforms in the water sector); (b) improving sector policies and planning; (c) strengthening the technical foundations of and knowledge base on irrigation and drainage; and (d) improving the irrigation and drainage infrastructure network. While the NDP Project originally contemplated a solution such as the NSDS, the results of the pre-feasibility studies and reviews by two Panels of Experts (POEs) led to the preference for solutions other than the “drainage superhighway” concept in favor of local disposal options.

9. The NDP Project, which marked a departure from the old infrastructure emphasis, was deliberately “front-loaded” with an institutional and policy reform agenda and “back-loaded” with an investment program. Management sought to focus the dialogue on strengthening governance and transparency in the management of irrigation and drainage affairs—increasing community participation, strengthening environmental planning and management and improving water use efficiency. The institutional reforms were seen as critical to improving water management and therefore addressing problems of waterlogging and salinization. From the outset, it was seen as a complex intervention with a number of risks. The major risks emanated from the possible impact of the Project on existing power relationships and alliances in rural Pakistan, as was evidenced by the strong opposition of feudal interests and parts of the irrigation bureaucracy; such opposition included thwarting civil works, damaging infrastructure and illegally removing water, and discouraging farmers from paying water charges.

10. Relative to its stated objectives and program targets, the implementation performance of NDP remained more or less unsatisfactory and its outcomes were modest. However, many lessons were learned (about keeping what could otherwise become highly com-

plex projects focused on a few key objectives, and about the need for encouraging flexibility with different forms of sound institutional reform), and the centrality of the NDP objectives remain valid.

11. **Project Components.** The NDP Project had four components:

- *Sector Planning and Research* (USD25.7 million) providing capacity building and technical assistance for: (a) policy-oriented studies in irrigation and drainage; (b) sector planning studies; and (c) research, including major research programs, and small grants programs.
- *Institutional Reforms* (USD57.7 million) calling for institutional reforms to WAPDA's Water Wing, focusing on strategic reorientation, streamlining and restructuring, and capacity building and training. An institutional program aimed at decentralizing Provincial Irrigation Departments (PIDs) and converting them to semi-autonomous Provincial Irrigation and Drainage Authorities (PIDAs), and establishing semi-autonomous pilot Area Water Boards (AWBs) and bringing farmers into the decision making process at the tertiary end of the system through Farmers' Organizations (FOs).
- *Investment* (USD683.1 million) designed to improve drainage and water management infrastructure and protect wetlands. Sub-projects are focused on rehabilitation, construction and improvement of on- and off-farm drainage; rehabilitation and modernization of irrigation systems; and operation and maintenance through performance-based contracts awarded to the private sector, including completion of some carry over projects from LBOD Stage I.
- *Program Coordination and Supervision* (USD18.5 million) which supports overall program coordination and monitoring, comprising the Federal Project Steering Committee, which is chaired by the Secretary of the Ministry of Water and Power of the Borrower; the Federal Irrigation and Drainage Cell (FIDC) in the Ministry of Water and Power; and WAPDA and Provincial NDP Coordination Cells.

12. **Project Financing.** The NDP Project's estimated cost at appraisal was USD785 million, of which USD525 million was provided by several donors. IDA contributed USD285 million; the ADB provided USD140 million; and the Overseas Economic Cooperation Fund (OECF), later renamed to Japan Bank for International Cooperation (JBIC), provided USD100 million. Farmers, through FOs, were to contribute USD32.1 million and the GOP and the provinces the balance of USD227.9 million. Loan Agreements with ADB and OECF were signed on December 6, 1996 and March 31, 1997, respectively. Both these donors participated in the Project on the basis of parallel financing.

13. According to the understanding among the NDP donors, IDA financed institutional reforms, a part of the investment component in all provinces, all sector planning and research, technical assistance, and coordination and supervision costs. ADB provided parallel financing for the major part of the investments in Balochistan and NWFP, some in Sindh and environmental management monitoring and evaluation. JBIC provided parallel financing for most of the investment projects in Punjab and training and capacity building.

14. **Project Supervision.** From effectiveness in February 1998, the NDP Project was intensively supervised by a combination of headquarters and field staff and consultants. Task management was based in the field from January 2000 to August 2003; the co-task team leader was located in Islamabad. In addition to regular interactions with the Borrower and implementing agencies, there were ten full supervision missions. Supervision required above average costs because of the range of expertise required and the intensity of the effort, given the complexity of the Project. Except for fiscal year 2002, NDP Project supervision costs were a factor of 2-3 times the norm in the South Asia region (see Table A2.2 below):

Table A2.2. Comparative Supervision Costs NDP, SASAR, SAR (USD000)

	FY98	FY99	FY00	FY01	FY02	FY03	FY04
NDP	237	285	389	269	96	372	177
SASAR	97	108	131	94	69	131	70
SAR	79	110	135	87	60	79	63

SAR: South Asia Region; SASAR: South Asia Sector Unit - Agriculture and Rural Development

15. **Project Status.** The NDP Project was closed on December 31, 2004, the original closing date. JBIC agreed to a two-year extension to allow completion of a large canal remodeling sub-project it is supporting in Punjab. ADB also authorized an extension up to December 2006.

Annex 3

Livelihood Support Programs for Coastal Area of Badin District and Sindh

A. Overview

1. Badin District is part of the Lower Indus Plain formed by the alluvial deposits of the Indus River. The District has four talukas (sub-districts), of which two (Badin and Golarchi) are close to the coast and affected by the drainage systems that empty the effluent into the Arabian Sea. The district has a population of 1.33 million of which about 475,000 people (85,000 households) are estimated to live in the two coastal talukas. The rate of population growth in Badin is about 2.26 percent. According to the 1998 census, the total in-migrants constituted 2 percent of the total population in the district. However, there was no census data on the number of households that out-migrated from Badin. There is anecdotal evidence that a fair amount of out-migration has taken place and many of these have settled in the coastal areas of Karachi, particularly Ibrahim Haideri and Rehri. Interviews with coastal communities in these areas revealed that the out-migration trend had started fairly early and families have been leaving the district over the last forty years. These families are almost all from the fishing communities and they prefer to settle along the coast in Karachi where they can continue their age-old occupation of fishing.

2. **Vulnerability and Sources of Livelihood.** The coastal communities of Badin have suffered from recurring disasters, the most recent of which include a cyclone in 1999, drought in 2000, earthquake in 2001 and drought and floods in 2003; and, changes that have taken place in the flow of the Indus River (mainly due to allocation of water from three major rivers to India, based on the Indus Treaty, and the construction of major dams and barrages upstream) in the last half century. Moreover, the communities suffer from inequity in land asset ownership and water distribution, which appears to be much worse here compared to other parts of the province. More than 80 percent of the land is owned by only 9 percent of the households in Badin District. Furthermore, over 65 percent of the rural households are landless and more than fifty percent are tenants who work on a share cropping basis. Entitlement to water is based on entitlement to land and, therefore, the landless and the tenants have no entitlement to water for crop or livestock farming.

3. In the past, these coastal communities used to rely on multiple sources of income depending on household resource ownership. While fishing formed a major part of their livelihoods, crop and livestock farming were also important sources of income. With the decrease in the fresh water flows to the Indus Delta, salinity levels increased, thus forcing the communities to reduce dependence on crops and livestock farming and to rely more on fishing. Unfortunately, the fisheries sector is organized in such a way that small fisherfolk can hardly make a living from this activities. Data on income of households surveyed by the World Bank study team towards the end of 2004 shows that 27 percent of the households were earning less than PRs. 1,000 per month (USD0.55 per day) and can be classified as extremely poor. About 75 percent of the households were earning less than PRs. 4,000 per month (less than USD2.20 per day) and also fall below the poverty line for Pakistan (PRs. 6,954).

4. **Socio-Economic Profile.** In terms of the socio-economic profile of the district, adult literacy is estimated at less than 30 percent and only 21 percent of the population has schooling between 1 to 5 years. The few schools present are run-down, without teachers and teaching materials. The situation in the health sector is dire. There is a high incidence of infant and maternal deaths. The household survey conducted in 2004 revealed that 54 percent of the households reported fever or some minor ailment two weeks before the interview. Health facilities are limited and, where they exist, are in disrepair. Sanctioned staff strength in health facilities is not all in place and many of the staff positions are vacant. Even where staff is allocated, there is a high degree of absenteeism and lack of medicines and supplies. The population per doctor is estimated at 5,428 persons and there is one hospital for every 240,020 persons and one bed for 7,776 patients.

5. **Physical Infrastructure.** The housing situation is dismal in these two talukas. While the occupants own a large majority of the houses, many do not own the land on which they are constructed. As a result, most have a makeshift appearance. The World Bank survey of 2004 shows that two-thirds of the housing units were constructed with wood and bamboo and 82 percent were one room houses. There is great pressure on the existing housing infrastructure judging by the persons per room and household size. Natural disasters have further eroded the housing stock in the area and a large number of homes were destroyed as a result of the cyclone and floods. Hand pumps, wells and ponds are used as a source of drinking water outside the housing units. About 16 percent use outside ponds for fetching water and 6 percent of housing units use dug wells. Only 26 percent of the people included in the survey had access to water supply from within the village. Of the remaining households interviewed, 44 percent had access to water within 5 kilometers of the village while the rest did not have a source within 10 kilometers. In some areas drinking water is purchased at a high cost from private tankers. Electricity is available to about one-third of the housing units and kerosene oil is used in over 70 percent of the dwellings. It is estimated that more than 80 percent of the housing units use wood as cooking fuel. Only about one-third of the residents have a separate sanitation facility and those without a proper latrine facility use adjacent rural environs. There are few all weather roads connecting the communities to both headquarters of the talukas and the District. Postal and telephone services are few and unavailable for the majority of the population.

6. It is important to note that the communities in the coastal areas of Badin are the poorest of the poor in Pakistan. There are several factors that have contributed to this situation. It is apparent that risk mitigation measures from World Bank supported projects may not have been as effective as anticipated, but the underlying causes of the problems faced by the people are complex and beyond the projects supported by the Bank. Attributing the problems to LBOD or NDP not only is simplification of the challenges, but may not help in addressing the issue in a comprehensive and sustainable way.

B. Government and Donor Actions

7. The GOP, through its Five Year Development Plans, Annual Development Programs and emergency assistance programs, has tried to address the root causes of poverty and backwardness in this district. In response to the natural disasters of the last few years, the government has provided funds for relief operations, waived land taxes, postponed the recovery of loans, provided subsidized wheat, and mobilized medical and veterinary teams to the areas. A wide range of short- and medium-term measures, such as the construction of roads, installation of pipeline wa-

ter schemes, electrification and public work programs, was implemented. However, these measures are not enough relative to the challenges of development in this area.

8. Many donors have also responded to the emergencies and provided relief measures. There are a large number of NGOs working in Badin. These organizations have all types of orientations ranging from relief and rehabilitation to livelihoods improvement, advocacy and infrastructure provision. The capacity of these local NGOs to undertake sustainable development programs is generally limited. They work on a small scale and generally do not have strategies that are likely to contribute to sustainable increases in incomes or livelihoods.

C. World Bank Actions

9. The World Bank provided assistance to Badin District through IDA financed federal and provincial projects. The most recent were the Drought Emergency Recovery Assistance (DERA), On-Farm Water Management Project (OFWMP) and Pakistan Poverty Alleviation Fund (PPAF). After the Request for inspection was received, Management, in addition to the response to the Requesters' claims, promised to carry out a socio-economic (diagnostic) study focused on livelihood improvement in the coastal areas and the study was completed in April 2005.

10. **Study Recommendations.** The report highlights the social and economic impact of the natural disasters that hit the coastal areas at different times, spanning a period of about a decade; identifies the most vulnerable segments of the population; explores their coping strategies and, recommends program of assistance that are appropriate to mitigate the combined effects of the disasters. These include: (i) better access to basic services and facilitating infrastructure; (ii) higher income generation through improved crop, fisheries and livestock production, marketing and micro-finance services; (iii) secure access to, and better management of the coastal area natural resources; (iv) viable community organizations that can operate in partnership with the public and private sector and NGOs; and, (v) improved access to high quality education, information, training and better nutrition and health.

11. **Implementation.** Management considered several alternatives for implementing the recommendations of the socio-economic study and is pursuing the following actions to mitigate the situation in the coastal areas.

- **PPAF.** Management determined that implementing the recommendations of the study through the ongoing Bank supported PPAF project would be more effective than many of the other options considered, since PPAF already has a presence on the ground and is working with partner organizations (POs) in these areas. Thus, interventions can be implemented quickly, avoiding some of the lengthy processes that would otherwise have to be followed within the government or the Bank. The Bank and PPAF management discussed the implementation of the recommendations of the study at length and PPAF agreed to assist in spite of the fact that its funds are largely committed for its on-going activities. PPAF has agreed to scale up its activities in the coastal areas and took immediate action by soliciting proposals from existing and potential new partners, appraising the proposals, and submitting them to its Board for approval. On July 4, 2006, the PPAF Board approved the first phase of the POs' proposed interventions of USD2.0 million, out of the PPAF estimated cost of USD18.0 million needed for the coastal areas over the next three years. The POs are now making the necessary preparations to launch their projects in the respective communities. The broad areas of interventions identified by the POs and that will be funded under

PPAF include, community physical infrastructure projects such as water supply, roads, rural electrification and irrigation, as well as social services provision and rehabilitation of the ecosystem – education and health services and agricultural extension services provision, and mangrove rehabilitation, among others (see Attachment 1 for details of proposals approved by PPAF Board).

- **Sindh OFWMP.** The GOP is implementing a National Program for Improvement of Watercourses (NPIW). This is an initiative to solve the problem of scarcity of irrigation water through conservation. It aims at lining of 40,000 watercourses in Sindh Province, of which about 5,160 (13 percent) are in Badin and 5,410 (13.5 percent) are in Thatta, at a total cost of PRs. 26 billion. Of the improved watercourses in the province, only 5 percent are found in these two districts, illustrating that in spite of the large number of watercourses, the two coastal districts have not benefited from public investment programs for watercourse improvement in the past and much remains to be done. The Bank-supported SOFWM Project is contributing to the government effort in this regard by financing the improvement of 4,000 watercourses. The project has been recently mainstreamed with the NPIW and is, thus, contributing to watercourse improvement in Badin and Thatta districts. Through the regular implementation review process the Bank will ensure that irrigation infrastructure at the tertiary level is improved and that water used for drinking, agriculture and livestock reaches the coastal communities at the tail end of the system.
- **DERA.** In 2001, due to severe drought conditions in the country, the GOP requested IDA to re-allocate USD100 million from the NDP Credit and USD30 million from the Second Social Action Project Credit towards the Government's drought emergency assistance program. The Bank agreed to the proposal and a total of USD130 million was re-allocated from the two projects towards DERA. The objective of DERA was to help alleviate the macroeconomic impact of the drought and to assist the GOP to alleviate the impact of the drought by restoring and improving productive capacity, livelihoods and incomes of people severely impacted by drought. The first objective is pursued through a quick-disbursing component at an estimated cost of USD90 million, which provides support for imports necessary to restore productive capacity lost/reduced by drought conditions, including animal vaccines, agricultural and water sector equipment and inputs, petroleum and fuel products and, seed and fertilizer. The second objective is pursued through investments aimed at drought rehabilitation. The allocation for this component is USD36.5 million, of which USD14 million was allocated for Sindh Province.

Out of the Sindh allocation, the share of Badin and Thatta districts was about USD2.0 million and was mainly used for the construction of rural roads and provision of drinking water supply, thus meeting the immediate needs of the communities in this area. This project closed in December 2004.

- **ADB Coastal Development Project.** The Bank is closely collaborating with the ADB in the formulation and implementation of a coastal areas livelihood support project for Sindh Province. The ADB initiated project formulation for the coastal area of Badin and Thatta Districts at the beginning of 2005. The project will cover eight coastal talukas that are identified under the socio-economic study. The project has

two major components. First, a community development component, to provide benefits directly to the most vulnerable communities - livestock development interventions; social uplift interventions facilitated through small grants; provision of basic services such as small-scale infrastructure, health, education and skills development; and interventions to rehabilitate the ecology; and second, an institutional development component. It is expected that Bank intervention through the PPAF will bridge a critical gap and provide valuable lessons for implementing the bigger ADB project. The ADB project is expected to go to its Board in October 2006 and a preliminary cost estimate is USD38.0 million.

12. **Next Steps.** Management will work with PPAF management to implement the proposals approved by the Board, as well as with the POs to assist the implementation of community interventions. Providing the necessary additional finance for PPAF for the implementation of this initiative is critical and management should reach a decision soon. Through regular supervision of the OFWMP, watercourses in the coastal areas as well as water use efficiency will be improved. The collaboration with ADB in the implementation of coastal development initiatives will be further strengthened. The experiences of the PPAF will be shared with ADB to ensure consistency and create synergy. Duplication of efforts will be avoided through coordination.

Pakistan Poverty Alleviation Fund (PPAF)
Consolidated Project Appraisal Report For
Coastal Areas of Sindh Approved by
PPAF Board
(Phase One: 2006-2008)

1. Names of Partner Organizations (POs):

Existing

1. National Rural Support Program (NRSP)
2. Strengthening Participatory Organization (SPO)
3. Aga Khan Planning and Building Services (AKPBS)
4. Indus Earth Trust (IET)
5. Society for Conservation and Protection of Environment (SCOPE)

New

6. Health and Nutrition Development Society (HANDS)
7. Badin Rural Development Society (BRDS)

Nature of Financing:

- Micro Credit
 Community Physical Infrastructure
 Capacity Building

2. Cost Estimate (Million Rupees)

Description	Existing POs					New POs		Total
	NRSP	SPO	AKPBS	IET	SCOPE	HANDS	BRDS	
Community Physical Infrastructure (CPI)								
CPI Cost	48.110	15.525	21.408	5.680	5.804	3.120	3.132	102.779
Operational Cost	4.530	1.806	2.038	0.154	0.567	0.382	0.384	9.861
Capital Items Cost	0.840	0.405	0.526	0.672	0.129	0.085	0.085	2.742
Total CPI Grant	53.480	17.736	23.972	6.506	6.500	3.587	3.601	115.382
Capacity Building								
Staff Training						0.137	0.260	0.397
Community Training						0.565	0.340	0.905
Total CB Grant						0.702	0.600	1.302
Period	24 months	18 months	18 months	12 months	12 months	12 months	12 months	

3. Beneficiaries:

POs	Districts	Projects	Villages	COs	BHH	Bene.
NRSP	Badin	83	20	83	3320	21580
SPO	Thatta	25	15	25	1000	6500
AKPBS	Thatta	43	35	46	1500	12000
IET	Karachi west	10	10	11	640	5120
SCOPE	Malir	27	22	27	1080	8640
HANDS	Karachi East	14	12	14	630	5040
BRDS	Badin	15	15	15	670	5400
Total		217	129	221	8,840	64,280

4. Implementation Arrangement

The World Bank carried out a socio-economic study of the coastal areas of Badin and Thatta in Sindh Province. The report highlights the social and economic impact of the natural disasters that hit the coastal areas at different times, spanning a period of about a decade; identifies the most vulnerable segments of the populations; explores their coping strategies and, recommends Program of assistance that are appropriate to mitigate the combined effects of the disasters.

