



**SINDH IRRIGATION & DRAINAGE AUTHORITY**

**INTEGRATED SOCIAL & ENVIRONMENTAL ASSESSMENT (ISEA)**

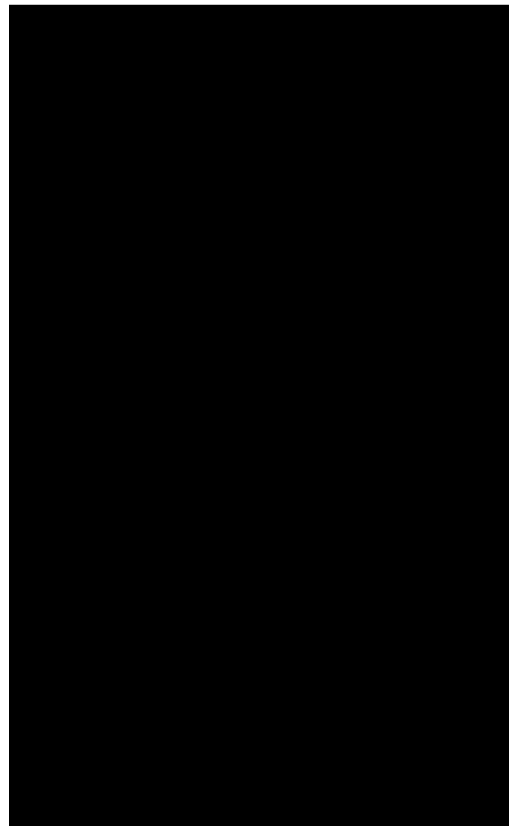
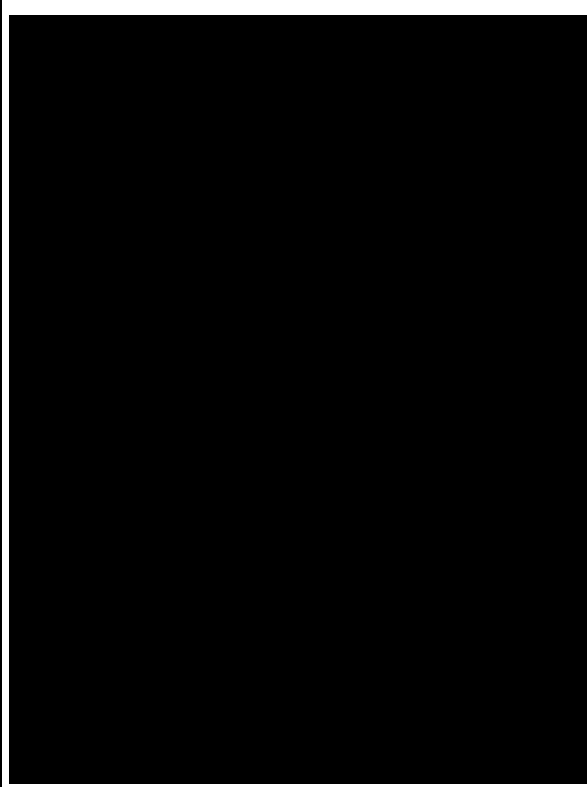
**FOR**

**WATER SECTOR IMPROVEMENT PROJECT (WSIP-I)**

**SUMMARY REPORT**

**October 25, 2006**

Location of Sindh Province of Pakistan





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# INTEGRATED SOCIAL & ENVIRONMENTAL ASSESSMENT (ISEA) FOR WATER SECTOR IMPROVEMENT Phase-I PROJECT

## Summary Report

### 1. INTRODUCTION

#### 1.1 The Basic Issue

Sindh is one of the major beneficiaries of the Indus Basin Irrigation System (IBIS) which is life line of Pakistan's economy. Due to arid and desert like climate of Sindh, agriculture without irrigation is not possible. Surface water is even more important in Sindh as most of its lands are underlain by saline groundwater. Despite importance of surface water resources, they are managed very inefficiently. The water use efficiency is low (around 35 percent) and inequity in its distribution is pervasive leading to a several social and economic problems adversely affecting the long term sustainability of the irrigated agriculture. The deteriorating irrigation infrastructure poses a major challenge to the sustainability of Sindh's irrigated agriculture which is the single most important source of employment and livelihood. Sindh also has a major problem of waterlogging and salinity due inefficient use of water resources and lack of adequate drainage network. Progress in revamping the essential infrastructure is constrained by weak institutions, lack of proper governance and inappropriate cost recovery and financing policies. Implementation of Water Sector Improvement Phase-I (WSIP-I) would be a major step forward in addressing major issues of Sindh's irrigated agriculture.

#### 1.2 Irrigation Sector Background

The Indus Basin Irrigation System (IBIS), the largest integrated irrigation network in the world, consists of Indus River and its tributaries, three major storage reservoirs, 19 barrages, 12 inter-river link canals, 13 irrigation canal commands, and over 110,000 watercourses, delivering water to farms. Water is diverted from the rivers through barrages or head-works into the main canals. Generally the hierarchical canal system runs from main canals to branch canals, distributaries / minors and watercourses that supply water to chacks or dehs (tertiary irrigation command area) through moghas (un-gated outlets) in distributaries and minors.

Sindh is one of the primary beneficiaries of the IBIS. It has three major barrages on the Indus River that divert approximately 48 million acre feet (MAF or 59.0 billion cubic meters BCM) of water annually to the 14 main canal commands in Sindh. These canal systems have an aggregate length of 11,916 miles (19,066 km) of canals, which serve a gross command area (GCA) of 14.391 million acres (5.8 million ha).

There are about 42,000 watercourses (tertiary channels), which have an aggregate length of about 75,000 miles (120,000 km). Around 78% of the area in Sindh province is underlain by saline groundwater which is unsuitable for irrigation. Surface and sub-surface drainage systems are inadequate, resulting in much of the drainage effluent being either retained in the basin or disposed into rivers and canals. There are 13 existing surface drainage systems in Sindh which serve a total area of over 6.2million acres (2.5 million hectares) and have an aggregate length of about 2.981 miles (4,800 km). In addition there are two sub-surface drainage systems which serve an area of 0.10 million acres (0.04 million ha). Due to inadequate drainage cover, nearly one-fifth of the canal command areas have been affected by water logging and salinity.

A major part of population (over 60 percent) lives in rural areas and poverty is pervasive in rural Sindh. About 37% of the rural population lives below the poverty line compared to 33% in Pakistan on an overall basis. Over 70% of the rural population is landless. Analysis of the 2001 Pakistan Rural Household Survey data shows that rural households, including the landless derive 56% of their income from agriculture, directly or indirectly. A typical poor household in rural Sindh, has little assets or land, depends on wage income, and is significantly larger than the non-poor household in Sindh or even compared to the average poor household of Pakistan. The rural poor tend to be employed mostly as sharecropper (hari) or agriculture wage labour. Rural Sindh is highly dependent on public services with little role of the private

sector. Thus reforms to improve public service delivery and stimulate rural growth – that raise agricultural and non-agricultural wages are fundamental for reducing poverty in rural Sindh.

### **Issues and Constraints**

The major bottleneck in improving efficiency in water distribution and deliveries stems from the inherent institutional weaknesses. One of the major weakness of the water delivery system design has been the non-participation of water users at any level in the system. As a result of this, the discrepancies between supply of and demand for water could not be reduced – further aggravating the environmental problems of waterlogging and salinity. The extensive control of the irrigation and drainage system by public sector entities characterized by centralized bureaucracies, lack of skills and training, poor interaction with farmers and lack of independent supervision has historically impeded the efforts to exploit the potential gains reposed in the water sector.

Institutional weaknesses manifest in the form of (i) low surface water delivery efficiency (only about 35-40% from the canal head to crop root zone); (ii) water distribution inequities (iii) wasteful on-farm water use; (iv) waterlogging and salinity; (v) poor operation and maintenance (O&M) and low cost recovery; and (vi) constrained investment climate. In Sindh, these issues are even more acute because a major part of its irrigated lands are underlain by saline groundwater, thus lacking groundwater resources that can supplement surface flows; ominous land tenure with large number of very influential farmers often interfering in the operation of the irrigation system, and relatively lower institutional capacity. Since 1970's Pakistan has not been able to make investments to capture and expand additional surface irrigation water supplies.

Traditionally, the whole irrigation system is a public property except the watercourses. The construction, operation and maintenance of the irrigation system up to Minor level has been the responsibility of the Provincial Government's Irrigation & Power Department (IPD). The watercourses are however is common property land-owners who construct, operate and maintain them. Water allocation to watercourse is determined by the Government based water allocation criteria for the canal command.

Many distributaries and watercourses are in the process of deterioration because of accumulated deferred maintenance. This is evident by the frequent breaching of canal banks and clogging of irrigation channels and drains with sediments and debris. Also in case Sindh where groundwater is generally saline, to reduce seepage from the channels (canals, branches, distributaries, minors and watercourses), there is a desperate need to improve irrigation system, main and branch canals and distributaries and minors and improve water resource management through enhanced participation of users in operation and maintenance.

### **1.3 Project Objectives**

The proposed Sindh WSIP-I envisages improved efficiency, reliability and equity of irrigation water distribution in three Area Water Board (AWB) namely Ghotki, Nara and Left Bank. These objectives will be achieved through;

- i). Deepening and broadening the institutional reforms already underway in Sindh.
- ii). Improving the irrigation system in a systemic way covering key hydraulic infrastructures starting from barrages, main and branch canals, and distributaries and minors, while watercourses are being renovated under SOFWM and national program.
- iii). Enhancing long-term sustainability of irrigation system through participatory irrigation management and developing institutions for improving operation and maintenance (O&M) of the system.

The following parameters would be adopted for achieving the objectives:-

Increased conveyance efficiency across canals, distributaries / minors, watercourses and farms. Reduced discharge of drainage water.

Higher consistency between water supplied by the system and water demanded by the farmers through a close

- i). monitoring on a ten-day, monthly, seasonal and annual basis.
- ii). Reduced incidences of canal breaches.
- iii). Regular measurement of delivery performance ratio (DPR) between watercourses located at head and tail of the canal system.
- iv).
- v).

- vi). Farmer's participation through F.O's (Farmers Organizations) in taking over distributary/ minor canals control and IDMTA (Irrigation and Drainage Management Transfer Agreements).
- vii). Increase in abiana collections to be managed by the F.O's and assurance of adequate repair and maintenance work at distributary / minor level by the F.O's.
- viii). Reduction in area with shallow ground water and soil salinity.

#### 1.4. Project Area

The project area for the proposed Sindh WSIP-I would consist of irrigated area of three Area Water Boards (AWBs) namely Nara Canal AWB, Ghotki Feeder AWB and Left Bank Canals (Akram Wah and Fulelli canal commands) that have been established and already functioning (Map 1.1). The project will be primarily implemented by the Sindh Irrigation and Drainage Authority (SIDA) under overall guidance of Sindh Government, through its Planning and Development (P&D) Department with day-to-day coordination by Project Coordination and Management Unit (PCMU) with the P&D Department.

#### 1.5 Project Components

The Project consists of the following components and estimated cost is US\$ 175 million:

- **Component - A:** Community Development and Capacity Building (US\$ 10 Million): Sindh Irrigation and Drainage Authority's (SIDA) capacity would be enhanced to carry out functions in accordance with the Sindh Water Management Ordinance of 2002 (SWMO 2002) in managing water sources in the province and irrigation and drainage services. The project would provide support in rehabilitation of SIDA offices, developing capacity to transform I&D services from the traditional system to a new structure of FOs and AWBs by providing staff with expertise in social mobilization, capacity building of FOs, training, legal advisors, and by establishing an Environmental Management Unit (EMU) to strengthen its capacity for integrating environment considerations in planning, development and use of water resources.
- **Component - B:** Rehabilitation and Improvement of Irrigation and Drainage System (US\$ 137.9 Million): A systematic approach would be adopted in improving the irrigation network starting from the barrage to users in the three AWB's included in the project. The project would cover all main and branch canals and distributaries / minors while watercourses are being improved under the national program and Sindh OFWM Project. The necessary works comprises four sub-components. These would include main and branch canals, distributaries and minors, improvements of the drainage system, design and construction supervision.
- **Component - C:** Management Plans of Major Irrigation and Drainage Infrastructure (US\$ 12 Million). This would include feasibility studies of barrages, preparation of master plan for left bank of Indus Delta and Coastal Zone.
- **Component - D:** Monitoring and Evaluation of the Project Impact and Environmental Management Plan (US\$ 4.2 Million)
- **Component - E:** Project coordination, assistance in procurement monitoring, preparation of a future project, technical assistance and training, strategic studies and pilot projects (US\$ 11 Million).

#### 1.6 The ISEA

The Integrated Social and Environmental Assessment (ISEA) was prepared as part of the project preparation process in by the Government of Sindh, Sindh Irrigation and Drainage Authority (SIDA) and Project Coordination and Monitoring Unit (PCMU). The ISEA was prepared by M/s Osmani & Company (Pvt.) Ltd., Consulting Engineers for the Sindh Irrigation & Drainage Authority (SIDA). An ISEA for Sindh On-Farm Water Management Project, (SOFWMP) was earlier prepared by Osmani & Company (Pvt.) Ltd. The SOFWMP covered the same project area with some similarities in interventions. As such the current WSIP-I ISEA is built-upon the experience of SOFWMP ISEA.

At the initial stages the details of physical and institutional interventions under WSIP were not available. As such, the ISEA was prepared keeping in view the generalized and broad-based physical and institutional interventions prepared for the project. During 2005 the WSIP was better defined based on which draft final

ISEA was prepared in September 2005. This draft and its summary (also translated in Sindhi) were the basis for consultation workshops that were held in January 19, 25 and March 29, 2006 in Ghotki, Badin, and Mirpurkhas respectively. The feedback received was introduced in the Project design. The final draft of the ISEA was also disclosed at the Bank's Infoshop in December 2005. During summer of 2006 the project design became final and accordingly ISEA was updated. Based on final version a second round of consultations/disclosure session were held on October 5, 7 and 9 in Ghotki, Badin and Mirpurkhas and an updated Sindhi translation is being disclosed.

