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Report No.: PAD841

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF SDR132.7MILLION (US$187.0 MILLION EQUIVALENT)

TO

PAKISTAN

FOR A

SINDH IRRIGATED AGRICULTURE PRODUCTIVITY ENHANCEMENT PROJECT

February 27, 2015

Water Global Practice
South Asia Region

CURRENCY EQUIVALENTS

January 31, 2015

Currency Unit	=	Pakistan Rupees (PKR)
US$1	=	PKR101
US$1.4098	=	1 SDR

FISCAL YEAR

July 1 – June 30

Weight and Measures

Metric System

1 meter (m)	=	3.280 feet	1 hectare (ha)	=	2.470 acres
1 Kilometer (km)	=	0.620 miles	1 cubic meter (m)	=	35.310 cubic feet

1 million acre feet (MAF) = 1.234 billion cubic meters

1 cubic foot/second (cfs) = 0.0283 cubic meters/sec (m^3/sec)

ABBREVIATIONS AND ACRONYMS

AWBs	Area Water Boards
AWP	Annual Work Plan
CCA	Cultivable Command Area
CPS	Country Partnership Strategy
CQ	Consultants' Qualification
CI,	Cropping intensity
DA	Designated Account
DD	Deputy Director
DGAEWM	Director General Agriculture Engineering and Water Management
dgMarket	Development Gateway Market
EA	Environmental Assessment
EFA	Economic and Financial Analysis
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EPA	Environmental Protection Agency
EMP	Environmental Management Plan
FBS	Fixed Budget Selection
FFS	Farmers' Field School
FIRR	Financial Internal Rates of Return
FM	Financial Management
FOs	Farmers Organizations
FWP	Future With-Project
FWOP	Future Without-Project
GAP	Gender Action Plan
GDP	Gross Domestic Product
GESIAF	Gender Equality and Social Inclusion Action Framework
GIS	Geographic Information System
GoP	Government of Pakistan
MIS	Management Information System
mm	millimeter
MRL	Minimum Reporting Level
MTR	Mid Term Review
NCB	National Competitive Bidding
NGO	Non-Government Organization
NPV	Net Present Value
O&M	Operation and Maintenance
OFWM	On Farm Water Management
ORAF	Operational Risk Assessment Framework
PAD	Project Appraisal Document
PCPL	Precast Concrete Parabolic Lining
PD	Project Director
PDMA	Provincial Disaster Management Authority
PDO	Project Development Objectives
P&DD	Planning and Development Department
PIC	Project Implementation Committee
PIU	Project Implementation Unit
PKR	Pakistani Rupees
PMP	Pest Management Plan
PSIACs	Project Supervision & Implementation Assistance Consultants
PPC	Project Policy Committee
PSC	Project Steering Committee
QBS	Quality Based Selection
QCBS	Quality and Cost Based Selection
R&D	Research & Development
RFP	Request for Proposal

GoSindh	Government of Sindh
GRM	Grievance Redressal Mechanism
Ha	Hectare
HEIS	High Efficiency Irrigation Systems
IBRD	International Bank for Reconstruction and Development
IBIS	Indus Basin Irrigation System
ICB	International Competitive Bidding
ICR	Implementation Completion Report
ICT	Information & Communication Technology
IDA	International Development Agency
IFR	Interim Financial Report
IPMP	Integrated Pest Management Plan
IRBS	Indus River Basin System
LCS	Least Cost Selection
LDPE	Low Density Polyethylene Pipes
MAF	Million Acre Feet
M&E	Monitoring and Evaluation
M&EC	Monitoring and Evaluation Consultants
SA	Social Assessment
SOFWMP	Sindh On Farm Water Management Project
SOPs	Standard Operating Procedures
SSS&C	Sales, Supply & Services Companies
SSS	Single Source Selection
TA	Technical Assistance
TATCs	Technical Assistance and Training Consultants
TPV	Third Party Validation
TOR	Terms of Reference
UNDB	United Nations Development Business
WCA	Water Course Association
WMO	Water Management Officer
WSIP	Water Sector Improvement Project

