Government of Sindh, Pakistan

Irrigation Department

Agriculture, Supply & Prices Department

Sindh Water and Agriculture Transformation (SWAT) Project

Environmental and Social Management Framework
Executive Summary

Project Coordination & Monitoring Unit

Planning and Development Department

March 2022

Cover Photo: An aerial view of a minor irrigation canal, agricultural lands and rural landscape in Nara Canal Command Area (FO Sarki Minor, near Jhole city, Sinjhoro taluka, Sanghar district, off taking from Shahoo Wah Jamrao System Nara Canal)

List of Acronyms

A/RAP	Abbreviated/Resettlement Action Plan
ADU	Agriculture Delivery Unit
AWB	Area Water Board
BP	Bank Practice
BOQ	Bill of Quantity
CAP	Corrective Action Plan
CSA	Climate Smart Agriculture
CSC	Construction Supervision Consultant
C-ESMP	Construction Environmental Social Management Plan
CDD	Communication Driven Development
ECP	Environmental Code of Practice
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMU	Environmental Management Unit of SIDA
EPA	Environmental Protection Agency
ESHGs	Environmental, health and safety guidelines
ESHS	Environmental, Social, Health & Safety
ESU	Environmental and Social Unit
FO	Farmer Organization
E&S	Environmental and Social
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
GBV	Gender-Based Violence
GoS	Government of Sindh
HAI	Hydro-Agro Informatics
IEE	Initial Environmental Examination
IUCN	International Union o for Conservation of Nature
IWRM	Integrated Water Resources Management
IWRD	Integrated Water Resources Department
NGO	Non-Government Organization
O&M	Operation and Maintenance
OP	Operational Policy
OHS	Occupational Health and Safety
PCMU	PCMU Project Coordination and Monitoring Unit
PDD	Planning and Development Department
PIC	Project Implementation Consultants
PIU	Particulate Implementation Unit
PMO	Project Management Organization
RPF	Resettlement Policy Framework
SAGP	Sindh Agriculture Growth Project
SBIP	Sindh Barrages Improvement Project
SIDA	Sindh Irrigation and Drainage Authority
SWAT	Sindh Water and Agriculture Transformation Project
SWP	Strategic Water Plan
WB	World Bank
WCA	Water Course Association
WSIP	Water Sector Improvement Project

The Government of Sindh (GoS), through the Planning and Development Department (PDD), Irrigation Department, and Agriculture Department, is planning to implement the **Sindh Water and Agriculture Transformation Project** (hereinafter referred as **SWAT** or **the Project**), with financial assistance from the World Bank (WB). Under the SWAT, GoS aims to increase agricultural water productivity in selected Area Water Boards (AWBs) command areas and improve the institutional framework for water resources management. The present Environmental and Social Management Framework (ESMF) has been prepared to screen the potential environmental and social impacts of the SWAT and guide the screening, assessment and management of environmental and social risks and impacts of subprojects that will be identified during the project implementation. The ESMF has been prepared following the World Bank safeguard policies and the relevant government regulations. A Resettlement Policy Framework (RPF) has also been prepared for the SWAT to address the involuntary resettlement impacts of these subprojects and presented as a standalone document.

Project Overview

The project development objective is to increase agricultural productivity and improve water resources management throughout Sindh province through a series of projects. SWAT focuses on three AWBs on the Left Bank Canals of the Indus River: Ghotki (Ghotki Feeder canal with a command area of 381,000 Ha), Nara (Nara canal with a command area of 1,047,946 Ha) and Left Bank (Akram Wah and New Fuleli canals with a command area of 592,548 Ha). SWAT will also focus on completing the "last mile connections" in the canal network upgraded through the recently completed Bank-funded Water Sector Improvement Project (WSIP)[1] and ongoing Sindh Barrages Improvement Project (SBIP)[2]. In addition, SWAT will introduce modernization concepts for canal operation and irrigation service that will help Sindh make better use of these infrastructure investments. The Project consists of five components: (i) **Water Resources Management** policy and institutional reforms in Sindh, (ii) **Water Service Delivery** improvement of irrigation services, (iii) **Agricultural Incentives and Investments** to promote higher value, water-thrifty crops, (vi) **Project Coordination and Monitoring** to support the implementation of the project, and (v) **Contingent Emergency Response** to support any support unforeseen emergency needs from natural disasters. The implementing agencies are the Project Coordination and Monitoring Unit (PCMU) of the Planning and Development Unit (for Components 1 and 4), Sindh Irrigation and Drainage Authority (SIDA) of the Irrigation Department (for Component 2) and Agriculture Department (for Component 3).

The activities and typical subprojects to be implemented under these five components are listed in the following table. These subprojects are divided into two categories based on the requirement of civil works (i) Soft Interventions, which don't involve any civil works (Components 1 and 4) and (ii) Physical Interventions, which involve civil works (Components 2 and 3). During the preparation of SWAT, only the design and location of one subproject, the rehabilitation of the Akram Wah canal, is finalized. In addition, there are approximately 40 “Farmer Organization Subprojects” which are relatively small in scale and will be selected, defined, and approved during implementation through a community-driven development (CDD) process.

The soft interventions (such as engineering and ESIA studies) that could lead to civil works in future projects are also included under the physical interventions category (to guide the preparation of ESIA documents). A schematic view of major irrigation canals in Sindh is shown in Figure E.1 to better

[1] The Water Sector Improvement Project (WSIP), closed in 2020, financed the renovation of the main canal networks for the three AWBs under SWAT.

[2] The on-going Sindh Barrages Improvement Project (SBIP), scheduled to close in 2024, is improving the safety of the three large barrages on the Indus River which feed the Sindh irrigation system.

understand the project interventions. A detailed map showing the locations of barrages and canals in Sindh is given in Figure E.2, and the locations of three Area Water Boards where the FO subprojects will be implemented are shown in Figure E.3.