After weighing several alternative implementation arrangements, the World Bank decided to implement the Program through the PPAF. This option was found more attractive than the rest because it was felt that the interventions can be implemented quickly. The PPAF already had a presence on the ground and was working with a number of Partner Organizations in the affected areas. Moreover, this option was preferred because it avoids the lengthy process of reallocating funds from one project to another and the bureaucratic processes all other options entail.

Following the above, the World Bank and PPAF management discussed the role the PPAF can play to implement the Program and what can possibly be done in the short term and, what could be needed to engage the communities in the effort to remove social, economic and infrastructure development constraints.

The Bank and PPAF also made an extra effort to intimately study the plight of the coastal communities through social immersion, which involved the team members spending approximately two days and two nights resident in the homes of the fishermen, learning what challenges they face and, what they hope to achieve through the Program. During the September 2005 supervision, a PPAF – World Bank immersion team spent 3 days and 2 nights in villages in Badin and Thatta to experience the lives of ‘the poorest of the poor’ – people with no/little access to even the most basic facilities. The second immersion took place in the first week of May 2006, when a team, including PPAF and POs and the World Bank staff, spent three days in the coastal villages of Thatta and Karachi West. The intensive interaction with the poor fishermen communities helped the participants refine and improve strategies for assisting these communities come out of the poverty trap.

5. Outreach

In terms of actual presence in the coastal areas, the PPAF has already been working with a number of POs. Aga Khan Planning and Building Services is implementing an integrated area upgrading program in Thatta, Indus Earth Trust (IET) is working in Karachi West, and the Society for Conservation and Protection of Environment (SCOPE) is active in the Malir district. Although not specifically working with the fishermen communities, NRSP has a strong presence in the coastal districts of Badin and Thatta, and has expressed willingness to encompass coastal settlements.

With a view to deepen its outreach in the coastal belt, the PPAF has identified two highly regarded civil society organizations with a track record of consistently high performance in the coastal areas of Badin, Thatta and Karachi East. They include: Badin Rural Development Society (BRDS) and Health and Nutrition Development Society (HANDS). Following extensive interaction during roundtables at Islamabad and Karachi, and based on detailed desk and field appraisals, these organizations are being recommended to be taken as POs with a mandate to work in sea water intrusion affected and coastal areas *talukas* of Badin and Karachi East.

6. Strategic Framework

Based on the findings of the World Bank Socio-economic Study, extensive social immersions, roundtable discussions with various stakeholders, and deliberations among the PPAF – World Bank team, the Sindh Coastal Areas Development Program has been envisioned to aim at integrating these areas with the National space and economy. This is proposed to be achieved through the implementation of a multi-pronged strategy, involving:

- Development of rural growth centers through integrated development of physical infrastructure, followed by setting up of health and education facilities and promotion of income generating activities through micro-credit;
- Reducing physical vulnerability, through the construction of flood protection and sea water containment structures;
- Construction of directly productive infrastructure, such as jetties and wharfs;
- Developing transport and mobility, through the construction of inter and intra-village roads and intermediate modes of transport through infrastructure grants and micro-credit; and
- Promoting technological innovations, particularly the use of solar and wind energy for pumping of water and generation of electricity.

7. Costing and Phasing

The Coastal Areas Development Program has been planned to be implemented over a period of 5 years, (2006 – 11). The CPI component of the Program has been estimated to cost USD18.0 million. Other components will include capacity building, micro-finance, health and education.

The Program has been planned to be implemented in two phases. Phase one will be of two years duration (2006-2008) and will involve a CPI grant outlay of USD6.0 million, whereas Phase two (2008-11) will be of three years duration and provide for an outlay of USD12.0

million. Each phase will in turn consist of various overlapping stages, each of which will be built on the lessons learnt and progress achieved during the previous stage. This consolidated appraisal report relates to Stage-I of Phase One and is envisioned to be overlapped by a follow-up stage of one year (2007-08) duration.

8. Recommendations of the Credit Committee

With a view to help improve the quality of life of the poverty stricken people of the area, an amount of Rs. 115.382 million for implementing 217 CPI projects in the coastal /sea water intrusion affected talukas of the districts of Badin, Thatta, Karachi East, Karachi West and Malin. Also recommended is a capacity building grant of Rs. 1.302 million for the two new POs. The inter-PO apportionment of the amounts recommended will be in accordance with the limits reproduced below.

Description	Existing POs					New POs		Total
	NRSP	SPO	AKPBS	IET	SCOPE	HANDS	BRDS	
Community Physical Infrastructure (CPI)								
CPI Cost	48.110	15.525	21.408	5.680	5.804	3.120	3.132	102.779
Operational Cost	4.530	1.806	2.038	0.154	0.567	0.382	0.384	9.861
Capital Items Cost	0.840	0.405	0.526	0.672	0.129	0.085	0.085	2.742
Total CPI Grant	53.480	17.736	23.972	6.506	6.500	3.587	3.601	115.382
Capacity Building								
Staff Training						0.137	0.260	0.397
Community Training						0.565	0.340	0.905
Total CB Grant						0.702	0.600	1.302
Period	24 months	18 months	18 months	12 months	12 months	12 months	12 months	

Annex 4

Review of Performance of Left Bank Outfall Drain Stage I (KPOD, DPOD, Tidal Link and Cholri Weir)

Report of the World Bank International Panel of Experts

Executive Summary

1. The Left Bank Outfall Drain (LBOD) Stage I project was executed during 1984-1997 to relieve waterlogging and salinity in 1.27 million acres in Mirpurkhas, Sanghar, and Nawabshah Districts. The project included a Tidal Link canal to carry the saline drainage effluent from a spinal drain 42 kilometers across the coastal zone to the Arabian Sea in view of the international and environmental dimensions of the Rann of Kutch. Soon after completion some of the banks and weir structures in the Tidal Link failed mainly because of the silty loam material of the soil in the area used in the construction which is highly sensitive to flow velocity which scoured the bed and breached the embankments. In 2001 a WB fact finding mission concurred with the government that the damages were beyond repair. In July 2003 storms resulted in extensive damages and losses in the Lower Badin District in the vicinity of LBOD which galvanized the Government of Pakistan (GOP) and the population in the Badin District to find and implement a solution to this problem.

2. The World Bank organized a mission in March 2005 to review the present conditions at the outfall and identify the possible alternatives to mitigate the damages and secure the benefits of LBOD. The mission concluded that the Tidal Link carried a flow at least two times the design discharge of 4,400 cusecs during the floods of July 2003. A combination of factors that caused damages and losses in the lower basin were identified by the mission: (a) the storm that affected the area combined with a typhoon and sea high tide; (b) water coming to the area from the irrigation canals and irrigation refusals; (c) breaches occurred in the upper LBOD basin; (d) lack of maintenance in the LBOD system; and (e) institutional weakness and lack of preparedness for an emergency flood management. These conditions were not foreseen at design stage.

3. Sea water was not expected to penetrate more than 19 kilometers from its outlet upstream into the Tidal Link, to an area about 11 kilometers downstream of the Cholri Weir. At present both tidal fluctuations and sea water intrude into the dhands and Kadhan Pateji Outfall Drain (KPOD), and the drainage and environmental functions of the Tidal Link portion of the LBOD outlet are impaired. The result is that there is now an open connection between the dhands and the Tidal Link, exposing the dhands to tidal fluctuations, sea water intrusion, sedimentation, and excessive drainage during low tide. A small tidal creek type system of drainage channels has now developed in Cholri Dhand, which is closest to the Tidal Link. No tidal fluctuations are evident in Sanhro and Mehro Dhands.

4. During the July 2003 storm, Badin received 218 millimeters of rain and Nawabshah in the upper part of the LBOD basin received 191 millimeters. LBOD canals were overtopped and numerous breaches occurred, in part because farmers in the upper LBOD basin cutting the banks of the drains to hasten the drainage of rain water from their fields.

Equally important, the discharge into KPOD and the Tidal Link canal were more than twice the design discharge, resulting in severe scour of the Tidal Link canal as well as breaches in both its right and left embankments. As a result local people have felt the LBOD outfall scheme increase the vulnerability of their already fragile livelihood system.

5. The LBOD can now be described as a “new river” that is forming an estuary and is an integral part of creek formation into the coastal area. The Tidal Link has invited the sea to approach the land and now the tidal fluctuations are visible. This process will continue, and its progress is difficult to predict. Adapting to this new process requires continuous hydraulic and environmental monitoring in a ‘learning by doing’ approach.

6. The mission believes that the present actions taken by the Government, namely repairs to parts of the drainage system and lowering the Dhoro Puran Outfall Drain (DPOD) weir, are considered appropriate for those site conditions, but do not constitute a comprehensive solution. Other actions should be further analyzed before implementation.

7. The mission recommends a combination of “hard” structural measures and institutional “soft” actions to address these objectives. Most of the agencies concerned with some aspect of LBOD drains and the Tidal Link have undertaken missions to examine the conditions on the ground, and have made proposals, including so called immediate measures, to alleviate the situation. A comprehensive strategy or plan to solve the current problems has not yet been prepared, particularly a plan that would respond the wide range of challenges and objectives.

8. In view of the mission estimate that a 24 hrs storm event similar to that experienced in July 2003 has a 56 percent probability of occurring in a five-year period, the mission recommends to initiate the implementation of the institutional and structural following proposed actions:

- Develop and agree in a Flood Management Plan to compliment the emergency contingency plan proposed by the Badin DCO;
- Establish a professional O&M program for the main drains and outfall system;
- Implement the World Bank’s proposed concept for a the livelihoods relief and improvement program in the coastal areas of Badin and Thatta; and
- Re-design the outfall system, considering the alternative proposals identified by the mission to reduce the flood risk problems and the impact of the discharge of saline effluent.

9. The proposal to extend the drainage system by studying LBOD Stage II & III in light of the present outfall conditions of the outfall should be postponed until the existing problems are adequately address and solved. Moreover, the strategy to manage the storm drainage in the upper basin needs to be organized and tested. This approach would avoid aggravating or increasing social unrest, vulnerability and anxiety in the Badin District that might result from a decision to go ahead with premature studies at a time when people participation is most needed.

10. Given the complexity of the system and its present evolution and dynamics, the proposed physical interventions require continuous monitoring as a part of the learning by doing process, and the collection of data essential for adequate analysis of problems and

options. These studies and follow-up actions, if the Sindh Government agrees, will be included in the Sindh Water Sector Improvement Project (WSIP) presently in advanced stage of preparation.

11. Structural options. To facilitate discussion of the structural options presently available, the following diagram shows a schematic diagram of the LBOD outfall system including the basic elements of the system and the various options:

- “A” – Regulating structure at the junction of KPOD and the Tidal Link. Nearly everyone has a strong feeling that measures should be taken to prevent tidal fluctuations and sea water from entering KPOD. This would commonly be accomplished by construction of a gated regulator across KPOD. At high tide in the Tidal Link the gates would be closed to prevent intrusion into KPOD. At low tide, the gates would be opened to allow the water in KPOD to flow downstream into the Tidal Link canal. There are several considerations and issues that cast doubt on the viability of this option. First, a very large structure with many gates would be needed. The two abutments of the structure in this area appear to the mission to be weak with a significant risk that KPOD could erode a path around the structure. Second, the gates of such a structure would have to be operated with discipline for it to be both safe and effective, and present experience in Sindh suggests that this may not be possible. Third, measured data are not available as yet to show what the tidal amplitude and salinity are in the lower reaches of KPOD, and hence whether a structure is really needed and would provide substantial benefit commensurate with the high cost of such a structure. The mission believes that if further data collection and analysis demonstrates the need and value of such a structure, that it should be located well upstream of the junction of KPOD and the Tidal Link canal.
- “B” & “C” – Control structures at the bifurcation of the spinal drain. An uncontrolled weir was built in the Dhoro Link in the left bank of the spinal drain where it meets KPOD. The purpose of this structure was to allow a substantial portion of LBOD peak flows (2000 cfs out of 4400cfs) to be diverted through the Dhoro Link to the old Dhoro Puran River (referred to as DPOD) and thence to Shakoor Dhand.¹ As an immediate measure the weir crest has been lowered 2.5 feet, and the capacity of the Dhoro Link increased, to facilitate the diversion of a larger percentage of the peak flow of the spinal drain. The mission believes that the critical factor in the safety and security of the LBOD outfall system is the maximum discharge in KPOD, and that this should not exceed 5-6,000 cfs. Presently there is no data that would support assuming that a flow greater than about 2000 cfs can be diverted through the Dhoro Puran Link because of the downstream water levels in Shakoor Dhand and the condition of the Dhoro Puran River. Hence the maximum allowable flow in the spinal drain under these conditions would be about 7-8,000 cfs. If because of excess storm runoff upstream in the LBOD basin, the flow would be higher than this limit, escapes must be built into the left bank of the spinal drain to reduce

¹ In the LBOD design this was referred to as the diversion of freshwater (storm runoff) flowing in LBOD. However one would expect the flow—saline agricultural drainage water (base flow) and storm runoff—to be completely mixed by the time it reaches the diversion point, though the resulting salinity of the flow would certainly be lower than the base flow. The design was based on the operating assumption that the flow from all tubewells and tile drains would be stopped during a storm.

the discharge. These escaped flows could be routed to the upper portion of the ancient Dhoro Puran River so long as the tail water conditions of the Dhoro Puran Link were not worsened. The point where the spinal drain bifurcates is clearly a critical point in the LBOD outfall system. The mission believes that two gated structures are needed to ensure operating flexibility and the safety of KPOD. The first structure (“B”) would be located downstream of the bifurcation within the KPOD channel to enable strict control of the discharge in KPOD. The second structure (“C”) would be a gated structure in the Dhoro Puran Link replacing the present uncontrolled weir. The combination of these two control structure would provide maximum operating flexibility and control of LBOD flows. For example, not only would gated structure “B” ensure that the maximum flow in KPOD was below the limit, but at non peak times, the gates would permit significant flows to be sustained in the Dhoro Link helping to resuscitate the ancient Dhoro River and possibly improve groundwater and drinking water supplies in that area (flow simulations would need to be carried out and detailed water quality data would have to be available and analyzed to consider this possibility). Provision of uncontrolled escapes in the KPOD left bank, in addition to those mentioned above for the spinal drain, would enhance the safety of KPOD. In both the spinal drain and KPOD, the height of the top of the right bank must be at least 22 feet based on the mission’s estimate of the water surface profile at the point where the flow bifurcates.² This right bank must also be strengthened and all zones and points of weakness eliminated, especially around existing structures where drains enter the main canals.

- “D” & “E” – Measure to protect the Kotri Drains. The intrusion of tidal fluctuations and saline water into the small Kotri drains that flow into KPOD is a major concern of farmers in the eastern portion of Badin District (mainly in the Left Bank Canal sub-basin). Suggestions have been made to provide small gated regulators or tide gates near each of these drain inlets to prevent back flow into the drain at high tide in KPOD. Escapes could also be constructed in Serani drain to divert water into the waste land that separates this drain from the dhands in order to control the water level in these drains. The same approach might also be an attractive option in some of the other Kotri drains that outfall into KPOD if they are threatened by high water levels and there is similar waste land available. So far there is no data available to the mission that tidal fluctuations or sea water intrusion is a problem in the lower parts of these drains. If new data showed that the penetration of tidal fluctuations and sea water actually causes harm, then such structures may be a viable option. However there is another option. The mission noted that one of the main causes of increased salinity in the Dhands is the reduction of drain inflow, caused in part by the prolonged drought in the Indus River basin and the consequent reduction in the availability of irrigation water. Before the LBOD outfall system was constructed

² A preliminary estimation of water levels at DPOD and KPOD/Tidal Link channels was done using the HEC/RAS program from the US Corps of Engineers. The level at the DPOD/KPOD bifurcation was calculated assuming a common tide level at the discharge of both channels. Results suggest an embankments level of about 22 ft around the fork. It should be noted that this is only a crude estimation of the levels, due to the fact that no topographical information in the zone around Dhoro Dhand, data on the precise conditions at the outfalls, or the discharge coming from upstream at the Dhoro Puran old river course was available. Also, discharge into Cholri and Pateji Dhands was not taken into account.

KPOD acted as a collector drain and carried these drain flows into Pateji Dhand. Diversion of the Kotri drains that enter (or all of them as before) towards Pateji Dhand, and possibly Mehro Dhand, would, if the salinity of these drains is generally lower than the present salinity of the Dhands, contribute significantly to their improvement. A sound analysis is needed to insure that this action will not evolve in the formation of a new creek.

- “F” - Control of Tidal Link access to the Dhands. One of the most important and complicated problems arises because of the open connection between the Tidal Link canal and the Dhands created when Cholri Weir was destroyed. The mission believes that reconstruction of the Cholri Weir, even based on a new design, should not be considered at this time in part because of the still active scour and erosion processes ongoing in the Tidal Link. Recent remote sensing studies carried out by SUPARCO on behalf of WAPDA suggest that the main effect of the open connection appears to be the sedimentation of Cholri Dhand and the formation of a tidal creek within this dhand that facilitates its rapid drainage at low tide. No data or evidence has so far come to light that these tidal and sediment effects have extended further into Sanhro and Mehro Dhands where two Ramsar sites exist (Pateji Dhands is isolated from the other three dhands by low silt barriers). Not enough is known about the overall water and salinity balance of the dhands to say at this point which are the dominate causes of the high salinity although it seems sure that sea water intrusion from the Tidal Link has contributed significantly. Nor can one say for sure whether recovery of normal drain flows from Karo and Fuleli drains combined with restoration of the inflow from the other Kotri drains would be sufficient to lower salinity in Sanhro and Mehro Dhands to levels similar to the past when it was a highly productive fishery and good waterfowl habitat. Those conditions were more brackish or estuarine with a maximum salinity of 20 ppt and a significant salinity gradient.

12. Other possible options to conserve and improve the dhand ecosystems. The mission discussed a number alternative measures that might contribute to the recovery of the dhands.