## **1.7 Scope of Assignment.**

According to the Terms of Reference, the scope of the ISEA Study is as follows:

- (a) Identify key stakeholders, especially poor and vulnerable groups and through consultation with them formulate a participating framework to ensure that these groups benefit from the project;
- (b) Identify and assess potential social and environmental impacts of the project and prepare guidelines and framework to manage environmental and social impacts in sub-projects;
- (c) Identify capacity building measures that would enable effective participation and mitigation measures;
- (d) Assess, compare and synthesize lessons from various earlier and continuing initiatives in the sector;
- (e) Assess the possible affects of heavy rains in Badin District in Jul 2003 and advise on measures that can be undertaken possibly in WSIP-I or other interventions to minimize such impact; and
- (f) Ensure compliance with Government of Pakistan and World Bank Laws and Directives on social and environmental issues.

## **2. ISEA METHODOLOGY & FIELD WORK**

The overall methodological framework designed for the ISEA comprised the following sources of data and the concerned stakeholders:-

### **2.1 Review Of Policies, Guidelines And Legislation (GOP, GOS & WB)**

In order to determine the policy, legal and institutional environment for the Project, the Consultants reviewed the applicable Policies, Guidelines & Legislations concerning the WSIP. As the project is to be implemented by the Government of Sindh and funded by the World Bank, two sets of policies & legislations were reviewed i.e.

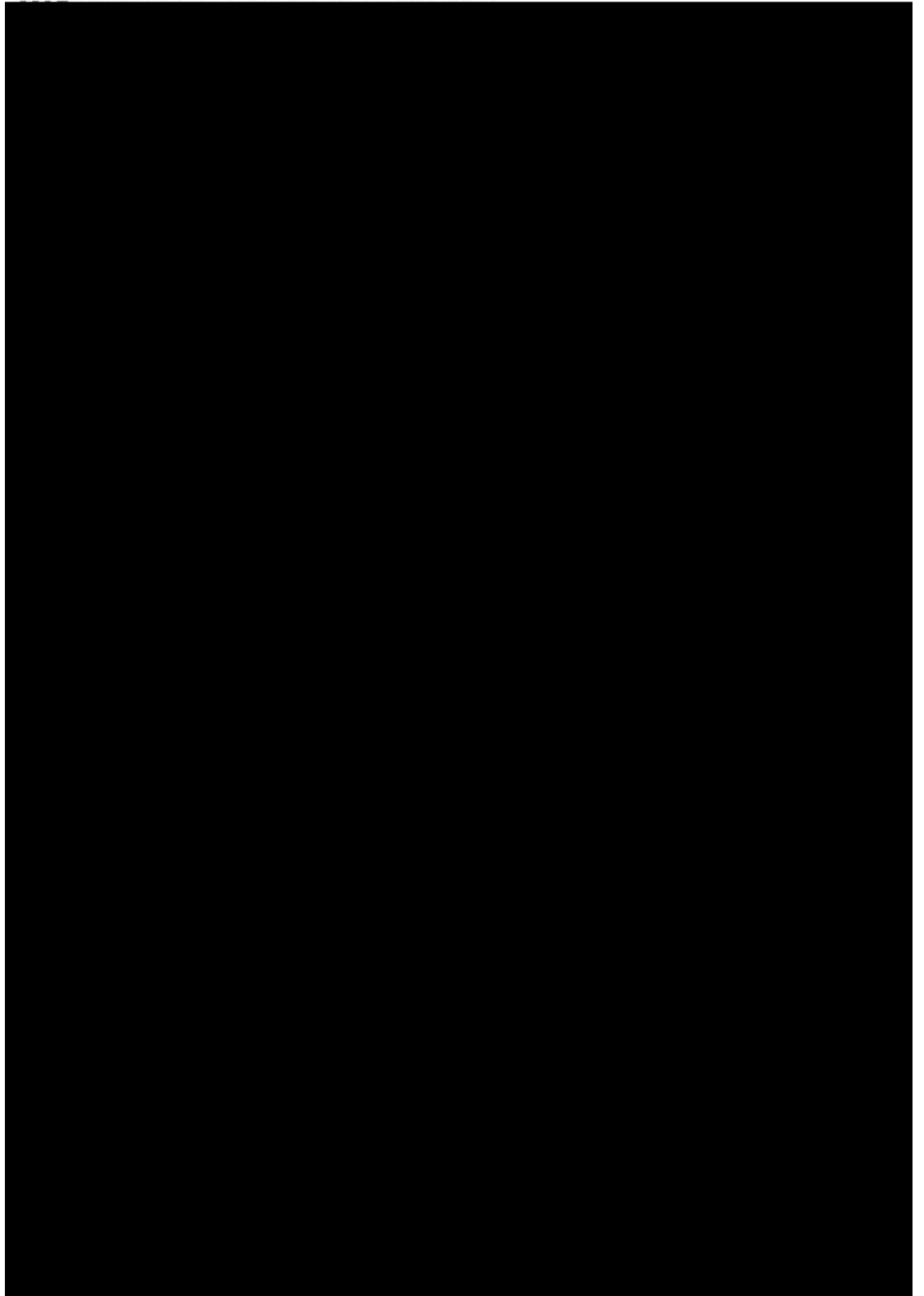
- i). Government of Pakistan and Government of Sindh policies and legislations, and
- ii). The World Bank Guidelines, Policies and Directives.

The following basic project related documents were provided to the consultants which formed the basis of the study requirements:

- Terms of Reference issued by Sindh Irrigation & Drainage Authority
- Project Concept Document (PCD) by the World Bank
- Draft Project Appraisal Document (PAD) by the World Bank (updated from time to time)
- Integrated Safeguard Data Sheet (ISDS) by the World Bank
- The Sindh Water Management Ordinance 2002 promulgated on October 26, 2002

Based on the above basic documents, the following relevant policies, guidelines and legislations were reviewed by the Consultants:-

- National Environmental Guidelines & Legislation - Pakistan Environmental Protection Act 1997
- Sindh Wildlife Protection Ordinance, 1972 and Amendments 2001
- The Sindh Water Management Ordinance 2002
- The Convention on Wetlands of International Importance, Ramsar 1971
- Land Acquisition Act 1894



- Framework for land Acquisition and Resettlement, National Drainage Programme-1 January 1996 (Revised May 2001).
- The relevant World Bank Operational Policies and Directives



## 2.2 Review Of Relevant Institutions, Teams and Farmer Groups

The ISEA also covered the formal and informal institutions that are of relevance to the forthcoming WSIP-I. These included SIDA and its Social Development Cell, AWBs, NDP Sindh, Farmer Organization Council, office bearers of FOs, NGOs and local water-related farmers groups including both landowners, leaseholders and *haris*.

## 2.3 Broad-Based Village / Farmer Organization (FO) Selection Criteria

ISEA used a multiple criteria for selection of sample areas that can truly represent socio-economic, agricultural, technical, and environmental characteristics of the project area. Given these considerations, the specific selection criteria for the districts and villages were as follows:

### A. District Selection:

The areas / districts covered by each AWB were as follows: -

- AWB – 1: Ghotki Feeder (i.e. Ghotki District)
- AWB – 2: Nara (i.e. Mirpurkhas District)
- AWB – 3: Left Bank Canal (i.e. Akram Wah & Fulleli in Hyderabad District)
- Control Group: Right Bank Canal (i.e. Pinyari & Kalri in Thatta District)
- Badin: Specific Area affected by floods

Based on above a representative sample of 10 FO's (hereafter referred to as villages) across different AWB's was as under:

1	Ghotki Feeder	1+1 (canal)	CCA under 2000 acres CCA CCA 2000 – 5000 acres
2	Left Bank Canal	1+1 (canal)	1 Medium (Control Group) CCA 8000 & above
3	Nara Canal	6 (canals)	1 canal of under 2,000 acres CCA 3 canals between 2,000 to 8,000 acres CCA 2 canals over 8,000 acres CCA & above
4	Right Bank Canal	2 (canals)	Control Group

On average, 10 households were covered in each FO, 20 households were covered from two control groups resulting in a total of 120 households which were covered from 10 FOs. The left bank districts outside these AWB's included Khairpur, Nausheroferoze, Nawabshah, Hyderabad (excluding T. M. Khan), Thatta and Umerkot. The areas thus selected represent all the three barrages in Sindh and all the previous administrative divisions on the left bank area and thus all cropping zones on the Left Bank. In addition, these areas are sufficiently spaced out from each other to capture the variability in soil type and cropping pattern and also carry a mix of watercourses rehabilitated under earlier OFWM programmes.

### B. Village Selection:

Within each selected district, one irrigation channel (i.e. minor or distributary) was selected. On each channel two villages were selected keeping in view their locations on that channel (i.e. head or tail).

The specific criteria for the selection of villages were based on: -

1. Coverage of FO's: The villages to be selected to carry a mix of coverage of new and old FOs.
2. Drainage: The villages also carried variations in terms of coverage of drainage in the area.
3. Ownership Pattern: The villages must also carry variations in terms of land ownership i.e. self-cultivation and tenant cultivation.

## 2.4 Household Questionnaire

The comprehensive household questionnaire was developed to cover the following aspects with regard to pre and post scenarios of the rehabilitation work of the watercourse:

- i). Household Profile
- ii). Use of Irrigation Water
- iii). Farmers Perceptions
- iv). Agricultural Production
- v). • Health and Environmental Issues
- vi). • Domestic Use of Water
- vii). • Perception of Locals Regarding Local Government Officials

## 2.5 **Focus Group Discussions**

### 2.5.1 **Target Groups**

For the Focus Group Discussions, the Consultants identified the following Target Groups:

- Stakeholders (Responsible for Institutional Arrangements of Water Management)
- Women
- Small Landowners, Sharecroppers / *haris* and tenants
- Medium & Large Landowners
- Non-agricultural users of water

### 2.5.2 **Basic Characteristics of Each Group**

#### a) **Stakeholders**

Representatives of the Institutions directly involved in the Water Management i.e. President / Chairman / Secretary of area Water Boards (AWBs), Farmers Organizations (FOs), & Water Course Associations (WCA), Government Officials of Irrigation Dept., SIDA, Agriculture Engg. & Water Mgmt. Dept., Local Govt., NGOs, etc.

#### b) **Women**

Women involved in agriculture and livestock activities, including wives of sharecroppers/*haris* and small landowners cum tenants.

#### c) **Small Landowners / Sharecroppers, Tenants, / Haris, etc.**

- Sharecroppers/*haris* (landless families)
- Small landowners (< 16 acres) cum Tenants
- Wage labourers

#### d) **Landowners**

- Medium Landowners (12.5-25 acres)
- Large landowners (25 acres and above)

### 2.5.3 **Focus Group Discussions – Organization**

Given the Timeframe of the work and the possible accessibility, a total of 6 focus group discussions were carried-out as follows:-

S.No	Area	Type
1	Left Bank	Small / subsistence farmers
2	NARA	Medium 2 & Large farmers
3	Ghotki	Female
4	Control Group – Sujawal	Medium 1
5	Other stake holders - Mirpurkhas	Non agriculture
6	Badin	Flood affectees

## 2.5 **Consultations and Disclosure**

In addition to focus group discussions, surveys and collection of data, extensive consultations were carried out with stakeholders during the course of project design and assessment of its possible social environmental impacts. First round of consultations were carried out after preparation of first draft of ISEA in September 2005. Summary of this was also translated in Sindhi and disseminated in the project area, and used during the consultations. Workshops and seminars were held in Ghotki, Badin and Mirpurkhas on January 16, 19 and March 29, 2006 respectively. All these workshops were participated by a large number of representatives of AWBs, FOs, prominent farmers, local NGOs and civil society. Information on the project objectives, components, potential environment and social impacts and proposed mitigation measures was provided to the participants and their views sought. The feedback from these consultations helped in project design. The ISEA was disclosed widely after the consultations meetings.

In September 2006 the ISEA report was updated, among other things incorporating the findings during the first round of consultations. The second round of consultations were carried out on October 6, 7, and 9, 2006 in Ghotki, Badin and Mirpurkhas respectively. The final report is again widely disclosed in the project area. First draft report was placed in Bank's InfoSop on December 12, 2005. The final draft was submitted on November ?? 2006.

## 3. **POLICIES AND LEGAL ENVIRONMENT**

In the light of the policies mentioned in the proceeding chapter, a brief review of each and its applicability is presented below:

### 3.1 **National Environmental Guidelines & Legislation - Pakistan Environmental Protection Act 1997.**

The Pakistan Environmental Protection Act, 1997 (PEPA) is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The PEPA is broadly applicable to air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. Penalties have been prescribed for those contravening the provisions of the Act.

The **Policy and Guidelines for filing, review and approval of environment assessments**, as of August 2000 categorizes projects as follows:

- (i) Initial Environmental Examination (IEE) - Projects identified in Schedule I.
- (ii) Environmental Impact Assessment (EIA) - Projects identified in Schedule II.

Detailed environmental assessment of the WSIP-I sub-projects which consist of rehabilitation and improvement of minors, distributaries and canals, will be done at their detailed designing stage and EA reports will be submitted to Sindh EPA if required. However, package/contract would be submitted to Sindh EPA if the distributary/minor improvements are on channels located within or proximity to the protected area. In case of main/branch canals improvements consisting of large contract each EA would be submitted to Sindh EPA.

### 3.2 **Sindh Wildlife Protection Ordinance, 1972 And Amendments Of 2001**

This ordinance provides for the preservation, protection, and conservation of wildlife by the formation and management of protected areas and prohibition of hunting of wildlife species declared protected under the ordinance. The ordinance also specifies three broad classifications of the protected areas:-

- a). **National Parks** - Hunting and breaking of land for mining are prohibited in national parks, as are removing vegetation or polluting water flowing through the park
- b). **Wildlife Sanctuaries** - Wildlife Sanctuaries are areas which are left as undisturbed breeding grounds for wildlife. Cultivation, grazing and residing is prohibited in the demarcated areas. Special permission is required for entrance of general public. However, in exceptional circumstances, these restrictions are relaxable for scientific purpose or betterment of the respective area on the discretion of the authority.
- c). **Game Reserves** - Game reserves are designated as areas where hunting or shooting is not allowed except under special permits.