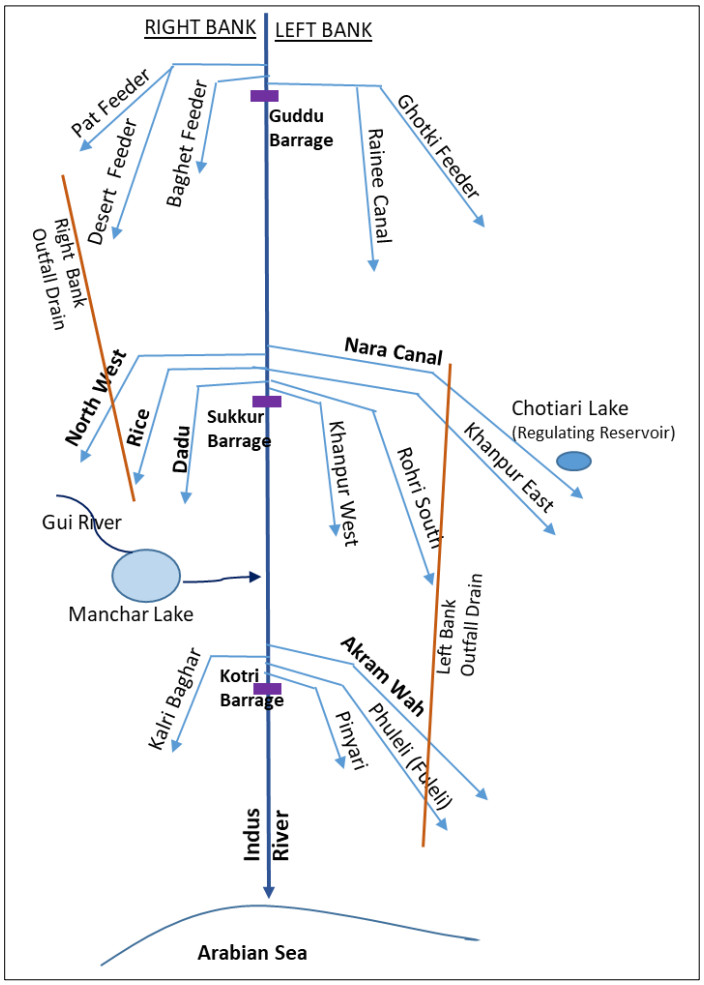


Figure E1: A Schematic View of Major Irrigation Canals in Sindh

Table E1. A Summary of Proposed Project Activities and Typical Subprojects

Component	Sub-Components	Typology of Subprojects	
		Soft Interventions (does not include civil works)	**Physical Interventions (includes civil works and E&S studies for future civil works)**
1: Water Resources Management ($25 Million)	1.1 Institutional development for Integrated Water Resources Management (IWRM) ($2 million)	Formulate new Water Resources Law. Transform the Irrigation Department into the Irrigation and Water Resources Department (IWRD) Comprehensive water pricing (*Abiana* system) reforms	

Component	Sub-Components	Typology of Subprojects	
		Soft Interventions (does not include civil works)	**Physical Interventions (includes civil works and E&S studies for future civil works)**
	1.2 Sindh Strategic Water Plan ($5 million)	Preparation of a 'Strategic Water Plan' to address key watershed level environmental and social cumulative impacts and risks, including strategic directions on infrastructure development, water allocation, and water-related environmental and social ecosystem service priorities.	
	1.3 Hydro-Agro Informatics (HAI) Program ($18 million)	Establishment of an 'HAI Center' to collect and monitor water and agriculture information (canal flows and levels, and quality, groundwater levels and quality, meteorology, crop production)	
2: Water Service Delivery ($150 Million)	2.1 – Integrated Farmer Organization (FO) Area Development - SIDA ($40 million)	Training on Famer Organizations (FOs) on groundwater management and monitoring	**Rehabilitation/Modernization** of irrigation infrastructure on approximately 40 integrated FO command areas on the left bank of the Indus river. (in three AWBs – Ghotki, Nara and Left Bank). Each FO command area is approximately 5,000 ha in size. Typical construction works include regulators, long-crested weirs for better upstream water level control, new off-takes for water course associations (WCAs), earthworks on canal banks, rehabilitation of and addition of structures for community use (canal crossings Support for FOs fall under SIDA's mandate.
	2.2 – SIDA, AWB and FO Support ($10 million)	Capacity building of SIDA, Area Water Boards (AWB) and FOs to provide reliable services to farmers. Establishment of two new AWBs on the Right Bank Training tools on canal operations	
	2.3 – Left Bank Main Canals Upgrading ($90 million)	Calibration of regulators at the head of main and distributary canals	**Rehabilitation** of the 116km-long Akram Wah Canal (reconstruction of regulators, new retaining walls in urban areas, rehabilitation of bridges)

Component	Sub-Components	Typology of Subprojects	
		Soft Interventions (does not include civil works)	**Physical Interventions (includes civil works and E&S studies for future civil works)**
			Studies on rehabilitation of Lower Nara Canal, including Chotiari regulating reservoir
	2.4. Right Bank Studies and small-scale high-priority works ($10 million)		**Studies** for rehabilitation of 3 Main Canals of Indus Right bank (Dadu, Rice and Northwest Canals) and Waarah Branch Canal (off-taking from NW Canal) and urgent rehabilitation of the most damaged structures.
3. **Agricultural Incentives and Investments** ($135 Million)	3.1 Integrated Development of 40 FOs supported under Component 2.1 ($40 million)	Training of farmers on climate-smart agriculture (CSA), and its promotion through Climate Business Field Schools Provision of budgetary support packages to farmers for replicating the learned CSA practices. Technology /Machinery Support for CSA practices: Provision of 600 precision laser land levelling equipment to farmers	The irrigation and drainage infrastructure at the Water Course Association (WCA) level will be improved in the same 40 FO command areas as in Component 2.1. Each FO command area has approximately 24 WCAs, with each WCA covering approximately 250 ha. Support for WCA falls under the Agriculture Department mandate.
	3.2 Financing Smart Subsidy Payments to farmers and facilitating wheat Procurement Reform ($35 million)	Providing farmers direct income support through smart subsidies (e-Vouchers) to small and medium-sized farmers in their efforts to move towards higher value, water-thrifty crops.	
	3.3 Improving Agriculture Information and Technology Base ($20 million)	Establish a market data information collection station at the Hyderabad Agriculture Extension wing, including strengthening the crop reporting system. Strengthening research and extension systems in the following: - Water-logging and salinity Productivity enhancement and resilience of saline soils of Sindh through a holistic approach.	**Construction/Rehabilitation** of district-level agriculture extension and facilities for: • Modernization of extension and research facilities that are affected due to floods or lack the necessary basic infrastructure and basic facilities • Providing additional infrastructure in other district offices for ICT agriculture extension services.

Component	Sub-Components	Typology of Subprojects	
		Soft Interventions (does not include civil works)	**Physical Interventions (includes civil works and E&S studies for future civil works)**
		. Establishment of agriculture training programs for enhancing and developing the capacity and skills of agriculture experts/officials,	
	3.4 Developing Agriculture Value Chain ($20 million)	Identify value chains and associated constraints in the FO subproject areas. Technical Assistance on government's Warehouse Receipts (WHR) that enable farmers to access credit from formal financing institutions.	Supporting selected farmers and medium-sized agri-businesses through free technical assistance and partially subsidized investments (equipment, materials and infrastructure)
	3.5 Agriculture Delivery Unit Support ($5 million)	Establishment of the establishment of an Agriculture Delivery Unit (ADU) in the Department of Agriculture to implement the SWAT.	
4. Project Coordination and Monitoring ($15 million)		The hiring of staff and consultants for project implementing agencies and capacity building.	
5. Contingent Emergency Response (US $0):		Following an adverse natural event that causes a major natural disaster, the government may request the World Bank to reallocate project funds to support response and reconstruction. This component could also be used to channel additional financing from the World Bank should they become available for such an emergency	