- First, one obvious option is to construct a low embankment or bund separating Cholri Dhand from Sanhro Dhand. The viability of this option might be questioned because of the likelihood of severe wave erosion, but low cost measures might be formulated to adequately protect the embankment. However, this option should be viewed as a serious step because it cuts off all opportunity for water to circulate between the dhands and it prevents the recruitment of juvenile fish, shrimp and other fauna. Moreover this option should not be chosen until the dynamic water balance and patterns of water movement within the dhand system are well known and a verified model of these dynamics can be used to assess the feasibility and impact of this option.
- Second, most experts and the mission agree that increased flow of brackish, relatively low salinity water into the dhands is the best restoration strategy assuming this would shift the water and salt balance toward a lower salinity environment, something that can be determined by a comprehensive monitoring program designed to provide the data needed to analyze the dynamic water quantity and quality

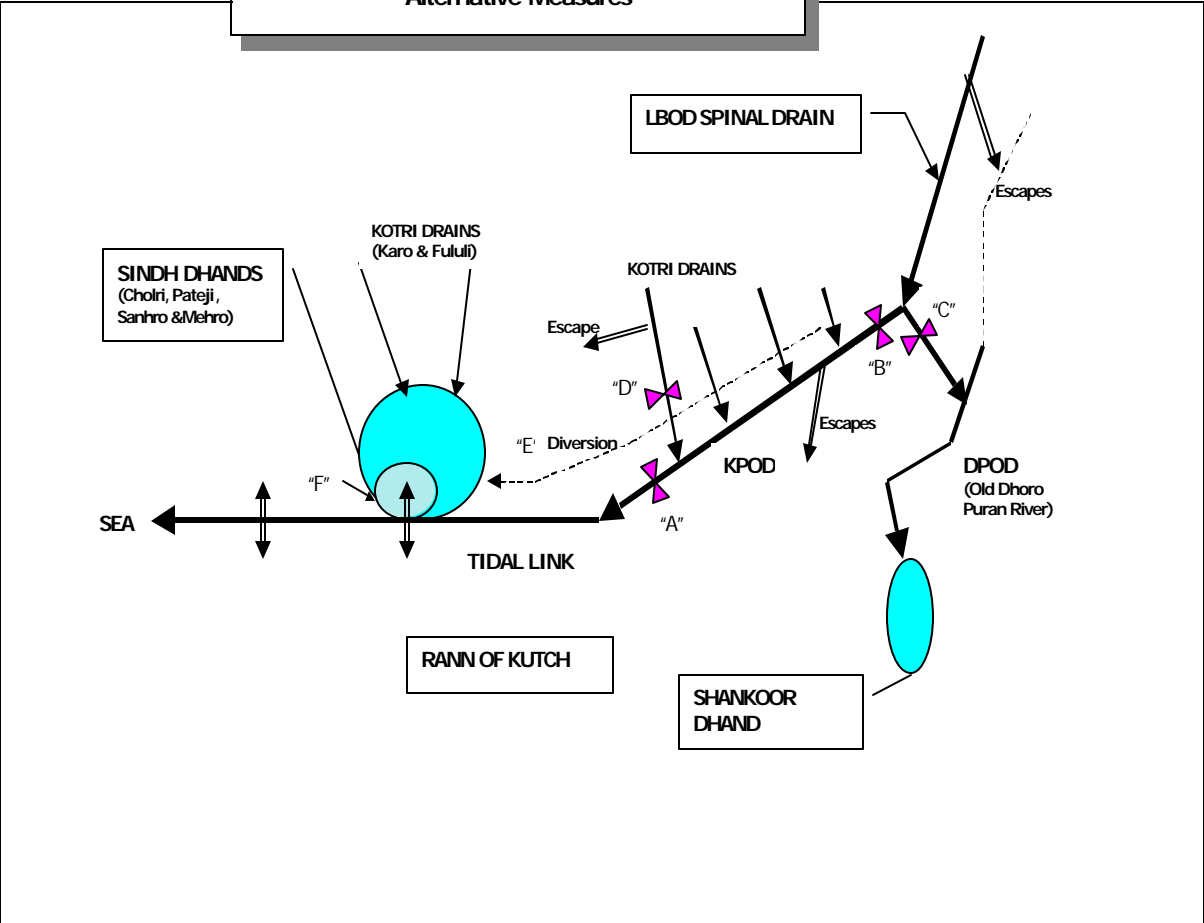
balance in the dhands. At present studies have begun to provide data and analysis to support ongoing negotiations concerning the allocation of Indus River flow to the Indus River and Delta below Kotri Barrage. Should these negotiations prove successful from Sindh's perspective, a percentage of the flow available should be diverted into the Kotri canals and drains to the dhands. This would likely have a significant impact on the restoration process.

- Third, experts suggested to the mission a number of non-structural natural measures that might attenuate the influence of the Tidal Link on the dhands and in particular slow or stop its progression beyond Cholri Dhand. A belt of mangroves generally along in the alignment where Cholri Dhand joins Sanhro Dhand has been suggested as a way of trapping sediment and attenuating any tidal pulses or effects that might enter Sanhro Dhand. However, past attempts to establish extensive mangrove belts or forests in this area of the coastal zone have not been successful probably because of the soils (they are reported to be flourishing in the area of Shah Samando Creek though over harvested by local people). A third possibility is to try to establish appropriate specie of reeds and other grasses that are well adapted to the prevailing salinities in the shallow silted area between Cholri and Sanhro Dhands. Such a reed and grass belt would behave much like a constructed wetland³ filtering both sediments and pollutants and nutrients moving from Cholri Dhand to Sanhro Dhand. Care would have to be taken to not prevent the recruitment of fish fry and young shrimps from the Tidal Link or the movement of breeding fishes toward the delta and the marine environment. If the dhands were to begin a slow recovery initiatives would have to be undertaken to organize fisherman and provide training and awareness to stimulate their management of the fishery by preventing over-fishing and use of fine mesh nets that take excessive quantities of young fish and shrimp.

13. The mission believes that for the time being, the best strategy is to ensure increased flow of brackish water into the dhands from the Kotri drains including the diversion of those drains that currently flow into KPOD, and to intensify the monitoring of water levels, tides, sediment, bathometry, salinity and drain flows in the Dhands to improve the understanding of the water balance and to detect any negative trends that emerge in order to formulate mitigation measures

³ Constructed wetlands have not been tried in Pakistan as a low cost method of treating wastewater or polluted water. This method possibly combined with other low cost methods should be piloted as a way of treating the agricultural drainage water (if this would improve the viability of an option such as diverting LBOD flows into parts of the Rann of Kutch) and in particular, as a method of treating sugar factory and other wastewater discharges to the drains that threaten the dhands. Global experience with constructed wetlands and other low cost wastewater treatment options has greatly increased in recent years, and Pakistan could benefit from this experience since its experience with command and control regulatory approaches have been unsuccessful.

MAP 2 SCHEMATIC DIAGRAM OF LBOD OUTFALL
Alternative Measures



Annex 5

IPOE Report: Environment Studies, Summary of Findings

- I. Three studies were commissioned by the GOP to reach consensus on the minimum required escapages below Kotri Barrage, which is the main outstanding item of the Water Apportionment Accord (WAA). It concerns:
 - Study I: *Water escapages below Kotri Barrage to check seawater intrusion;*
 - Study II: *Water escapages downstream of the Kotri Barrage to address environmental concerns; and*
 - Study III: *Environmental concerns of all the four provinces.*In order to have an independent external review of the studies an international panel of experts (IPOE) was appointed. The IPOE took good note of the historical developments and the WAA, especially of para 7 on *The need for certain minimum escapages to the sea, below Kotri, to check sea intrusion*. The IPOE reviewed the studies at relevant stages, had in depth discussions with government staff at Federal and Provincial level, as well as with the consultants, and analyzed international experiences and practices.
- II. The following aspects primarily justify the need for water escapages below Kotri Barrage: (i) salinity encroachment in the river, aquifer and coastal zone; (ii) requirement of coastal stability; (iii) requirement of a sustainable environment; (iv) fisheries; and (v) prevention of salinity accumulation in Indus Basin. In addition other factors may play a role: riverine forests, riverine agriculture, pollution control and drinking water supply. (see diagram below)
- III. In the determination of the IPOE's recommendations on the minimum escapages the following considerations have played a role: (i) to check seawater intrusion downstream of Kotri Barrage as identified in Study I; (ii) the needed environmental flows upstream of Kotri Barrage as provisionally indicated in Study III; (iii) the impact of the recommended environmental flows on the availability of water for economic and social needs (irrigation, domestic and industrial water supply) as indicated in Study III; (iv) the minimum needs for fisheries and maintenance of mangroves in the Expanded Delta as indicated in Study II; (v) flows to keep the river morphology in good condition; (vi) the international developments and practices with respect to environmental flows; and (vii) the recognition that a structural solution will not be feasible.
- IV. An escape at Kotri Barrage of 5000 cfs throughout the year is considered to be required to check seawater intrusion, accommodate the needs for fisheries and environmental sustainability, and to maintain the river channel. The IPOE likes to stress that seawater intrusion only concerns problems related to surface water, because salinity in the aquifer is predominantly due to fossil water salinity from geological origin.
- V. The IPOE understands the problem of sea intrusion/coastal erosion as occurring in

the Indus Delta area and considers this as a National problem. The reasons for this problem are primarily: (i) reduction in sediment supply by Indus River as indicated in Studies I and II; (ii) reduction in the mangrove vegetation as indicated in Study II; (iii) prevention of flooding of the outlying delta areas due to the river bunds; (iv) sea level rise; and (v) recent extreme weather conditions possibly due to climate change. With respect to the required sediment supply and mangrove vegetation the IPOE likes to give the following observations and recommendations.

- VI. As far as the sediment supply is concerned a substantial reduction has taken place over the years due to the diversion of most of the water for irrigation. The original supply of sediment is estimated at 400 million tons/year. Then the coastal accretion was about 30 m/year. A substantially smaller amount of sediment is needed to establish a stable coastline, especially when this supply is combined with coastal protection measures. By far most of the sediment is supplied during peak flows. It is recommended that a total volume of 25 MAF in any 5 years period (an annual equivalent amount of 5 MAF) be released in a concentrated way as flood flow (kharif period), to be adjusted according to the storage in the reservoirs and the volume discharged in the four previous years.
- VII. As far as the mangrove vegetation is concerned a certain flow and sediment supply will be required, together with control of camel grazing, fire wood cutting and mangrove replanting. In order to spread the water over the flats a concentrated high flow would be needed during the kharif season. The amounts of fresh water as mentioned under item VI will be sufficient for a sustainable mangrove growth. It is considered to be of utmost importance to manage the mangroves in such a way that a sufficiently wide mangrove belt is being maintained in front of the coastline. The IPOE recommends that this be considered to be a National responsibility.
- VIII. Based on the above considerations the IPOE recommends the escapages below Kotri Barrage as shown in Table A6.1 The flows can be adjusted according to the proportions of the allocations delivered to irrigation. In addition the IPOE recommends that peak discharges during the kharif period, as explained in item VI, will be made to supply sediment to the delta, sustain mangrove vegetation and preserve river morphology.

Table A6.1. Recommended escapages below Kotri Barrage in cfs and MAF

	<i>Kharif</i>						<i>Rabi *)</i>						<i>Totals</i>		
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Year	Rabi	Kharif
In cfs	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000			
In MAF	0.3	0.3	0.3	>= 0.3	>= 0.3	>= 0.3	0.3	0.3	0.3	0.3	0.3	0.3	3.6 +**)	1.8	1.8 +**)

*) In a dry year the amount can be proportionally reduced in relation to the reductions in irrigation water supply

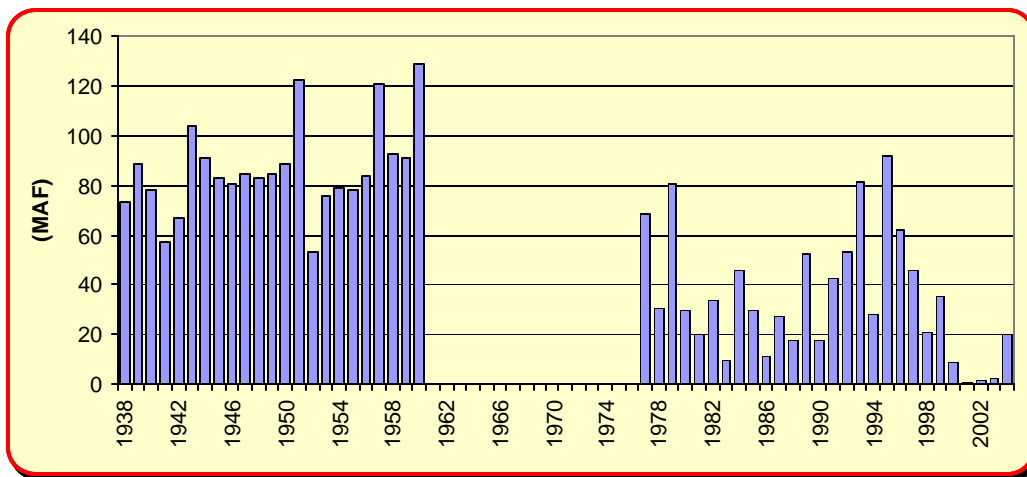
***) a total volume of 25 MAF in any 5 years period (an annual equivalent amount of 5 MAF) to be released in a concentrated way as flood flow (kharif period), to be adjusted according to the storage in the reservoirs and the volume discharged in the four previous years

- IX. Based on the post Tarbela flow data the above recommendations would result in a re-

quired additional release downstream of Kotri Barrage during low flow months of 1.26 MAF in an average year and 2.20 MAF in a typical dry year. This will require additional storage capacity to prevent a reduction of water availability for irrigated agriculture. Environmental flows would as and when appropriate be routed via upper rivers before release downstream of Kotri Barrage.

- X. The IPOE recommends that the proposals as made by Study III with respect to the environmental concerns of the provinces, not reducing the escapages downstream of Kotri Barrage as recommended in item VIII and acceptable to the concerned province, be prioritized for implementation.

Historical annual flows below Kotri Barrage.

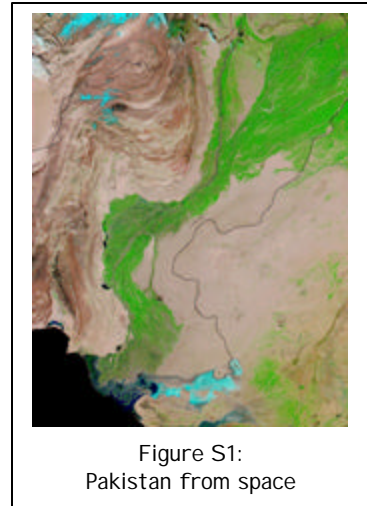


Annex 6

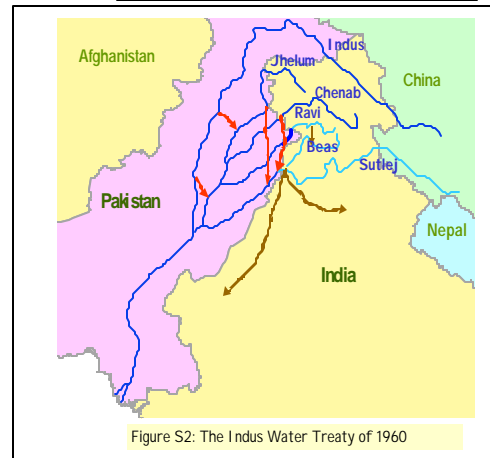
Country Water Resources Assistance Strategy

OVERVIEW AND EXECUTIVE SUMMARY

1. Pakistan is one of the world's most arid countries, with an average rainfall of under 240 millimeters a year. The population and the economy are heavily dependent on an annual influx into the Indus River system (including the Indus, Jhelum, Chenab Ravi, Beas and Sutlej rivers) of about 180 billion cubic meters of water, that emanates from the neighboring countries and is mostly derived from snow-melt in the Himalayas. Throughout history, people have adapted to the low and poorly distributed rainfall by either living along the river banks or by careful husbanding and management of local water resources. One of the greatest of human civilizations – the Indus Valley civilization (Harrapa and Mohenjo Daro) – flourished along the banks of the Indus.



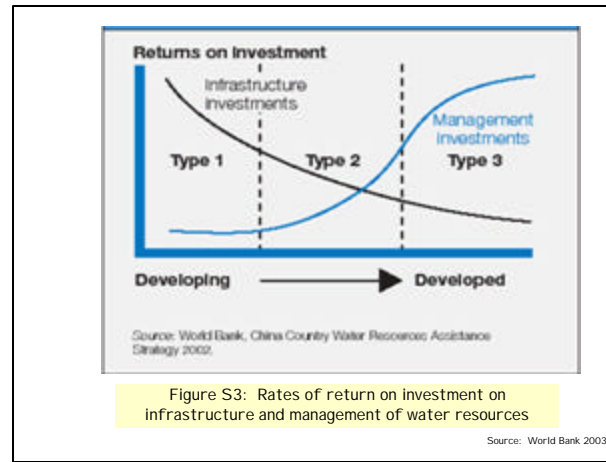
2. This precarious, low-level balance between man and water was decisively shifted with the advent of large-scale irrigation technology in the 19th century. The Indus irrigation system became the largest contiguous irrigation system in the world. As shown in Figure S1, the desert literally bloomed, with irrigated agriculture providing the platform for the development of the modern economy of Pakistan. This hydraulic economy has faced and surmounted three massive challenges in the last half century.



3. The first challenge arose because the lines of partition of the Indo-Pak sub-continent severed the irrigated heartland of Punjab from the life-giving waters of the Ravi, Beas and Sutlej rivers. In an unprecedented triumph of water diplomacy, Pakistani engineers, together with their Indian counterparts and the World Bank, negotiated the Indus Waters Treaty, giving Pakistan rights in perpetuity to the waters of the Indus, Jhelum and Chenab rivers, which comprise 75 percent of the flow of the whole Indus system.

4. The second challenge was that there was now a mis-match between the location of Pakistan's water (in the western rivers) and the major irrigated area in the east. Again Pakistan's water engineers were up to the task, building the world's largest earth-fill dam, the Tarbela on the Indus, and link canals, which ran for hundreds of miles and carried flows ten times the flow of the Thames River. (Figure S2) To a considerable degree (but not com-

pletely) the “heroic stage” of water engineering in Pakistan was now over – as in other countries the major challenges were now those of management. This is the case in all countries (see Figure S3). But in the case of Pakistan, however, the “heroic” era had involved particularly blunt affronts to the living organism that the river represents. The natural flow regime was dramatically altered: rivers which had previously meandered over wide plains were now confined within narrow channels, sediments which had previously nourished the delta were trapped, vast quantities of water were disgorged onto deserts, substantial parts of which were of oceanic origin and highly saline. It was this last reality which gave rise to the third major challenge facing Pakistan shortly after Independence. Hundreds of billions of cubic meters of water were now stored in the naturally-deep aquifers of Punjab alone. In many areas water tables had reached the level of the land, giving rise to the twin curse of waterlogging and salinity. In the early 1960s, it appeared that Pakistan was doomed, ironically, to a watery, salty grave.