### 3.3 **The Sindh Water Management Ordinance 2002**

The Government of Sindh has promulgated the Sindh Water Management Ordinance 2002 (SWMO 2002) on October 26, 2002. SWMO 2002 provided framework for institutional reforms in water sector by decentralizing the water resources management and irrigation and drainage services. Under the SWMO 2002, SIDA has been established at the provincial level for overall water resources management with a board coming from stakeholders. Similarly the AWBs are established at the canal command level, and FOs at the distributary/minor canal level consisting of water users's associations at the watercourse level. SIDA also has environmental and social unit that would be strengthened under WSIP to enhance SIDA capacity in participatory planning and mainstreaming environmental issues in development and management of the water resources. SIDA would there be involved in addressing the social and environmental issues under the project and through monitoring arrangements ensuring that they are implemented properly.

### 3.4 **The Convention on Wetlands of International Importance, Ramsar 1971**

Pakistan is a signatory to the said Convention. The principal obligations of contracting parties to the Convention are:

- To designate wetlands for the List of Wetlands of International Importance.
- To formulate and implement planning so as to promote wise use of wetlands, to make EIA before transformations of wetlands, and to make national wetland inventories.
- To establish nature reserves on wetlands and provide adequately for their wardening and through management to increase waterfowl populations on appropriate wetlands.
- To train personnel competent in wetland research, management and wardening.
- To promote conservation of wetlands by combining far-sighted national policies with coordinated international action, to consult with other contracting parties about implementing obligations arising from the Convention, especially about shared wetlands and water system.
- To promote wetland conservation concerns with development aid agencies.
- To encourage research and exchange of data.

So far 19 sites in Pakistan have been declared as wetlands of International Importance or *Ramsar* Sites.

Since the specific locations of the project rehabilitation and improvement are not yet identified, it can not be determined at this point whether or not any *Ramsar* site would be encountered during the execution of works. WSIP Study however has analysed the impacts, if any, of distributary and canal lining on any nearby wetland in more generalized terms.

### 3.5 **The World Bank Policies & Directives – General Applicability**

Based on the review of potential environmental and social impacts a brief description of the Bank's policies that would be triggered in the project is provided below:

#### 3.5.1. **Environmental Assessment**

The World Bank Operational Procedures (OP-4.01) as issued in January 1999 categorizes the projects in 3 Categories i.e. A, B & C. The WSIP-I would have positive environmental impact by improving the water resources management, reducing waterlogging and salinity and land and water resources degradation. However, during construction there could be some negative affects which need to be mitigated. Therefore, the Project is classified as Category "A" that would also provide a thorough framework for review and consultations on various interventions proposed under the project in decision making process.

The Environmental Assessment of the project was carried-out accordingly and an Environment management Framework is prepared to address any potential impacts during implementation of the project.

#### 3.5.2. **Nature Habitat**

So far 54 wildlife sanctuaries and wetland in Sindh, of this, 34 are in and around WSIP area and 5 have been declared as wetland of international importance (*Ramsar* Sites). The project works would be limited to rehabilitation and improvement of the existing systems only. An EMP would be prepared for each sub-project and impact on any Natural Habitat if any would be identified along with the mitigation measures in accordance with Project EMF that outlines the broad principles to prepare the protected area management plan for the physical works within or in the close proximity of any of the protected area.

### 3.5.3. Pest Management

The interventions of the proposed project are targeted towards the increased and equitable irrigation water availability through physical rehabilitation and institutional strengthening, which in turn is likely to increase the cropped area / crop production. Increased use of insecticides and pesticides, is therefore likely. The likely impacts include potential induced impacts of increased pesticides increase such as residue in drinking water resulting in health impacts and secondary impacts of pesticide residue on women cotton pickers and cultivating vegetable farmers.

A nation wide Integrated Pest Management Program is already going-on under the auspices of Ministry of Food, Agriculture and Livestock with the help of FAO in which Sindh Province is actively participating.

Further, a Pest Management Plan (PMP) for Sindh was prepared under another Bank-financed project - Sindh On-Farm Management Project (SOFWMP) – in 2003, which is operative and will remain in effect until its credit closing date of December 31, 2008. Incidentally, the area covered by the two projects is also the same, that is, Ghotki, Nara, and Left Bank AWBs. Implementation of the PMP would be monitored and supervised under Sindh OFWM Project. By mid 2008 a study would be carried out to assess the status of PMP implementation. If necessary the WSIP should provide funds for continuing the PMP activities in particular the farmers' training.

### 3.5.4. Involuntary Resettlement

Improvement of irrigation and drainage system may cause some adverse impacts, temporary and/or permanent, on private assets requiring limited acquisition of land for civil works. Additionally, there may be a need for small scale acquisition of land for rehabilitation and improvement of distributary/minor canals to be carried out by FOs. Precise impacts can only be determined after preparation of detailed designs.

The Land Acquisition Rules of 1983 of Government of Sindh, in tandem with Land Acquisition Act of 1894, has set rules and procedures for compensation and / or resettlement. These sets of rules clarify the situation, definition of entitlement, valuation and the time framework under which any land related dispute, arising out of any project activity, can be resolved thereby protecting the rights of the affectees. However, current procedures and provisions of the Land acquisition act of 1894 and the Land Acquisition Rules of 1983 of Government of Sindh are not fully consistent with the requirements of World Bank's OP 4.12. Therefore, a Social Impact Management Framework (SIMF) has been prepared to govern adverse social impacts in the project. The SIMF, summarized in the subsequent section of this report is consistent with the requirements of the World Bank's OP 4.12.

### 3.5.5. Project on International Waterways

The project is located on and receives water from the Indus River which is an international waterway. However, due to the nature of works limited to rehabilitation not adversely affect the quantity or quality of water flows to the other riparians.

## 4. PHYSIOGRAPHY, CLIMATE AND IRRIGATION SYSTEM CHARACTERISTICS IN THE PROJECT AREA

### 4.1 Topography

Sindh can be divided into four distinct parts topographically i.e. *Kirthar* range on the west; a central alluvial plain bisected by the Indus river in the middle, a desert belt in the east and the Indus delta in the south.

- a) **Kirthar Range** Consisting of three parallel tiers of ridges which run in north south direction & vary in width from 20 to 50 kilometres. The *Kirthar* range has little soil & is mostly dry and barren.
- b) **Central Alluvial Plain** Consisting the valley of the Indus River. This plain is about 580 kilometres long and about 51,800 square kilometres in area and gradually slopes downward from north to south. It is a vast plain, around 100 meters high above sea level. According to the past tradition it has been divided into three distinct zones.
  - i). Lar or Southern Sindh comprising the areas south of Hyderabad.
  - ii). Wichalo or Central Sindh, the area lying immediately around Hyderabad.
  - iii). Siro, or Northern Sindh, comprising the area beyond Naushahero Feroze and Sehwan.
- c). **Eastern Desert Belt including** low dunes and flats in the north, the Achhrro Thar (white sand desert) to the south & the Thar Desert in the south-east. There is small hilly tract known as Karunjhar hills. The Aravalli series belongs to Archaen system which constitutes the oldest rocks of the earth crust.
- d). **Indus Delta Consisting of** the distributaries of the Indus river which starts spreading out near Thatta across the deltaic flood plain in the sea. The even surface is marked by a network of flowing and abandoned channels. A coastal strip, 10 to 40 kilometres wide is flooded at high tide and contain some mangrove swamps.

The Project area in three established AWBs, Ghotki, Nara canals and Left Bank consisting Akram wah and Fuleli canals lie in the central alluvial plain. The overall project area is also in the same central alluvial plain which is the main irrigated area of the Sindh Province. Map (1.1) shows the physical configuration of the province of Sindh.

### 4.2 Climate

The climate of Sindh is arid and hot. According to classification made by UNESCO the region has been divided into three zones as under:

- (i) Coastal- South of Thatta.
- (ii) Southern- from Thatta through Hyderabad to Nawabshah.
- (iii) Northern-from Nawabshah to Jacobabad.

Annual average rainfall in the coastal region is 175-200mm. The hottest region is the Northern zone where mercury during summer goes upto 53C. The wind direction changes from west to southwest in the Coastal zone, to south-southeast in northern zone.

### 4.3 Irrigation & Drainage System

Irrigation has been practiced in Sindh since 5,000 years based on inundation canals and floods. However, the history of modern irrigation system with controlled canal systems is rather recent (i.e. 70 years old). The first barrage (i.e. Sukkur Barrage) was commissioned in 1932 followed by Kotri and Guddu Barrages in 1955 and 1962, respectively. These three barrages command a total area of 6.046 million hectares at present. This also includes a smaller area that is in Balochistan province. Under these barrages, a total of

5.186 million hectares is irrigated (Table 4.1). In net terms, these barrages irrigate over 80 percent of the cultivated area in Sindh.

**Table – 4.1 Proportional Barrage-Wise Command Area and Irrigated Area in Sindh (In percentage unless otherwise mentioned)**

Barrage	1996-1	997	1997-1	998	1998-1	999
	Command Area	Irrigated Area	Command Area	Irrigated Area	Command Area	Irrigated Area
1. Guddu	20.0	20.5	17.0	17.0	21.0	15.9
2. Sukkur	53.0	52.7	60.6	59.8	55.4	59.6
3. Kotri	27.0	26.8	22.4	23.2	22.7	23.5
4. Sindh	<b>4.360*</b>	<b>4.559*</b>	<b>5.463*</b>	<b>5.099*</b>	<b>6.046*</b>	<b>5.186*</b>

\* ⇒ in million hectares

Source: Development Statistics of Sindh, 2001 (p.71).

The irrigation network consists of 14 main Canals, 1,446 distributaries and minors and 42,000 watercourses having a (length 75,000 miles). Out of 14 main canals five canals are on the Right Bank and 9 canals are on the Left Bank of the Indus River. The culturable command areas (CCA) of the canals differ significantly. Rohri Canal covers the largest CCA as against the K.F.west which has the smallest CCA. Rice Canal and *Beghari* Feeder on the Right Bank and *Pin yari* and *Phullelli* on the Left Bank were originally non-perennial canal. However, except Rice canal, the other three canals have been converted into more or less perennial systems.

With the reduced potential for extracting groundwater resources over time (caused by increased soil and sub-soil salinity and alkalinity) and highly erratic rainfall pattern in terms amount, timing, regularity and distribution, the canal water supplies are accorded the status of life blood in Sindh.

#### 4.4 Groundwater

More than 80% of lands in Sindh are underlain by the saline groundwater unfit for irrigation that is a major constraint in irrigated agriculture. The shortage of irrigation water coupled with recent drought conditions in Sindh has increased the importance of exploitation of groundwater even in areas with marginal water quality.

The fresh groundwater is found mostly in a strip parallel to the left bank of Indus River and some pockets in other areas. The aquifer found at shallow depths highly transmissive. More than 30,000 tube wells have been installed in private and public sector to pump water for use in agriculture. Such development of groundwater could lead to increasing secondary soil salinity due to use of groundwater of marginal quality and intrusion of saline water into fresh water aquifer.

#### 4.5 Access to Water

The agriculture usage and water accessibility in last several decades has decreased mainly due to reduced surface waters in canals and increased waterlogging and salinity in arid/semi arid conditions in Sindh. The efficiency from the canal head to root zone of the canal irrigation in Sindh is around 30-40%. The low efficiency means less water available for crops and high losses that on the other hand contributes to waterlogging and salinity. The situation is further aggravated in areas with saline groundwater which cannot be pumped and re-used for irrigation. Scarcity of surface has led to a complete breakdown in the administration and management of water distribution resulting in illegal pumping thus tumbling it in viscous cycle of poor service-poor cost recovery-poor O&M which can only be broken through enhancing participation of the farmers in O&M of the system as promoted under WSIP-I.

#### 4.6 Water Logging & Salinity

Sindh has arid climate with very high evaporation and little or no rainfall. The natural slopes are extremely mild thus natural drainage is very limited and also obstructed by public infrastructure such as canals, roads, and railways. Network of manmade drains is inadequate. As a result water seepage from the extensive system of irrigation network, main and branch canals, distributaries, minors, watercourses, and farmers'

fields results in shallow groundwater levels that give rise to waterlogging conditions. Table 4.2 shows areas with groundwater level less than 5 feet (considered as waterlogged). There has been an increase in this areas particularly in Sindh except in 2000, 2001 and 2003 due to extreme shortage of water.

**Table – 4.2 Proportion of Waterlogged Area (less than 5 feet) in the month of June as percentage of Gross Canal Command Area in Punjab and Sindh Provinces**

Province	1995	1996	1997	1998	1999	2000	2001	2002	2003
Punjab	5	5	5	6	6	2	2	1	4
Sindh	31	26	47	38	48	6	7	59	3

Source: i). SCARPS: Monitoring, WAPDA (Lahore) published in Agricultural Statistics of Pakistan, 2004-2005 P-125.

ii). Development Statistics of Punjab, 2000 & 2004 PP-36.

iii). Development Statistics of Sindh, 2000 & 2004 PP. 69 & 71.

Note: The Gross Canal Command Area for both provinces across the period 1995-2003 are 23.90 million acres for Punjab and 11.43 million acres for Sindh.

The evaporation rates from shallow groundwater (less than 5 feet) are very high. With high evaporation and movement of water upwards through capillary action salts are mobilized from lower levels to higher level of soil profile causing high soil salinity. Farmers in turn apply large quantities of water to dilute and leach down the salts this turns into a vicious cycle of higher water application-higher losses-waterloggingsalinity which can only be broken by better drainage and improved water management at all level of the system.

#### **4.7 Water availability and Cropping**

Overall water is short compared to the available land, thus water is the constraining factor in expanding agriculture not land. The irrigation system is designed at very low cropping intensity covering more land than available water for meeting full water requirements of crops. The water supply is therefore rationed based on land ownership and supply rotated among the farmers of a watercourse on seven day turn namely the warabandi system.

Overall allocation or allowances are based consideration for agro-climatic conditions, cropping pattern, etc. The area on left bank of the Indus river has cotton and wheat and given perennial or a year round supply. The right bank of Indus where rice is grown generally is provided non-perennial supplies only during the summer period when river flows are high.

## **5. WATER SHARING SYSTEMS AND INSTITUTIONAL REFORMS**

This section looks at the traditional water sharing system and the recent institutional reforms in the water sector as they relate to WSIP-I.