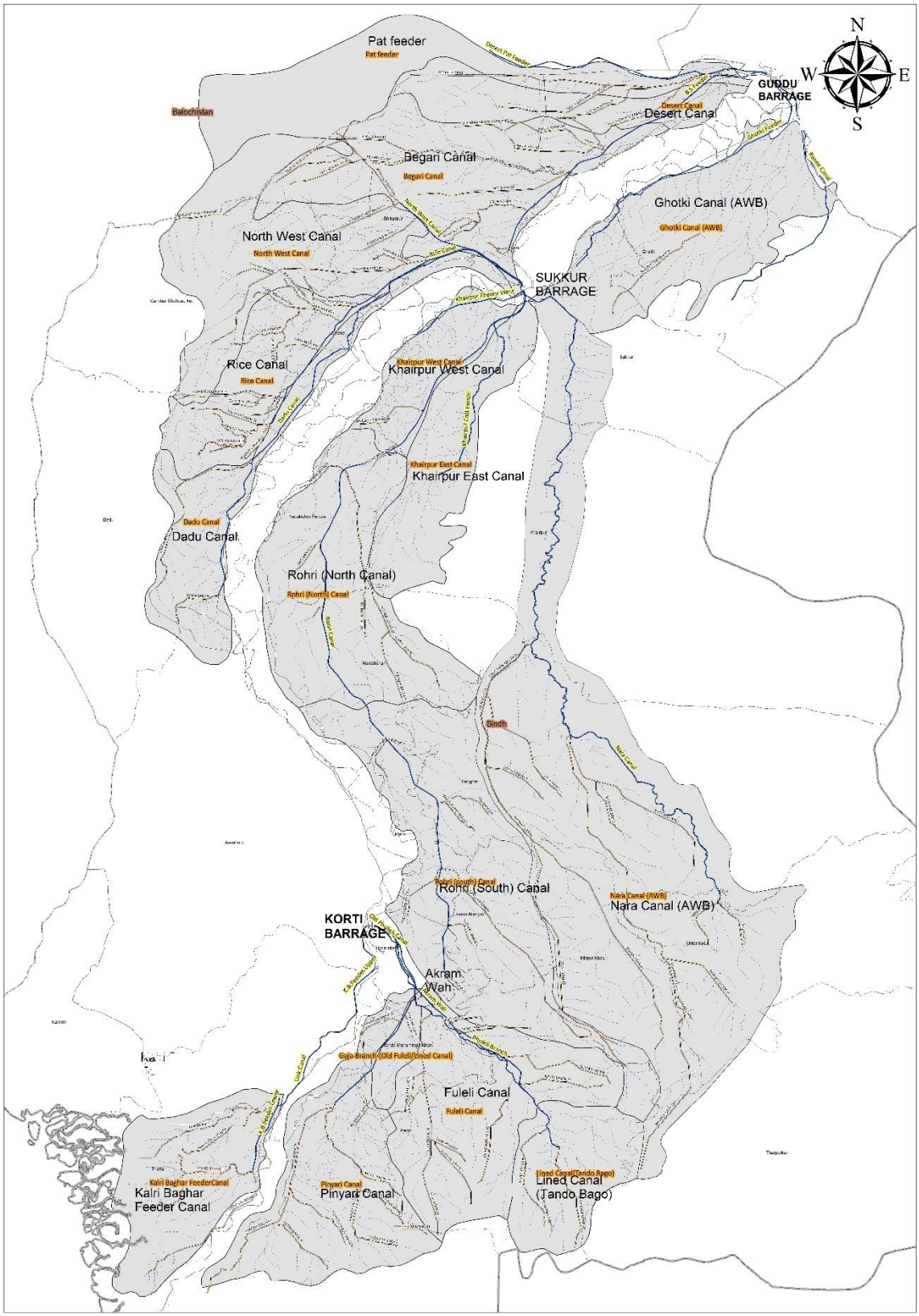


Figure E2: Location of Barrages and Canals in Sindh

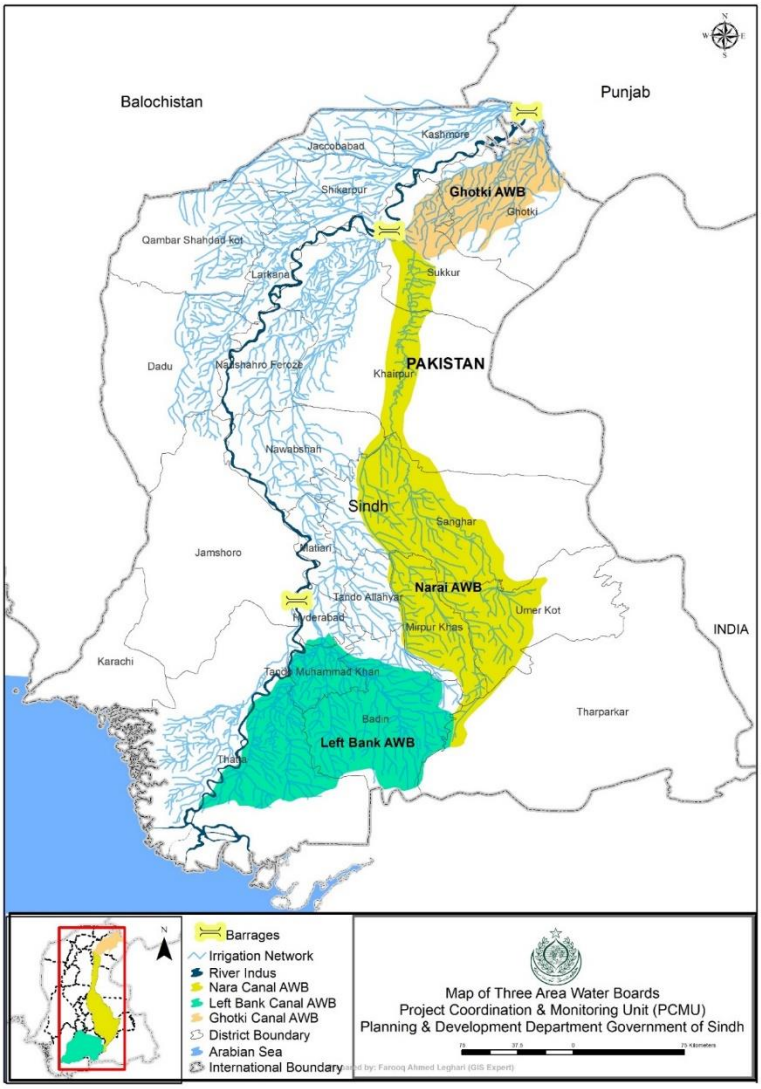


Figure E.3: Location of Area Water Boards in Sindh

Environmental and Social Assessment of Project Components

Table E2, Summary of Potential Environmental and Social (E&S) Impacts of SWAT, provides a summary of potential environmental and social impacts by sub-components. In general, Component 1 activities such as introducing policy reforms in water resources management and improving the water pricing system are expected to have significant positive environmental and social impacts. Component 2 activities such as rehabilitation of 116-km long Akram Wah canal and studies for rehabilitation of main canals on the Right Bank of the Indus Rivers (which may be implemented in future projects) are expected to have significant adverse environmental and social impacts due to large-scale civil works and resettlement. Modernization of irrigation and drainage at the FO level under Component 2 and at the WCA level under Component 2 are expected to have low to moderate negative environmental and social impacts.

An Environmental and Social Impact Assessment (ESIA) has been prepared for the Akram Wah based on the feasibility study. In early 2021, the Government of Sindh conducted a “anti-encroachment drive” (AED)

along the Akram Wah canal right of way, with approximately 1600 affected households. SIDA is preparing a Corrective Action Plan (CAP) to compensate for lost assets, ensure stable and dignified housing, and support livelihood development that resulted from the government's own AED that extended into the proposed project location. The preparation of a suitable Akram Wah CAP and its subsequent implementation is a condition for World Bank financing of the Akram Wah subproject. The general features of the Akram Wah subproject are presented in this ESMF, and the detailed social and environmental aspects are dealt with in the ESIA and CAP.

For the remaining subprojects under SWAT, and in particular, the FO subprojects, the exact interventions, locations, designs, and technologies are pending and will be determined during project implementation. Hence, the present ESMF has been prepared for these subprojects to provide guidance to conduct detailed environmental and social screening and assessments once the design details are available. A Resettlement Policy Framework (RPF) has also been prepared to address the involuntary resettlement impacts of these subprojects and presented under a separate cover.

The present ESMF has been developed to (i) ensure all relevant environmental and social issues are mainstreamed into the design and implementation of the proposed subprojects; (ii) ensure compliance of the Project with government and World Bank requirements; (iii) screen the generic environmental and social impacts of each of the Project components; and iv) describe the methodologies to be followed for the preparation of the appropriate safeguard instruments required for the individual subprojects.

The unforeseen activities under Contingency Emergency Response (component 5) will be addressed through a separate set of environmental and social instruments that will be prepared when this component is triggered.