5. With equal doses of good thinking, good planning and good luck, this problem is now not beaten (nor will it ever be) but controlled and managed, to a degree that no one foresaw fifty years ago. The good thinking was the application of water science and economics by many of Pakistan’s best and brightest in conjunction with many of the best water minds in the world. The “solution” was not the obvious one of lining canals and putting less water on the land but of increasing the use of groundwater, thus both increasing evapotranspiration, drawing down the groundwater table and leaching much of the salts down and out of the root zone. The good thinking and good planning were classic “public goods”. The “good luck” driver of this revolution was the modest but transforming tube well and diesel engine, bought and managed by millions of farmers for the simple reason that this decentralized “on-demand” source of water enabled them to greatly increase their crop yields and incomes.

6. So the modern history of water development and management in Pakistan is one in which the glass can be seen as more than half full. But, as this Report will show, the glass can also be viewed as much more than half empty too. Once again, the survival of a modern and growing Pakistan is threatened by water.

The facts are stark:

7. **Sobering Fact #1: Water Stress.** Pakistan is already one of the most water-stressed countries in the world (Figure S4), a situation which is going to degrade into outright water scarcity (Figure S5) due to high population growth.

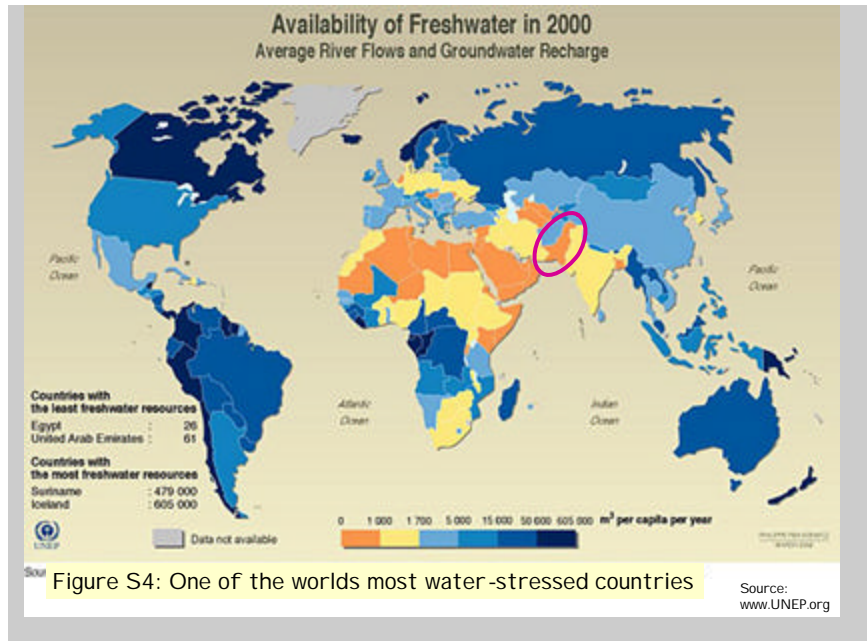
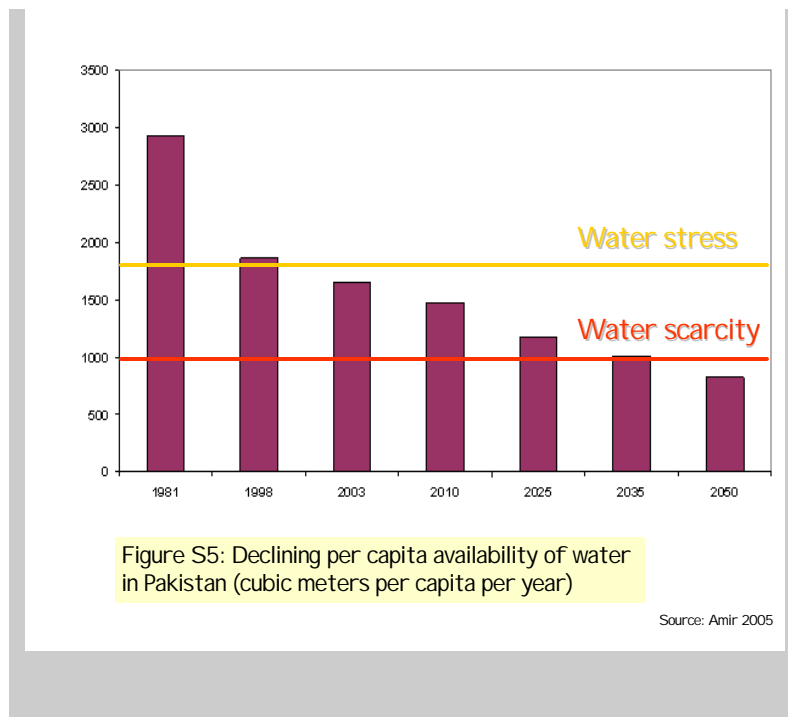


Figure S4: One of the worlds most water -stressed countries



8. **Sobering Fact #2:** There is no additional water to be injected into the system. There is no feasible intervention which would enable Pakistan to mobilize appreciably more water than it now uses. Arguably, as shown graphically in Figure S6, overall use for irrigation needs to decline so that there are adequate flows into the degrading delta.

9. **Sobering Fact #3: A high risk water environment.** Pakistan's dependence on a single river system means it has little of the robustness that most countries enjoy by virtue of having a multiplicity of river basins and diversity of water resources. While India (for example) might be able to muddle through because it has many rivers and if something goes wrong in one place the effect is cushioned by opportunities in other places, this is a luxury which Pakistan does not have. If the water/sediment/salt system of the Indus Basin goes badly wrong, that's it. There is no latitude for error.

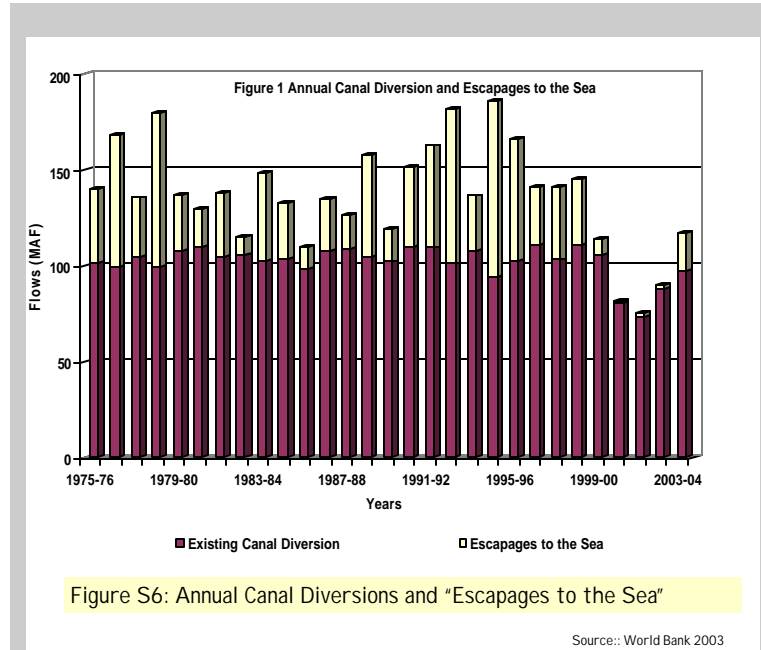


Figure S6: Annual Canal Diversions and "Escapages to the Sea"

Source: World Bank 2003

10. **Sobering Fact #4:**

Large-scale degradation of the resource base. There is abundant evidence of wide-scale degradation of the natural resource base on which the people of Pakistan depend. Salinity remains a major problem, with some aspects partially controlled but others – including the fate of the approximately 15 million tons of salt which are accumulating in the Indus Basin every year, and the ingress of saline water into over-pumped freshwater aquifers – remain only dimly-understood threats. And the delta, deprived of the water and silt which built and sustained it, is degrading rapidly, with large human and environmental consequences. Simultaneously, there is large-scale uncontrolled pollution of surface and groundwater from the increasing quantities of pesticides and fertilizers used in agriculture and by rapidly growing cities and industries. Major cities have inadequate sewage treatment plants. Many are either non-functional or working poorly. And there is only one industrial common effluent treatment plant working in the whole of the country. The result, as illustrated in Figure S7, is the presence of heavily degraded surface water around all cities and towns.

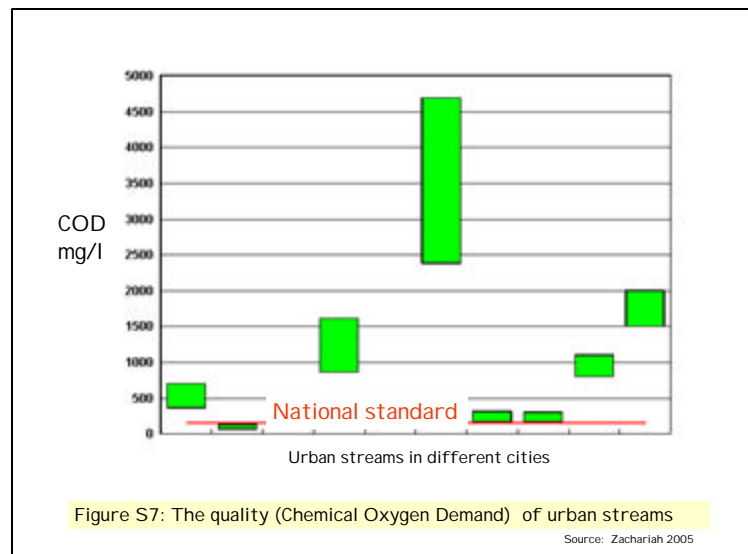


Figure S7: The quality (Chemical Oxygen Demand) of urban streams

Source: Zachariah 2005

11. **Sobering Fact #5: Groundwater is now being over-exploited in many areas, and its quality is deteriorating.** Over the past 40 years, the exploitation of groundwater, mostly by private farmers, has brought enormous economic and environmental benefits. A laissez-faire approach could be appropriate during this era. Groundwater now accounts for almost half of all irrigation requirements. Now, although, there is clear evidence that groundwater is being over-exploited, yet tens of thousands of additional wells are being put into service every year. In the barani areas of Balochistan, farmers are pumping from depths of hundreds of meters and in the sweet water areas of the Indus Basin, depletion is now a fact in all canal commands. Furthermore, there are serious and growing problems with groundwater quality, a reality that is likely to get worse because there are 20 million tonnes of salt accumulating in the system every year. Pakistan has thus entered an era in which laissez-faire becomes an enemy rather than a friend. There is an urgent need to develop policies and approaches for bringing water withdrawals into balance with recharge, a difficult process which is going to require action by government and by informed and organized users. Since much groundwater recharge in the Indus Basin is from canals, this requires an integrated approach to surface and groundwater. There is little evidence that government (or donors, including the World Bank) have re-engineered their capacity and funding to deal with this great challenge. And here delay is fatal, because the longer it takes to develop such actions, the greater would become the depth of the groundwater table, and the higher would be the costs of the “equilibrium” solution.

12. **Sobering Fact #6: Flooding and drainage problems are going to get worse, especially in the lower Indus Basin.** The natural state of heavily-silt laden rivers (like the Indus) is to meander. This is because as silt builds up in their beds, the rivers seek lower lands and change their courses. This creates havoc with human settlements and so, throughout the world, such rivers have been trained and confined by embankments within relatively narrow beds. But as with everything watery, solving one problem gives rise to another. In this case, the bed keeps getting higher and higher, and soon the river is, as in the lower parts of Sindh, above the level of the land. (To some degree the trapping of silt in upstream reservoirs alleviates this particular environmental hazard.) Over time, the likelihood of embankment breaching increases, as do the problems of drainage from flooded lands. When this coincides with unfavorable tidal conditions, the consequences can be disastrous.

13. **Sobering Fact #7: Climate change.** The Indus Basin depends heavily on the glaciers of the western Himalayas which act as a reservoir, capturing snow and rain, holding the water and releasing it into the rivers which feed the plain. It is now clear that climate change is already affecting these western glaciers in a dramatic fashion (far more seriously, for example, than in the damper Eastern Himalayas).

While the science is still in its infancy, best estimates (Figure S8) are that there will be fifty

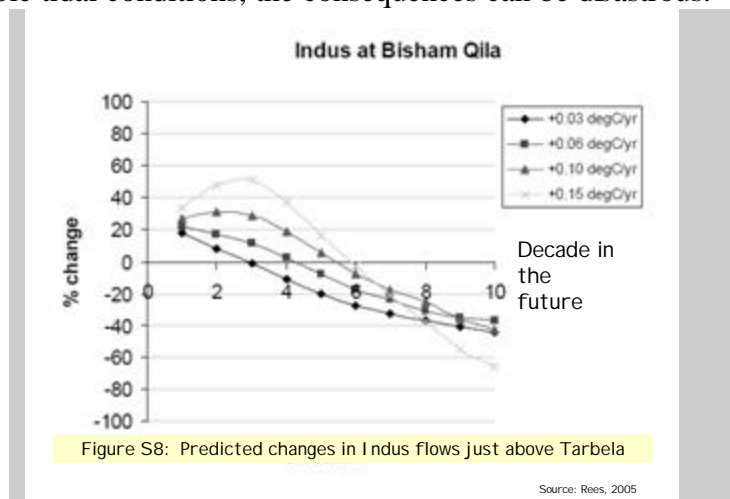


Figure S8: Predicted changes in Indus flows just above Tarbela

Source: Rees, 2005

years of glacial retreat, during which time river flows will increase. This – especially in combination with the predicted flashier rainfall -- is likely to exacerbate the already serious problems of flooding and draining, especially in the lower parts of the basin, in the next few decades. But then the glacial reservoirs will be empty, and there are likely to be dramatic decreases in river flows– as shown in Figure S8, conceivably by a terrifying 30 percent to 40 percent in the Indus Basin in one hundred years time.

14. **Sobering Fact #8: An inadequate knowledge base.** The Indus Basin is a single, massive, highly complex interconnected ecosystem, upon which man has left a huge footprint. When a dam or barrage is constructed the water and sediment cycles are changed dramatically. When water is diverted onto deserts, the water and salt balances seek new equilibriums. In a system so massive and complex, the generation and smart use of knowledge are the keys to adaptive management. But there has been very little investment in Pakistan in building this knowledge base and the accompanying institutional and human systems. The past twenty years should have been ones of massive investment in knowledge about this ecosystem. But the reverse has happened, and even the once-renowned Pakistan water planning capability has fallen into disrepair. The country is literally flying blind into a very hazardous future.

15. **Sobering Fact #9: Much of the water infrastructure is in poor repair.** Pakistan is extraordinarily dependent on its water infrastructure, and it has invested in it massively. Due to a combination of age and what has aptly been called the “Build/Neglect/Rebuild” philosophy of public works, much of the infrastructure is crumbling. This is true even for some of the major barrages, which serve millions of hectares and where failure would be catastrophic. There is no modern Asset Management Plan for any of the major infrastructure.

16. **Sobering Fact #10: The quality of project implementation is poor.** Pakistan is justifiably proud of its outstanding achievement in building the Indus Basin Replacement Works. In the intervening years, the quality of project implementation has declined substantially. Today, implementation of water sector projects in Pakistan is characterized by inefficiencies, completion delays and time and cost overruns. Factors that affect implementation include: weak implementation planning and management, litigation related to land acquisition, non-compliance with agreed resettlement and rehabilitation programs, lack of attention to environmental issues, delays in procurement, and delays in preparation of accounts and carrying out audits, and the lack of preparation for transition from construction to operations.

17. **Sobering Fact #11: The system is not financially sustainable.** There are three basic questions relevant to the financing of infrastructure – who pays? how much is paid? and how is the money used? In terms of “who pays”, there are many reasons why a substantial portion of the costs of public works which provide individual services (such as irrigation water) should be paid for by those who get the service. But in Pakistan users of canal water pay a very small part of the bill, which is basically paid by the taxpayer. In terms of “how much is paid”, the answer is: much less than the presently configured institutions require for rehabilitation and maintenance of the assets and for operations. The result is that most infrastructure is in poor repair. In terms of “how is the money used” the answer is that first

call is for payment of heavily overstaffed bureaucracies, whose productivity is low and whose appetite leaves insufficient funds for system maintenance and operation. This reality gives rise to a vicious circle, in which users are not willing to pay for poor and unaccountable services, which means that insufficient funds are available for operations and maintenance, which results in the decline of service quality and whereupon users are even less willing to pay....

18. Sobering

Fact #12: Pakistan has to invest, and invest soon, in costly and contentious new large dams.

When river flow is variable, then storage is required so that the supply of water can more closely match water demands. Relative to other arid countries, Pakistan has very little water storage capacity. Figure S9 shows that whereas the United States and Australia have over 5,000 cubic meters of storage capacity per inhabitant, and China has 2,200 cubic meters, Pakistan has only 150 cubic meters of storage capacity per capita. And Figure S10 shows the storage capacity available in some of the major arid basins in the world. The dams of the Colorado and Murray-Darling Rivers can hold 900 days of river runoff.

South Africa can store 500 days in its Orange River, and India between 120 and 220 days in its major peninsular rivers. By contrast, Pakistan can barely store 30 days of water in the Indus Basin.

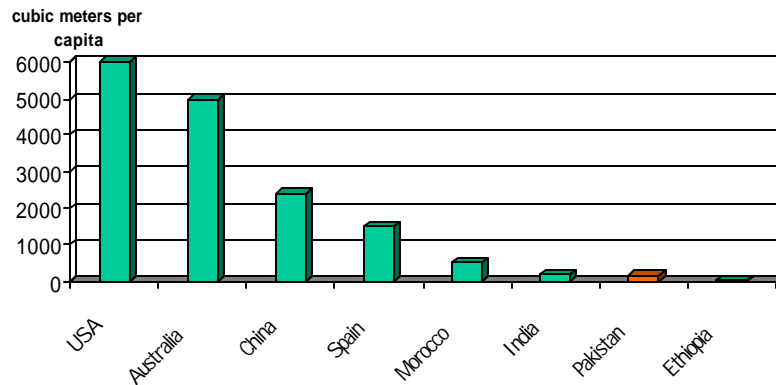


Figure S9: Storage per capita in different semi-arid countries

Source: World Bank analysis of ICOLD data

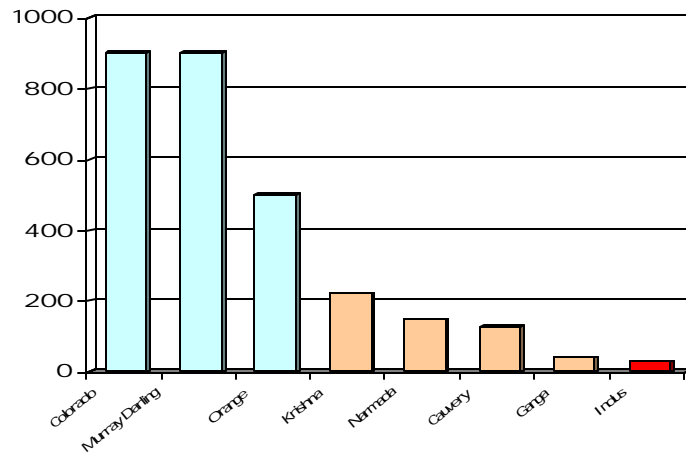


Figure S10: Days of average flow which reservoirs in semi-arid countries can store in different basins

Source: World Bank analysis of ICOLD and GDRC data

19. As shown in Figure S11, each million acre feet (MAF) of storage capacity lost means one MAF/year less water that can be supplied with a given level of reliability. And, as shown in Figure S12, there is an urgent need for storage just to replace the capacity that has (as predicted) been lost to sedimentation. Given the high silt loads from the young Himalayas, Pakistan's two large reservoirs are (as predicted at design) silting relatively rapidly.