Sindh has taken some bold steps in the move towards irrigation and drainage reforms. The long-term goal of the proposed reforms is to ensure farmers' participation in the system at successively higher levels. The process consists of formation of four distinct bodies: Sindh Irrigation and Drainage Authority (SIDA), Area Water Boards (AWBs) based on the command area of all 14 canals originating from three barrages of the province, and Farmers Organisations (FOs) that would control water management (including collection of water charges called Abiana) within the command area of the tertiary channel (i.e. distributaries & minors) & the watercourse association (WCA) at the watercourse level. Under the SWMO 2002 these reforms were envisaged to be completed by 2005.

Though reforms are slower than expected they are a substantial step in the right direction. As the reform program proceeds there would be a need to make adjustments. Progress in the reform program depends upon the following factors:

1. Participatory, strong, vibrant, equitable representative institutions WCA, FOs, AWBs and SIDA and their operation based on the lesson learnt from earlier three phases of On-Farm Water Management Projects, NDP and other projects;



2. the process of electing members at all levels i.e. WCA, FOs, AWBs & SIDA, need to remain participatory and transparent;
3. Representation of farmers at AWB and SIDA in such proportions which help them in taking effective stand on water related issues;
4. Empowerment of FOs to remain sovereign in fulfilling their obligations and reducing their dependence on AWB or SIDA on technical matters like water distribution and Abiana collection. FOs' role in monitoring AWBs performance oversight on O&M and related expenditures.

Autocratic land distribution in Sindh could pose a risk to the institutional reform process and large land owners may have self interest to discouraging the broader and meaningful participatory approach to water resources management. This constraint has to be overcome through legal instruments (such as SWMO 2002) and through administrative and social pressures. The following sections presents the features of the four levels of institutions listed in to SWMO 2002.

### **5.1 Watercourse Level Institutions**

Traditionally from the system development stage the O&M of a watercourse is carried out by the farmers themselves. The institutional reform program formalizes these arrangements in the form of watercourse association (WCA) and uses to build upon institutions at higher levels of the system such as distributaries and minors. The other body formed in case of Sindh where drainage is a major issue is drainage beneficiary groups (DBGs) including stakeholder (also the leaseholders of agricultural lands). DBGs that are still to be formed would have a Chairman, Secretary and a Treasurer and they are entrusted with functions to operate, maintain, improve and rehabilitate the drainage operations.

### **5.2 Farmers Organization (FO)**

FOs formed at the Distributary/Minor Level are a major step forward (taking participation of users one step above the watercourse) and crucial piece of the overall reform program. FOs are formed on a distributary/minor if at least two third of the command area of FO is covered by the WCAs. The General Body of the FO comprises one representative of each WCAs and / or DBGs on that distributary / minor, duly elected by that particular WCA and / or DBG. The minimum number of members is 21 and if the number of WCAs and DBGs together is less than 21, then they shall elect one equal number of representatives in the General Body to comprise at-least 21 members. The FO formation and transfer of management of the distributary / minor to the FO is therefore the crucial step towards transformation purely government managed I&D system to participatory management.. The FO would be responsible for the O&M of the respective minor / distributary as well as collection of "Abiana" ( the service charge levied on the farmers for the supply of surface irrigation water and the provision of drainage). The equitable water distribution to users within the channel will be the responsibility of the FO apart from carrying out the flood protection works, and drainage and sewerage system conferred on it.

### **5.3 Area Water Board (AWB)**

This institution is being formed at the level of previous Canal Command Areas and corresponds to the irrigation infrastructure corresponding to one of the major canals of the system. The AWBs would consist of 12 Members. The AWBs will be responsible for operation & maintenance of the Canal and Branch Canals and related infrastructure under the AWB jurisdiction, the drainage system, flood management as well as collection of their share of *Abiana* from the respective FOs. The AWBs will also be responsible for the operation and maintenance of the drainage system conferred on them.

### **5.4 Sindh Irrigation & Drainage Authority (SIDA)**

SIDA is responsible for the overall Irrigation & Drainage operations in the province. SIDA will consist of:

- i). Five members nominated by the Government of Sindh including the Chairman and four academicians
- ii). Five elected members – one each from FOs receiving water from *Guddu & Kotri* Barrages, and three from amongst the FOs receiving water from *Sukkur* Barrage.

- iii). Six Ex-officio members including ACS (Dev), Secretaries I&P, Agriculture & Finance Departments, the Provincial Coordinator NDP and the MD SIDA.

SIDA will control, operate and manage all the three barrages in Sindh, the drainage system assigned to it including spinal drains and the inter-AWB drains.

#### 5.5. Water Allocation Committees

One of the important aspects of the new ordinance is the introduction of **Water Allocation Committees (WACs)** at each level, i.e. SIDA, AWB, and FO Level. For AWB, there would be one for the whole AWB while an independent WAC for each Branch Canal Area under the AWB. These committees, having good representation of farmers will determine water allocation under their jurisdiction which may be termed as one of the most important aspects of the new system.

#### 5.6 Current Status of Institutional Reforms

Under Sindh Water Management Ordinance 2002 the SIDA has been established and functioning though it is still a weak organization largely dependent of Irrigation and Power Department's technical staff. The WSIP-I would provide necessary assistance in building its capacity to carry out its responsibility, planning, developing, managing the provincial water resources. Among other things an Environmental Management Unit (EMU) has been established under SIDA for incorporating environmental considerations in its planning, development and management of water resources. Three AWBs have been formed on Ghotki, Nara Canals and Akram wah and Fuleli canals. Perhaps most progress is made on development of FOs. As per the SIDA's Monthly Bulletin of August 2006 total of 213 FOs have been established in 3 AWBs and 3 Canal Command Areas.

As may be seen, most of these have been formed in NARA AWB where Management transfer to 141 FOs has already taken place. The development of FOs is continuing under the Bank supported Sindh OFWM and a National program. It is expected that by the time WSIP-I is effective FOs would be formed on all distributaries/minors in the project area. The WSIP-I would primarily focus on capacity building of FOs, and enabling them to participate in planning, designing and implementation of project works and in O&M of the system afterwards.

#### Water Pricing and Cost Recovery

Water charges are levied based on cropped area and type of crop grown as a proxy to the amount of water used with higher rates for crops using more water such as rice and sugarcane. Currently there is no direct linkage of O&M expenditures and recovery of water charges. However, initially water rates were set to recover O&M and part of capital cost of development of the system and part of development cost was recovered through land betterment charges. Overtime the water charges did not keep up with inflation and revenue from water charges was barely equal to the O&M expenditures. In early 1970s, after the oil shock and installation of government owned groundwater/drainage wells demanding high O&M expenditures, the revenue from water charges fell below the O&M expenditures of the system. This has continued to be the case since then and lower revenue recovery began to affect government's capacity to allocate adequate O&M expenditures. Due to lack of proper O&M the system started degrading resulting in poor service to the users. The willingness of the users to pay higher charges necessary for O&M of the system in the absence of good I&D services also evaporated. Also the degraded system resulted inequity in distribution particularly between head and tail end users. This led to breakdown in discipline and governance where influential farmers began illegal pumping further accentuating the inequity and total breakdown of the system as well as I&D administration and service and inefficient use of water resources.

The way forward to address the problems is the reform program (initiated following Pakistan: Irrigation and Drainage Strategy – Issues and Options -1994) with participatory irrigation management which is now constituted through the SWMO 2002. The challenge is to make the legally mandated institutions work on the ground and over come risks posed by many factor such as vested interests, lack of governance, and discipline at all levels of the government.

## FO formations & Management Transfer in Sindh

S#	Area Water Boards / Canal	Total FOs to be Registered (Tentative)	FOs Registered	Management Transferred (IDMT Signed)
<b>Guddu Barrage</b>				
1	<b>Begari Sindh Feeder Canal AWB</b>	85	0	0
2	Desert Pat Feeder	45	0	0
3	<b>Ghotki Feeder Canal AWB</b>	94	17	12
<b>Sukkur Barrage</b>				
4	<b>Nara Canal AWB</b>	170	162	141
7	<b>Western Canal AWB (Dadu 111+ Rice 72)</b>	183	0	
8	Khairpur Irrigation Circle (East and West Feeder Canal)	123	2	0
9	Rohri Canal Circle	283	7	0
<b>Kotri Barrage</b>				
10	<b>Left Bank Canal AWB (Phuleli 75+ Akram Wah 48)</b>	105	24	22
11	Kalri Beghar Feeder Circle	110	0	0
12	Pinyari Circle	113	0	0
<b>Others</b>				
	Lift Irrigation River Indus	1	1	0
<b>Total (14 Canals)</b>		<b>1312</b>	<b>213</b>	<b>175</b>

Source: SIDA Monthly Bulletin August 2006.

### 5.7 Current Issues of Relevance to WSIP

There are a number of issues that have to be addressed to make a progress in institutional reform program that WSIP would have to address:

#### 5.7.1. Lack of Knowledge and Awareness

- A vast majority of farmers are not fully aware with the formation as well as the autonomy of FOs
- The irrigation authorities also do not possess full and complete awareness with regard to transfer of distributaries/minors to FOs
- There is a lack of understanding between SIDA (Sindh Irrigation & Drainage Authority) and AWB (Area Water Board) on the demarcation of their respective responsibilities.
- It is not clear as to who is responsible for the repairs and maintenance of regulators installed at the beginning of a distributary (or minor) i.e. AWB or FOs.
- There is a complete lack of clarity on the allocation of water across canals.

#### Action to be taken under WSIP

- Social mobilization, information about the legal status of FOs, capacity building and training. Provide information about water allocation, warabandi and plans on rotation distributaries and minors, clarity and roles and responsibility of FOs.

#### 5.7.2. Apprehensions

- Detailed discussions with FO members reveal that an FO seem to not have full autonomy in the collection of Abiana (water charges) from the users. In the event some users do not pay Abiana, the

FOs should have the requisite legal status to ensure collection as persistent losses in recovery will give rise to problems, resulting in neglect of O&M of the system thus negate purpose of the reforms.

#### Actions

- Information and dissemination about the legal status of FOs, bylaws, right and obligations. Technical training has to be provided to the FOs in O&M of the system, prioritization of work, organization and institutional skills, collection of water charges, budgeting of expenditures, etc. Provision of a technical specialist and assistance from social organizers from the project to help FOs in institutional development. Subsequently, FOs can recruit itself technical staff if it is found useful and its members cannot perform these functions themselves.
- The FOs should be given full responsibility and authority in Abiana collection and ability to take action against defaulters through appropriate byelaws. Currently, AABDARS (canal patwari) who are employees of SIDA are also involved in Abiana assessment that causes confusion.
- FOs have to be made part of the decision making in water allocation and rotation of distributaries in case of shortages.

#### 5.7.3. Representation

- The representation of farmers at the AWB is considered inadequate.
- Similarly at SIDA, there are only 5 FO representatives in the body, which has a membership of 16. It means that SIDA can hold meeting even if FOs for any reason decide not to attend the meeting. Similarly the other 11 members can be decisive for actions that are opposed by farmer's representatives.
- Farmer's selection for FO membership is normally based on nomination/selection and not on the basis of election as per requirement of institutional reforms.
- There is currently no arrangements to ensure the representation of haris & women on the WCAs &FOs

#### Actions

- As more FOs develop in the area increase number of FOs representatives on AWB and SIDA.
- Measures are to ensure the participation of haris & womens (at WCA & FO levels in particular) as well as more farmer representatives at AWB & SIDA levels. The Social Assessment found that contrary to general perception women's representation at WCA and FO would be a cultural barrier.

#### 5.7.4. Role and Effectiveness of FOs

- FO are currently more effective in the Nara canal command area, where they have operated for a while and there is a larger proportion of medium size farmers.
- It is important to monitor and evaluate the performance of FOs and ensure that they are not compromised by vested interests, and their functioning is truly participatory, transparent and effective.
- Currently, the effective FOs have shown success in Abiana collection. However, it was observed that in some cases FOs collected only 60 percent of the water charge, the proportion that has to be paid to the AWB according to SWMO 2002. The remaining 40 percent which was also to be collected by FOs and kept in their own accounts for O&M of the system was not collected.

#### • Actions

- Performance of FOs should be monitored. There should be performance and financial audits of FOs and remedies ensuring that O&M of the system would remain sustainable in the long run.
- At the beginning, a quota for women and sharecroppers at FO would ensure balanced representation. NGOs may be involved to support these activities. .

#### 5.7.5. Relationship Between Land Owners & Tenants

- The representation of various stakeholders, particularly of tenants, at FO level is a major issue. The process of social mobilization and capacity building should include working with small farmers, tenants, women and vulnerable groups.

## Actions

- There is a clear need for capacity building in order that the core aspect of water sector reforms (i.e. community participation) becomes effective. FOs have to find a way to broaden their base by including non-land owner water users and beneficiaries in order to maximize the impact of institutional reforms particularly as the tenants participation would help in improving the water use drinking water quality is becoming a major issue in the project area.

## **6. SUMMARY OF ENVIRONMENTAL ASSESSMENT**

### **6.1 Project Components**

The WSIP components are briefly given below:

- a). Community development, and capacity building of SIDA, AWB and FOs. This component would have positive impact in the short as well as in the long run.
- b). Civil works for improving main and branch canals, distributaries and minors, a modern water measurement and monitoring, database, and establishment of control rooms for operating and managing water distribution in the canals systems covered under the Project;
- c). Management Plans for major I&D infrastructure, such as barrages and preparation of plans for management of floods and drainage on left bank of the Indus river, Indus delta and coastal zone. These preparatory studies at this stage cover regional plans, feasibilities and detailed designs. The Environmental and Social Assessments would be integral part of these studies. They studies would be designed to carried out in participation with the major stakeholders;
- c). Project monitoring and evaluation, implementation progress and impact monitoring as well as implementation of the environmental management framework/plans and social impact management framework;
- d). Project coordination, monitoring, future project preparation strategic studies and pilot projects.

The components and details of works to be carried out are described in more detail in Project Implementation Plan/Project Appraisal Document as well as in the main report

### **6.2 The Physical interventions under the Project**

The WSIP covers three areas Ghotki canal command, Nara canal command, and Akram Wah and Fuleli canal commands. .