Regulatory Framework and World Bank Requirements

The Sindh Environmental Protection Act of 2014 is the main legislative framework related to environmental protection in the province. Per this Act, the development of projects on irrigation infrastructure will need to be cleared by the Sinch Environmental Protection Agency (SEPA) following the procedures given in the Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014. These regulations classify the projects into three categories (Schedules I, II and III) based on their scale of works for environmental assessments and clearances. The SWAT is subjected to the World Bank safeguard policies, and an environmental assessment of its subprojects should be prepared in compliance with Bank's Operational Policy (OP) 4.01. The requirements of SEPA to develop IEE and EIA follow within the framework of World Bank OP 4.01, and the ESIA documents prepared in compliance with the World Bank requirements will be accepted by SEPA for review and approval.

SWAT utilizes the World Bank Safeguard Policies, as opposed to the Bank's newer Environmental and Social Framework (ESF), because the project entered into the World Bank lending pipeline in late 2018. The present ESMF has been prepared in compliance with the World Bank OP 4.01 (Environmental Assessment). The Project has been classified as Category A. Other World Bank policies relevant to the SWAT include Natural Habitats (OP 4.04), Pest Management (OP 4.09), Physical Cultural Resources (OP 4.11), Involuntary Resettlement (OP/BP 4.12), Safety of Dams (OP/BP 4.37) and Projects on International Waterways (OP/BP 7.50). A gap analysis, carried out by the World Bank, identified that the preparation of a stakeholder engagement plan (SEP) and labour management procedures (LMP) and updating procedures for biodiversity assessments in this ESMF would help the ESMF also to comply with the principles of the World Bank ESF. Hence, the ESMF also includes SEP and LMP.

Environmental Setting

Location. The general area of influence of the SWAT project is the irrigated area in Sindh, covering approximately 5 million hectares. The irrigation infrastructure in Sindh consists of three barrages (Guddu, Sukkur, and Kotri) and their extensive irrigation network on the left and right banks through 14 main canals. The direct physical interventions of the SWAT will be implemented in the command areas of Ghotki (a left bank canal of Guddu barrage, managed by Ghotki AWB[3]), Nara (a left bank canal of Sukkur barrage, managed by Nara AWB), and Akram Wah and Fulleli (left bank canals of Kotri barrage, managed by the Left Bank AWB). The feasibility studies for main canal rehabilitation under Component 2.4 will be carried out on the three right bank canals of the Sukkur barrage. The policy and institutional support by the SWAT will be applicable to all irrigated areas in Sindh.

Physical Setting and Land use: The project interventions will be mainly located in rural areas dominated by agricultural lands, however, barrages are located in urban and peri-urban areas. All the initial sections of the canals defined by the presence of barrages are located in urban and peri-urban areas (Sukkur city for Nara Canal and Hyderabad city for Akram Wah canal). The embankments are also dominated by trees and shrubs in some sections. The terrain is mostly plain. Beyond the canals' right of way (ROW), agriculture is practiced on a larger scale, with cotton, wheat, rice and sugar cane being the dominant crops in the area. Wheat is the largest cropped area, followed by rice, cotton and sugarcane. Cultivated areas are interrupted by large expanses of barren land. The agricultural land accounts for about half of the land use. The total agriculture area of three Project AWBs is about 2 million hectares.

Climate. According to Koeppen's climate classification, the Sindh area can be classified as a 'desert hot climate' because of its low annual rainfall compared to potential evapotranspiration and high temperatures. The summer season starts in April and ends in October (maximum temperatures reach up to 45 ^{o}C), while the winter begins in November and ends in March (with the lowest temperature up to 3 ^{o}C). The average annual rainfall in Sindh is 120 mm, with nearly 61 percent of precipitation falling in the monsoon months of July and August.

Water resources. The main source of water available to Sindh is the Indus River, and the irrigation system in Sindh draws water from the Indus River through Guddu, Sukkur and Kotri barrages. Canal water is the primary source of water supply in the project area. Although the canal water is mainly used for irrigation purposes (about 26.6 to 41.7 MAF), it is also used for domestic consumption (1.2 MAF) and industrial uses (about 0.5 MAF). The groundwater is located in shallow depths and generally brackish, except near the canals and the Indus. The groundwater is being used for drinking and irrigation at some locations. There are also many important wetlands in Sindh and the important areas relevant to the SWAT are Manchar Lake and Indus Delta, as they will be benefitted from the overall SWAT activities. Manchar Lake is the largest freshwater lake in Pakistan, with an approximate area of 26,000 ha.

Biodiversity. According to the Integrated Biodiversity Assessment (IBAT) tool, there are 44 protected areas, 15 key biodiversity areas and 129 IUCN red list species in the areas covered by irrigation networks in Sindh. Although none of the proposed infrastructures in the SWAT are expected to be directly located within these protected areas, the overall SWAT activities will benefit the biodiversity of Manchar Lake and the Indus Delta. The ecosystem of Manchar seems to be an extremely resilient one. The submerged wetland vegetation survives and regenerates quickly after the lake dries out completely. Manchar Lake also supports a major fishing industry in addition to feeding/nesting areas for waterfowl. The Indus Delta

[3] Area Water Boards (AWB) are quasi autonomous organizations under the Irrigation Department. They deliver water to the Farmer Organizations (FOs). The Farmer Organizations (FO) are legally constituted organizations responsible for managing the smaller distributary canals but rely upon the Irrigation Department to cover most costs, including the provision of technical staff. The FOs deliver water to Water Course Associations (WCAs). The WCAs are community organizations supported by the Agriculture Department.

is the landmark of Pakistan's coastline, extending up to 150 km along the Arabian Sea, with an area of about 600,000 ha. The delta holds 97% of the total mangrove forests of Pakistan. Ecologically, the Indus Delta mangroves constitute a complex ecosystem by providing habitat, shelter and breeding ground for economically important marine plants, animals and migratory birds; protecting coastline and seaports from storms, cyclones and Tsunamis; meeting fuelwood requirements of local communities and fodder for their livestock; sustaining livelihoods of the coastal population of more than 100,000 people; and serving as a nursery for fish, shrimp and crabs, those spend at least a part of their lives in mangroves.

Environmental Challenges in Water Sector. The environmental challenges associated with the water sector in Sindh are:

- **Canal drainage system**. Waterlogging in Sindh remains endemic and covers, depending on the season, 50 to 70% of the canal commands. This stifles agricultural production, brings salinity to the surface and creates an unhealthy rural environment with a higher incidence of water-borne diseases and limited options for rural sanitation.
- **Wetlands**. Lakes and wetlands in Sindh are under excessive pressure and risk. The threats to the wetlands of Sindh are largely anthropogenic, namely related to unavailability of freshwater, uncontrolled abstraction, disposal of untreated industrial and agricultural effluent, encroachment, siltation and shrinkage, threats to native flora and fauna species by invasive exotic species, illegal hunting, overgrazing and uncontrolled logging.
- **Indus delta**. Prior to the development of the mega-irrigation infrastructure on the Indus and its tributaries, the delta was a highly productive area with rice cultivation on the higher lands and rich grazing on the dried-up inundated areas. At present, it is, however, an area of ecological deterioration, endemic poverty and poor access to basic services such as clean drinking water
- **Urban Water Supply**. Keeping in view rapidly growing population in urban areas, there are serious concerns about the long-term access to reliable water resources for the major cities in Sindh. Domestic water use in urban areas is expected to double between 2017 and 2050.
- **Rural Water Supply**. Rural water supply in Sindh is challenged by the difficulty of finding good quality drinking water resources. With 80 percent of the province underlain by saline to highly saline groundwater, small fresh groundwater lenses, created by seepage from canals floating on the saline water, are the major sources of rural water supply. These small fresh water lenses are precarious and dependent on how the water in the canals is managed.

