



Environmental Management Plan
(EMP)

Kandiaro Minor
(Community Based Contract)

Component B-2

Of

Water Sector Improvement Project (WSIP)
Phase-I

July -2011

Environmental Management Unit (EMU)
Sindh Irrigation & Drainage Authority (SIDA)
Left Bank Barrage Colony Hyderabad
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This Environmental Management Plan (EMP) for Kandiaro Minor under Community Based Contract has been prepared by Mr. Akbar Ali Khatian, Environmental Ecologist, EMU-SIDA, left Bank Barrage Colony Hyderabad, Sindh Pakistan.

Abbreviations

Acronym	Definition
AWB(s)	Area Water Board
CBC	Community Based Contracting
CoI	Corridor of Impact
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
FO	Farmer Organization
FTC	Field Team Coordinator
IBIS	Indus Basin Irrigation System
IBC	International Competitive Bidding
IP	Inspection path
ISEA	Integrated Social and Environmental Assessment
M&E C	Monitoring and Evaluation Consultants
NIP	Non-inspection path
NGO	Non Governmental Organizations
NEQS	National Environmental Quality Standards
NCAWB	Nara Canal Area Water Board
L/S	Left Side
OP	Operational Procedure
PCMU	Project Coordination & Monitoring Unit
PICs	Project Implementation Consultants
RD	Reduce Distance
RoW	Right of Way
R/S	Right Side
SDC	Social Development Cell
SEPA	Sindh Environmental Protection Agency
EMU	Environmental Management Unit

VRB	Village Road Bridge
WB	World Bank

1. Introduction

Pakistan has the largest contiguous Irrigation system in the world. The economy of Pakistan is largely based on its agricultural produce. Water is therefore a critical resource for its sustained economic development. In order to fully utilize the river water resources the Indus Basin Irrigation System (IBIS) has to be fully operational. The IBIS comprises of three large dams, eighty five small dams, nineteen barrages, twelve inter-river link canals, forty five canal commands and 0.7 million tube wells which irrigates 45 million acres of farm land which produces wheat, rice, fruits, vegetables, sugarcane, maize and cotton for local use as well as for export.

Sindh province is the second biggest beneficiary of the Indus Basin Irrigation System after Punjab with three barrages and 14 canal commands. The irrigation system has a total 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). Approximately 48 million acre-feet (MAF) or 59 billion cubic meters (BCM) of water is diverted annually to the canal commands. Yet the province suffers from water shortage for its agricultural requirements.

The Government of Sindh has launched “Water Sector Improvement Project (WSIP-I)” with the financial support of the World Bank (WB). The overarching project objective is to improve the efficiency and effectiveness of irrigation water distribution in Ghotki, Nara and Left Bank Area Water Boards (AWBs) with respect to measures of reliability, equity and users satisfaction.

The WSIP-I is being implemented in different phases, mainly, through the SIDA and Area Water Boards AWBs with support from PIC and M&EC.

The EMP addresses the environmental impacts during the design, construction and operational phases of the project. In order to achieve the maximum socio-environmental benefits, a number of environmental recommendations and standards are being set in EMP. These set standards are aimed to ensure;

- Minimum adverse environmental impact of civil works during construction.
- Appropriate restoration of areas affected by construction works.
- Prevention of long term environmental degradation.

It was decided that, Project Implementation Consultants would conduct Environmental Assessment of the selected minors and distributaries with focusing potential impacts during the construction & Post Construction phase and the approach would 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 rehabilitation of Branch Canal would be done through International Competitive Bidding (ICB) contracts, the distributaries/Minors works would be tendered in groups and the FO will also be involved in the rehabilitation of Minors/Distributary through Community Based Contract (CBC). Accordingly EMU is directly responsible in the preparation and implementation of EMPs with stakeholders’ consultation

This report refers as Environmental Management Plan (EMP) has been prepared by EMU for Kandiaro Minor, wherein the FO is responsible for Rehabilitation work is through CBC Contract. The

purpose of this EMP report is to highlight the environmental consequences of rehabilitation activities in the project area and purpose appropriate measures to eliminate or reduce adverse affects.