Physical interventions under the Project are:

- a) Rehabilitation and improvement of main and branch canals, water measurement and accounting system for improving water management and monitoring.
- b) Rehabilitation and improvement of distributaries and minors, in some case lining of distributaries with geo-membrane where justified technically and economically and can be done without construction a diversion channel.
- c) Improvement of drainage in the FOs areas, removing major bottlenecks, improving structures, etc and planting trees along the drains.

Baseline environment of the project area are examined and the impacts due to project interventions are assessed as per World Bank Guidelines, Policies and directives (OP 4.01, BP 4.01), and the findings are being summarized as follows.

### **6.3 Long Term Impact**

The Project addresses underlying issues of improving water resources management and thus in the long run during operation phase the Project would have positive environmental impact by reducing land and water

degradation, waterlogging soil salinity, waste of water and its effective use resulting in better incomes and employment. The Project will also contribute to ecological enhancement of the area by planting trees along the canals, distributaries and minors and drainage channels. This would make a significant improvement in the ecological conditions, through biological drainage, help in improving storm drainage through retention, reducing soil erosion, recycling of nutrients from lower layers of the soil profile to upper levels resulting in improving organic matter of soil, and flora and fauna.

However, during construction there are several issues that need to be dealt with in order to avoid environmental/ecological damage. The main focus of the environmental assessment is on potential impacts during the construction phase and the approach is to provide an overall framework to clearly identify any adverse impacts and develop mitigation measures, and supervise implementation to ensure that environmental mitigation measures are implemented. The potential impacts on physical and biological environment due to project interventions have been divided into two phases i.e. Construction Phase and Post-Construction Phase Impacts, and measures have been suggested to mitigate potential damages and enhanced scenario.

#### **6.4 Construction Phase Impacts**

The rehabilitation and new construction works involve major earth work, desilting and concreting. Potential impacts and mitigation measures are as under:

- i. Disposal of Excavated Earth and Canal Silt.
  - Disposal of excavated earth to be used for making spoil banks. Proper cut and fill methodology to be incorporated in the design.
  - The silt removed to be disposed off properly and where possible utilized as fertilizer in the fields.
- ii. Dust Pollution
  - Serious negative impact on workers and population living in close proximity to site.
  - To mitigate the negative impact, all approach and other roads used for construction traffic should be to be sprinkled with water. Roads which are likely to be used in future to be metalled.
- iii. Noise Pollution
  - Use of Earth moving equipment would generate noise levels exceeding the allowable limits.
  - Impact will be medium and negative but of a temporary nature.
- iv. Labour Camps
  - Labour camps, servicing and refueling, of vehicles would cause air, soil, and water pollution. The impact will be medium and negative but of a temporary nature.
  - For mitigation provision of septic tanks, treatment of waste water to be made. The treated water to be used for sprinkling on un-metalled approach roads to control dust pollution.
- v. Borrow Pits.
  - Extraction of material from borrows pits may damage ecosystem balance of the area and, upset the aquifer and leave an unscentic site. The impact will be small and negative but of a permanent nature.
  - For mitigation, necessary measures in planning borrow pits to be adopted which include restoration of the site after completion of works.
  - A safe distance from the canal banks to be kept to ensure safety against short circuiting of seepage path.
- vi. Approach Roads
  - Construction activity such as movement of earth moving equipment, transport of materials would cause additional load on existing roads. Approach roads to site may damage the crop.
  - Cultivated areas to be avoided for building approach roads.
- vii. Destruction of Flora & Fauna

#### Flora

- The destruction of some flora would take place during construction of approach roads, areas of labour camps, oil and vehicle storage areas. There is a possibility of tree removal due to the project activities. The project authorities will ensure not to cut any tree unnecessarily and if it has to be cut then it will be identified and marked. Further for each tree removed at least five trees will be planted in the immediate vicinity and project will be responsible to bring them to maturity.
- Mitigation measures to be adopted is to avoid approach roads, through vegetation. Compensate damage by extensive plantation after construction is over. This will enhance and mitigate this pollution.

#### Fauna

- High noise level may disturb the fauna in wildlife sanctuaries located close to the work area.
- Working to be confined to day light hours. No night travel to be allowed. This will have limited and negligible impact on fauna.
- Extended canal closures for rehabilitation works may have short to medium term adverse impact on the aquatic life, wetlands and other terrestrial life. Detailed EAs will identify and analyze such impacts and location of such impacts in detail and will propose adequate mitigation measures.

#### Reptile Communities

- These communities will be affected during construction phase of embankment and canal lining.
- This impact will be temporary and not significant as this will only be within canal.

### 6.5 Post Construction Impacts

Potential post-construction physical & biological impacts and enhancement & mitigation measures are:

#### **Physical Environment:**

##### a) Water Resources

- i) Water Quality / Irrigation Water availability will improve.

The design will take into account provision of washing bays and cattle baths. Cattle crossing will be made standard features of the lined canals along with washing bays and cattle baths.

Seepage will reduce and water availability would increase, particularly for the tail enders. This would be a positive impact.

- ii) Ground Water Quality and Levels

Ground water levels are raised due to seepage from canal system and fields. Overall reduction in seepage due to project intervention will not be substantial and as such there will be no effect on ground water level except in limited areas around lined portion.

##### Increased use of Pesticides

There is likelihood of increased use of pesticides due to increase in intensity of cropping as a result of increased water availability. However, this aspect of increased use of pesticides due to increased water availability is not of significant nature. Nevertheless, a pest management plan (PMP) is being implemented in the project area under Sindh OFWM in Sindh as well as in the Project AWBs. Status of implementation of the PMP under Sindh OFWM has been reviewed and report is included in main report. The PMP implementation would be supervised under Sindh OFWM Project. A study would be carried out in the first half of 2008 (if necessary under WSIP), to review the progress and performance PMP implementation and assess activities that need to be continued or if there are any additional actions required for proper IPM. These activities would then be funded from the WSIP (Component E3) if necessary. In particular, the IPM training program may continue in order to achieve desired level of the number of farmers trained in proper IPM.

##### b). Surface Runoff

The project interventions are as such that these would not cause any significant impact on surface runoff. In fact the plantation of trees along all channels would result in improving storm drainage, also erosion would reduce due to increased vegetation as well as stabilization of slopes of all channels improved under the project.

c). Seepage and Wetland Recharge

The seepage from distributaries & minors, if cut off due to lining, may create some impact on adjoining wetland recharge. However no impact is foreseen as the listed wetlands are away from the proposed project area. This aspect will however be investigated in detail during the environmental assessment studies for each sub-project and adequate mitigation measures will be proposed where required. The Environment Management Plans prepared for each subprojects would be reviewed by the monitoring and evaluation (M&E) consultants, and by the Bank according to the prior review requirements.

d). Land and Soil

i) Soil Salinity and Alkalinity

Soil Salinity / Alkalinity will tend to reduce as a result of WSIP. The project interventions and proper Water Management will help control soil salinity.

ii) Soil Erosions

Bank erosion of canals which normally occur in unlined channels will reduce with the rehabilitations of canals and project interventions under WSIP.

iii) Excavated Soil / Silt

If not disposed off properly it can cause a negative environmental impact of significant and permanent nature.

Mitigation measures include:-

- Use of silt in the agricultural fields by the farmers
- Construction of embankments along the sides of canals.
- Spreading of earth evenly outside the embankment to avoid unpleasant landscape consisting of uneven heap of earth.

e). Borrow Pits for Construction Activities

Borrow pits for canal rehabilitation work shall be located away from the canal and where good quality soil is available. For improvement of main canals, rehabilitation of distributaries and other construction activities standard practice as followed by Irrigation Department Govt. of Sindh need to be adopted to ensure proper location.

f). Temporary Diversion Channels

Diversion channels if built during improvement of distributaries/minors would have to be filled properly. It should be mandatory for contractors to fill them up after the construction activities are over and restore the site including re-plantation of trees and vegetation. Detailed EAs will propose adequate mitigation measures for potential environmental or social impacts for sub-projects requiring temporary diversion channels .

g). Land Productivity

The crop yield levels would increase due to increased water supplies and sediments to the tail end.

h). Climate

No significant impact is foreseen on the climate

**Biological Environment**

a) Fauna

i). Bird Communities / Habitats

No significant impact on bird communities as a result of any of the physical intervention is foreseen.

ii). Mammal Communities



No impact on mammal communities, because during construction phase water will flow through temporary bypass, similarly in the post-construction phase no impact is foreseen.

iii). Reptile Communities

No impact on reptile communities is expected once the construction phase is over.

iv). Fish Communities

No affect on fish communities.

b) Flora

Forest & Trees

There is likelihood of trees being removed for approach roads required for construction activities. The mitigation measures efforts should be made to adopt approach road alignment through least vegetative areas. However where unavoidable it would be mandatory to plant three to five times the number of trees and restoration of vegetation.

c) Natural Habitat / Protected areas

At present it appears that the Natural habitat / Protected Areas do not come within the project area since the work is being proposed on the existing channels and no new work / alignment is foreseen. However, if any of the sensitive areas are found to be affected by project interventions, a protected area management plan will be prepared under the detailed environmental assessment for that sub-project.

## 6.6 The Environmental Management Framework (EMF)

Detailed design of sub project works would be prepared during the project implementation period. Therefore, the approach is to prepare subproject specific EA/EMPs for each contract in the framework of overall ISEA that would be implemented under the project. Depending upon nature, scale and complexity of works, subproject/contract specific EA would assess general as well as site specific environment issues and preparation of sub-project specific EMP. Implementation of EMP would be included in the contract and addressed under the Project. Separate EA and EMPs would be prepared for the three major construction contracts related to rehabilitation of main and branch canals --Ghotki, Nara and Fulleli -- as part of the detailed design report identifying overall and site specific environmental issues along with the management plans. In case of rehabilitation of distributaries and minors the detailed design reports would be prepared for a group five distributaries that are adjacent or as close as possible. The design reports would also include EA and EMP in addition to the technical designs and form the basis of bidding documents. The contract specific EA/EMP would be reviewed and cleared by the M&E consultants (reporting to PCMU) who are also responsible for monitoring and supervision of the environment and social management plans in addition to project impact assessment. All design reports and EA/EMP related to the large canal rehabilitation contracts, and first five lots of design reports in each AWB for distributary/minors would be review by IDA.

The environmental management framework in Table 6.1 presents a broad list of adverse environmental impacts likely to occur under WSIP proposed works with generalized mitigation measures and also assigning the responsibility to manage them. However, detailed environmental assessment for each sub-project will narrow down the potential adverse environmental impacts and will present an EMP which will become part of the sub-project bidding document.

**Table 6.1: ENVIRONMENTAL MANAGEMENT FRAMEWORK**

Sr.#	Source of Impact	Potential Impact	Mitigation Measure	Responsibility		
				Implementation	Supervision	Monitoring
1.	Rehabilitation of Main Canals & Branch Canals	i) Improperly excavated earth/silt ii) Unattended borrow pits causing ponds a breeding ground for mosquitoes, safety hazard, and deterioration of land scaps iii) ree cutting iv) Dust, construction waste, noise, and other pollution due to traffic, oil spills, etc. v) Changes in surface/groundwater quantity & quality vi) Impact on land productivity vii) Impact on wetlands, protected areas viii) Impact on aquatic & terrestrial life	i) Proper Disposal of excavated earth will be carried out as integral part of the Rehabilitation works ii) Mandatory restoration and leveling of borrow pits. iii) The bidding documents would include proper management of the silt, excavated areas, and borrow pits, etc. removal of waste, standards for control of dust, noise, oil spills, management of the construction traffic etc. iv) Also bidding documents would include plantation of trees along the channels which would be improved under the project. These costs are included in the project; (v) Impact on land productivity, wet lands, protected areas, aquatic life, flora and fauna would be assessed in detail for each sub-project and construction site and included in the construction/implementation plans.	Project Implementation consultants (PICs) screening and preparing EMPs for each subproject, and incorporating those in the bidding documents, construction plans, project plans along with monitoring require general of specific if any.  SIDA EMU would work with the PICs in incorporating and ensuring Environment work is incorporated in the subproject designs and implemented in accordance with agreed and professional, national and international standards	PCMU's environmental unit with support from the Monitoring and Evaluation (M&E) consultants.	M&E Consultants, PCMU  Sindh EPA where applicable and perhaps National EPA where applicable  Bank supervision missions, with involvement of environmental specialist as and when required.  PSC and Sindh P&D Department
2)	Rehabilitation of Distributaries & Minors	i) Improperly excavated earth/silt ii) Unattended borrow pits causing ponds a breeding ground for mosquitoes, safety hazard, and deterioration of landscapes. iii) Impact on wetlands iv) Tree cutting  Several of the impact in this case would be similar to the main and branch canals and would be handled in similar ways.	These impacts would be handled in similar manner to the above for improvement of mina and branch canals.  Silt would be more in case of distributaries and minors. However, silt from the these channels has very high fertilizer value and a system would be evolved by FOs to distribute the silt to ther participating farmers and also perhaps generate some funds for O&M of the channels.	Same as above with more involvement of FOs as they would be the implementing agencies and contractors in many cases.	Same as above with more involvement of AWBs	Same as above with more role of AWBs  PSC and Sindh P&D Department

3	Washing of clothes in the distributaries and minors.  Buffaloe crossings etc.	Contamination of irrigation and drinking water by detergents and soaps.  Deterioration of drinking water quality.	Washing bays be located and designed in consultation with the FOs and local community particularly for distributaries, and minors to minimize canal water contamination.  Proper buffalo wallos and crossing identified jointly with the FOs would be constructed.	FOs, PICs,  AWB	FOs assisted by their Assistant Engineer, and AWB  PCMU, M&E consultants	SIDA Environmental Unit  M&E Consultants, PCMU
4	Supply of appropriate O&M equipment to FOs	No impact	Not required	FO/AWB	FOs assisted by their Assistant Engineer	M&E Consultants, PCMU
5.	Increased agricultural activity	Possible increase in use of chemical and pesticides.	A Pest Management Plan (PMP) is under implementation under the Sindh OFWM Project and national Integrated Pest Management (IPM) project covering whole Sindh. The implementation of PMP is being supervised under Sindh OFWM upon completion of which a study would be carried out in mid 2008 and continuation of any incomplete activities under PMP would be funded under WSIP particularly further training of farmers in IPM.	SIDA/AWB/FOs	M&E Consultants/PCMU	M&E Consultants, PCMU  PSC and Sindh P&D Department
6.	Preparation of regional plan for left bank of Indus, feasibility studies for rehabilitation of barrages	Full EA and SA are to be prepared as part of the studies which would be carried out through extensive participation of major stakeholders and NGOs.	Environmental Management and Social management plans to be prepared as part of the preparatory studies	SIDA, consultants for preparation of studies	SIDA, PCMU	PCMU, M&E Consultants  Sindh P&D Department., PSC  Bank Supervision missions.