Socioeconomy. The irrigation canal network in Sindh is spread over 17 districts, and the interventions in the SWAT are expected to be implemented in all these districts. About 20 million people live in these districts, in which more than 70 percent of people living in rural areas. About 36 percent of employment in Sindh province is in the agriculture sector. Sindh has the second-highest poverty rate in Pakistan. In 2015, the poverty gap between rural and urban areas was 33.6 percentage points in the province.

Gender. Women's labor participation is the highest in agriculture. In Pakistan, overall, only 1 percent of women are engaged in entrepreneurship. Typically, rural women are engaged more in dairy and livestock management. Most rural women are involved in livestock management. In agriculture, their participation is characterized by low-paid work that is usually repetitive and very time-consuming with low returns. Women are crucial stakeholders in irrigation management. As users, their decision on water delivery schedules, the quantity and quality of water, and the type of water infrastructure constructed are crucial because women's daily household activities and their livestock's well-being depend on it. Despite women's significant role in agriculture, such as crop production from sowing to harvesting stages and livestock rearing, they have traditionally been excluded from decision-making in irrigation management.

Screening of Potential Impacts and Risks

The proposed interventions in SWAT will directly benefit about 1.25 million people and 0.5 million ha of agricultural land. The potential environmental and social impacts and risks of the SWAT interventions and proposed mitigation measures are summarized below. Environmental and social assessment will be carried out for each subproject, and the procedure for this assessment is described in the following sections. The project implementation units (PIUs) will be responsible for implementing the proposed mitigation measures.

Table E2. Summary of Potential Environmental and Social (E&S) Impacts of SWAT

(Scale of Impacts: High, Substantial, Moderate, and Low)

Component and Intervention Type	Potential E&S Benefit Levels	Potential E&S Adverse Impact Levels	Potential Risks	Proposed Mitigation Measures
Component 1: Water Resources Management (US$ 25 Million)				
Component 1 .1 Formulate new Water Resources Law (Technical Assistance)	**High:** The new water law will establish a legal foundation for integrated water resources management (IWRM) that will facilitate water-related environmental sustainability. By creating a legal foundation for water allocations, it will also help promote transparency and equity in water use.	**Low:** The new water law should not have any indirect adverse impacts.	A new water law might not be passed by the Sindh Assembly. The water law might not include enough focus on environmental sustainability and social equity.	Passage of the water law is a performance-based condition (PBC) associated with Bank financing of Component 1. The water law will be prepared in a consultative manner with all stakeholders and must be approved by the elected provincial assembly. This will help ensure a broad consensus The 2022 Sindh Water Policy highlights the importance of environmental sustainability and social equity, and the water law is expected to codify these principles.
Transform the Irrigation Department into an Irrigation and Water Resource Management Department (IWRD). (Technical Assistance)	**Substantial:** Strengthen the institutional capacity of the irrigation department with an IWRM mandate and expertise. Enhance the ability of the IWRD to provide better bulk water supply services. Thereby	**Low**: Improving organizational capacity for IWRM and water supply delivery should not have indirect adverse impacts.	Lack of commitment by the Irrigation Department to take on new mandates and new practices	The project will finance a comprehensive study to assess the capacities and roles of various Irrigation Department entities, including SIDA and AWB, and build consensus on necessary changes based on the 2022 Sindh Water Policy.

	reducing water losses and improving distribution equity.			
Comprehensive Water Pricing Reform (Technical Assistance)	**Substantial.** Adjustments to water rates (*Abiana*) will encourage users to better consider the opportunity cost of water and potentially reduce water use. It will also provide more revenue for AWBs and FOs to better operate and maintain their canal and distributary systems, thereby reducing water use, water logging and soil salinity.	**Moderate**: Increased water rates may disproportionally affect small farmers and sharecroppers.	Political opposition may undermine pricing reforms. Water revenues might not be equitably distributed and used Some water users might challenge changes in water rates in courts Resistance from other stakeholders to acknowledge and accept to pay for ecosystem services.	Water rates have not been adjusted in two decades and currently are an insignificant cost for farmers who have poor quality service—thus creating a vicious circle. A gradual and moderate increase in water rates, combined with improvement in service provided by the project, should help start a virtuous circle. Water reforms will be comprehensive, including requirements for cities and industries, and considering farm size, thus allowing for differentiated rates based upon ability to pay. Studies for developing a Payment for Ecosystem Services (PES) scheme where private sectors that use ports could be charged for coastal protection, reduced sedimentation/dredging costs, and extension of mangrove cover as a result of efficient IWRM
Component 1.2	**High**: The plan will assess and address key water and environmental issues in Sindh,	**Low**: Properly formulated SSWP should not generate any adverse impacts but	Inadequate coverage of environmental and	The scope of work for SSWP is included in ESMF and highlights the importance of including

Preparation of a "Sindh Strategic Water Plan" (Technical Assistance)	considering cumulative impacts. Provide strategic directions to the government departments on infrastructure development, water allocation, and water-related environmental priorities. Sustainable management of water resources in the province through the assessment and management of cumulative environmental and social impacts and risks.	rather provide strategic direction to Sindh on how to reduce cumulative water-related environmental degradation.	social issues in the SSWP. Inadequate data to project needs of different users Lack of proper consultation with stakeholder groups, including marginalized and vulnerable groups. The Sindh government may not adopt or utilize the SSWP.	environmental and social issues in the SSWP. The SSWP will include a cumulative impact assessment of water and agricultural practices in Sindh's irrigated areas. The first task in the SSWP is to prepare a Stakeholder Engagement Plan to ensure adequate consultations with key groups. Adoption of the SSWP is a Project Development Objective (PDO) indicator.
Component 1.3 Establishment of Hydro-Agro Informatics Program (Goods and Technical Assistance) .	**High**: Providing reliable, transparent, and actionable information for water services, water resources management, and agricultural advisory services should help to better manage water, increase agricultural productivity, and better manage floods and droughts.	**Low:** No adverse environmental or social impacts are anticipated due to the provision of information services.	Lack of capacity or incentives for the Irrigation and Agriculture Department to collect and process information.	A management contract will be provided to a university to operate an "HAI Center," which will be responsible for analyzing, processing, and providing information services. The quasi-independent center will be able to attract and maintain high-quality professionals. The data collection capacities of the Irrigation Department and the Agriculture will be boosted through project funding.
Component 2: Water Service Delivery (US$ 150 million)				
Component 2.1 Modernization of Irrigation	**Substantial:** FOs will be able to distribute water more equitably and efficiently, reducing water losses and	**Moderate**: General construction-related impacts associated with small civil works such as soil	Lack of commitment by FOs to employ irrigation modernization practices.	Selection of subprojects in consultations with AWBs and FOs on a demand-driven basis.