2. Location of the Project

Kandiario Minor off-takes from Hiral Wah at RD 70+000, the total length of Minor is 7+230 RDs with a design discharge of 25.69 cusec over a cultural command area (CCA) of 2738 acres.

3. Study Approach

The Environmental Impact Assessment (EIA) of the WSIP prepared in 2006 as of an umbrella project has been cleared by the Sindh Environmental Protection Agency (SEPA) vide letter No. EPA/Lab/MM/MISC JII/8/02 of 18th December 2006 (Appendix-A). However, it was proposed in said letter that execution agency will compliance the Mitigation Measures recommended in the IEE/IEA.

It had been agreed in Standard Operating Procedure (SOP) jointly prepared by SIDA (GM Transition) and PIC (Environmental Specialist) and accepted as a part of the Design Manual submitted vide letter No. WSIP/253277/1/1/20 dated 1st December 2009, that “No Further Detailed Environmental Impact Assessments are required for; EMP and SAP are to obtain clearance by M&E Consultants through PCMU, and if needed for EIA is determined will be done accordingly”.

The present study has been conducted by following guidelines and instructions prescribed in the Pakistan Environmental Protection Act, 1997; Review of IEE/EIA Regulations 2000; National Environmental Quality Standards (NEQS) notified in 1993 and revised in 2001; Land Acquisition Act, 1894; Sindh Wildlife Protection Ordinance and Sindh Water Management Ordinance, 2002, Environmental Assessment Source Book Vol: I,II and III Policies, Procedures, and Cross sectional Issues World Bank Technical Paper Number 139, Forestry Act/Policy of Pakistan etc. The EMP is in consistence with the procedures for conducting the Environmental Assessment and in conformity with the requirements of the World Bank Operational Policies 4.01 on Environmental Assessment, and the general guidelines provided in the Environmental Source Book. The EMP is also in line with World Bank overall Environmental Management Framework (EMF) prepared in November 2006.

The primary data was collected through field visits; walk through surveys, formal/informal interviews and community consultation sessions, these activities were gathered by PICs. The secondary information pertaining to various environmental and socio-economic parameters was gathered through the review of available literature and from the records of relevant organizations.

4. Project Proponent

The sub-project rehabilitation of the Kandiario Minor will be implemented under a sector loan agreement between Government of Sindh (GoS) and the World Bank. The Sindh Irrigation and Drainage Authority (SIDA) will be the project proponent and will execute the project through Farmers Organization (FO) of Kandiario Minor of Nara Canal Area Water Board under the supervision of Project Director (WSIP-1). The Project Coordination and Monitoring Unit (PCMU), will overall monitor and coordinate project implementation activities.

4.1 Scope of Work

The century old Canals system of Sindh Province is in poor condition with an irregular prism, weak embankment and deteriorated hydraulic structures, which retard the diversion of the designed discharge. Resultantly, the system cannot irrigate the entire command area and necessitates its rehabilitation and up-gradation in accordance with the ground realities.

The rehabilitation activities can be grouped as shifting/rehabilitation of Minor Head works, construction of berms and side slopes, dressing of IP and NIP, construction of outlets, de-silting of Minor and repair of and VRB etc. The rehabilitation activities will involve the following main engineering works,

Table: 01 **Main Engineering Works/Scope of Work**

Name of Work/Category	Quantity (#)	Activity/ Type of Work	Location/	Remarks
Earthwork & Jungle Clearance	-	Bushes from head to tail both sides may be cleared and spoils may be removed to maintain the minor and filling with compaction for restoration of embankments.	from RD 0+000 to Tail,	As per X-Section, jungle clearance from head to tail and longitudinal groynes in the eroded sections
Rehabilitation of Head Regulator	01	Replacement of gate plates, steel membrane, opening mechanism, deck slab and parapet walls including minor repair work on head wall, wing walls and abutment proposed.	Head Regulator RD 00	Gate plates, steel membrane and opening mechanism are in worst condition need replacement. Deck slab and parapet walls are damaged and need replacement. Head wall, wing walls and abutment need repair
Construction of Bridge	02	Two new foot bridges	RD 2+300 and RD 5+500	Two new foot bridges are proposed for by FO
Construction of Measurement structure (Gauge)	01	Construction of Measurement structure (Gauge)	At Head Regulator	No measurement structure at Minor Distributary. Construct a measuring section at head reaches to record the discharge by FO on daily basis.
Outlets	06	Construction of new outlets for equitable distribution of water.	--	To be replaced with new structure
Washing Ghats/ Buffalo Wallow	01	One New washing Ghat	RD 5+600 L/S	It is social and environmental requirement to facilitate the villagers along the Minor. The washing ghat is recommended by FO.
Tree plantation	40 trees	Compensatory Tree Plantation	--	08 trees will be cut down out of 11 existing trees in rehabilitation work.
FO Office Building	01	Construction of the office building along with furniture, fixture and	FO will select the site.	To operate the FO administratively, financially and