Regional Vice President:	Annette Dixon
Country Director:	Rachid Benmessaoud
Senior Global Practice Director:	Junaid Kamal Ahmad
Practice Manager:	William Kingdom
Task Team Leader:	Mahwash Wasiq

PAKISTAN

Sindh Irrigated Agriculture Productivity Enhancement Project (P145813)

TABLE OF CONTENTS

PAD DATA SHEET

Pakistan

Sindh Irrigated Agriculture Productivity Enhancement Project (P145813)

PROJECT APPRAISAL DOCUMENT

SOUTH ASIA

GWADR

Report No.: PAD841

Basic Information		
Project ID P145813	EA Category B - Partial Assessment	Team Leader Mahwash Wasiq
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects [ ]	
Project Implementation Start Date 20-March-2015	Project Implementation End Date 30, June, 2021	
Expected Effectiveness Date 30-June-2015	Expected Closing Date 31-Dec-2021	
Joint IFC No		

Practice Manager	Senior Global Practice Director	Country Director	Regional Vice President
William Kingdom	Junaid Kamal Ahmad	Rachid Benmessaoud	Annette Dixon

Borrower: Economics Affairs Division, Government of Pakistan			
Responsible Agency: Sindh Agriculture Department			
Contact:	Agha Zafarullah Durrani	Title:	DGAEWM
Telephone	92-21-99211462	Email:	dg@aewm.org,

Project Financing Data(in USD Million)					
[ ]	Loan	[ ]	Grant	[ ]	Guarantee
[X]	Credit	[ ]	IDA Grant	[ ]	Other

Total Project Cost:	242.20	Total Bank Financing:	187.00
Financing Gap:	0.00		

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Financing Source	Amount
BORROWER/RECIPIENT	55.20
International Development Association (IDA)	187.00
Total	242.20

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Expected Disbursements (in USD Million)

Fiscal Year	2016	2017	2018	2019	2020	2021			
Annual	6.00	33.70	35.00	36.00	34.30	42.00			
Cumulative	6.00	39.70	74.70	110.70	145.00	187.00			

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Proposed Development Objective(s)

The objective of the Project is to improve irrigation water management at tertiary and field levels in Sindh.

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Components

Component Name	Cost (USD Millions)
Component A: Community Water Infrastructure Improvement	120.20
Component B: Promotion and Installation of High Efficiency Irrigation Systems	65.80
Component C: Improved Agriculture Practices	24.40
Component D: Project Management, Monitoring and Evaluation, and Strategic Studies	31.70

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Institutional Data

Sector Board

Water

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Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Agriculture, fishing, and forestry	Irrigation and drainage	60	X	
Agriculture, fishing, and forestry	Crops	25		
Water, sanitation and flood protection	General water, sanitation and flood protection sector	15	X	
Total		100		

☑ Pakistan's reliance on a single river basin system makes its water economy vulnerable in light of climate change. The impacts of global climate change, including changes in glacial melt, temperature, and precipitation patterns leads to variations of river flows and increasing the instances of floods. Analyses project that all rainfall/snow-fed rivers will have a significantly reduced discharge in the long-run, and glacier-fed rivers will increase their discharges by 10-15 percent through 2050 but thereafter also significantly reduce their discharges. Given the fact that 95% of water is used for

irrigation one element of adaptation of climate change is improving productivity of water. The project supports efficient management of scarce water resources at the tertiary and field level where water losses are highest together with promotion of high efficiency irrigation system and improved irrigation agronomy, the project is designed to augment adaptation under different climate change scenarios.

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Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Rural development	Rural services and infrastructure	50
Environment and natural resources management	Water resource management	30
Economic management	Analysis of economic growth	20
Total		100

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Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ] No [X]

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Does the project require any waivers of Bank policies?	Yes [ ] No [X]
Have these been approved by Bank management?	Yes [ ] No [ ]
Is approval for any policy waiver sought from the Board?	Yes [ ] No [X]

Explanation:

Because the project area is located on the Indus basin part of Pakistan territory, which is an international waterway, the International Waterways Policy (OP 7.50) is triggered. Consistent with the policy notification exception provisions, the project does not involve works and activities that would exceed the original scheme, change its nature, or alter or expand its scope and extent to make it appear a new or different scheme. In addition, the nature of works envisaged under the proposed project: (a) will not adversely affect the quality or quantity of water flows to other riparians; and (b) will not be adversely affected by other riparians' water use. Therefore, the Project falls within the exception to the notification requirements of OP 7.50, set forth in paragraph 7(a) of OP 7.50. RVP approval has been obtained for the exception.