Infrastructure in Farmer Organization (FO) Command Areas. (Civil works, each FO command area around 15,000 acres, 5000 ha)	decreasing water logging and associated soil salinity.	erosion and sedimentation, dust and noise pollution, generation of waste, groundwater pollution, traffic and road safety, and occupational health and safety risks, etc. Low: Inadequate drainage causing water logging Moderate: Disagreements between FOs and SID on the management of modernized infrastructure	FOs may not have sufficient O&M funds to manage new infrastructure. Degradation of land caused by water logging	Technical capacity development of FOs Civil works designs to include drainage plans Develop and implement FO-specific ESMPs and RAPs (if required) in accordance with ESMF and RPF. Passage of water pricing reforms is a performance-based condition (PBC) associated with Bank financing of Component 2.
Component 2.2 Capacity building of AWBs, FOs, and SIDA. (Technical Assistance)	**Substantial**: Improved capacity and coordination at all three levels SIDA, AWB, FO will help to reap full social and environmental benefits of the irrigation modernization program and support IWRM.	**None:** This involves only training and capacity building.	Organizations may lack incentives for enhancing their capacity. Women may not be able to fully benefit from training programs.	FOs will be selected on a demand-driven basis for inclusion in the project. AWB institutional reforms will promote transparency and accountability, which will motivate AWB management to adopt a more service-oriented approach. Gender Action Plan includes provisions for promoting female professional participation in SIDA and AWBs. Gender Action Plan includes provisions for promoting female participation in FO Committees.
Component 2.3	**High**: Restoring the original canal flow capacity and improving associated water	**High**: Significant construction environmental impacts, occupational	Implementation of the CAP/RAP may not proceed smoothly,	ESIA/ESMF and CAP/RAP have been prepared for the Akram Wah

Rehabilitation of Akram Wah Canal (Civil Works)	control structures to enable more effective distribution of water within the command areas, securing irrigation supplies for 462,000 people and drinking water supplies for over 2 million.	health and safety and gender-based violence issues associated with large-scale civil works. Social risks are high. Addressing the legacy issues of approximately 1600 households affected by the 2021 anti-encroachment drive along Akram Wah Canal requires the implementation of a Corrective Action Plan (CAP) in RAP.	interrupting construction progress. Construction can only take place for a limited period each year so as not to disrupt the water supply. Contractor may not follow ESMF provisions	subproject and approved by the Government of Sindh. Continuous meaningful and effective stakeholder consultations, from subproject project identification to completion and disclosure of project documentation. Independent resettlement monitoring consultants will track CAP/RAP implementation; robust Grievance Redress Mechanisms have been established. An Akram Wah Project Implementation Consultant (PIC) will be contracted to support construction and monitor compliance with ESMF.
Component 2.4 Investment Preparation Studies for Renovation of Right Bank Main Canals (Technical Assistance) and small-scale emergency works (Civil Works)	**High**: Renovation of Right Bank canals is the first and most important step to improving irrigation service to 900,000 hectares of farmland. Small-scale emergency works will be undertaken to prevent the collapse of critical structures or canal embankments.	**Substantial**: Although this activity is only technical assistance, the nature of the works is similar to Akram Wah in Component 2.3 above, with potentially significant construction impacts and resettlement issues.	Social and environmental issues may not be considered in Right Bank Main Canal technical design studies.	Preparation of ESIA and RAP, in compliance with ESMF and RPF in parallel with technical feasibility studies ESIA and RAP must meet World Bank policy requirements to be considered for future financing. Emergency civil works will be subject to environmental and social screening and the Environmental Code of Practice as presented in the ESMF.
Component 3: Agriculture Incentives and Investments (US$ 120 million)				

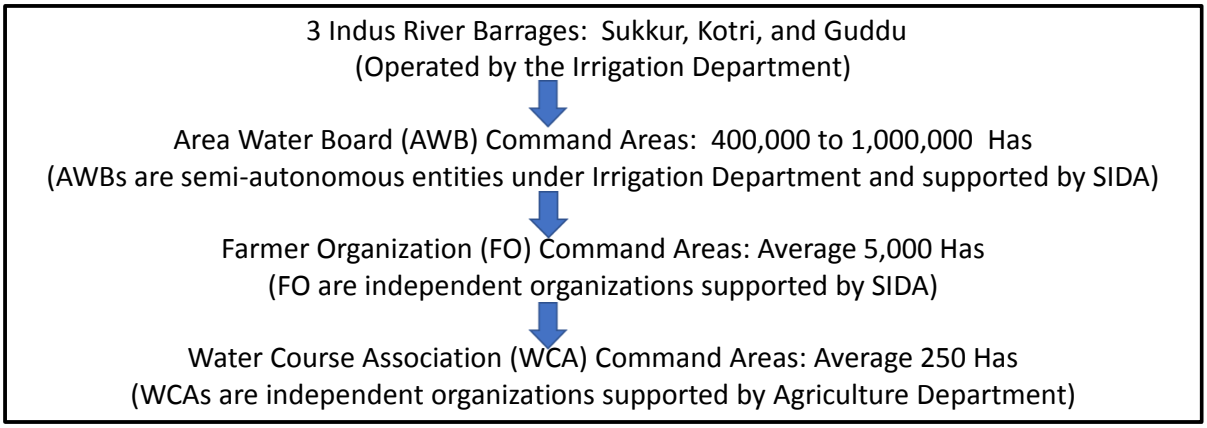
Components 3.1 Integrated agricultural development of the same 40 FOs supported under Component 2.1. (Technical Assistance and Small Civil Works)	**Substantial**: Improved on-farm irrigation systems (less than 250 ha) will reduce water losses and decrease water logging and associated soil salinity. Climate-smart agricultural practices will reduce water use, improve soil quality, enhance productivity, and boost resilience. Training will be provided on pesticide management.	**Low**: Very small-scale civil works, for example, installation of small pre-cast irrigation ditches by farmer groups (i.e., Water Course Associations (WCA), will have minor construction impacts.	WCAs may not maintain small-scale infrastructure. Women may not be able to fully benefit from training programs.	WCAs will be supported on a demand drive basis and must contribute labor to infrastructure construction, thus increasing ownership. Separate training sessions for female farmers to ensure culturally appropriate training. SIDA will contract project implementation consultations to supervise construction activities and ensure compliance with ESMF ECPs. Integrated Pest Management Plans will be developed for each FO subproject, including training for farmers on appropriate pesticide and fertilizer use.
Component 3.2 Financing smart subsidy payments to farmers and facilitating wheat procurement reform. Subsidies provided through an e-voucher system; and (ii) direct income support through the banking system to small farmers growing water-thrifty crops.	**Substantial**: Promotion of high value and water-thrifty crops, such as fruits, vegetables, oilseeds, pulses, etc. and that are suitable for the relevant agro-ecological zone, will reduce water use and increase farmer incomes.	**Low:** Subsidy payments will have no direct adverse environmental impacts but may, in some cases, result in increased pesticide use to protect more valuable crops. Seeds treated with pesticides might be ingested with related human health impacts.	Subsidies may not provide sufficient incentives for farmers to switch to high-value water-thrifty crops. Wheat procurement reform may not be successful, limiting fiscal space for transfer to smart subsidy scheme. Women or poor farmers without land titles might be excluded from subsidy programs.	Developing smart subsidy regulations is a performance-based condition (PBC) associated with Bank financing of Component 3.2 Wheat procurement reform is a performance-based condition (PBC) associated with Bank financing of Component 3.2 Smart subsidy scheme will start off as a relatively small pilot program to learn by doing and to adjust program design before scaling up.