## 7. INDIGENOUS PEOPLE

### 7.1 General Profile

Pakistan does not have any separate policy to define indigenous peoples or to protect their rights and cultural identities. However, the World Bank's Policy OP 4.10 on 'Indigenous Peoples' defines indigenous peoples, in a generic sense of the term, to a distinct, vulnerable, social and cultural groups possessing the following characteristics:

- Self-identification as member of a distinct indigenous cultural group and recognition of this identity by others;
- Collective attachment to geographically distinct habitat or ancestral territories in the project area and to the natural resources in these habitats and territories;
- Customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- An indigenous language, often different from the official language of the country of region.

In Sindh two groups of people may be considered as indigenous or in the context of Pakistan, ethnic minorities for purposes of applicability of World Bank's OP 4.10. These are the *Mohanas* (boat people) of *Manchar* Lake and the original *Thari* people who have a distinctive culture and lifestyle, conditioned to living in almost perpetual drought. A majority, though not all, of these people are Hindus belonging to what are termed as the 'scheduled castes'.

The total Scheduled Cast population in Sindh was around 300,000 as per the 1998 Census. Out of these, 93% were amongst the rural population of Sindh and out of this rural population, 87% were residing in the Tharparkar District. The Hindu Schedule Cast tribes in Sindh that may be termed as 'ethnic minorities' are mainly *Bheels*, *Kolhi's*, *Oads* and *Meghwar*. Some Muslim tribes of Tharparkar can also be considered as ethnic minorities, given that their culture and lifestyle is very similar to the Hindu tribes.

The *Bheels* are mostly nomads, while the *Kolhi's* and *Meghwar* (who migrate seasonally) are engaged largely in non-farming work e.g. road construction and house building. Large numbers of women also work on construction sites. Women of these tribes are well known for their hard work and put in long hours of physical labour whether in Thar or outside.

While the *Mohanas* of *Manchar* Lake do not come within the project area of WSIP-Phase-I, some groups of scheduled castes, mainly *Tharis* and *Bheels*, are known to migrate seasonally to work as *haris* and temporary wage labourers in barrage-irrigated agricultural areas bordering Thar (Mirpurkhas, Badin and Sanghar districts). However, none of these ethnic groups appear to have any collective interest in any ancestral land within the project area.

### 7.2 Outcome of Consultative Meetings

A number of consultative meetings and Focus Group Discussions were organized at Ghotki, Badin and Mirpurkhas during the preparation of ISEA that were participated by NGO's, civil society and farmers representing the Area Water Boards of Ghotki, Left Bank, and Nara. Since representatives of these ethnic groups were not able to participate in any of the above meetings and focus group discussions, additional focus group discussions were specially organized (during October 2006) with several men and women from these communities in Mirpurkhas to investigate any specific social issues and concerns that these groups may have in regard to their relationship to water management, their poverty and social levels. Local NGOs and CBOs also participated in these FGD. Findings of these discussions include:

- ❶ The participants were largely concerned about, water shortages, inequitable distribution and drainage. They were keen to learn about institutional changes under the water sector reform though with apparent apprehensions about its success.
- ❶ These community members (both Hindus and Muslims) normally work on farms as *haris* or wage labourers. As *haris* they have the same sharecropping terms as other sharecroppers, and do not seem to be discriminated against for being different ethnic groups or Hindus per se. They face the same

- problems and have the same kind of relationship with the landlord as other sharecroppers from mainstream population. Some *hari* families have lived and worked in the same area (and sometimes for the same landlord) for several years, while others are more recent arrivals. In many cases they move regularly between their home in Thar and their current place of residence and work in the irrigated areas.
- ❏ As wage labourers they get paid similar daily rates as other daily waged workers. These group of workers stay on the farmlands for periods between a few months and a few years, most (though not all) travelling back and forth to their homes in Thar.
  - ❏ All these group of *haris* and labourers run the risk of being evicted by the landlords and do not have any permanent place or sustainable source of livelihood.
  - ❏ In their opinion, the WSIP interventions are likely to augment the possibilities of greater benefits of increased wage labour during construction period and subsequently in farming. These benefits would directly accrue to the all those who work as wage labour or *haris*. With greater representation of *haris* and waged labourers at WCA and FO levels, the benefits to these groups can be further increased.

### 7.3 Conclusion

As *haris* and daily wage labourers, the ethnic groups such as *Bheels* and *Tharis* share the same issues, problems and terms of engagement as other mainstream groups. The benefits and impacts of the project would be felt uniformly by these ethnic groups and those from mainstream population. None of these ethnic groups are likely to be affected adversely due to their ethnicity. Nor are they the main and direct beneficiaries of the proposed project. In as far as they are *haris* and wage labourers, they will be part of the inclusion plans for sharecroppers, wage earners and women. None of the planned project interventions will adversely affect them and the project will have no specific negative impact on them for being *Bheel* and *Tharis*..

In terms of the benefits as *haris* these ethnic communities will benefit directly due to increase in agricultural production and as wage labourers they are likely to benefit indirectly as increased farm activities like sowing of crops (sugarcane, vegetables), harvesting (wheat, rice), picking (cotton, chillies) and cutting of sugarcane, will mean increased employment opportunities.

None of the ethnic community members, *Bheels* and *Tharis*, have any collective attachment to any ancestral land within the project area and they do not have any political, cultural or political institutions distinct to those of mainstream population. These *haris* from *Bheel* and *Tharis* speak the mainstream Sindhi language and are fully integrated with the mainstream population, culturally and economically. However, these groups do maintain their ethnic identity and speak their own language as well. Since, none of these ethnic groups cumulatively satisfy IP criteria specified in the World Bank's policy, the OP 4.10 will not be applicable.

## **8. SOCIAL IMPACTS, BENEFITS, CONSTRAINTS AND MITIGATION MEASURES**

This chapter presents the assessment of potential social impacts due to the WSIP-I covering the three Area Water Boards (AWB) of Sindh Province. The section also focuses on the economic and social aspects of the water sector as they relate to the area within the jurisdiction of the project that includes: Ghotki canal command Nara, Left Bank (Akramwah and Fuleli). For this analysis and comparison with non-project area i.e. for control group area on the right bank of the Indus river was covered.

Additionally, field based data was collected at the level of farmers/water users through the household survey of 121 respondents, sampled from 12 distributaries/minors (hereinafter referred as villages) including the control group, and Focused Group Discussions (FGD).

A total of six FGD's were conducted covering different locations within the WSIP area. The FGD focused upon specific group of water users based on farm size: predominantly small or medium or large farmers. This segregation was considered necessary for a meaningful discussion on the subject without hesitation and fear from any side. Of these six FGD's, one (at Ghotki) was exclusively conducted for women farmers. One FGD at Mirpurkhas entirely focused on non-agricultural users of canal water. Within each FGD, other stakeholders like local pesticide/fertilizer dealer, local government persons or someone from revenue/irrigation department were also present. The size of each group was between 8 and 12 persons., with the exception of non-agricultural users of water at Mirpurkhas where 18 persons attended.

### **8.1. Socio-Economic Aspects**

The key socio-economic aspects as they relate to future sustainability of the project focused on the following:

#### **8.1.1 Farm Level Water Availability**

A comparison of availability of water (measured in duration of flow) across various categories of farm size, location (head, middle and tail end of water course), and tenurial arrangements shows significant variability. The highest variability is observed across farm size categories i.e. from 0.46 hours per acre of large farms to 1.01 hours for subsistence farms. This is possibly due to the fact that under the generally prevalent system of sharecropping in Sindh, the larger farms sharecrop-out land to tenants in small pockets of 6 acres to 15 acres, and the available water is intensively used within each pocket leaving behind a larger part of owned land uncultivated. The variations across tenurial groups tend to substantiate this explanation where the tenanted land receives 35 percent higher water sanctions as compared to owner cultivated pond.

The variabilities across the four regions shows wide variation particularly in relation to the control group i.e. Right Bank area which is predominantly a rice growing area but has tended to receive water supplies in both seasons. It is, however, interesting to observe that, in some cases the tail enders appear to receive larger supplies in relation to those at heads. The most plausible explanation seems that access to water supplies are not so strongly related to location per se. Rather it is the degree of economic and political power of land owners that gives them a better access to water supplies as well as other inputs in terms of their timing, amount and regularity. However, this must be reminded that there may be other control over water which the respondent did not reveal. For example, access through direct outlet (D.O.'s), unauthorized use of lift pump or undue sanction of orchard allowance etc. Though it was not possible under this study to conduct specific case study to further explore into such practices, it remains part of the common knowledge that such illegal and/or improper practices are quite common in Sindh. Under such circumstances inherent inequities in the system cannot be ruled out.

#### **8.1.2 Levels of Cropping Intensities**

The level of cropping intensity shows the extent to which the land available for cultivation is cropped. In a perennial area with two cropping seasons (e.g. left bank of Indus) the level of maximum intensity may reach 200 percent mark. However, in order to achieve such levels adequate control over water supplies is required, in addition to access to other inputs. A close comparison of cropping intensities with water availability per acre shows strong relationship. Here again, the locational variations were not strongly associated with variations in cropping intensities except in case of location of watercourse on the channel. Those located at head of the channel attained 170 percent as compared to tail watercourse at 160 percent.

### 8.1.3 Income Levels

The income levels of sampled households were estimated keeping in view farm and non-farm sources of income. As such two levels of incomes were computed i.e. one based on all sources and the other based on farm income only. In order to observe the sensitive issue of rural income poverty in Sindh, each estimate of income was classified into farms below and above poverty line which has been established by Government of Pakistan as Rs.9,120 per person (in adult units) per annum. The assessment of income levels indicates that:

The non-farm sources augment the per capita farm income by 24 percent and 4 percent, respectively, for those below and above poverty line. This implies that those under poverty line are more mobile and search for other sources of incomes in significant proportions.

- The total income of those above poverty line was 5.4 times higher, whereas in terms of farm income alone this proportion was 6.4. These disparities amply demonstrate groups of farms vulnerable to poverty trap. Across farm size categories, the ratio of total income of large farms above poverty to those below poverty were over 22. Only 1 out of 13 large farm was below poverty. Among owner cultivators at this ratio was 5.4 and in case of tenants it was 2.7. Similar ratios when computed on the basis of farm income only revealed a ratio of 6.8 for owner and 2.58 for tenant.
- Such income disparities were also obvious across regions. For example, the data shows disparity ratios of 6.6 for NARA, 4.2 for Left Bank, 6.9 for Right Bank and 3.8 for Ghotki area, between those below and above poverty line. The variations in incomes across those at head and tail of either within a watercourse or within a channel was not ostensibly different, which further strengthen the earlier held view that location per se does not indicate a source of deprivation as compared to variations in land holdings, tenure, and regions reflecting different agro-climatic and soil conditions, ethnicity, etc. The analysis reflects the incidence of non-farm incomes in reducing the extent of income poverty.
- These comparisons amply demonstrate the fact that poverty is more pronounced within the scenario of farm income and that it significantly reduces (though still remains at alarming levels) with the advent of non-farm income opportunities. It also shows that variations in income are more related with farm size variations, tenurial arrangements and regional specificity and not locational factors.

### 8.1.4 Depth of Poverty

The depth of income poverty were also measured to show the sources that create poverty gaps. The analysis highlights the depth of poverty based on farm income levels. Extreme levels of poverty gaps across different strata of the rural / agricultural households were revealed by the household data collected under the study. These included variations across farm size, tenure and farm location.

## 8.2. Institutional issues

### 8.2.1 Awareness of Water Sector Reforms

Most of the participants (with the exception of Nara and left bank areas) were found largely ignorant about Water Sector Reforms, establishment of SIDA or its functioning, emergence of Area Water Board and above all their enhanced role and the degree of autonomy accorded to farmers under the reform. The general awareness of the people on the subject was largely concentrated over the apparent duality of functions/roles between Irrigation and Power Department (IPD) and SIDA. They do not regard this conflict as part of the transition during which IPD would become part of SIDA at the end. Their apprehension does carry some weight given the non-existence of exemplary traditions of development and sustenance of organisations and institutions in the area. As a consequence people largely focus on day to day events that they think affects them.

People largely demonstrated a sense of disassociation with new institutional changes in the water sector and future development works being initiated. They were largely concerned over non-dependability and erratic variations in the water supplies causing inequities in its distribution.

### 8.2.2 Dissemination of Information

The farmers were casting heavy doubts over the reliability of the announcements/promises made by the canal authorities (they largely attribute this to IPD and less to SIDA authorities) for the opening up of specific canal which they had closed apparently to ration out the limited supplies available. The farmers in many sessions advocated the idea to establish local radio stations to regularly disseminate the canal operation plan prepared by the canal authorities. The farmers agreed that such system will create a peer pressure on the authorities to strictly adhere to their schedules for water delivery.

It was also suggested that in order to increase the effectiveness of the system (which will undoubtedly increase the confidence and respect of farmers in the system) a third party validation may also be enforced. This validation will periodically assess the deviations from the announcement of water schedule and report for any judicial actions (if required).

The farmers also agreed to share the cost of partial lining of the irrigation channel on the understanding that it would ensure higher supplies to them through reduced seepage losses. This issue was heavily debated since at the beginning farmers were not in a mood to listen to any suggestion that requires them to contribute financially for the functioning of the system.