Does the project meet the Regional criteria for readiness for implementation?	Yes [X] No [ ]

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Safeguard Policies Triggered by the Project	**Yes**	**No**
Environmental Assessment OP/BP 4.01	**X**	
Natural Habitats OP/BP 4.04		**X**
Forests OP/BP 4.36		**X**
Pest Management OP 4.09	**X**	
Physical Cultural Resources OP/BP 4.11		**X**
Indigenous Peoples OP/BP 4.10		**X**
Involuntary Resettlement OP/BP 4.12	**X**	
Safety of Dams OP/BP 4.37		**X**

Projects on International Waterways OP/BP 7.50	**X**	
Projects in Disputed Areas OP/BP 7.60		**X**

.

Legal Covenants

Name	Recurrent	Due Date	Frequency
Establishment of Project Steering Committee	No	1 month after effectiveness	once
Establishment of Grievance Redress Committee	No	1 month after effectiveness	once
Recruitment or nomination of FM additional staff (one FM officer and one accountant at the Provincial office and one assistant for each of the two Regional offices		1 month after effectiveness	
Recruitment or nomination of Procurement additional staff (one procurement officer and one assistant for the Provincial office)		1 month after effectiveness	
Submission of the Annual Work Plans and Budgets to the Association for approval	Yes	January 1st except first one 1 month after effectiveness	annual
Recruitment of two Internal Auditors		1 months after effectiveness	
Adoption of Annual Work Plans and Budgets	Yes	3 months after submission to the Association	annual
In-depth Project review	No	1 month after effectiveness	once
Mid-term review	No	November 30, 2018	once

Description of Covenant

Retroactive financing up to a maximum amount of SDR 15,924,000 for payments made on or after April 1st 2014.

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Team Composition

Bank Staff

Name	Title	Specialization	Unit
Mahwash Wasiq	Senior Water Resource Specialist	Team Lead	GWADR
Hisham A. Abdo Kahin	Lead Counsel	Legal Department	LEGES
Helene Bertaud	Senior Counsel	Legal Department	LEGSO
Chaohua Zhang	Lead Social Development Specialist	Social Development	GSURR

Akram El-Shorbagi	Senior Financial Management Specialist	Financial Management	GGODR
Muhammad Riaz	Sr Agricultural Spec.	Agricultural	GFADR
Javaid Afzal	Senior Environmental Specialist	Environmental	GENDR
Rehan Hyder	Senior Procurement Specialist	Procurement	GGODR
Samina Mussarat Islam	Social Development Specialist	Social Development	GSURR
Muqaddisa Mehreen	Gender Specialist	Gender	GSURR
Fouad Muhammad Khan	Environmental Specialist	Environment	GENDR
Shahzad Sharjeel	Senior Communications Officer	Communications	SAREC
Umar Nadeem	Governance and Public Sector Specialist	Public Sector Specialist	GEDDR
Haris Khan	Senior Disaster Management Specialist	Disaster Management	GSURR
Gunnar Larson	Operations Analyst	Bank Operations	GFADR
Sana Shahid Ahmed	Operations Analyst	Bank Operations	SACPK
Lilac Thomas	Program Assistant	Program Assistant	GFADR
Shahnaz Meraj	Program Assistant	Program Assistant	SACPK

Non Bank Staff

Name	**Title**	**Office Phone**	**City**
Thomas Muenzel	Sr. Economist (FAO)	+390657054643	Rome
Walter Klemm	Water Resources Engineer	+390564629485	Manciano
Ohn Myint	Irrigation and Dam Specialist	1-301-355-6752	Montgomery Village

.