20. Sobering Fact #13: Poor governance and low trust.

Conceptually the simplest task for water managers in the Indus Basin is to move water in a predictable, timely manner to those who need it and have a right to it. Pakistan has among the best water engineers in the world. And yet this task is done less and less satisfactorily, less in the light of day and more behind an opaque curtain in which, as always, monopoly + discretion - accountability = corruption. The result is inequitable distribution of water, poor technical performance and a pervasive environment of mistrust and conflict, from the provincial level to the water course. The water bureaucracy has yet to make the vital mental transition (depicted in Figure S3) from that of builder to that of manager.

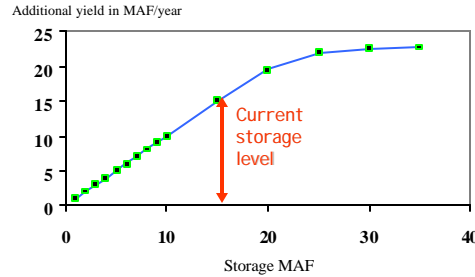


Figure S11: Storage-additional yield curve for the Indus

Source: Liefhink, 1968

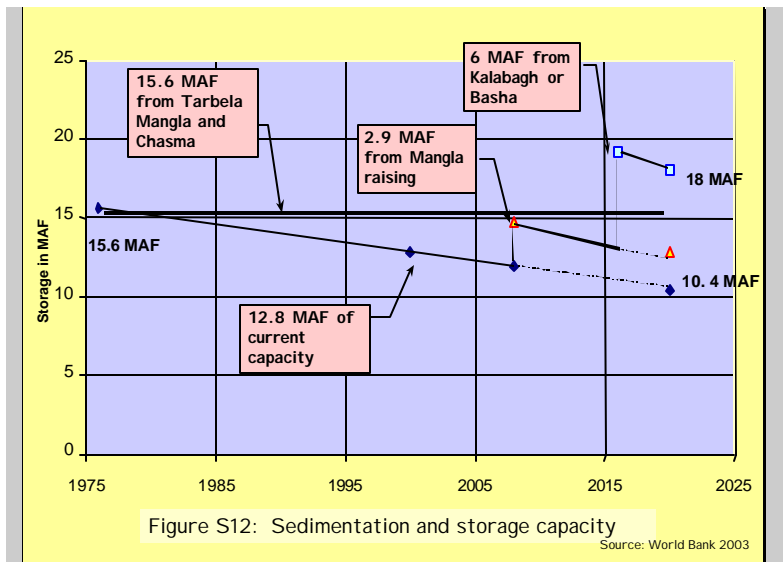
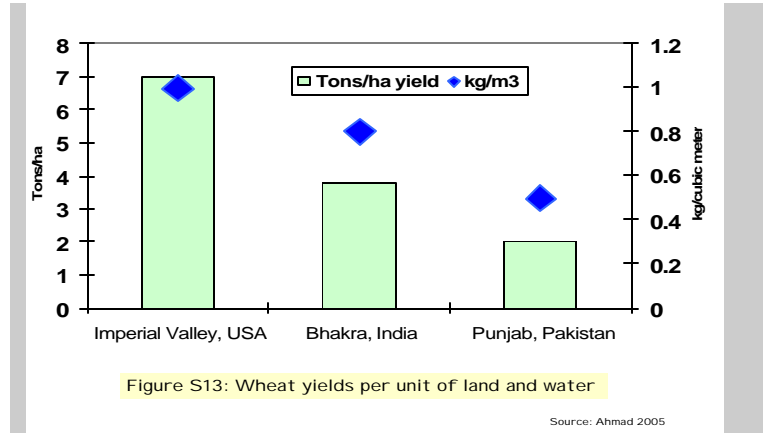


Figure S12: Sedimentation and storage capacity

Source: World Bank 2003

21. Sobering Fact #14: Water productivity is low.

Large parts of Pakistan have good soils, abundant sunshine and excellent farmers. And yet crop yields, both per hectare and per cubic meter of water, are much lower than international benchmarks, and much lower even than in neighboring areas of India (Figure S13). The quality of water service plays an important role in this: yields from reliable, self-provided groundwater are twice those of unreliable and inflexible canal supplies.



22. In water matters, the cup is always half empty, but it is also half, or, in the case of Pakistan, at least a quarter, full. In confronting these awesome challenges, Pakistan has considerable strengths, too.

23. Hopeful Fact #1: A well-established tradition and system of water entitlements.

Pakistan has an unusually long- and well-established tradition of water entitlements. At the international level, Pakistan’s rights to water from the Indus Basin system are unambiguously defined in the Indus Waters Treaty. The 1991 Water Accord is a major achievement, which establishes clear entitlements for each province to surface waters. Implicit in the Water Accord, too, is a set of water entitlements at the canal command level (established on the basis of historic use). In large areas of the system, these entitlements serve as the basis for allocation of water among canal commands. There are also well-established rules for further distributing water to the distributary and outlet levels. Below the outlets, the *wara-bandi* is a proxy (appropriate in its era) to a water right, in which a farmer has a right to time, a surrogate for water. The existence of such well-established entitlements means that Pakistan can now focus on: putting in place a similar system for the surface systems that do not currently have such established entitlements; extending the entitlement system to cover any new water that might be mobilized; formalizing entitlements for environmental flows (including to the delta); and moving towards a similar definition of entitlements for groundwater, and, above all, administering this system in a more transparent, participatory manner.

24. Hopeful Fact #2: Pakistan has largely avoided the trap of subsidizing electricity for groundwater pumping.

One of the obvious ways governments around the world address the problem of agricultural distress is to subsidize inputs. In many countries, electricity for irrigation pumping is heavily subsidized. This policy greatly exacerbates the underlying problem, which is making sure that groundwater pumping does not exceed recharge, and that the water table is not too deep. To date, this policy has been followed only in Balochistan, with disastrous effects both on the water table and on the financial state of the utility, and for pumping from public wells in Sindh. At present, the political pressure for “free power” has been muted because the water table is shallow and most pumps are diesel powered. The Federal and Provincial governments should be applauded for their

stance to date and should continue to strongly resist pressures to move towards free power for irrigation in the future.

25. **Hopeful Fact #3: There is much scope for increasing water productivity.** The flip side of current low water productivity is that Pakistan can get much more product – crop, jobs and income – per drop of water. As shown in Figure S14, reduced water supplies in the irrigated areas have little detrimental impact on production (at least in the short run), in part because groundwater is available to make up the difference in the short run, in part because waterlogging and salinity are reduced, and in part because limited water supplies are used more carefully when there are shortages. But the bottom line is that this shows that it is quite possible to substantially increase production with existing supplies of water. A second, very important, factor is the emergence of a new class of progressive farmers, who are shifting to high-value crops (which produce far more income and jobs per unit of water), introducing new crops and agricultural technologies, and putting unprecedented pressures on the irrigation departments to become more accountable and efficient.

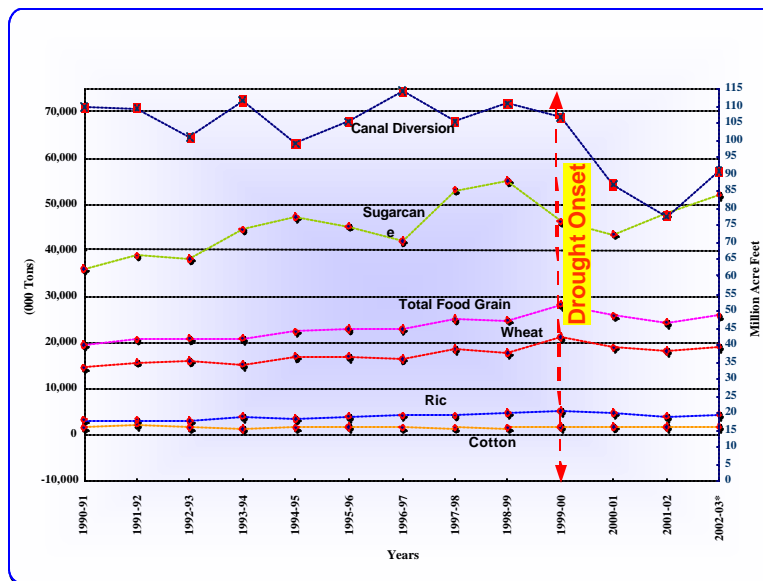


Figure S14: Crop production and drought

Source: World Bank 2003

26. **Hopeful fact #4: High returns from previous major water infrastructure.** Pakistan benefited immensely from the major water infrastructure built in the Indus Basin. As shown in Figure S15, the benefits from Tarbela substantially exceeded those which were predicted at the time of construction. Through forward and backward linkages in the economy, the total benefits were probably about twice those of the direct power and irrigation benefits. It is also certain that, as has been shown for the Bhakra project in Indian Punjab (Figure S16), it was the poor who, through the operation of labor markets, were probably the greatest beneficiaries of these investments. It is important to note that although much

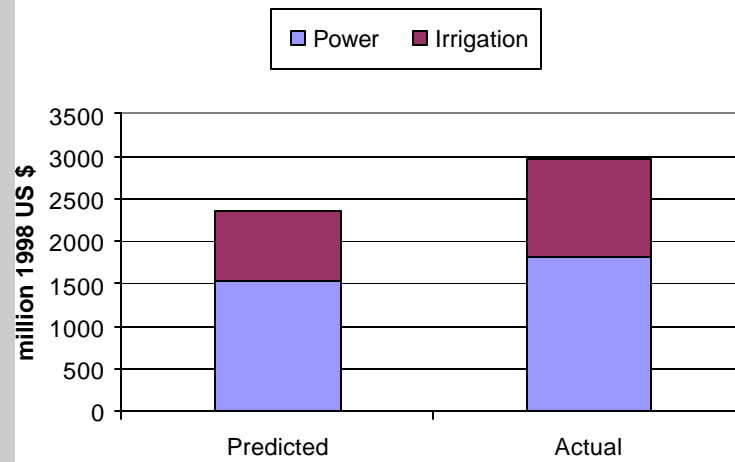


Figure S15: Benefits from Tarbela 1975-1998

Source: WCD 2000

% change of Income of Different Types of Households With and Without Bhakra Dam

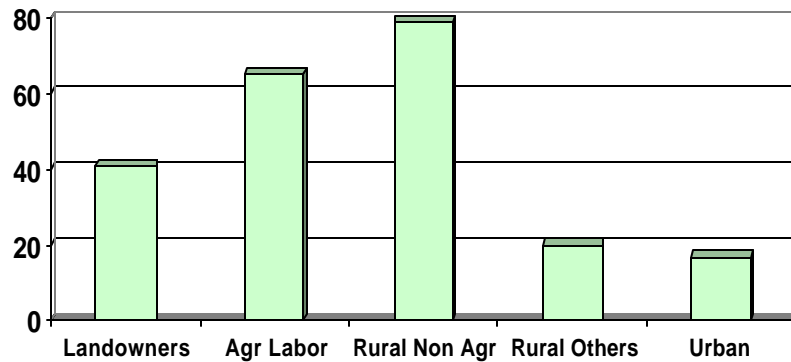


Figure S16: The effect of Bhakra Dam on different social groups

Source: Bhatia, 2005

of the discussion of such projects is in terms of agriculture, in fact it is the power benefits which are often greatest (Figure S16). And here, too, as shown in Figure S17 below, Pakistan lags behind its neighbors – 86 percent of the 50,000 mw of Pakistan’s economically-viable hydropower potential has yet to be developed.

27. Hopeful Fact #5: Pakistan has overcome major water challenges in the past. Pakistan has a remarkable history of successfully confronting major water challenges. It has enormous human capacity to confront this next round of challenges, which can be pooled in four major categories.

28. The sustainable management of a huge, inter-linked and very complex natural resource base

Challenge 1 is to develop a world-class knowledge-based capacity for adaptive resource management and service delivery.

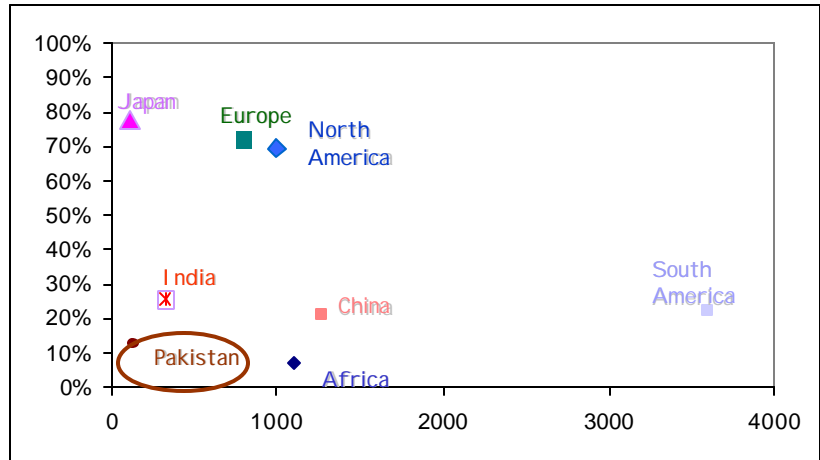


Figure S17: The development of economically-feasible hydropower potential in Pakistan in international context

Source: World Bank 2003

is probably the single most challenging long-term task for Pakistan and requires the development of world-class capacity in three related areas. First are the natural sciences. Adaptive management of the Indus Basin system requires high levels of knowledge and understanding of a series of linked basic natural processes, the more important of which include: the behavior of the glaciers as climate

change proceeds; the fate of the large amounts of salt being mobilized; the qualitative and quantitative dimensions of the aquifer systems in the Indus Basin and in the other parts of the country; the evolution and behavior of the ecosystems of the delta; and the impact of changed sediment loads on river morphology. Second are the engineering sciences. The plumbing for the world's largest contiguous irrigation system has underpinned much of Pakistan's development. Pakistan has long been a world leader in hydraulic engineering, and it is going to have to renew this capacity so that a new generation can maintain and modernize the water transmission and distribution systems. The third leg of the intellectual stool is the social sciences. Because at the end of the day government is going to have to design institutions and instruments, which will ensure that the actions of the millions of people who live in and off of the natural and engineered water systems are in consonance with the requirements of those systems. Pakistan, accordingly, needs to build a strong natural, engineering and social scientific cadre capable of working with all users in defining the problem, developing solutions, monitoring, assessing and adjusting. This is a capacity which requires a wide range of disciplines – those necessary for understanding climate, river geomorphology, hydraulic structures, surface and groundwater hydrology, limnology, water chemistry, sediment management, hydraulics, soil sciences, terrestrial and coastal ecosystems, agronomy, plant physiology, industrial organization, conflict management, politics, economics and financing. In the past Pakistan has relied heavily on outside knowledge, especially in sciences. Now Pakistan needs to develop its indigenous capacity and make a major push to establish and nurture a new set of institutions that will provide the

scientific, technical and policy support for the management of increasingly scarce water. Experience in other countries shows that if this is not done there will be serious economic, social and environmental consequences.

Challenge 2 is a financially feasible approach to maintaining and modernizing existing infrastructure and building needed new water infrastructure.

29. The water economy of Pakistan depends fundamentally on a gigantic and complex hydraulic infrastructure system. There are now a set of related challenges which have to be addressed – how to maintain what has been built, what major new system-wide infrastructure needs to be built, what infrastructure needs to be built for populations who have not been served and for environmental protection, and how to build institutions that will manage the resource effectively in the looming era of scarcity. First is rehabilitation and maintenance. Many elements of the vast hydraulic system are now reaching the end of their design lives, and have to be rebuilt. There is an enormous back-log of deferred maintenance. Most recent irrigation and water supply “investments” from donors, including the World Bank, have been for the rehabilitation of poorly maintained systems. There is no systematic Asset Management Plan at either the Federal or Provincial level which describes the condition of the assets, the requirements for replacement, rehabilitation (or retirement) and operations and maintenance and the associated costs, and the proposals for financing of these costs. Development of such plans is a high priority.

30. Second is the urgent need for construction of major new storage on the Indus. There is probably no more contentious an issue in Pakistan today. In part, this is for legitimate and necessary reasons (such as the resettlement of substantial numbers of people), partially for legitimate but resolvable reasons (lack of transparency about how this would affect the actual allocation of waters among the provinces and to the delta) and partially the discussion of dams has become a vehicle for a host of remotely- or un-related political grievances. A curiosity is that the most vehement opposition to new dams comes from Sindh, when in fact it is the downstream riparian who is typically the greatest beneficiary of the enhanced regulation which comes with new storage. (For this reason, in other countries lower riparians will often pay for upstream storage.) The requirements for government are obvious – there needs to be a totally transparent and verifiable implementation of the 1991 Water Accord, and reasonable quantities of water need to be guaranteed and delivered to the delta (as was discussed as part of the Indus Treaty negotiations). Equally important is a well-designed plan for paying for the costs of this storage, with the very large hydropower potential offering possibilities for raising substantial amounts of private financing.

31. Third, there are needs for large investments in meeting the needs of those who do not have water and sanitation services in cities, towns and villages.

32. Fourth, Pakistan has been accumulating an “environmental debt” by not investing in municipal and industrial wastewater. It is clear that this has to change, and that it is going to take large amounts of investments.

33. Fifth and finally, Pakistan has to walk on two legs – investing simultaneously in infrastructure and in developing the institutions required for the sustainable management of increasingly-scarce water.

34. The resource requirements for all of these priorities are very large. Government faces three essential tasks. First, to set priorities for the short and medium term. Second, to define the principles which will govern what proportions of the initial and recurrent costs are paid by taxpayers and by users. Third, government has to ensure that the limited financial resources are used very efficiently. This is obviously not happening in the “business-as-usual” model at present. It is going to mean exploring a whole set of mechanisms for introducing competition, for paying for output not inputs, and for increasing accountability.