### 8.2.3 Non-Agricultural Use of Water

- The participants strongly criticised the water supplies made to Mirpurkhas city for the use of residents and industrialists/businessmen.
- The following specific points were indicated by the participants:
  - i) The water supplies made to the city are not treated.
  - ii) Every fifth person in the city is suffering from hepatitis A, B or C.
  - iii) Contamination of water supplies with sewage water is common.
  - iv) The water is supplied from Jamrao Canal through tanks which are not regularly cleaned and carry heavy silt.
  - v) The water through boring of well is sold by local municipality at a rate of Rs.200 per tanker or Rs.30 per drum.
  - vi) Water is apparently available in plentiful quantity but its quality is extremely poor.
  - vii) Market for mineral water has increased several folds during the last 10 years or so.
- The participants suggested the following measures:
  - i) Water supply system be privatized.
  - ii) People are willing to pay a higher price if the quality of water improves (Currently only 30 percent pay water tax to municipality which is less than Rs.100 per household per year).

## 8.3. Potential Social Impacts and Issues

The respondents were provided with information on various components of WSIP before seeking their views on the likely impact. A summary of potential impacts and issues highlighted by the farmers are articulated below:

### 8.3.1 Water Availability.

The main apprehensions of the farmers were centered at current water shortages. Their views and perceptions were largely affected by the current shortages for which they hold the system to be responsible. As a result, their responses were extremely cautious. Nearly 85 percent related adequate water supplies with reductions in the levels of waterlogging and salinity. Around 14 percent considered WSIP to be a success but regarded it as a difficult task.

### 8.3.2 Impact of Direct Outlets (D.O.'s) and Lift Pumps

A total of 20 respondents either did not know about any impact or were confident that D.O.'s have no adverse impact. Of those who considered D.O.'s to have adverse impact on water distribution included those 59 percent who considered shortages at tail end to be its impact. Nearly 9 percent regarded lift pumps to deprive others right over water and 16 percent considered lift pumps to be inevitable due to higher elevation of land.

### 8.3.3 Farmers Organisations (FOs)

During the household survey the respondents were also asked questions to seek their perception and assessment on different issues including FO's membership, its governance, process of election, dominant group, joint management, health and environment related issues, drinking water, institutional and technical constraints, resettlement issues etc. The responses received for each issue are presented below:

*Election Process.* The small and medium size farmers showed their concerns on the process of election whereby selection is generally made by few or nomination conducted in such social environment where the



less privileged ones have no courage or social bondage to confront. A suggestion was also made to make it mandatory for an office bearer who wants to contest or is being nominated for the third time in office to acquire at least two-thirds majority votes at FO level.

*Membership of F.O. (Farmers Organization).* Only 14 households out of 121 (i.e. 11.6%) reported membership of F.O. and 76 clearly reported non-membership. A total of 31 (i.e. 25.6) never heard about F.O.'s.

*Size of Land Holdings of President (Head) of F.O.'s.* There is predominance of large landowners in controlling the affairs of F.O.'s. It in turn raises the issue that if over 82 percent of farmers in Sindh are small, their representation and control over F.O.'s seems on the contrary.

*Frequency of F.O.'s Meetings since its Establishment in the Area.* Though the frequency of F.O.'s meeting does not seem very frequent but it shows that F.O.'s are functional as compared to WCA's who rarely meet after the lining/civil work.

*Effectiveness of FO's.* Of the 89 respondents, 15 (i.e. 12.4%) reported F.O.'s as very effective in carrying out their due functions. Nearly 37 percent (i.e. 45 farmers) were not convinced that the F.O.'s are effectively working. The above mentioned responses reveal a mixed picture of F.O.'s effectiveness as perceived by the farmers.

*Joint Management of Channel by F.O.* Of the 88 respondents, 80 i.e. 90 percent were of the view that joint management of the channel is possible through F.O. The higher proportion of those affirming the question belonged to Nara region. In view of the responses on the effectiveness of F.O. (discussed earlier) the responses on joint management of channel by farmers seems a reiteration of the confidence and hope the farmers still carry for their active participation in canal water management. This in a way affirms the design of the irrigation sector reforms in Sindh. However, their worries, apprehensions and constraints in this regard need adequate attention of the policy makers.

*Joint Collection of Abiana.* A significantly high percentage of respondents showed their confidence (i.e. 80 out of 89) in abiana collection by F.O.'s.

*Institutional Constraints.* A vast majority i.e. 78 percent either did not know of any institutional constraints in the formation of F.O.'s. Nearly 20 percent, however, argued that the good governance of WCA (Watercourse Association) is a precondition for an effective F.O. This proportion though small nevertheless points towards an extremely essential component of overall irrigation sector reform. It means that the institutional strengthening at the lowest level i.e. watercourse level (WCA) needs to be vitalized if the onward movement/involvement of farmers at channel, Area Water Board (AWB) is to be meaningful.

*Farmers Representation at F. O. Level.* Nearly 56 percent reported no representation of farmers. However, these also included those where no F.O.'s have been established. Nearly 29 percent were indifferent due to the lack of knowledge on the issues. The rest i.e. 15 percent were of the view that influential farmers are represented at F.O. level. The pattern of responses on the issue of representation shows lack of ownership of the majority who either do not actively participate in the formation of F.O.'s or consider it to be a part of the status quo which will not change.

#### 8.3.4 General Health Problems

A predominantly high proportion of respondents i.e. nearly 97 revealed various diseases in the area in general. The highest reporting was for malaria. Over 88 percent reported malaria. The incidences of tuberculosis and hepatitis are also not uncommon in the area. It appears that standing water and improper drainage facilities have aggravated the health problems. The reporting of large-scale incidences of malaria is consistent with the general assessment that malaria and other diseases are re appearing in Pakistan.

*Water Related Health Problems.* As reported above, the incidence of malaria, hepatitis and stomach related ailments are largely associated with water. A total of 97 out of 121 cases reported these ailments and considered them to be caused by water. The severity of the health related problems abundantly shows that the problem is largely related to water and its management. The reported incidences of sickness due to water related factors were also verified during FGD's.

#### 8.3.5 Medical Expenses

Given the general income levels of rural households, nearly 48 percent of the households reported an expenditure of Rs.100 to Rs.500 per month on health.

#### 8.3.6 Current Sources of Drinking Water

A vast majority (66%) receives water from hand pumps followed by 20 percent who use canal water. Another 8 percent receive water through pipes. There were no reporting of water supplies through tankers in rural areas. However, in urban areas (e.g. Mirpurkhas) presence of tankers was reported during FGD's. The reported level of cropping intensities in the sample area does not suggest that the recharge from the canals could be so low to affect hand pumps water supplies. Nearly 75 percent of the respondents, however, maintained that no qualitative change was observed in the water received with the advent of rehabilitation of canals.

#### **8.3.7 Constraints in Livestock Movements**

A vast majority i.e. 89 percent reported no constraint in the movement of livestock as a result of any canal rehabilitation work. This proportion of responses, however, included those who reported no rehabilitation work as well.

#### **8.3.8 Resettlement Issues**

Component B of the Project will cover the improvement of irrigation and drainage system including implementation of modernization works, water metering and control structures and programs at all levels of the selected command areas in the jurisdiction of the three AWBs. The investment related to improvement of main and branch canals of Akam Wah may be included in the future project after completion of detailed design, and environmental and social assessment studies. For Ghotki, Nara and Fuleli canal systems the Project would cover some 700 km of main canals and 1400 km of branch canals. These works are likely to result in some adverse impacts, both permanent and temporary, on private assets and may also cause loss of income and livelihood of some households in the vicinity of the canals. Some of these canals banks are encroached upon by squatters who may be adversely affected due to the rehabilitation works that may be proposed in the project. Additionally, there may be a need to address the relocation issues arising from emergency flooding in the lower Badin areas. However, precise impacts of these works can only be determined during the project implementation after detailed designs for rehabilitation/improvement of main and branch canals systems are prepared and feasibility studies for coastal development are completed.

Rehabilitation and improvement work for the distributary/minor canals will be undertaken by FOs. The scale of the work envisaged is small and any loss of land or adverse impacts on private assets is not expected. However, the design report for each the lot of five distributaries would be prepared following the environmental and social screening process and will outline, in addition to technical design aspects, the major issues and environment and social impacts, together with appropriate mitigation plans, that would have to be accounted for in design and construction management.

In view of proposed activities under WSIP, the resettlement was not regarded as a significant issue by the majority (i.e. 56%) but 44 percent had reasonable doubts. Over 30 percent were worried that insufficient land will be given through resettlement. Over 13 percent were of the view that low quality of land will be given in exchange.

### **8.4. Summary Of Social Impacts, Constraints, Mitigation & Enhancement Measures and Responsible Institutions**

Based on the findings of field works and analysis of potential social impacts, a summary of the same alongwith the constraints, mitigation measures and enhancement measures is attached (Table 8.1) identifying the responsible institutions for each item.

### **8.5. Social Impact Management Framework (SIMF)**

To address social safeguard issues that may be caused by any of the rehabilitation and civil works activities in the Project, a SIMF, incorporating social screening process, is prepared for the Project. Full design report for each canal system and the design reports for rehabilitation and improvement works for the distributary/minor canals would include, in addition to technical aspects, a social impact assessment report, incorporating social safeguard issues i.e. specific impacts on assets, incomes and livelihood, and any impacts on vulnerable groups including nomads and migratory indigenous groups; and appropriate mitigation measures and necessary safeguard documents in accordance with the provisions of the SIMF. Upon approval from the Bank, these design reports would form the basis for preparing the bidding documents for carrying out the construction works.

To address social safeguard issues that may be caused by any of the rehabilitation and civil works activities in the Project, a SIMF, incorporating social screening process, is prepared for the Project. The SIMF (Table 8..2) provides the overall guidance on process and procedure required for addressing social impacts caused by the sub-projects and for social screening, and preparation and implementation of Resettlement Plans (RPs), and /or other mitigation plans as necessary. The RPs will describe distinctly and clearly how the sub-project would improve, or at least restore economic livelihoods of Project Affected Peoples (PAPs) through adequate asset compensation and economic rehabilitation measures.

RPs of the project will be guided by the following policy objectives:

Land acquisition is an integral part of the project design, and should be dealt with from the earliest stages of project preparation.

Both involuntary resettlement and the negative impacts on people by acquisition of assets should be avoided or minimized whenever feasible, exploring all viable alternative project designs. Persons to be affected should have their former living standards and income earning capacity improved or at least restored. In the case of displacement, they should be provided with adequate support during transition period.

Project stakeholders, including PAPs are consulted and given the opportunity to participate, as practicable, in the design, implementation, and operation of the project.

Particular attention will be paid to the protection of marginalized, disadvantaged, and vulnerable groups, including women and children, and promoting and providing, wherever possible, opportunities for such groups to take advantage of the investment.

Entitlements for compensation and rehabilitation assistance to different categories of PAPs are described in the attached Entitlement Matrix (Table 8.2). Entitlement packages are classified in terms of category of loss rather than category of person affected as each category of person may suffer more than one loss.

**TABLE 8.1**

**Summary of Social Issues, Potential Impacts and Recommended Mitigation Measures**

Activity	Impact	Potential Constraints	Required Mitigation & Enhancement Measures	Implementation	Responsibilities	Monitoring
					Supervision	
1. Capacity Building + Community Organization	1. Greater participation of farmers in water management system at FO & Watercourse levels.	1. The prospects for greater involvement of farmers may reduce unless representation of small farmers and tail enders truly reflects their proportions in the total.	1. Number of small farmers and tail enders as representative of their respective groups at AWB and SIDA be determined in proportion to their share in the farming community.	Project Implementation Consultants, SIDA Social Unit	SIDA PCMU Sindh Project Steering Committee	M & E Consultants PCMU
	2. Representation of farmers at the upper tier of the system i.e. AWB and SIDA.	2. In addition to the proportions, the true representation of small farmers and tail enders will not be achieved unless these terms are correctly defined. Failure to do so may cause collusion that may take place between large farmers and authorities at the cost of ignoring the interests of a vast majority of farmers.	2. The terms such as small farmers and tail enders, as used in Sindh Water Management Ordinance (Oct. 2002), be redefined as: i) Small Farmer: An owner of agricultural land of 16 acres or less provided that he/she does not own any other agricultural land in Sindh. ii) Tail Enders: Those farms located at the tail of such watercourses which are at the tail of a distributary/ minor.	FO & WCA	SIDA PCMU	M & E Consultants PCMU
	3. The landless and women may also benefit through their active participation at WCA/FO levels.	3. In the absence of proper representation of the landless and the women, horizontal inequities may be created. Those left out will not adequately benefit from the project.	3. The sharecroppers and women, wherever applicable, be given atleast some representation at WCA and FO levels e.g representation of formal association on WCA & F.O.	WCA & FO	AWB, SIDA	M & E Consultants PCMU PSC
2. Devolved structure and demand orientation of the system.	1. Delegation of powers to farmers, will be consistent with the objective of devolved government structure at local levels.	1. If the devolution plan is not implemented across all sectors or sub-sectors concurrently, the pace at which the decentralization of the irrigation system is planned may retard.	1. In improving the efficiency of water use, the other components of the devolution plan, e.g. community based school management committees (SMCs), PHED level activities and agricultural extension programs, be closely coordinated to acquire maximum benefits from the complementarities reposed in such activities within a devolved structure..	Education Deptt./ Public Health Engg. Deptt./ Agriculture Deptt.	FO	Local Government PCMU M&E consultants

3. Improvements in main / branch canal system (to be undertaken at AWB level).	1. Reduction of water losses above distributary level and improvement in water use efficiency at system level.  2. Loss of private land, displacement and impacts on livelihood	1. Inequitable membership, the farmers would be de-motivated to participate in the system's management. This way the	1. A larger proportion of farmers at WAC Committees i.e. a minimum of 51 percent, be maintained in order to ensure effectiveness of farmers participation.	AWB	SIDA	M & R Consultants
		central theme of the sector's reform (which hinges on user participation and making the entire system a demand oriented one) would be badly shattered. 2. Due to the perceived delays caused by the LA process and higher cost some of the components of the projects requiring land acquisition may be avoided.	2. Pro-active implementation of Social Impact Management Framework to ensure timely implementation of resettlement and acquisition of needed land.			
4. Project Management Support Component	1. The development of a management information system and training would be a key factor in determining the transparency of the system.	1. Being a radical change in disseminating system's information, it could be subjected to criticism from within the system, as it would create the basis for public accountability.	1. This activity be given maximum legal protection and be made public through a website 2. There is a clear need for establishing a Project Directorate for WSIP (Phase-I) Project	Project Directorate WSIP-Phase-I	SIDA	M&R Consultants
	2. The periodic review and impact evaluation would help estimate economic / social rate of return on such massive capital investment	2. There is a high risk that such a task may be conducted internally which may conceal weaknesses in the design and/ or implementation process.	2. In order to remain impartial and free from conflict of interest, the task needs to be conducted by an institution/firm outside the normal government structure.	M & E Consultants	SIDA	Local Government