Locations

Country	**First Administrative Division**	**Location**	**Planned**	**Actual**	**Comments**
Pakistan	Sindh	Sindh	**X**		

I. STRATEGIC CONTEXT

A. COUNTRY CONTEXT

1. Despite its strategic location and potential for regional trade, diverse resources, and vast population, Pakistan faces significant challenges to its economic growth, including weak governance, inadequate security, and political and economic instability. Pakistan's volatile security environment and law and order situation costs the economy about two percent (US$ 4.7 billion) of GDP annually. Coupled with unsustainable macroeconomic policies, it has depressed the environment for attracting private and foreign investment and undermines its potential for regional trade. Pakistan's population is growing at the rate of 3.5 percent, and it is expected to double from 180 million in 2014 to over 350 million by 2050. While a large and growing population can be a positive attribute to economic development and growth, with low human capital, unfavorable economic conditions, and limited resources, it can also impose a major political and social burden. Recovering economic stability is a precondition for regaining high growth rates and addressing the structural development challenges which the country faces. Fostering agricultural productivity is one of these challenges owing to its importance to the country's productive diversification, job creation, and poverty reduction. Agriculture has traditionally been a source of economic growth. It accounts for approximately 22 percent of the country's GDP, 65 percent of its employment, and over 70 percent of export earnings. It absorbs about PKR2trillion of investment annually, contributes substantially to the country's industrial base, and produces 90 percent of Pakistan's food and fiber requirements. Most of the poor live in rural areas and are mainly employed in agriculture as wage workers.

2. Pakistan's economy faces a number of short and medium term challenges such as persisting energy sector crisis, low private sector investment, weak external position, unsustainable fiscal imbalances, and high inflationary pressures leading to low GDP growth of about three percent per annum over the last five years. This level of growth is inadequate to reduce poverty and improve the social indicators in the country. Current GDP growth rates are well below output potential and are half their level of five decades ago. Regaining macroeconomic stability and creating a proper business environment requires major structural reforms, especially in tax policy and administration, the energy sector, efficient management of public expenditure, strengthening of the financial sector, creating equal employment opportunities in a competitive market environment, and enabling measures and policies for enhanced business environment and private sector participation and investment.

B. SECTORAL AND INSTITUTIONAL CONTEXT

Agriculture Sector

3. Sindh is the second most populated province of Pakistan. The province covers an area of 140,900 square kilometers and has a population of about 43 million, including 16 million in metropolitan Karachi. Over 60 percent of the population lives in rural areas, and their main source of livelihood is agriculture. The agriculture sector is an important driver of economic growth and source of employment for the poor in Sindh. It provides employment to about 70 percent of the province's population and accounts for a significant portion of GDP.

4. Sindh has over 5.8 million hectares of irrigated land, and over 800,000 farms. Major crops include cotton, rice, sugarcane, and wheat. Sindh is also a major horticulture producing area. The average farm size is small, and over 93 percent have less than seven ha corresponding

to 64 percent of total farm area. Agriculture productivity in Sindh is low. Average yields are generally about 50-70 percent of the yields in other countries with similar agro-climatic and water conditions, such as Turkey, Egypt and in case of cotton, Uzbekistan. Poverty is pervasive and deep in rural Sindh. About 37 percent of the rural population lives below the poverty line, compared to 33 percent in Pakistan as a whole. Over 70 percent of the rural population is landless. The poor derive 56 percent of their income from agriculture. Women comprise 50 percent of Sindh's agriculture labor force, in some districts their participation reaches more than 70 percent, and contribute considerably to agricultural practices with their skills, knowledge and time. There are however structural gender inequalities in Sindh in which society and tradition can be powerful forces in differentiating access to resources and services and marginalizing women and girls, particularly in poor and rural areas and in time of natural disasters and insecurity.