Challenge 3 is to put in place a modern set institutional framework, with the key task being the development and application of instruments which will motivate sustainable, flexible and productive use of water.

35. The agrarian economy of Pakistan accounts for about 25 percent of GDP and employs about half of the labor force. While the transition to an urban and industrial economy can and must continue, agriculture will remain central for the well-being of large numbers of people. Better water management is a key constraint to improving agricultural productivity and generating jobs. Over the past several decades, farmers have largely taken the problem into their own hands, and “solved it” by sinking hundreds of thousands of tubewells which provide just-in-time water for their crops. To a substantial degree the main function of the canal systems has been to recharge the groundwater – about 80 percent of groundwater abstractions in Punjab come from recharge from canals. The survival of the water economy over the last several decades has largely been despite rather than because of the State – it has been the tapping of the unmanaged groundwater by millions of farmers, by towns and villages and industries that have pulled the economy through. It is clear that this era of “productive anarchy” is now coming to an end, since groundwater is now being over tapped in many areas (including both the Indus Basin and Balochistan and other non-Indus areas). This poses two very major challenges to the State. First, surface water supply systems are going to resume their previous high importance, and need to be managed much more accountably and effectively. Second, groundwater will have to be managed – for related reasons of quantity and quality – much more aggressively than has been the case in the past.

36. It is also obvious that the needs for water are changing substantially, as a result of agricultural diversification, urbanization, industrialization, recognition of environmental needs, climate change and the evolution of the natural resource base. Since there will be, if anything, less rather than more water, it means that the new water economy is going to have to be one which is much more flexible, in which a key will be the voluntary reallocation of water from those who need it less to those who need it more.

37. It is going to require a very different type of state machinery at both Federal and Provincial levels to meet these challenges. In constructing this “new water state”, the focus must be primarily on instruments which govern the relationships of different users with the water, and with each other. The logical organizational architecture then is that which is re-

quired to manage the instruments and order the relationships between the parties. Some of the key elements of the “new water state” will be:

- Introducing accountability, efficiency, transparency and competition into the surface water supply business. This will mean unbundling the business into bulk, transmission and distribution enterprises, with relations among the parts governed by contracts which specify the rights and responsibilities of both parties. While it will not be easy to enforce such contracts, experience shows that this can stimulate improved accountability and service quality. This will mean moving away from a monolithic service model below the distributaries (with Farmers’ Associations competing “for the market” with the irrigation department) and into the canal commands (where a variety of forms of public-private partnerships can provide an alternative to the irrigation department). In many cases, professionals from the Irrigation Departments would be encouraged to form private businesses for the provision of such services, thus ensuring that their skills are not lost, and that they do not see the changes as purely a loss of security. The bulk business (operation of dams and barrages) would probably remain in state hands, but with many major functions (such as operation of power plants) concessioned out to private operators. A similar institutional architecture would pertain for the drainage infrastructure.
- In such a system (which would take place as a sequenced and prioritized process over many years) the government would, gradually, play a very different role. It would corporatize the state owned operating units and develop new capacities to do the economic regulation. The government would also be far more active in groundwater management, where it has been largely absent. This would mean developing a new legal and regulatory framework for co-managing groundwater with user associations. It would mean developing the sophisticated natural resource management capacity required for management of the water and land systems.
- A center-piece of these systems, both surface and ground water, would be improving the administration of a well-established system of water entitlements. What is now needed is finalization of the agreement on environmental flows into the delta (a process that is underway) and then implementation of the Accord in a transparent manner, audited by an auditor who is, and is perceived to be, neutral. The same system then needs to be “drilled down” to the canal commands within the provinces (where entitlements are mostly well established but not transparently administered). And so on down all the way to the users’ associations and eventually to the farmers. There is broad agreement among most water professionals in Pakistan that this improved administration is quite feasible and that it would increase efficiency, allow flexibility in adapting to scarcity and reduce conflict and install trust in the system.
- A similar, and even more difficult, process is essential for the management of groundwater quantity and quality, since groundwater reservoirs are already being mined in the *barani* and sweet water areas. Again, this will take a well thought-out, pragmatic, patient and persistent strategy. The central elements will be heavy involvement of users, substantial investments in modern water and agricultural technology, and the State playing a vital role as developer of the enabling legislation, and regulator and provider of knowledge and decision support systems.

Challenge 4 is to trace a principled and pragmatic path for implementing this reform agenda over the coming decades.

38. In the eyes of many the idea of such a modern, accountable “Pakistan water system” is panglossian, given the deteriorating performance in recent decades and the broader challenges of governance. The glass is, of course, always half empty. But it is half full too. Pakistan has a stronger base for doing this than most other developing countries, and there are some important signs that the need for change is being understood, there are political leaders who are starting to grapple with these realities, and the government and private sector leaders are taking the important first steps down this long and winding road.

39. Pakistan is fortunate, too, in that it is not the first country in the world to face this (daunting) set of challenges. The experiences of other countries suggest that there are a set of “rules for reformers” in undertaking such a transition. These rules include:

- Initiate reform where there is a powerful need and demonstrated demand for change.
- Involve those affected, and address their concerns with effective, understandable information.
- If everything is a priority, nothing is a priority -- develop a prioritized, sequenced list of reforms.
- Pick the low-hanging fruit first – nothing succeeds like success.
- Keep your eye on the ball – don’t let the best become the enemy of the good.
- Be aware that there are no silver bullets.
- Don’t throw the baby out with the bathwater.
- Treat reform as a dialectic, not mechanical, process.
- Understand that all water is local and each place is different – one size will not fit all.
- Be patient, persistent and pragmatic.
- Ensure that reforms provide returns to politicians who are willing to make changes.
- Recognize that water, unlike electricity or telecommunications, is “far from a simple commodity”

Water is far from a simple commodity
Water's a sociological oddity
Water's a pasture for science to forage in
Water's a mark of our dubious origin
Water's a link with a distant futurity
Water's a symbol of ritual purity
Water is politics, water's religion
Water is just about anyone's pigeon
Water is frightening, water's endearing
Water's a lot more than mere engineering
Water is tragical, water is comical
Water is far from the Pure Economical.

Kenneth Boulding

40. An important objective of this Report is to help define the water elements of the framework (known as the Country Assistance Strategy) which will govern the relationship between the World Bank and Pakistan for the period 2006-2010. This is an iterative process, in which there have already been many discussions involving the Federal and Provincial Governments, the Bank's Country Management and the Bank's Pakistan Water Team. While the final agreement on water will only be decided jointly with the other elements of the CAS, the contours of this agreement are already broadly clear.

How the World Bank might be a more effective development partner.

41. The Federal and Provincial governments and the management of the World Bank all agree that water management is one of the central development challenges facing Pakistan, and that it is an area where the Bank has a long history and a strong comparative advantage. This is in broad agreement with the findings of a major poll of a wide variety of South Asian stakeholders (Figure S18), which concluded that infrastructure, education and governance were the three areas which were both of high national importance and where the Bank was perceived to have a comparative advantage.

holders (Figure S18), which concluded that infrastructure, education and governance were the three areas which were both of high national importance and where the Bank was perceived to have a comparative advantage.

42. There is, therefore, a general agreement that there will be a major increase in Bank lending for water-related activities, with the indicative overall figures shown in Figure S19.

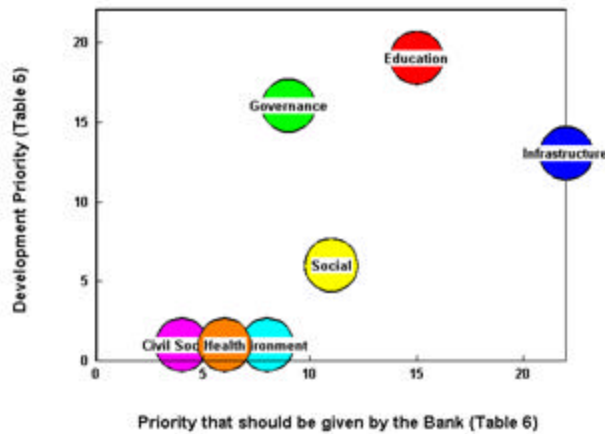


Figure S18: The "global poll" results for South Asia

Source: World Bank 2002

43. This would mean that water-related lending for Pakistan would increase about 10 fold from the 2000-2004 period, and account for about USD1 billion in the coming four years. World Bank support would be based on "principled pragmatism" recognizing that reforms and investments must proceed in parallel and the best should not be allowed to become the enemy of the good. Broadly speaking, Bank assistance would support four pillars of the water sector, as described below

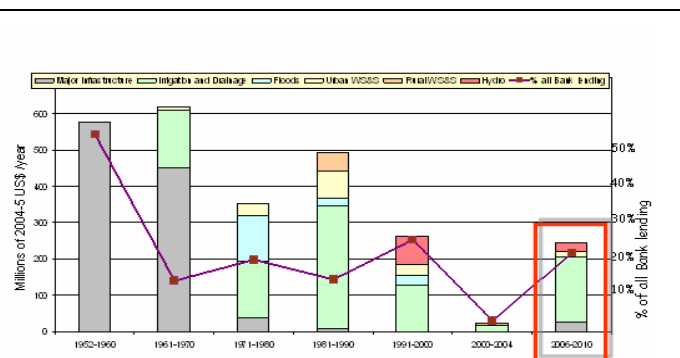


Figure S19: World Bank Lending to Pakistan for Water-related Sectors - Past and Prospective

Source: World Bank 2004

Pillar 1: Asset Development and Management

44. Pakistan has a large endowment (with an estimated replacement value of USD60 to 70 billion) of water resources infrastructure, most owned and managed by the provinces, and much now quite old. Bank-funded projects will make major investments in rehabilitation of some critical assets (including barrages) and will help put in place Asset Management Plans which will set priorities for asset rehabilitation and maintenance, make explicit the requirements for public and user financing, and develop efficient institutional arrangements for rehabilitating and maintaining this infrastructure. The Bank will also continue its support for: developing and implementing a drainage and salt management strategy, other investments – including small dams, minor irrigation and groundwater management – in *barani* areas outside the Indus Basin, as well as for improving livelihoods and safety in coastal areas.

45. One major issue that is likely to emerge in the 2006-2010 CAS period is possible Bank engagement in developing and co-financing major new Indus Basin storage and hydro, if and when the Government makes such a decision. The Government is actively addressing some of the major issues which have been raised about a new dam on the Indus, including transparent implementation of the 1991 Water Accord and environmental flows into the delta. In discussions with the Government it has been agreed that the Bank could be involved, with the usual provisions that any such project met the Bank's normal technical, economic, social and environmental standards, and that these investments were part of an overall program which included institutional reforms and investments at federal, provincial, canal command and farm levels to ensure better use of water.

Pillar 2: Water Resources Management

46. The Bank expects to support development of capacity at the provincial and federal levels for improving water and associated natural resource management. For surface water supplies, a major emphasis will be building on Pakistan's platform of defined water entitlements, making the administration of these more transparent and accountable, from the inter-provincial to the user levels. For groundwater, the Bank will support the development of the government's capacity for knowledge generation, policy generation and management. A major emphasis will need to be on developing a better understanding of salinity and formulation of salt management strategies; groundwater recharge; and flood flows. For both surface and groundwater there will be an emphasis on incorporating environmental issues (including water quality, wetlands and environmental flows). An important element of Bank support will be training of a new generation of multi-disciplinary water resources specialists and support for multi-disciplinary centers of excellence for water resources, natural and social sciences.

Pillar 3: Service Delivery

47. The Bank expects to be heavily engaged in provincial- and city-level efforts to improve the quality, efficiency and accountability with which water supply, sanitation and irrigation services are delivered. The Bank will emphasize the development of frameworks which encourage

the entry of new players (including community organizations, and the small- and large-scale private sector), the use of contracts which specify the rights and obligations of providers and users and benchmarking for all water services. The Bank will emphasize the modernization of infrastructure – including canal re-modeling and the use of measuring devices, which are integral for moving to a more flexible, accountable, transparent and monitorable service delivery paradigm.

Pillar 4: On-farm Productivity

48. The Bank will continue to invest in the on-farm services (land leveling, watercourse lining, and introduction of new technologies through private-public partnerships) which are essential for agricultural diversification and for improving the amount of crop, income and jobs produced per drop of water.

49. The Bank anticipates providing such support through its various lending instruments, including budgetary support for policies and prior actions that address key issues (Development Policy Lending) as well as through specific investment lending for infrastructure and institutional reforms. Finally, given the major scientific, policy and implementation challenges ahead, the Bank, with partial support from the Government of the Netherlands, will mount a major program for providing analytic and technical support to the federal and provincial governments.

50. Paraphrasing Akhter Hameed Khan, the great Pakistani reformer, it might be said that the Bank's involvement in water in Pakistan has been one in which the Bank "has chased the rainbow of well-functioning institutions and dreaded the nightmare of further institutional decay.... and that only the boldest among us can say that we may not be similarly engaged tomorrow."¹

¹ Akhter Hameed Khan. *A History of the Food Problem*. Agricultural Development Council, New York, 1973.

Annex 7

Drainage Master Plan-International Panel of Experts

Summary

I General

1. The sector planning studies component of the World Bank assisted National Drainage Program (NDP), includes the development of a Drainage Master Plan (DMP). The objectives of the plan are to: (i) encourage and sustain, increased agricultural production and improve agricultural productivity; (ii) alleviate poverty and improve quality of life; (iii) ensure equitable sharing of benefits accruing from investments and as far as possible to target these benefits towards the disadvantaged; (iv) encourage beneficiary participation in project formulation and construction, as well as in Operation and Maintenance (O&M); (v) reduce O&M liability of government to a minimum level; (vi) minimize and mitigate adverse environmental impacts; (vii) improve the knowledge base of the planners, designers, executors, and operators of projects.

2. In order to achieve the objectives the following broad scope of work for the DMP was formulated: (i) identification of the drainage basins/sub-basins for the entire area of the country; (ii) collection and review of existing irrigation and drainage data and all other relevant information like industrial and municipal effluent, etc. for each drainage basin; (iii) preparation of an inventory of the existing horizontal and vertical drainage network of each basin/sub-basin regarding location, length, capacity, design parameters and other salient features; (iv) review of the drainage strategy; (v) encouraging sustainable use of brackish water for saline agriculture/agro-forestry; (vi) assessment of adequacy of the drainage network within individual basins/sub-basins; (vii) identification of areas in need of drainage for each basin/sub-basin and their prioritization for implementation; (viii) analysis of medium- and long-term measures for controlling waterlogging and salinity in the affected areas; (ix) formulation of integrated drainage plans for all the basins/sub-basins for disposal and management of the drainable surplus/saline effluent; (x) proposing a methodology for effective management of the existing and future drainage infrastructure; (xi) preparation of conceptual level plans with economic, social and environmental analysis of each drainage basin/sub-basin; (xii) carrying out a preliminary environmental examination for the proposed drainage works; (xiii) prepare the DMP report and the Drainage Atlas for Pakistan.

3. The objective of the World Bank - Netherlands Water Partnership Program (BNWP) supported mission of a Panel of International and National Experts (POE) in drainage, water and environmental management was to: (i) prepare a review report with comments and recommendations on the concept, approach, assumptions and conclusions of the DMP; (ii) give recommendations on the next steps; (iii) do a field survey to identify the different functions of the resource system in Kotri Left Bank Drainage Basin; (iv) prepare terms of reference (TOR) for a Drainage Development and Water Management Plan (DDWMP) for Kotri Left Bank Drainage Basin; (v) training of staff in charge of the master planning; (vi) hold a workshop to present findings and disseminate results. Based on the TOR for the POE the following was to be delivered: (i) an initial discussion note; (ii) a

draft executive summary on the findings and recommendations; (iii) a final report on the outcome of the POE's reviews and discussions, including recommendations. This task was implemented in the period August - December 2004.

4. A first draft of the executive summary and the main text of the DMP were sent to the POE before the mission. The draft Drainage Atlas and part of the Annexes were submitted during the mission. The findings and recommendations of the POE refer to these documents, as well as to the meetings, workshops and field visits during the mission.

II Findings

Findings on the DMP

5. Drainage of agricultural land is intended to support the required increase in food production and sustainable rural development in Pakistan. Farmers, as well as the country benefit from improved productivity resulting from improved waterlogging and salinity control. Drainage, however, may also have an important role in storm water removal, the protection of built-up areas, control of waterborne diseases, water quality management and even water supply. If not managed well this role can turn from beneficial to detrimental. It is therefore important to view drainage in the framework of integrated water management. In light of this the DMP will have to be positioned in relation to several policy papers, ongoing projects and accords, like: Water Sector Strategy, Medium Term Investment Plan, National Drainage Strategy (NDS), NDP, Water Apportionment Accord (WAA) and the Five Year Development Plan 2005 – 2010 of the Government of Pakistan (GOP). In addition there are various related documents of multilateral donors.

6. The DMP contains a good and clear overview of the past developments with respect to drainage in Pakistan. As far as the inflow to the drains is concerned a distinction is made between agricultural - partly brackish or even saline - drainage water and urban and industrial wastewater. Also the approach, which is based on drainage basins, is useful. The drains in the Indus Basin, however, generally also have an important storm drainage function, which has so far not adequately been covered. Clearly this function cannot be ignored in the DMP.

7. Concerning the type of drainage system the POE fully supports the stated priorities: (i) improved surface drainage; (ii) pipe drainage; (iii) private tubewell development in FGW zones; (iv) bio-drainage and saline agriculture solutions for land which cannot feasibly be improved by conventional methods. It is, however, unclear in the DMP how the lessons that can be learned from the past result in the ideas, concepts and proposals for future projects. As such it lacks a systematic analysis of the different drainage situations in the country. It is therefore often not clear why certain solutions are proposed for specific sub-basins. Diversity of drainage situations at macro, meso and local level appears not to have played a role in the formulation of the solutions. Due to this there is a serious risk that the proposed solutions will not effectively address the actual problems. A first step might be to define the issues relevant to the drainage sector. A next step would be an integrated analysis of causes and effects of the problems, the benefits of drainage, and the roles and responsibilities of the various formal and informal stakeholders. This would have to be followed

by the definition of conditions that are needed for effective drainage interventions, conditions for which responsibility may lie beyond the drainage sector. This sets the agenda for future collaborative work with other sectors. A DRAINFRAME-type of approach - as shown later - may provide a structuring mechanism for such an integrated analysis. There are many interdependencies between the different parts of the Indus Basin that require analysis and management solutions at provincial and federal level. The different drainage requirements and technical solutions would have to come from the local levels and have to be aggregated from there to the main systems. Certain guidelines and boundary conditions for the local solutions have to be set by the provincial and federal level.