			Subsidy program might not be demand and time driven	Special provision in the smart subsidy scheme to ensure access to sharecroppers and women farmers. Famers receiving smart subsidies will receive agricultural extension information as well as market information with access to direct support by local extension officials if requested. Only non-pesticide seeds will be eligible for support through the e-voucher scheme.
Component 3.3 Improving the agricultural information and technology base (Goods and Technical Assistance)	**Substantial:** Improving agricultural information systems and enhancing agricultural research will help Sindh with transition to high value water thrifty crops and ensure more sustainable irrigated agriculture. Water logging and salinity program will help Sindh address one of its most pressing environmental problems.	**Low:** No physical works are anticipated under this component.	Information generated may not be used in a productive manner. Agricultural research may not be focused on Sindh's most pressing agro-ecological issues.	The hydro-agro informatics (HAI) program in Component 1 will draw upon agriculture information to help provide useful water and agricultural services. Adoption of a new Agricultural Research and Extension Policy is a performance-based condition (PBC) associated with Bank financing of Component 3.3
Component 3.4 Developing Agriculture Value Chain. Supports farmer producer groups to address regulatory, infrastructure and	**Substantial**: Reduces value chain constraints to higher value, water thrifty crops. Improve productivity and quality of produce, reduce post-harvest loss, and increase value addition	**Low**: Only small-scale works, and goods will be included in the component, for example, construction of local warehouses or processing equipment.	Farmers' groups may not organize to create producer groups to take advantage of opportunities.	Agriculture Department provides value chain mapping and analysis of selected agricultural commodities and supports the creation or strengthening of farmer producer groups. Adoption of a new Warehouse Receipt regulations is a

technical bottlenecks for high value crops. (Goods and Small Works)	Promote project assisted as well as organic growth of agri-support businesses and services Address the financial constraints facing producers by providing access to loans financial institutions through warehouse receipts (without selling their produce)		Marketing and financing channels may not be fully accessible to allow the shift to new crops. Farmers might find Warehouse Receipt Systems complicated and cumbersome	performance-based condition (PBC) associated with Bank financing of Component 3.4
Component 3.5 Agriculture Delivery Unit (ADU) support (Technical Assistance)	**None**: Supports Component 3 implementation.	**None**: Supports Component 3 implementation.	N/A	N/A
Component 4: Project Monitoring and Coordination (US$ 15 million)				
PCMU Unit Support (Technical Assistance)	**None**: Supports overall project implementation.	**None**: Supports overall project implementation.	N/A	N/A

Institutional Arrangements

SIDA, FOs and WCAs. The Sindh Water Management Ordinance (SWMO) of 2002 helped to establish a stronger foundation for participatory irrigation management with the creation of the Sindh Irrigation and Drainage Authority (SIDA) to serve as a change agent within the Irrigation Department; Area Water Boards (AWBs) to serve as semi-autonomous organizations under the Irrigation Department responsible for the management of the main canal command areas; Farmer Organizations (FOs) which are organized at the distributary canal network and include constituent Water Course Associations (WCAs). Understanding the structure of this sprawling irrigation system is important for understanding the SWAT project design, and a schematic is presented below



Project Implementing Units. The Project will be implemented by three existing Project Implementing Units (PIUs), as shown in the following table. The PIU is responsible for all aspects of project management for its respective component, including procurement and contract management, financial management, safeguards, monitoring and evaluation under the overall supervision of the PCMU.

Table E3. Project Implementation Units

Component	Parent Department	PIU	Partner Entities
1. Water Resources Management	Planning and Development (PDD)	Project Coordination and Management Unit (PCMU)	Irrigation Department Agriculture Department Environment Department Disaster Management Authority Civil Society and Research Institutes
2. Water Services	Irrigation Department	Sindh Irrigation and Drainage Authority (SIDA)	Agriculture Department Area Water Boards (AWBs) Farmer Organizations Water Course Associations Farmers
3. Agriculture Subsidies and Investments	Agriculture, Prices, and Supply	Agricultural Development Unit (ADU)	SIDA Food Department Agriculture Dept Directorates: Research, Extension, and Water Management Farmers and Agi-Business
4. Project Coordination and Monitoring	Planning and Development (PDD)	Project Coordination and Monitoring Unit (PCMU)	All of the above

All the PIUs have existing environmental and social staff who have extensive experience with Bank-financed projects. The PCMU has a Deputy Director for Environment and a Deputy Director for Social. SIDA has an Environmental Management Unit (EMU) with six specialists, a Deputy Director, an Environmental Specialist, an Ecologist, a sociologist and two Environmental Inspectors. The ADU/PIU has only one Environmental and Social Safeguards Specialist working under SAGP. The ADU/PIU will hire two additional staff - a junior environmental specialist and a junior social specialist, to support the existing safeguard specialist. After completion of the project, AWBs will be responsible for the management of canal infrastructure. Currently, there are no safeguard specialists in the AWB teams, and the Project will support the hiring of a social specialist in each AWB. Each PIU will also contract project implementation consultants (PICs), which will help implement its specific component. Each PIC will appoint dedicated environmental, social, health and safety (ESHS) staff to ensure the implementation of ESMF and subproject-specific ESIAs/ESMPs. PIC staff will include an Environmental specialist, an Occupational Health and Safety Specialist, an Ecologist, Social Specialist, and ESHS site Inspectors.

E&S Procedures for Subprojects

The step-by-step procedure to be followed during the environmental and social assessment of the proposed subprojects, from screening to the preparation of ESIAs/ESMPS and their implementation, are given in the following table.

Table E4. E&S Procedures for Subprojects

Step	Activity	Description of the Activity	Timing/Status	Responsibility
1	Screening	Screening of the proposed subprojects to assess the requirement of safeguard instruments (site-specific ESIAs/ESMPS or generic ESMPs) to be prepared	After identification of the proposed subproject	PIUs (EMU of SIDA and ADU Agriculture Department) will conduct a screening exercise (**Annex 2**) whenever new subprojects are identified. PCMU will review and approve the screening forms.
2	E&S Considerations in Project Design & Analysis of Alternatives	Environmental and social aspects (e.g., site selection, spoil management, land acquisition) shall be considered during the analysis of various project alternatives and designs For subprojects that do not involve any civil works, stakeholder consultations will be carried out in accordance with the Stakeholder Engagement Plan	During Feasibility and E&S assessment studies	PIUs (with the support of PIC)
3	E&S Studies – Baseline Data Collection, Impact	Primary baseline environmental data of the project influence area (covering physical, chemical, biological and	During E&S assessment studies	PIUs with the support of PIC and ESIA Consultants

Step	Activity	Description of the Activity	Timing/Status	Responsibility
	Assessment, preparation of ESIA/ESMP and RAP/ARAP	socioeconomic environment) will be collected Assessment of impacts and their significance Preparation of site-specific ESIAs/ESMPs and RAPs		
4	Consultations and Disclosure	Consultations with the stakeholders (including affected communities) prior to E&S studies and after completion of draft ESIA/ESMP and RAP/ARAP. Disclosure of the ESIA and RAP (including translated summaries) on PIU's website and on the external website of the World Bank	During E&S studies After completion of ESIA/ESMP and RAP/ARAP	PIUs with the support of PIC
5	Submission of ESIA/ESMP and RAP for Sindh EPA and WB clearance	Submission of ESIA/ESMP documents along with necessary fees to Sindh EPA, and arranging a public hearing for Sindh EPA	After Completion of ESIA/ESMP – Before construction	PIUs. PCMU will coordinate the approval process.
6	Environmental and social specifications for Bidding Documents	Preparation of environmental and social specifications for bidding documents, including preparation of BOQs and inclusion of ESMP in the bidding documents.	Prior to bidding	E&S Staff of PIUs will review and approve the bidding documents.
7	Implementation of ESMP	Contractors will develop site-specific construction-ESMPs and OHS Plans and will implement them Regular monitoring and reporting of compliance by the Construction supervision consultants and PIUs	During Construction	E&S staff of PIUs will review and approve the C-ESMPs and OHS Plans. ESHS Staff of Contractor will implement the plans. E&S staff of PIUs and PIC will supervise the implementation of these plans

Subproject Screening Criteria

A screening exercise (Annex 2) will be carried out for all the proposed subprojects once they are identified through a reconnaissance site visit. The purpose of this screening exercise is to categorize the subprojects into low, moderate, substantial and high-risk categories, based on the baseline environmental and social features of the area and anticipated risks during the subproject implementation. If the screening process concludes that the proposed subproject is a high-risk category, an ESIA will be prepared. If the subproject is a substantial risk category, an ESIA or site-specific Environmental and Social Management Plan (ESMP)

will be prepared. If the screening process concludes that the subproject is a low to moderate risk category, the generic ESMPs in the ESMF (Annex 3) will be used. The generic ESMPs and templates for ESIA and ESMPs are prepared to ensure the requirements of SEPA IEE and EIA regulations. ESIA documents prepared in compliance with the World Bank requirements will be accepted by SEPA for review and approval. If the subproject is likely to cause resettlement impacts, a RAP will also be prepared.