Name of Work/Category	Quantity (#)	Activity/ Type of Work	Location/	Remarks
		equipments		operationally
Stone Pitching	50ft stone pitching	Protection against scouring at D/S of head regulator	at D/S of head regulator both sides proposed	

4.2 Environmental Assessment

The Corridor of Impacts (CoI) of Minor to assess the impacts has been considered as 35 ft from the centre of the aforementioned water channels. Most of the construction activities mentioned in Table 1 aiming at rehabilitation and improvement of the existing Canal system are anticipated to remain within the available Right of Way (RoW). However, in the followings situations the impact corridor goes beyond the boundaries of the RoW and embankments:

- Borrow sites for earthwork material,
- Haulage tracks and temporary diversion routes,
- Distant disposal of excavated material
- Tree cutting & Vegetation clearance
- Agriculture land clearance for approached roads.

4.2.1 Physical Environment

The entire project area is mostly flat. Texturally the soil is classified as loamy clay soil. The climate of the area remains dry and hot most of the year. The months from November - February is fairly cold. The summer season (Mid-April to Mid-September including the monsoon period) is considerably longer than the winter.

The rainfall in the project area is variable which includes two rainy seasons usually occur from Mid-July to Mid-September (Monsoon) and from Mid-December to end of February (winter).

- Air Quality

No industry with significant gas emission is located within the project area. Smoke is generated through domestic activities such as cooking and heating where wood is a main source of fuel.

- Noise

There is no noise within the project area however the equipment and machinery to be used during the rehabilitation works may create noise when in operation.

- Hydrology

The quality of surface water of the irrigation system is fit for agriculture purpose as no point or non point source pollution is observed during the walk through survey. But the ground water of the area is mostly saline.

4.2.2 Biological Environment

The rehabilitation of Kandiaro Minor will not create any impact on buffer zone, since no protected area within the vicinity of project area the biological environment of the project area is mainly agriculture conducive.

Due to agricultural dominated area, no pastures or grazing land exists in the project area. However, following trees are occurring in the agriculture fields, around and along the Kandiaro Minor:

Table-02 **Name of Trees**

<i>Sr. No.</i>	<i>Local Name of Tree</i>	<i>Biological Name</i>
1.	(Neem)	Azadirachta indica
2.	Babul	Acacia nilotica
3.	Shesham/ Talhi	Dalbergia sissoo
4.	kandi	Prosopis cineraria

At the same time due to non availability of protected area and natural forests, the project is also free from any negative impacts on terrestrial fauna. The project are and it surroundings possess only common avifauna and mammals'. The list is mentioned below:

Table-03 **Avifauna**

<i>Sr. No.</i>	<i>local Name/ English Name</i>	<i>Biological Name</i>
1	Kabootar/Pigeon	Columbidae
2	Kanw/ Crow/ Kang	Corvidae
3	Bhuro Titer/ Grey Francolin / Partridge	Francolinus pondicerianus
4	Karo Titar/ Black Francolin/ Partridge	Francolinus francolinus
5	Jhirki/ Larks	Lark (disambiguation)
7	Starlings/ Meena	Sturnidae

5. Environmental Management Plan

The WSIP at an initial / conceptual stage when the Integrated Social & Environmental Assessment (ISEA) was carried out and it was prepared in generalized and broad-based physical manner and institutional interventions prepared for the WSIP-I & Physical work involved.