8. Although the DMP covers not only drainage improvement measures but also a wide range of supporting non-drainage measures and actions (pollution control, improved irrigation, institutional reform, incentive policies, agricultural development, etc.), the proposed interventions only concern investments in drainage infrastructure. The list does not include non-drainage measures and water management improvements. These measures and actions are, however, indispensable and it is of concern that the financing and implementation requirements of these measures have not been worked out. One intervention area that is missing, for example, is to regulate main system supplies and rationalize irrigation duties. It is understood, that in the recent dry years similar (even slightly higher) crop yields were achieved with less releases from the main reservoirs. This was done through rotation of the available supply and on the farmers' side additional development of private tubewells. As a result there was less waterlogging, which also, may have, contributed to higher yields. Though the DMP mentions that 'the preventive approach has not been pursued vigorously' in the past, it does not work out how this could be done in the coming period.

9. The draft Drainage Atlas promises an excellent publication that may be of great help in investigating existing drainage, waterlogging and salinity situations. Two additions can improve its value. First of all to understand the groundwater flow better it would be useful that maps are being added where the groundwater levels are shown with respect to Mean Sea Level (MSL). In addition a small overview map highlighting the concerned area could be added in the different maps. The POE realizes that this will need more time and resources.

10. Salt balances play a crucial role throughout the DMP. The vertical breakdown of the salt balance into separate balances for the surface water, the root zone and the underlying groundwater, is appreciated. Some of the figures - particularly as they relate to root zone salinity - may need to be revisited. The true significance of the figures in the salt balance, however, cannot be assessed and remedial actions cannot be defined without a more detailed and disaggregated understanding and qualification of the salt dynamics in the basin.

11. An important question remains how salinity can be controlled throughout the Indus Basin. Over a 30-years period the data in the DMP do not indicate a worsening of the salinity content of the Indus water at Kotri Barrage. On average the surface salinity at field level has not increased. However, at present there is an increase in profile salinity and sodicity. It is stated in the DMP that from a salinity point of view the water quality in the entire Indus Basin is useable for agriculture throughout the year. It may be expected that several of the

measures as proposed in the DMP - e.g. closing of Saline Groundwater (SGW) wells, installation of sub-surface pipe drains - will reduce the salinity content of the drainage water. On the other hand expansion of the irrigated area, as is still occurring, may increase the salt load.

12. The DMP includes the same outfall drain, which was originally proposed under the National Surface Drainage System (NSDS) pre-feasibility study, now renamed as Trans-Basin Outfall Drain (TBOD). The plans for this outfall drain were reviewed by an International Panel of Experts (IPOE) (Oct./Nov. 2002), which concluded that the need for such a drain was not urgent as for the medium term more feasible alternatives for coping with the salt disposal problems in the Indus Basin are still available. This conclusion was widely shared by the involved national and provincial officials. The data in the DMP provide even stronger support to this recommendation.

13. The DMP lacks a mechanism that describes how the proposed drainage interventions will be carried out. While infrastructural investments are proposed in a fair amount of detail, institutional and financial mechanisms are lacking. It is difficult to understand how the DMP will be implemented in a sustainable manner, especially with a view to the rather bold statements on the lack of O&M of existing infrastructure. A central theme in the DMP would have to be how to organize and finance adequate levels of O&M. In the budget, however, construction work far outweighs any other activity. Given the observed difficulties in O&M of the existing systems and the financial and institutional improvements that are needed, the Rs 305 billion for infrastructural work and Rs 2 billion for institutional work look out of balance. An explanation and breakdown of proposed interventions and resulting O&M requirements, budget and cost sharing arrangements at basin level is expected to provide better insight in the best solutions.

14. The institutional framework does not describe the roles and responsibilities or the coordination mechanisms between the sectors and the different administrative levels. This is particularly important due to the multiple administrative layers in the water sector. The POE expects that in the final version of the DMP participation of stakeholders representing functions other than irrigated agriculture will be presented. The same holds true for the role of the beneficiaries/private sector in O&M.

15. The integration and scope of stakeholder participation would have to be broadened. An integrated approach would have to take into consideration the changes in the resources system (land and water) due to drainage whether direct or indirect, primary or higher order. The approach would have to include but not be limited to the important role of agriculture production. Improved drainage may also help in mitigating flood damages, which extend beyond agriculture to urban and rural buildings and infrastructure, and it may save human lives. Drainage may also improve health conditions in the rural area, which has impact on the national economy at least by reducing the cost of health care. Drainage systems may also act to drain treated rural and urban wastewater, including industrial wastewater. Untreated wastewater, however, will have a very negative impact on the drainage water and the required measures would have to be taken to treat and/or reuse such effluent. On the cost side there are site-specific problems that would need mitigation measures or additional interventions. In such an analysis the cost of ecological damage with and without the drain-

age system would have to be analyzed. Stakeholders, who benefit from or are affected by a drainage system, would have to be engaged in the planning, design and construction of the system, and eventually share costs.

16. The Initial Environmental Examination (IEE) of the DMP would have to be improved for this level of planning. It contains unsubstantiated assessments, which give reason to doubt the outcome of the IEE. The assessment lacks an overview of planned activities, and consequently does not link potential impacts to specific activities. No attention is paid to potential off-site impacts, such as changes in volume and quality of water in downstream areas. It is difficult to find out on what criteria environmental impacts are considered an improvement or deterioration. Although some of the commonly held views about the origin and genesis of the salt problems seem to be questioned, these views have not been substantiated while at the end the IEE fully supports the central thrust and proposed measures of the DMP. Furthermore, the approach in the IEE is rather defensive as it mainly looks at impacts; it does not address opportunities to create a higher value resource management system. A more fundamental issue is that a basin level plan cannot be screened according to project level Environmental Impact Assessment (EIA) criteria. Consequently the category B classification as referred to in the DMP is not yet relevant. Basin level plans lead to projects that are normally subject to an EIA. For basin level plans a strategic level environmental assessment would be more appropriate. It is effective to integrate a Strategic Environmental Assessment (SEA) in basin planning.

Findings during the visit to Sindh Province

17. During the visit to Sindh Province meetings and workshops were held in Karachi, Hyderabad, Badin and Tando Muhammed Khan. The area of Kotri Left Bank Drainage Basin was visited. Based on these activities the following observations were made by the POE: (i) drainage issues play an important role and are heavily debated in the area; (ii) there are surface irrigation and drainage systems throughout more or less the whole area. However, the density of the drains is relatively low to meet the demands; (iii) the drainage system does not include on-farm drainage and has not been designed for multifunctional use (e.g. cattle drenching, reuse); (iv) a number of the drainage systems are being rehabilitated under the NDP; (v) a good record is available of the alignments, dimensions and design criteria of the irrigation and drainage systems; (vi) there is a considerable potential of drainage water reuse; (vii) the water sector reform is accepted, but the implementation will need more time than originally envisaged. The new organizations—Area Water Boards (AWBs) and Farmers' Organizations (FOs)—would have to play an important role in the water management in their areas, but their capacities are still weak; (viii) the importance of an integrated basin approach is broadly accepted; (ix) Sindh Province wants to take the lead in the preparation of the DDWMP for Kotri Left Bank Drainage Basin; and (x) plans need to be developed in intensive consultation with the local communities, and need their consent prior to implementation.

18. Problems in the Kotri Left Bank Drainage Basin that were identified by the POE were, among others: (i) loss of lives and damage due to flooding in July 2003, caused by a combination of extreme events: seawater set-up, heavy rainfall, high drainage discharge from upstream, fully flowing irrigation canals and local removal of some embankment sec-

tions; (ii) waterlogging and salinity problems; (iii) the blockage of certain main drain flows by the tidal effects in the Kadhan Pateji Outfall Drain (KPOD) and the Tidal Link during high tides, combined with seawater intrusion in the outfall drains; (iv) bed and bank erosion of the KPOD and the Tidal Link with tidal effects now extending upwards, however, no indication of flow obstruction to the Arabian Sea under normal sea level conditions; (v) severe pollution of irrigation and drainage water, especially by urban and industrial waste; (vi) over use of irrigation water in the upstream areas and severe shortage, especially in tail-end areas, also causing salinization; (vii) inadequacy and inequity of canal water supply due to unequal distribution, but also due to uneven power distribution among users; (viii) certain loss of biodiversity and fisheries resources in the dhands; (ix) ineffective implementation of Pakistan's commitment to the Ramsar wetland convention on conservation of internationally important wetlands; (x) the miserable drinking water situation in the lower area, where a large part of the population depends on polluted water from canals and even in certain areas from drains. This problem is particularly severe in the Rabi season in the non-perennial canal commands; and (xi) the prevalence of waterborne diseases. Based on a sound understanding of the present conditions a package of improvement options will have to be formulated. In the formulation of this package the on-going reform in the water sector will need due attention as well as a clear formulation of the required cost sharing, tasks and responsibilities of the stakeholders. The POE has formulated TOR for the development of DDWMPs.

19. A special problem concerns the coastal erosion at various places along the coastal zone. There are several reasons for this erosion. First of all, due to the construction of the barrages in the Indus River the annual sediment supply to the coastal area has gone down from about 400 million tons to about 35 million tons. In addition there may be other reasons like: storm surges, currents induced by the tidal fluctuations, the rise of the mean sea level the disappearance of a significant part of the mangroves. It looks like the phenomenon has been accelerated in the area of the Tidal Link. The impression exists that a new equilibrium is developing. However, additional coastal erosion will have to be expected, at least in the forthcoming decades. Measures will have to be considered to manage such erosion.

Annex 8

**July 2003 Floods
Fatal Casualties in Sindh**

No	District	No of Fatalities			Compensation Paid (Rs In Million)
		Breadwinner	Non Bread earner	Total	
1	Karachi	24	23	47	3.500
2	Hyderabad	7	9	16	1.150
3	Dadu	9	25	34	2.200
4	Badin	21	65	86	4.450
5	Thatta	17	22	39	2.750
6	Nawabshah	4	13	17	1.000
7	Khairpur	2	6	8	0.500
8	N Feroze	6	3	9	0.690
9	Sanghar	1	7	8	0.450
10	Mirpurkhas	2	7	9	0.550
11	Tharparker	19	5	24	2.000
12	Larkana	8	9	17	1.070
13	Shikarpur	4	-	4	0.400
	Total	124	194	318	20.710

Source: Sindh Provincial Relief Committee Karachi Pakistan. September 5, 2003 Meeting

Annex 9

Chronology of Key Events

LBOD		NDP	
December 1984	Board Approved LBOD Stage 1		
February 1989	EIA for LBOD Stage-1 (including Tidal Link)		
September 1991	Tidal Link and overflow weir (Cholri weir) implementation begun		
		June 1993	Drainage Sector Environmental Assessment (DSEA)
March 1993	Environment, Supporting Report #10, Mid-Term Review, LBOD Stage-1 Project		
		January 1994	Initial Executive Project Summary for the NDP Project
		June 1994	Preparation of NDP Project begins
November 1994	Interim Environmental Report, LBOD Stage-1		
1995	Draft Environmental Management and Monitoring Plan (EMMP) for the LBOD – Stage 1 Project		
June 1995	Tidal Link operational		
		July 1995	Second Preappraisal Mission, during which a limited Initial Environmental Scoping (IES) was conducted jointly with the ADB
		October 1995	Appraisal of NDP Project
1995-1996	Erosion and scour of Tidal Link bed and both banks observed. Remedial works along embankment undertaken by WAPDA O&M (South), but bank sloughing, bed and bank erosion continued; differential settlement of upstream face of Cholri Weir detected beginning in 1995, remedial works undertaken and completed by end 1996		
		April 1996	Disclosure of DSEA at Bank Infoshop
		January 1997	PIDAs Ordinances and Acts
		November 1997	Board Approved NDP Project
December 1997	LBOD Stage 1 project closed		
April 1998	Update of 1995 EMMP for the LBOD – Stage 1 Project including the Tidal Link area		
June 1998	250 feet of Cholri Weir section length collapsed. Attempts to close the breached weir section failed		
June 1998	Implementation Completion Report for LBOD Stage 1 Project		
October 1998	Federal and provincial authorities stop further remedial works after breach in Cholri Weir increased to 450 feet length		
May 1999	Catastrophic tropical cyclone caused severe damage, including almost complete destruction of Cholri Weir, and breaches of both Tidal Link embankments in 56 places		

LBOD		NDP	
		February 2000	Review/MTR Mission for NDP Project with Aide-Memoire in April 2000
May 2000	Government of Sindh High-Level Technical Committee on Cyclone damages to Tidal Link/Cholri Weir with report made in October 2000		
December 2000	GOS second High-Level Technical Committee to review environmental and social effects of damages to Tidal Link/Cholri Weir		
March 2001	World Bank Tidal Link Fact Finding Mission on Cyclone damages to Tidal Link/Cholri Weir		
		March-April 2001	Joint World Bank, ADB and JBIC MTR Mission for NDP Project
		July 2001	Funds allocated from NDP Project for Drought Emergency Recovery Assistance
		January 2001	Pre-feasibility studies begin for NSDS
		February 2002	EMP Framework for NDP; Special Committee Appointed by the President of Pakistan to make recommendations to restructure NDP (Junejo Committee)
		March 2002	Preparation of DMP begins
		Mid 2002	GOP requests NSDS Panel of Experts (POE)
		October 2002	Approval of Sindh Water Management Ordinance -- Sindh revised the SIDA Act of 1997
		October-November 2002	MTR Completion Joint Donor Review
		April 2003	NSDS POE Report
July 2003	Very heavy flooding due to abnormally high rainfall during monsoon		
August 2004	Meeting to review Recommendations of the Chief Corps of Engineers on LBOD Performance after July 2003 floods – chaired by President of Pakistan		
		September 2004	DMP POE Mission to review DMP study
		September 2004	Request to Inspection Panel
November 2004	Diagnostic Study of Livelihoods starts in Badin and Thatta districts.		
		December 2004	NDP Project Closed
March 2005	POE for the LBOD Outfall System mission starts.		
November 2005	Country Water Resources Assistance Strategy (CWRAS) was presented to the Board		

Annex 10

Schedule of Supervision Missions for LBOD and NDP

Project	Date	Mission Type	Supervisions Team
LBOD	October- November 1985	Supervision	Agriculturist Division Chief
	April 1986	Supervision	Economist (3) Irrigation Engineer Civil Engineer Division Chief
	November 1986	Supervision	Agriculturist Irrigation Engineer Economist Civil Engineer
	November 1987	Supervision	Agriculturist Irrigation Engineer
	April 1988	Supervision	Irrigation Engineer (2)
	February 1989	Supervision	Irrigation Engineer (2)
	November 1989	Supervision	Economist Irrigation Engineer
	May 1990	Supervision	Irrigation Engineer
	November 1990	Supervision	Irrigation Engineer
	September 1991	Supervision	Irrigation Engineer
	November- December 1991	Supervision	Irrigation Engineer Project Officer Admin. Officer
	April 1992	Supervision	Financial Analyst Irrigation Engineer
	June 1992	Supervision	Irrigation Engineer (2)
	December 1992	Supervision	Financial Analyst Irrigation Engineer (3)
	June 1993	Supervision	Financial Analyst Irrigation Engineer (2) Anthropologist Reg. Planner Land Tenure
	January- February 1994	Supervision	Financial Analyst (2) Anthropologist Irrigation Engineer (4)
	September 1994	Supervision	Financial Analyst (2) Irrigation Engineer (4) Dam Specialist Procurement Specialist
	January 1995	Supervision	Financial Analyst (2) Irrigation Engineer
	March 1996	Supervision	Irrigation Engineer (2) Disbursement Specialist
	November- December 1996	Supervision	Financial Analyst Environment Specialist Irrigation Engineer (2) Water Resource Engineer Reg. Planner

Project	Date	Mission Type	Supervisions Team
	July-August 1997	Supervision	Financial Analyst (2) Financial Management Procurement Specialist Sector Investment Specialist Communication Specialist NGO Specialist Irrigation Engineer Staff Assistant Projects Analyst
	January 1998	Completion	Financial Analyst (2) Financial Management Irrigation Engineer Projects Analyst
	March 1998	Completion	Financial Analyst (2) Financial Management Procurement Specialist Projects Analyst Irrigation Engineer
NDP	March 16 to 25, 1998	1st Supervision mission	Task Team Leader/Financial Management Financial Analyst Irrigation Engineer Project Analyst Procurement Specialist Disbursement Officer NGO Specialist
	August 3 to 18, 1998	2nd Supervision mission	Task Team Leader/Financial Management Irrigation Engineer Resettlement Engineer Procurement Specialist Project Analyst
	February 22 to March 4, 1999	3rd Supervision mission	Task Team Leader/Financial Management Irrigation Engineer M&E Economist Operations Analyst Procurement Specialist Disbursement Officer Social Development
	May 17 to June 24, 1999	4th Supervision mission	Task Team Leader/Financial Management Agriculture Economist Project Analyst Procurement Specialist
	February 28 to April 7, 2000 February 2000 (MTR) March 2000 (2 nd leg MTR) October 2000	5th Supervision mission (Joint WB/ADB/JBIC MTRI mission)	Task Team Leader/Agriculture Economist Irrigation Engineer Disbursement Analyst Procurement Specialist Financial Management Specialist Social Development Project Implementation (ADB) Program Officer (ADB) Project Implementation (JBIC)

*Pakistan National Drainage Program Project
Annex 10*

Project	Date	Mission Type	Supervisions Team
	March 11-17, 2001 World Bank Tidal Link Fact Finding Mission on Cyclone damages to Tidal Link/Cholri Weir	Post completion/Tidal Link (May – Pvt. Ground water mission P010501) June 17-25, 2001 visited Quetta and Karachi Peshawar re P075172 LEN Visited Karachi Sept./Oct. 2001 visited Karachi re P071095-LEN	Project Team
	March 19 to April 6, 2001	(Joint WB/ADB/JBIC MTR-II mission)	Task Team Leader/Agriculture Economist Irrigation Engineer Disbursement Analyst Procurement Specialist Financial Management Specialist Social Development Project Implementation (ADB) Program Officer (ADB) Project Implementation (JBIC)
	June 18 to July 8, 2001	Follow-up mission on Institutional Reforms	Institutional Development Specialist
	December 9-12, 2001	SPN mission-Visited Karachi	Usman Qamar
	January 16-18, 2002	To discuss the institutional reform component and other aspects of mid-term review of NDP with the Secretary Irrigation Punjab and GM NDP WAPDA	
	January 27-February 01, 2002		
	October 30 to November 15, 2002	(Joint WB/ADB/JBIC MTR-III mission) ¹	Task Team Leader/Agriculture Economist Irrigation Engineer Disbursement Analyst Procurement Specialist Financial Management Specialist Social Development Project Implementation (ADB) Program Officer (ADB) Project Implementation (JBIC)
	December 11-12, 2003	Constance Bernard's meetings with Government of Punjab Officials regarding NDP and sector dialogue.	
	December 13-15, 2003	Constance Bernard's trip to Karachi to discuss NDP issues and conduct sector dialogue.	Co-Task Team Leader SD visited Karachi
	May 11 to June 13, 2003	Implementation Review mission	Task Team Leader/Agriculture Economist Irrigation Engineer Environmental Specialist Financial Management Specialist Drainage Advisor