5. Development of agriculture is closely linked with the introduction of large-scale irrigation infrastructure in Pakistan in the 1960s which had a significant impact on the human and physical environment of the Indus River Basin. The progressive development of irrigated agriculture allowed the country to support its growing population because of the impressive achievements in turning dry arid lands into intensively cultivated and settled areas. Water remains an important resource for sustaining economic development in the country. In a context of urbanization, climate change, and a growing population, competition for water between hydropower, industry, domestic use, the environment and other uses is intensifying. While the need for more efficient water use applies to all sectors of the economy, it applies to agriculture in particular because the sector consumes 95 percent of the country's water resources.

C. WATER RESOURCES, CLIMATE CHANGE, IRRIGATION AND DRAINAGE

6. Pakistan relies on the Indus Basin Irrigation System (IBIS) for provision of water to all sectors, including the irrigation sub-sector. IBIS consists of the Indus River and its tributaries, three major multi-purpose storage reservoirs, 19 barrages, 12 inter-river link canals, 45 major irrigation canals (covering over 14 million hectares), about 148,000 water courses, and over one million tube wells delivering water to farms and for other productive uses. The annual Indus River volume is 177 billion cubic meters (BCM), of which about 128 BCM is diverted annually from the river system to canals. The total length of the canals is about 60,000 km, with an additional 1.8 million km of communal water courses and farm channels. An estimated 80 percent of the flow of the Indus River is generated during monsoons from June to August. Pakistan's reliance on a single river basin system makes its water economy vulnerable in light of climate change. The impacts of global climate change, including changes in glacial melt, temperature, and precipitation patterns leads to variations (often negative) of river flows. Therefore, the increase of instances of floods and droughts on the IBIS needs to be carefully considered. Analyses project that all rainfall/snow-fed rivers will have a significantly reduced discharge in the long-run. Glacier-fed rivers will increase their discharges by 10-15 percent through 2050 but thereafter also significantly reduce their discharges.

D. IRRIGATION AND DRAINAGE SUB-SECTOR ISSUES

7. Owing to the country's semi-arid climate, with an average annual rainfall of 240 mm in most parts of the country and high evaporation rates, 90 percent of its agriculture is irrigated. Main issues include: (i) low surface water delivery efficiency; (ii) water distribution inequities; (iii) lack of storage capacity and control structures; (iv) wasteful on-farm water use; (v) inadequate drainage infrastructure leading to water logging, salinity, and environmental

degradation; (vi) poor operation and maintenance (O&M) and low cost recovery; and (vii) a restrictive investment climate. As a result of water resources mismanagement, an estimated 40 to 50 percent of the water that is delivered through community water course networks is lost and irrigated agriculture in Sindh province is facing water shortage, particularly of surface water which is especially important in Sindh because most of its lands are underlain by saline groundwater, unfit for irrigation.

E. INSTITUTIONAL ARRANGEMENTS AND REFORMS

8. Management of IBIS is dominated by the public sector, which controls, owns, and operates the upper tier, the main and secondary irrigation systems, including barrages, main canals, branch canals, distributaries, and minors. Farmers own and operate the lower tier, or the tertiary systems called water courses. Tertiary systems are the focus of the proposed project. Water management institutions are generally weak because the system is mainly controlled by the public sector, which is characterized by bureaucratic inefficiencies and poor farmer focus and accountability. Governance issues result in inequities in water distribution, inadequate O&M of the system, and lack of confidence among users. Low cost recovery results in constrained sector finances and limited capacity for investment. These issues are being addressed through the reform program to establish efficient and sustainable irrigation and drainage institutions. The World Bank-financed Water Sector Improvement Project (WSIP) supports the reform program under which three Area Water Boards (AWBs) were established, encompassing about 1.8 million hectares of land or 31 percent of the total irrigated area of Sindh. In addition, over 350 Farmer Organizations (FOs) have so far been formed in Sindh, and management transfer agreements have been signed with over 300 of them. FOs are formed with representation from Water Course Associations (WCA) of tertiary canal systems, which are the focus of the proposed project. Effective WCAs will ensure sustainability of FOs and *vice versa*. Outcomes of these reforms have been mixed, with some FOs performing well, some poorly, and others much politicized. In areas where the FOs are functioning well, improvements have been observed in the equity of water distribution and delivery.