**Table 8.2**  
**Entitlement Matrix**

No. (1)	Type of Loss (2)	Application (3)	Definition of Entitled Person (4)	Entitlement Policy (5)
1	Loss of agriculture Land	<p>Partial loss of land holding and the remaining holding economically viable and at least equal to or more than 0.5 acres (marginal impact on household income and living standards)</p> <p>Loss of entire land holding lost or where partial loss but the remaining land is less than 0.5 acre or is rendered economically unviable. (severe impact on household income and living standards).</p>	<p>a) Legal owner with valid title or customary or usufruct rights</p> <p>b) Tenant, leaseholder and sharecropper</p> <p>c) PAPs without valid title (encroachers, squatters)</p> <p>a) Legal owner with valid title or customary or usufruct rights.</p> <p>b) Tenant, leaseholder and sharecropper</p> <p>c) PAPs without valid title (encroachers, squatters)</p>	<p>PAPs will be entitled to: - Cash compensation for acquired land at replacement value.</p> <p>PAPs will be entitled to: - Compensation in cash for lost income for the remaining period of lease</p> <p>PAP's will be entitled to: - Vulnerable squatters will be entitled to assistance for loss of income Encroachers will not be entitled to any compensation or assistance.</p> <p>PAP's will be entitled to: - Equivalent area of land with equivalent productive potential at location acceptable to PAP, or - Cash compensation for acquired land at replacement value at informed request of the PAP and cash assistance for land preparation - "Transition allowance for a period of three months.</p> <p>PAP's will be entitled to: - Cash compensation equivalent to market value of gross harvest for one year production or for the remaining period of tenancy/lease, whichever is greater. Affected labor will be compensated for loss of income equivalent to three months of wages.</p> <p>PAP's will be entitled to: - Vulnerable squatters will be provided assistance for loss of livelihood and incomes - Compensation at replacement cost for loss of affected structures. Encroachers will not be entitled to any compensation or assistance.</p>

2	Loss of residential, commercial, industrial or institutional land	Partial loss of residential, commercial, industrial or institutional land with remaining land sufficient to reorganize	a) PAPs with valid title or customary and usufruct right	PAPs will be entitled to the following: - Cash compensation for affected portion of the land at replacement value.
			b) PAPs such as tenants and leaseholders	PAPs will be entitled to the following: - Reimbursement for loss of income for the un-expired lease period.
			c) PAPs without title (squatters and encroaches)	PAI's will be entitled to the following: - Vulnerable squatters will receive a transitional allowance equivalent to two months income (in case of impact on income or livelihood). - Cash compensation for affected structures at replacement cost  Encroachers will not be entitled to compensation or assistance.
		Loss of residential, commercial industrial or institutional land without sufficient remaining land. PAPs will be required to relocate	a) PAPs with valid title or customary and usufruct right.	PAPs will be entitled to the following: An equivalent area of land of similar characteristics and access to facilities in an acceptable location, or - Cash compensation for the entire land holding at replacement value
			b) PAPs such as tenants and leaseholders	PAPs will be entitled to the following: - An equivalent area of leased land for un-expired lease period or - Reimbursement for un-expired lease period
			c) PAPs without title (squatters and encroachers).	PAPs will be entitled to the following. - Cash compensation for affected structure at replacement value (For Vulnerable squatters only). Encroachers will not be entitled to land compensation.
3	Structures (Residential, commercial industrial or institutional)	Partial loss of structure and the remaining structure viable for continued use.	a) Legal owner of the affected structure with valid title or customary or usufruct rights.	PAP's will be entitled to the following: - Cash compensation for affected part of the structure at replacement value; and - Allowance to cover repair cost of the remaining structure.
			b) Owner of affected structure without title to the land (squatter / encroacher).	PAPs will be entitled to the following: - Cash compensation for affected part of the structure at replacement value; and - Allowance to cover repair of the remaining structure.
		Entire loss of structures or where only partial impact. But the remaining structure is rendered unviable for continued use, and sufficient land for reorganization.	a) legal owner of the affected structure with valid title or customary or usufruct rights	PAP's will be entitled to the following: - Structure of equivalent standard in an acceptable location or - Cash compensation for entire structure at replacement value - Transport allowance for shifting to new location.
			b) Owner of affected structure without title (squatter / encroacher).	PAP's will be entitled to the following: - Cash compensation for entire structure at replacement value - Transport allowance to new location.
			c) Tenant / leaseholder in the partially affected structure.	PAPs, if displaced, will be entitled to the following: - Transition allowance equivalent to Three months' rent - Transport allowance for shifting to new location.

4	Loss of trade / livelihood / occupation or business incomes.	Agricultural / industrial / commercial or institutional wage employment impacts.	Individuals.	- Employment in reconstructed enterprise or package for re-employment or starting a business - Transition allowance equivalent to three months incomes / wages in case of permanent closure. - In case of temporary closure, compensation will be wages equivalent to closure period.
5	Loss of access to common resource and facilities.	Loss of access to rural common property resources and urban civic amenities.	Communities / Households	PAPs will be entitled to the following; - Replacement of common property resources / amenities. - Access to equivalent amenities / services.
6	Loss of standing crops.	Standing Crops that could not be harvested.	Owner of affected crops.	PAPs will be entitled to cash compensation equivalent to market value of damaged crops.
7	Loss of perennial plants & trees	Affected Plant% and trees.	Owner of affected plants and trees.	PAPs will be entitled to cash compensation equivalent to market value on the basis of type, age & productive value.
8	Loss of public infrastructure.	Infrastructure (electric water supply, sewerage & telephone lines: public health center; public water tanks).	Relevant agencies.	Compensation in cash at replacement cost to respective agencies.
9	Losses to host communities.	Affected amenities and services	Relevant community	Restore losses as a result of resettlement for amenities / services equivalent to those provided to PAPs.
10	Temporary Losses	Affected structures or other fixed assets.	Affected PAPs	In cash on the basis of replacement cost of material and labor without deduction for depreciation or salvageable materials for the damages during the period of temporary possession.
		Severely affected structures	Affected PAPs made to shift temporarily from their present location	Entitlement will be in terms of rent allowance to cover the cost of alternate accommodation for the period of temporary displacement.
		Loss of crops and trees	Affected PAPs	Compensation at market value and for loss of net income from subsequent crops that cannot be planted for the duration of temporary possession.
		Temporary acquisition	Affected PAPs	No compensation for land if returned to the original user, but a monthly rent as per market value will be paid to PAPs. PAP's will be compensated immediately and damaged assets will be restored to its former condition.



## **9 CONCLUSIONS, RECOMMENDATIONS AND IMPLEMENTATION ARRANGEMENTS**

### **9.1 Conclusions**

1. Water is indeed the most crucial natural resource for Sindh irrigation and drainage system is the lifeline of civilization, livelihood and economy of Sindh. Improvements in I&D system proposed under WSIP are essential. The weakness identified in analysis for project design and approach adopted to address the institutional reform program through participatory irrigation management by strengthening of FOs and enhancing their participation in SIDA and AWBs is most suitable. The implementation of this approach would need careful monitoring and adjustments during the project implementation in order to address some of the issues which may arise during project implementation period.
2. Transparency and accountability in distribution of water and O&M of I&D systems is the major concerns that has to be addressed through WSIP-I through greater decentralization and participatory irrigation management approach with greater role of beneficiaries in decision making.
3. It is crucial to strengthen FOs' capacity through technical assistance and training, institutional building, organizational skills and management of I&D system in order to achieve the objectives of improving the water resources management. A clear role of FOs' in water charges collection and authority to take actions against defaults has to be reflected in FOs' bye laws.
4. At the beginning, a quota for women and sharecroppers at FO level would ensure higher and effective representation of farmers. The FOs' can then be better endowed to carryout the task of social mobilization. In this context NGOs can play a useful role.
5. There are no indigenous people in the project area which may be affected. They generally work as labourers in the project area and their issues are similar to day labourers and haris. They would be indirect beneficiaries of the project due to increased cropping activities and demand for labour.
6. Availability of safe drinking water is a major issue which would be resolved to some extent by improving irrigation supplies but needs to be addressed through properly designed intervention. The citizens of Mirpurkhas municipality reported substantial increase in the use of mineral water from 20 to 25 cartons per month 10 years ago to a current monthly consumption of 600 trucks, loads of mineral water. They also showed willingness to pay 2 to 3 times higher water rate to the municipality (i.e. local government) for the water supplies if the quality of water is improved through treatment plants. Pilot projects may be carried out to develop low cost methods improving the water quality, protecting water supplies by separating waste water and its safe disposal, and other means of improve water quality for possible scaling up later through other projects.

### **9.2 Recommendations**

1. The environmental study carried out indicates that the environmental impacts of the project are overwhelmingly positive and of permanent nature for the eco-system, socio-economic growth and improvement of human life style, except during construction phase when some impacts are likely to be negative but will be temporary and can be fully mitigated. The implementation of the Project is therefore, strongly recommended.
2. The wetlands protected areas are not going to be affected by the project interventions. No archeological sites will be affected by the project provision of monitoring following "chance find" procedures would be adequate. Therefore project is cleared for implementation on environmental grounds. However the clearance has been obtained from SEPA.
3. Institutional strengthening and capacity building of SIDA, AWBs and in particular FOs is crucial for transformation of the purely government management I&D system to decentralized system of management with participation of beneficiaries. The technical assistance and training to be provided under WSIP to FOs in the form of staff and through social mobilization unit of SIDA is a good approach. These arrangements

may be monitored during project implementation (including the performance of FOs) and adjustments made to the assistance program to better suit the needs of FOs as they emerge with them taking over more role in management of the distributaries and minors.

4. Social mobilization has to be accompanied with good communication strategy. Particularly, information about water allocation, rotation of flows to distributaries and minors, and O&M plans and expenditures of the system should be disseminated widely through internet (placing on SIDA and AWBs website and if some FOs develop their own websites) and broadcasted on an local radio (FM band).
5. Lack of adequate and safe drinking water major is a issue, resulting in health problems of epidemic proportion and population is interested in addressing this issue. One way to broaden FOs base to other water users, in particular haris, labour and women (who play a major role in securing water for domestic use) would be to do some small scale pilot project for improving water supply with FOs who involve and extend membership to other water users preferably to tenants, haris and women.
6. The Environmental Management and Social Units of SIDA should be strengthened in order to support implementation of EMF/EMPs under the project and also to improve SIDA's capacity in planning and development and operation of water resources management systems with proper consideration to environmental and social issues and participation of stakeholders in order to make water systems sustainable in the long run and generate higher benefits.
7. The left bank area of the Indus river in which three WSIP AWBs are located has been suffering from problems of storm drainage and flooding in the recent years. Also there are several problems in the LBOD's (Left Bank Outfall Drain) effluent disposal system causing environmental damages and social issues. The Indus delta, dhands and coastal zone are also suffering due to reduced surface water flows and degradation of water and land resources. In both storm and flooding issues and delta and coastal zones, several solutions are being proposed. These issues are very complex and solutions considered have wide ranging impact. It is necessary to have a comprehensive analysis of the situation on the ground, full examination of alternative solutions in participation with the local communities, NGOs and different stakeholders.
8. The studies proposed under component C of the project would be of great assistance in addressing these issues. However, they should be carried out with detailed technical, topographic, information and participation of stakeholders at all stages of preparation, conceptualization methodology, feasibility and design of alternatives. This may be done through a three staged approach with consultation with all stakeholders so that final outcome is acceptable and can be implemented in most effective way.

### **9.3 Implementation Arrangements**

The implementation of EMF and SIMF are fully integrated into the project design. As mentioned above detailed design of sub project works would be prepared during the project implementation period. Therefore, the approach is to prepare subproject specific EA/EMPs, Social Assessment and RPs, following the provisions of the EMF and SIMF, for each contract that would be implemented under the project. Depending upon nature, scale and complexity of works, subproject/contract specific EA would assess general as well as site specific environment issues and implementation of EMP would be included in the contract and addressed under the Project. Separate EA /EMPs/SA and RPs would be prepared for the three major construction contracts related to rehabilitation of main and branch canals --Ghotki, Nara and Fulleli -- as part of the detailed design report identifying overall and site specific environmental issues along with the management plans. In case of rehabilitation of distributaries and minors, the detailed design reports would be prepared for a group of five distributaries that are adjacent or as close as possible. The design reports would also include EA/EMP and RPs in addition to the technical designs and form the basis of bidding documents. The contract specific EA/EMP would be reviewed and cleared by the M&E consultants (reporting to PCMU) who are also responsible for monitoring and supervision of the environment and social management plans in addition to project impact assessment.

**9.4. Cost of EA/EMPs and RPs.** The cost of EA/EMP and RPs implementation is included in the Project (components A for SIDA EMU and Social unit, and B for civil works). Major part of the mitigation measures

would have to be incorporated into the construction contracts. Some, such as IPM studies, etc. may be funded through Component E of the Project. The cost for designs and preparation of sub-project specific EMPs, RPs is included in the cost of PICs (Component B). Cost for monitoring and supervision of EMF/EMPs and RPs is included in the component D (M&E consultants) and E.

**9.5 Institutional Setup and Monitoring Arrangements.** . SIDA is the primary implementing agency for the Project. Its EMU would be strengthened by supporting seven additional professional positions (Deputy Director of EMU, an environmental specialist, ecologist, hydrologist, sociologist/participation specialist and environmental inspectors). SIDA's Social unit would also be strengthened under the project by providing about 20 additional staff (including for social mobilization and support to FOs). SIDA's EMU and Social Units would work closely with PICs to ensure that EMF/EMPs and RPs are prepared and implemented properly. The monitoring of EMF/EMP and RP implementation would be done by the M&E consultants reporting to PCMU in the Planning and Development Department of Government of Sindh. The PCMU would be provided with a small unit with about five staff for overseeing M&E of project impact as well as implementation of EMF/EMPs and RPs.