Project	Date	Mission Type	Supervisions Team
			Water Resources Advisor Agriculturist Administrative Client Support
	November 29, 2003 to December 6, 2003	Implementation Review mission (Procurement)	Task Team Leader Irrigation Engineer Procurement - Regional Procurement Advisor - SAS Financial Management Specialist Lawyer (Consultant)
	March 28 to April 7, 2004	Implementation Review mission	Task Team Leader Irrigation Engineer Rural Development Specialist Drainage Advisor Water Resources Advisor
	June 26 to July 4, 2004	Implementation Review mission	Task Team Leader Irrigation Engineer Irrigation Advisor Water Resources Specialist - FAO Irrigation Consultant Irrigation Consultant
	July 5-12, 2004	Field Visit	Task Team Leader Co-Task Manager Country Director Sector Director Operation Officer
	May 10-15, 2005	FAO ICR Mission	(Task Team Leader joined this mission. Also reviewed with GOS on actions taken on preparation process of Sindh WSIP in Karachi (May 21-26)
	December 17-22, 2005	Final Implementation Review Mission	Task Team Leader Co-Task Leader Financial Management Water Resources and Civil Works Environment Specialist
	February 22-25, 2005	Field Visit	Co-Task Leader Sector Director
Sindh OFWM	September 12-Oct 02, 2002	To participate in brain storming on water sector issues in the context of Pakistan Public Expenditure Review and the Water Resources Management Study.	
	November 25-29, 2002	To move forward preparation of the Sindh On-Farm water Management Project, including, inter alia, aspects concerning institutional and implementation arrangements, financial management system, integrated social and environmental assessment, productivity	Task Team Leader/Irrig. Spec. Procurement Community Development spec. Disbursements Financial Management Environment Pest Management Spec. Agricultural Economist

*Pakistan National Drainage Program Project
Annex 10*

Project	Date	Mission Type	Supervisions Team
		enhancement component and procurement.	
Sindh OFWM	September 2003	TOR only Implementation mission	Task Team Leader/Irrig. Spec. Procurement Community Development Disbursements Financial Management Environment Pest Management Agricultural Economist
	April 22-May 2, 2003	To Move forward preparation of the Sindh On-Farm Water Management Project	
	May 9 – 15, 2003	Wrap-up meeting	See NDP for mission Team
	June 6 – 11, 2003	To attend a meeting with the Sindh Agr. Dept. regarding preparation of Sindh OFWM Project	
	Sept 30 – Oct. 17, 2003	To appraise the proposed Sindh On-Farm Water Management Project.	
	October 22 – 23, 2003	To attend the appraisal mission wrap-up meeting with GOS at Karachi. The wrap-up meeting was earlier scheduled for October 18, 2003 but was postponed to October 23 at the request of the Sindh Planning and Development Department so that the Additional Chief Secretary could chair it.	
	April 18-May 5, 2005	Preparation Mission	Task Team Leader/Irrig. Spec. Procurement Community Development Disbursements Financial Management Environment Pest Management Agricultural Economist
	November 14- Dec 6, 2005	Implementation mission	Task Team Leader/Irrig. Spec. Procurement Community Development Disbursements Financial Management Environment Pest Management Agricultural Economist
	June 7-16, 2006	Implementation mission	Task Team Leader/Irrig. Spec. Procurement Community Development Disbursements Financial Management

Project	Date	Mission Type	Supervisions Team
			Environment Pest Management Agricultural Economist
Sindh WSIP	June 26- July 1, 2004	Preparation Mission	Task Team Leader Irrigation Specialist Consultant Implementing agencies –SIDA, Irrigation and Power Department and P&D
	July 9-20, 2006	Preparation Mission	Masood-Intro
PK Country Water Re- sources Assis- tance Strategy (CWRAS)	November 16-18, 2003	Field visit (To accom- pany the SASRD team (Constance Bernard, Adolfo Brizzi, John Briscoe, Manuel Conti- joch, Tekola Dejene) to Sindh to discuss CWRAS preparation for Pakistan)	Task Team Constance Bernard Adolfo Brizzi John Briscoe Manuel Contijoch Abid Hasan Tekola Dejene Usman Qamar
	February 2003	Meeting with the stake- holders	Task Team Gonzalez, Jeremy, Drainage and Salinity Specialists Water Resource Engineer Irrigation Specialist Environment Specialist
	January 27 2005	Institutional Meeting	Water Specialist, Contijoch Dejene Qamar Consultant (Economist)
	February 1, 2005	Consultation Workshop	Water Specialist Contijoch Dejene Qamar Consultant (Economist)
	September 17-19, 2005	Dissemination Workshop	Water Specialist, Contijoch Dejene Qamar Consultant (Economist)

¹ On June 29, 2001, the President of Pakistan appointed a Special Committee headed by the Federal Minister for Food, Agriculture and Livestock to review the NDP Project in light of the MTR recommendations. This review culminated in a report entitled, "Report of the Special Committee on the Review of NDP" dated February 2002, which was ultimately approved by the President on August 27, 2002. While the review was in progress and until the Special Committee's recommendations were approved by the President, the NDP project was put "on-hold".

Supervision Costs for LBOD and NDP

PAKISTAN: National Drainage Program (P010500)			
Supervision Cost by FY			
FY	Actual Amount (US\$)		
	BB	TF	BB/FAO
1998	190,793.15	46,334.05	
1999	222,236.35	62,858.98	
2000	383,047.04	5,931.82	
2001	269,116.22		
2002	95,757.00		
2003	248,078.75	74,335.49	50,000.00
2004	1,186,451.00	40,950.00	
2005	418,773.95	89,790.13	99,000.00
2006	93,963.81	1,121.84	
2007	9,307.19		
Total	3,117,524.46	321,322.31	149,000.00
Total SPN cost US\$3,587,847.00			

PAKISTAN: Left Bank Outfall Drainage (P010209)	
Supervision Cost by FY	
FY	Actual Amount (US\$'000)
	BB/BBFAO (excluding TF)
1985	44
1986	144
1987	128
1988	91
1989	90
1990	84
1991	77
1992	132
1993	273
1994	246
1995	172
1996	187
1997	307
1998	169
1999	1
Total	2,146

SPN Cost 'Actuals (USD)						
Proj ID		Approval FY	Date, Rev Closing\Fiscal Year	BB/BBFAO	Other	Total
				P010209	LEFT BANK OUTFALL DR	1985
P010500	Natl Drainage Prog	1998	12/31/2004	2198719	223180	2,421,899

Annex 11

Documents and References

- Agrar-Und Hydrotechnik GMBH and National Engineering Services Pakistan (Pvt.) Ltd. June 1995. "Feasibility Study-SCARP Dera Ghazi Khan Phases I and II (Surface and Subsurface Drainage)." Lahore, Pakistan
- Ahmad, Ejaz, Salma Omar and Fayyaz Rasool. 2004. "*Proceedings of Consultative Workshop on Indus Delta Eco-Region (IDER)—December 16-19, 2002 in Karachi.*" WWF, Lahore, Pakistan
- Ahmad, Masood, and Gary P. Kutcher. April 1992. "Irrigation Planning with Environmental Considerations—A Case Study of Pakistan's Indus Basin." World Bank Technical Paper No. 166, World Bank, Washington, D.C.
- Aparicio, Javier, J. Lafragua, M. Preciado et al. 2005. "Pakistan Review of the Performance of the Left Bank Outfall Drain Stage I—Appendix 1 Review of Drainage Options." Instituto Mexicano De Tecnologia Del Agua (IMTA), Jiutepec Morelos, Mexico
- Arcadis BMB. "Opinion on the Performance of the Surface Drainage System in Sindh under Extreme Rainfall in July 2003. Hyderabad, Pakistan
- Asian Development Bank (ADB). December 2000. "Project Completion Report—Left Bank Outfall Drain Project in Pakistan (Ln. # 700-PAK/Rept. # PAK 17055, Manila, Philippines
- _____. 2004. "*Challenges in the Water Sector, a presentation at the Pakistan Development Forum.*" Islamabad, Pakistan
- Bhatti, Ahmed Khan. January 1995. "Reorganization of Water Wing of WAPDA." WAPDA for the 22nd Senior Management Course, WAPDA Administrative Staff College, Lahore, Pakistan
- Delft Hydraulics, 1990. "Tidal Link Mathematical Model, Modelling Effects of Dhand-Tidal Link Weir, Summary of Results of 1990 Modelling." The Netherlands
- _____. 1989. "Left Bank Outfall Drain Stage I Project—Pre-design Study for Tidal Link and Outfall." Final Report
- Gonzalez, Fernando J., Thinus Basson and Bart Schultz. October 16, 2005. "Final Report of IPOE for Review of Studies on Water Escapages below Kotri Barrage." International Panel of Experts, Islamabad, Pakistan
- Government of Pakistan. June 1994. "Eighth Five Year Plan (1993-98)." Planning Commission, Islamabad, Pakistan
- Government of Pakistan, Indus Associated Consultants (Pvt.) Ltd. and Louis Berger International Inc. May 2003 "Pakistan National Surface Drainage System (NSDS)—Pre-Feasibility Study." Final Report, Islamabad, Pakistan
- IUCN Pakistan. 2003. "*Pakistan Environmental Degradation and Impacts on Livelihoods—Sea Intrusion (A Case Study).*" Karachi, Pakistan

- Khan, Azmat Hayat, July 2003. "Flash Floods in Sindh, an evidence of Climate Variability in the Region." News Article, Pakistan Meteorological Department, Islamabad, Pakistan
- Memon, A. A., 2004. "Evaluation of Impacts on the Lower Indus River Basin due to Up-stream Water Storage and Diversion." Salt Lake City, UT
- Ministry of Food, 2004. "Agriculture and Livestock, Crops Area Production 2000-2001 to 2002-03." Islamabad, Pakistan
- Mott MacDonald Limited. February 1989. "LBOD Stage I project, Environmental Impact Assessment of the Outfall Drains."
- _____. June 1993. "Drainage Sector Environment Assessment National Drainage Program, Main Report Vol. 2—Conceptual Framework." Islamabad, Pakistan
- _____. November 1994. "Interim Environmental Report." Left Bank Outfall Drain Stage I Project"
- _____. April 1998. "Comparative Land Use Assessment Pre and Post Construction." Left Bank Outfall Drain Stage 1 Project (Study ENV/1)
- Mott MacDonald International Limited and Hunting Technical Services Ltd. (MMP/HTS). 1984. "LBOD Stage I Project Preparation, Annexes 9, 10 and 11, Spinal Drain and Surface Drainage Network"
- _____. February 1992. "Lower Indus Region Right Bank Master Plan"
- National Engineering Services Pakistan (Pvt.) Ltd. And Mott MacDonald International Ltd. June 1993. "Pakistan: Drainage Sector Environmental Assessment—National Drainage Programme"
- _____. May 1995. "Feasibility Study, National Drainage Programme I"
- National Engineering Services Pakistan (Pvt.) Ltd, Agrar-Und Hydrotechnik GMBH, and National Development Consultants. October 1994. "Feasibility Study—Second Irrigation and Drainage Sukh Beas/Lower Baari Doab Canal Project Interim Report." Lahore, Pakistan
- National Institute of Oceanography. "October 1998. Bed Level Survey of LBOD Tidal Link & KPOD Up to RD+26 by Echosounding." Final Report, Karachi, Pakistan
- _____. 2002. "Bed Level Survey of LBOD Tidal Link, KPOD, DPOD and Shah Samando Creek at Outfall of Tidal Link by Eco/Sounding." Karachi, Pakistan
- _____. 2004. "Annual Physical Monitoring Report." Karachi, Pakistan
- Prime Minister Secretariat (Public), August 20, 2004. "Minutes of President's Meeting Held at Sindh Governor's House Karachi." Karachi, Pakistan
- SCARPs Monitoring Organization WAPDA and National Institute of Oceanography. March 1999. *Memorandum of Understanding.* Hydraulic Monitoring of Tidal Link, LBOD Under National Drainage Programme-I, Hyderabad, Pakistan

- SCARPs Monitoring (South) WAPDA. December 2000. “Physical Monitoring Left Bank Out Fall Drain Stage I Project Under National Drainage Programme—Two Volumes.” Hyderabad, Pakistan
- _____. March 1999 to June 2004. “Physical Monitoring left Bank Out Fall Drain Stage I Project under National Drainage Programme.” Final Report, 3 Vols., Hyderabad, Pakistan
- Schultz, Bart, Thinus Basson, et al. December 2004. “Pakistan Drainage Master Plan (DMP), Panel Consultation—Review Report BNWP.” The Netherlands
- Sindh Irrigation and Drainage Authority (SIDA). 2003. “Performance of Left Bank Outfall Drain During Monsoon 2003, Hyderabad, Pakistan
- _____. 2004. “Water Sector Improvement Programme in Sindh, a presentation at the Pakistan Development Forum. Hyderabad, Pakistan
- _____. February 2006. “Report on Rainfall 2003-Damages.” Relief Operations by Government and Non Government Organizations.” Hyderabad, Pakistan
- Sir M MacDonald and Partners Limited and Associates. January 1984. “Left Bank Outfall Drainage Stage I Project Preparation, Annex 12, Outfall system and Tidal Link”
- _____. March 1993. “Environment, Supporting Report 10, Mid Term Review, Left Bank Outfall Drain Stage I Project”
- _____. 1994. “Performance of Drainage Systems on the Left Bank of the River Indus during the 1994 Monsoon.” Final Report
- _____. October 1994. “Performance of the Drainage Systems of the Left Bank of the River Indus during the 1994 Monsoon.” Album of Photographs
- _____. 1995. “Review of the Morphology of the Tidal Link”
- _____. May 1997. “Morphology of the Tidal Link Post 1996 Monsoon.” Left Bank Outfall Drain Stage-I Project
- _____. June 1997. “Performance of the Drainage Systems during 1996” Left Bank Outfall Drain Stage I Project
- _____. April 1998. “Environmental Management and Monitoring Plan.” Left Bank Outfall Drain Stage I Project
- _____. December 1990. “Water Sector Investment Planning Study”
- _____. February 1999. “A Review of Erosion Problems in Tidal Link/Breach in Cholri Weir Structure and Proposals for Rehabilitation.” Specialist Group, Lahore, Pakistan
- SZABIST Center for Information and Research. “Socio-Economic Impact of Cyclone-02A on Coastal Sindh.” Study Report, Karachi, Pakistan
- University of Sindh. December 1997. “Fisheries Survey of Chotiari Reservoir (Sanghar) and Tidal Link Lakes (Badin).” Sanghar, Pakistan

- Water and Power Development Authority (WAPDA). May 1994. "Lower Indus Right Bank Irrigation and Drainage Project (Stage-I) Priority Works (PC-1)." Hyderabad, Pakistan
- _____. January 1997. "Presentation to the Minister for Water and Power, Left Bank Outfall Drain Stage I Project." Hyderabad, Pakistan
- _____. February 1997. "LBOD Project Issues Communication with Parties at Stake." General Manager (South), Hyderabad, Pakistan
- _____. October 2000. "Committee Report on Damages to Cholri Weir in June 1998 and Tidal Link During May 1999 Cyclone to the Additional Chief Secretary." Chief Engineer and Project Director (South), Government of Sindh. Hyderabad, Pakistan
- _____. September 2005. "Drainage Master Plan of Pakistan—Vol 1" Final Report. Lahore, Pakistan
- _____. 2005. "Physical Monitoring of LBOD Stage I Project under National Drainage Programme." Islamabad, Pakistan
- World Bank. November 5, 1984. "Staff Appraisal Report on Pakistan Left Bank Outfall Drain Stage I Project." Agriculture and Rural Development Department, Washington, D.C.
- _____. July 1992. "*Aide Memoire-Joint Review Mission--Socio-Economic Impact Evaluation Study*." Agriculture and Rural Development Department, Washington, D.C.
- _____. March 25, 1994. "Pakistan Irrigation and Drainage: Issues and Options." Agriculture and Rural Development Department, Washington, D.C.
- _____. November 22, 1995 and March 20, 1997. "Country Assistance Strategy of the World Bank Group for the Islamic Republic of Pakistan." and "The Country Assistance Strategy Progress Report." Pakistan Country Management Unit, Washington, D.C.
- _____. May 1997. "National Drainage Program: Implementation Volume to Staff Appraisal Report." Agriculture and Rural Development Department, Washington, D.C.
- _____. June 19, 1998. "Implementation Completion Report, Left Bank Outfall Drain Stage I Project (Cr. 1532-PAK)." Agriculture and Rural Development Department, Washington, D.C.
- _____. 2002. "Country Assistance Strategy for the Islamic Republic of Pakistan." South Asia Region, Washington, D.C.
- _____. March 30, 2003. "Water Resources and Environment Technical Note C.2—Environmental Flows: Case Studies." Working Paper # 26122, East Asia Pacific, Washington, D.C.
- _____. November 5, 2003. "Reclaiming Drainage Towards an Integrated Approach." Draft. Washington, D.C.
- _____. June 6, 2004. "Review of the Performance of the Left Bank Outfall Drain Stage I--(KPOD, DPOD, Tidal Link and Cholri Weir)" Report of the World Bank International Panel of Experts, World Bank, Washington, D.C.

- _____2004. “Report and Recommendation on Request for Inspection.” Pakistan National Drainage Program Project. World Bank Inspection Panel. Washington, D.C.
- _____2005. “National Drainage Project Final Completion Implementation Review Mission Aide-Memoire.” Agriculture and Rural Development Department, Washington, D.C.
- 2005. “Diagnostic Study and Proposal for Livelihoods Improvements: Badin and Thatta Districts, Sindh, Pakistan.” Islamabad, Pakistan
- _____November 22, 2005. “Pakistan Country Water Resources Assistance Strategy—Water Economy: Running Dry.” Agriculture and Rural Development Department, Washington, D.C.
- _____April 4, 2006. “Country Assistance Strategy for the Islamic Republic of Pakistan for the period FY06-09.”, Washington, D.C.
- Water Watch, “Remote Sensing Study Left Bank Outfall Drain—Indus Delta”, Final Draft, The Netherlands
- Zoological survey Department. May-December 1997. “Survey of the Avifauna of Tidal Link and Adjoining Areas.” Islamabad, Pakistan