F. HIGHER LEVEL OBJECTIVES TO WHICH THE PROJECT CONTRIBUTES

9. The proposed project is fully consistent with Pakistan's Vision 2025 and the Sindh Development Plan, and recognizes the important role of water in various sectors of the economy and its effective management in the future economic growth of the country and the province. The project will contribute to the Bank's twin goals of reducing poverty and promoting shared prosperity by directly benefiting around two million people (out of which 37 percent are below the poverty line). Beneficiaries include smallholder and medium-size farmers engaged in irrigated agriculture, as well as female-headed households and landless farmers, through a mix of improved irrigation, land improvement, and training in improved agronomic practices. The project will indirectly benefit a large population through generation of employment. At the same time, given that the poor in rural areas either have small plots or are working as agriculture wageworkers, the improvement of watercourses will directly enhance the agriculture production livelihood for both groups. Access to flood shelters for the poorest and most vulnerable people will also be provided and kitchen garden drip irrigation kits would be provided to 10,000 female headed households and landless farmers. Around 66 percent of total project benefits are expected to go to the poor and the project is expected to make a significant contribution to poverty reduction in Sindh Province.

10. The proposed project is in line with the World Bank Group's FY15-19 Country Partnership Strategy (CPS) for Pakistan, which was discussed by the Board on April 4, 2014 (Report No. 84645-PK). It would contribute to the result areas of private sector development and inclusion. By supporting water use efficiency and encouraging technology that will promote crop diversification and increased productivity, the proposed project will directly contribute to the CPS Outcome 2.2 of increased productivity in farms and selected irrigation schemes. It will support efficient management of the country's water resources and be instrumental in its adaptation to future climate change scenarios, thereby contributing also to Outcome 3.3, increased resilience to disasters in targeted areas.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO.

11. The objective of the Project is to improve irrigation water management at tertiary and field levels in Sindh.

B. PROJECT BENEFICIARIES

12. The main beneficiaries of the Project will be the smallholder farmers (up to 5 ha) and medium-size farmers (5-20 ha) in Sindh engaged in irrigated agriculture, including (i) around 198,000 farm households cultivating land in the command areas of the water courses to be improved by the project, and (ii) around 2,600 farm households supported by the project in high-efficiency irrigation. At least 60,000 farmers would benefit from land improvements (laser leveling and deep plowing – also outside the water courses rehabilitated under the project) and 33,750 farmers from training in improved agronomic practices. In addition, 5,000 female-headed households and 5,000 landless farmers would benefit from high-efficiency irrigation kits for kitchen gardening. The total number of farm households that will increase their agricultural production as a result of the project will be at least 250,000, benefitting more than 2 million people[1]. About 106,650 poor and vulnerable people and about 114,000 farm animals in the most vulnerable areas would have access to flood shelters, affording them protection in the event of prolonged flooding (last seen in 2010 and 2011).

13. A large population would also benefit indirectly from the project, such as landless farm laborers for agricultural operations, and temporary and permanent labors engaged in construction and manufacturing sectors. Employment will be generated through installation of the High Efficiency Irrigation Systems (HEIS). Private companies will supply construction materials and farm inputs, help improve water courses, and gain additional business from incremental gains in agricultural production.

C. PDO LEVEL RESULTS INDICATORS

14. Progress towards achieving the PDO will be measured through the following key performance indicators: (i) water courses with an increase in water course conveyance efficiency of at least 15 percent (5500); (ii) direct project beneficiaries (2,000,000), of which female (25%); (iii) water users provided with new/improved irrigation and drainage services (210,000), of

[1] Based on an average size of agricultural households of 8.5 (Agricultural Census 2010).

which female (25%); (iv) increase in cropping intensity in water course areas (20%); and (v) increase in cropping intensity through high-efficiency irrigation systems(50%).

III. PROJECT DESCRIPTION

15. The project supports efficient management of scarce water resources and is designed to augment adaptation under different climate change scenarios and population growth. Most of the project interventions are well tested and demand driven, with reasonable co-financing from beneficiary farmers. It comprises of four components briefly described below; Annex 2 provides a detailed project description.