The ISEA necessitates the preparation of Environmental Management Plan (EMP) for the WSIP projects to mitigate or minimize adverse environmental impacts. The EMP for Kandiaro Minor Component B-2 (sub-project of WSIP-I) is to comply with national legislative and as per provided Environmental Framework for the Project and also fulfill the World Bank's requirements.

The EMP proposes an effective plan of action that will indicate responsibilities and required measures. Most of the mitigation activities planned in the EMP will be executed & covered under provisions in Community Based Contract.

The FO will be responsible for the implementation of EMP with the technical assistance of Environmental Management Unit (EMU) SIDA. The EMP will address the environmental impacts during construction and operational phases of a project. The FO must be made aware of the environmental obligations that are stipulated in this document, and declares himself/herself to be conversant of all relevant environmental legislation. The EMU- SIDA & M&E Consultants will monitor the implementation of the EMP.

The EMU SIDA will conduct training Program & Workshop for dissemination of environmental obligations, environmental legislation, implementation strategy and stakeholder's role in the implementation of EMP. The construction activities will also be monitored by EMU.

5.1 Scope of study

The present EMP study is based on both primary & secondary data, information, and discussions held with stakeholders that cover:

- Anticipated environmental impacts due to project interventions.
- Proposed suitable mitigation measures for each adverse impact.
- Environmental Management Plan (EMP) including monitoring plan, the operational procedures, institutional responsibilities; and
- Cost estimates of Environmental Management Plan.

The EMP is a dynamic and flexible document subject to review and updating. During the implementation of a project there is always the possibility that the identified impacts may differ and unforeseen issues could arise, therefore, the EMP could be revised where necessary to mitigate the impacts.

5.2 Objectives of EMP

The basic objective of EMP exercise is to minimize adverse impacts of project interventions on the environment of the project area. The specific objectives of the EMP are as follows:

- To review the current environmental status of the Kandiaro Minor's rehabilitation site and its surrounding area
- To estimate the environmental concerns that would occur during rehabilitation and its impact on the surrounding environment.
- To suggest Mitigation measures to minimize the adverse environmental impacts at rehabilitation site.
- To propose a post-project environment monitoring plans to ensure that the EMP achieves its desired objectives.
- To increase the capability of FO in Environmental Management and environmental training requirements at various levels.

The EMP also serves to highlight specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactory prevented or mitigated, corrective action will have to be taken. The document should therefore be seen as a guideline that will assist in minimizing the potential environmental impact during the rehabilitation/ construction activities.

5.3 EMP Implementation Period

The EMP will focus during the whole implementation/construction period and operational Phase of the sub-projects.

5.4 Roles and Responsibilities

Supervision and monitoring are fundamental to the successful implementation of an EMP. The FO is the main Legal body and responsible to tackle the issues of Minor/Distributory. Simultaneously, EMU SIDA will also play its part in the implementation & monitoring of EMP. EMU would be responsible for environmental and environmental socio-economic concerns in a participatory way during construction phase

Besides both stakeholders (i.e. EMU and FO), Social Development Cell through its Field Team Coordinators and Assistant Engineer will have also vital monitoring responsibility in the environmental management compliances as they are directly involved with FO activity and have part in CBC. The FO will adhere on mitigation measures of EMP.

The Project Implementation consultants (PICs) would also participate in the implementation of EMP of sub-project as and when required. And M&E Consultants will also monitor the activities of EMP accordingly.

The Detailed EMP activities are mentioned in table 04:

Table-04 **Environmental Management Plan**

Activity	Impacts/ Indicators	Environmental Issue	Mitigation Measures	Mitigation Budget	Institutional Responsibility	
					Implementing Agency	Supervision/ Monitoring
Design Distributary / Minors to standard width with special reference to cattle / wildlife trespassing and washing areas.	Deteriorated channel banks and prism and low water delivery of system. Low cropping intensity and yields	Deterioration in channel regimes with the passage of time and siltation problem	Washing Ghats	Cover under engineering costs	FO	EMU-SIDA /FO/M&E C
			Buffalo Wallows	Cover under engineering costs.		
Embankment works, like clearing of vegetation, filling, excavation of channel and strengthening of embankments	Changes in landscape.	Soil Erosion Loss of vegetation and habitat. Air pollution due to dust emissions	Avoiding undue interference with the stabilized landscape and proper handling / compaction of cleared sites to minimize wind erosion. Slopes of embankments be constructed and maintained at stable gradient according to design specifications to minimize erosion.	Cover under engineering costs	FO	EMU-SIDA /FO/M&E C
Excavation of borrow pits	Systematic selection of barrow pits and their rehabilitation	Land disputes. Soil erosion. Loss of potential	Borrow materials from recommended / approved borrow areas. The FO will not cause	Cover under engineering costs	FO	EMU-SIDA /FO/M&E C