Preparation of ESIAs, ESMPs and A/RAPs

The ESIA and ESMP templates have been prepared (Annexes 3 and 4), which will guide the design and implementation of the substantial and high-risk projects. Based on the initial screening of proposed investments, it is anticipated that most of the subprojects in Component 3 are likely to fall into the moderate and low-risk categories. Hence, standard Environmental and Social Management Plans (ESMPs) have been prepared for all potential subprojects under Component 3 (**Annex 3**) to address generic impacts during their implementation, which can be readily adapted for all low and medium risk projects. Further, the Environmental Code of Practices (ECPs) to address all generic construction impacts have been prepared and presented in **Annex 1**, which will be attached to the bidding documents of all construction works along with the ESMPs.

The ECPs are prepared following Good International Industry Practices (GIIP) to address construction-related impacts. The ECPs prepared for the Project are Waste Management (ECP 1), Fuels and Hazardous Goods Management (ECP 2), Water Resources Management (ECP 3) Drainage Management (ECP 4). Soil Quality Management (ECP 5), Erosion and Sediment Control (ECP 6), Topsoil Management (ECP 7), Topography and Landscaping (ECP 8), Quarry Areas Development and Operation (ECP 9), Air Quality Management (ECP 10), Noise and Vibration Management (ECP 11), Protection of Flora (ECP 12), Protection of Fauna (ECP 13), Protection of Fish (ECP 14), Road Transport and Road Traffic Management (ECP 15), Labor Influx Management and Construction Camp Management (ECP 16), Cultural and Religious Issues (ECP 17), Workers Health and Safety (ECP 18), Instream Construction Works (ECP 19) and COVID-19 Health and Safety Plan (ECP 20).

The detailed procedure to prepare RAPs is given in the RPF, presented under a separate cover. The ESIAs, ESMPs and RAPs will be submitted for World Bank and Sindh EPA clearance after appropriate consultation with stakeholders and disclosure before starting construction works of respective projects.

The cost of implementing ESMF has been estimated at USD 1.5 million. It will also cover hiring environmental and social staff in the PIUs and implementing the SEP. Detailed cost estimates for managing environmental and social risks will be provided in the ESMPS and RAPs of respective subprojects.

Gender Action Plan.

A Gender Action Plan that identifies key gender gaps and proposes actions to close those gaps is included as an annex in the ESMF. The key action items include: (i) implementing programs that allow women to play a more significant managerial and technical role in the Irrigation Department, SIDA, and the Agriculture Department; (ii) requiring that women be actively engaged in decision-making within FO and WCA organizations; and (iii) providing special training on climate-smart agriculture for women under Component 3.

Grievance Redress Mechanism

A grievance redress mechanism (GRM) is being established by all implementing agencies of SWAT to provide a systematic and transparent set of arrangements to enable local communities, people affected by the project activities, contractors, employees, and other stakeholders to raise grievances and suggestions and seek resolution of complaints relating to corresponding components/subcomponents of

the project. Each PIU has a multi-tier grievance registration and redress mechanism to address complaints ranging from mild to severe nature. The system encourages complaints to be handled at the lowest level in time bound period, but in case of dissatisfaction, complaints can be forwarded to higher levels where GRM committees of relevant PIUs would deliberate over the cases. PCMU will handle all project-related complaints related to Component 1: Water Resources Management. It will also resolve complaints, including implementation of environmental and social safeguards, mainly from communities identified in the project and command areas that are escalated to them by SIDA and ADU. SIDA will institute and manage GRM for Component 2: Water Service Delivery. Likewise, Component 3: Smart Subsidies and Agriculture Investments will be overseen by ADU. The risk of gender-based violence (GBV) in the project is screened as low as the construction activities will be carried out mostly by local labour, and interaction between the construction labor force and the women is expected to be limited due to the conservative culture in the region. The contractor's code of conduct shall cover clauses related to avoiding gender-based violence, sexual exploitation and abuse, and sexual harassment. The code of conduct will be included in the worker's contract agreement, and any violation of the code of conduct will lead to termination of employment. Complaints/reports on gender-based violence or harassment will be collected and addressed through the above GRM in a partnership with local civil society organizations.

Consultation and Disclosure

Two rounds of stakeholder consultations were conducted during the preparation of this ESMF, one at the initial stages of preparation and the second after completion of the draft ESMF. Initial consultations were held in April 2021 with AWBs of Ghotki, Nara and Left Bank canals, FOs of these three AWBs, Sindh EPA, Public Health and Engineering Department, Forest and Wildlife Department, Livestock and Fisheries Department, Irrigation Department, Agriculture Departments, and PIUs. In addition to these consultations, a gender-specific consultation workshop was carried out with the AWBs, FOs, UN Women, ILO, and a women's NGO. All these consultations were carried out through video conferences and telephonic interviews. All the stakeholders realized that water is scarce and that it needs to be managed much more efficiently. They appreciated the proposed activities under the SWAT and recommended that the proposed policies, particularly the water prices, should not adversely affect poor farmers and domestic users, and strong technical support is needed for the FOs and manage the proposed canal modernization works. Farmers also suggested that the project should include provision for rehabilitation of water courses and land levelling for improving agricultural productivity and water efficiency. Smart subsidies should be given to farmers for expensive equipment to prepare the land and post-harvest processes. They suggested a shift in agriculture practices and preference for water-thrifty crops would occur only if government policies support the shift, strong markets are developed, and there is demonstrated benefit.

The second round of consultations was carried out in August 2021 with the AWBs, FOs, and WCAs to disclose the draft ESMF and obtain feedback from all the relevant stakeholders. Further, a workshop was conducted on 24th August 2021 at the SIDA office in Hyderabad with all the relevant stakeholders, including AWBs, FOs, PIUs, EPA, Public Health and Engineering Department, Forest and Wildlife Department, Livestock and Fisheries Department. The overall feedback from the participants is very positive, and they agreed that the draft ESMF has adequately addressed all the potential environmental and social issues of the SWAT. The participants recommended continued consultations throughout the project implementation and provided some suggestions for the successful implementation of the SWAT. They suggest that FOs and WCAs are to be continuously engaged in selecting and implementing all the project activities, including payments to the contractors, to ensure ESMPs are implemented to their satisfaction. FOs and WCAs need training and capacity development in implementing the project activities.

The ESMF has been disclosed on the PIU websites, and the updated ESMF will also be disclosed on the PIUs and World Bank external websites. The executive summary of the ESMF will be translated into the Sindhi language and will be published on the PIU websites, and hard copies of these documents will be made available at local AWB offices for public access. Stakeholder consultations will be carried out regularly during all stages of the project implementation in accordance with the project's stakeholder engagement plan. The ESIA and RAP documents to be prepared for proposed subprojects will also be consulted upon and disclosed on the PIU and World Bank external websites and made available to the local communities by placing them at local AWB and FO offices.