Activity	Impacts/ Indicators	Environmental Issue	Mitigation Measures	Mitigation Budget	Institutional Responsibility	
					Implementing Agency	Supervision/ Monitoring
		crop land. Loss of vegetation. Landscape degradation	any loss to crop land or private plantation			
Rehabilitation of borrow pits	Borrow pits properly rehabilitated	Soil Erosion. Derelict land uses. Conflicts. Visual sores in landscape. Public health risks due to mosquito- breeding places.	Rehabilitation of borrow pits as per approved Site	Cover under engineering costs	FO	EMU-SIDA /FO/M&E C
Disposal of spoils	Spoils removed	Increase in siltation , difficulties in inspection	Use of spoil if suitable for bank stabilization or alternatively disposed off to nearby waste lands	FO/ Cover under engineering costs	FO	EMU-SIDA /FO/M&E C
Construction and rehabilitation of diversion channels	Diversion sites restored properly	Loss of trees and crops Loss of fertile soil	Avoid any sort of interference/ trespassing in the adjoining agricultural lands and Refill the diversion channels with same soil type as excavated and compact it properly	Cover under engineering costs	FO	EMU-SIDA /FO/M&E C
Removal of floating debris and water weeds along the channel banks	Water flow free of floating debris and water weeds	Congestion/ choking of hydraulic structures/ bridges due to floating water weeds	Ensuring proper disposal of removed floating debris away from the channel bank in a safe manner	FO	FO	EMU-SIDA /FO/M&E C
Tree Plantation	Soil Erosion/ Landscaping	Cutting of tree during execution work	Plantation of five trees against each cut down tree	EMP Budget / FO will utilize the funds of hewed Trees.	FO/EMU SIDA	EMU-SIDA /FO/M&E C

Activity	Impacts/ Indicators	Environmental Issue	Mitigation Measures	Mitigation Budget	Institutional Responsibility	
					Implementing Agency	Supervision/ Monitoring
Surface water quality	Baseline data collection	Pollution load in surface water.	Water sampling and analysis and record maintenance	EMP Budget /	EMU-SIDA	EMU- SIDA/AWB
Ground water quality	Baseline data collection	Deterioration of Groundwater and measures salinity	Water sampling and analysis and record maintenance	EMP Budget / FO	EMU-SIDA	EMU- SIDA/AWB
Trainings and Workshop	Dissemination of Information	Incapability and unawareness to Environmental Management	Trainings & Workshop session for FO, FTC, Assistant Engineers, EPA and other Stakeholders	EMP Budget / FO	EMU- SIDA/Social Cell /AWB/FO	EMU- SIDA/AWB/

6. Cost Estimates

The major portion of environmental management costs will be incurred in the rehabilitation cost, however, some cost will be borne by EMP.

The EMP Cost is mentioned below:

Table: 05 Environmental Management Plan (EMP) Cost

Sr. No.	Item	Quantity	Unit Cost (Rs.)	Total Cost (Rs. Million)
1.	Ground Water Quality Monitoring	One Sample at Head, Middle and Tail	20,000.00	0.020
2.	Surface Water Quality Monitoring	One Sample at Head, Middle and Tail	20,000.00	0.020
3.	Tree Plantation	40 trees* (Compensatory)	119.50** x40	0.005
4.	Training and Workshop	50 Participants***	Lump sum	0.060
Total				0.105
10% Contingency				0.0105
Grand Total				0.0105

* The number of trees may be increased.

** The Tree plantation cost is provided by PICs, therefore, cost may vary at the time of EMP implementation.

*** Training and Workshop for other Minors may be arranged jointly. Accordingly cost will be adjusted.