A. PROJECT COMPONENTS

Component A: Community Water Infrastructure Improvement (Total: US$ 120.20 million, IDA US$ 95.90 million)

16. This component consists of three sub-components. Sub-Component A1 will assist Government of Sindh efforts to: improve and rehabilitate tertiary distribution level water courses. Activities under this component will include farmer mobilization, establishment of Water Course Associations (WCAs) and their registration, survey and design, and construction. About 5,500 water courses will be improved through the provision of lining (corresponding to 30 percent of water course length). The farmers will co-finance 24 percent of the costs through provision of skilled and unskilled labour.

17. Sub-Component A2 will increase the resilience of the rural poor to floods through the strengthening of flood mitigation measures, including the establishment of shelters. It will finance the provision of approximately 380 permanent flood shelters of three types in the seven most vulnerable districts in the irrigated areas of Sindh to increase their resilience to water related disasters such as flooding and heavy rains. Land for construction will be largely public or community owned land located in non-cultivable areas, preferably on higher ground. Once constructed, these shelters will be transferred to the Provincial Disaster Management Authority (PDMA) and their affiliates at the district level for operations and maintenance; some will be used for community activities.

18. Sub-Component A3: This sub-component will finance the provision of supervision and implementation assistance consultants (PSIAC) for project design and construction supervision for activities under Component A. PSIAC will assist the Project Implementation Unit (PIU) in construction supervision, engineering and designs, procurement, financial management, quality control, and the timely completion of strategic studies and pilot projects.

Component B: Promotion and Installation of High Efficiency Irrigation Systems (Total US$ 65.80 million, IDA US$ 40.10 million)

19. Sub-Component B1 will support: installation of HEIS drippers and bubblers for growing high value crops on irrigated and irrigable land; provide technical assistance packages to farmers on operations and maintenance of HEIS; and provide additional training and assistance to farmers in the use of HEIS by specialists and consultants. Approximately 2,600 HEISs will be installed on 14,300 ha (35,000 acres) of irrigated and irrigable land. HEIS' will be provided (on demand) to the farmers on a 40 percent cost sharing basis. They will be installed by Sales, Supply and Service companies (SSCs) who will also provide a technical assistance package for the farmers in operation and maintenance of the system. Additional training and assistance will

also be provided by the HEIS specialist in the field teams assisted by the technical assistance and training (TAT) consultants.

20. Sub-component B2 will support the establishment of HEIS demonstration sites and distribution of kitchen garden HEIS kits, consisting of drip irrigation equipment to female-headed households and landless farmers. It will include 48 demonstration sites of 2 ha (5 acres), two in each district, and the distribution of approximately 10,000 kitchen garden HEIS kits consisting of drip irrigation equipment for a plot of 10m x 10m, including a small water storage of 160 liter with a conveyance pipe for the daily provision of water. The 100 kitchen garden HEIS kits for demonstration purposes will be provided free of charge; individual households requesting a HEIS kit will need to contribute 10 percent of the investment cost of US$100.

Component C: Improved Agriculture Practices (Total US$ 24.40 million, IDA US$ 19.30 million)

21. Sub-Component C1 will provide laser guided land leveling equipment and associated deep ripping equipment, and will facilitate training in the use of deep ripping equipment. These will help farmers save irrigation water, curtail irrigation time, improve efficiency of agriculture inputs such as fertilizers, and achieve uniform seed germination, resulting in increased crop yields. Sub-Component C2 will facilitate training to farmers to improve crop production and irrigation agronomy practices. Sub-Component C3 will provide Technical Assistance and Training (TAT) Consultants to provide training to field teams, public sector staff and farmers in HEIS installation, operation and repair, crop diversification, crop production under HEIS, soil measurement and fertilizer application, and to support piloting of activities under Sub-component B2 and training of trainers for operators in laser land leveling and deep ripping under Sub-Component C1.

Component D: Project Management and Monitoring and Evaluation and Strategic Studies (US$ 31.70 million, IDA US$ 31.70 million)

22. Sub-component D1 will provide support for project monitoring and evaluation and carrying out impact assessments. Sub-Component D2 will provide support for the Project Implementation Unit and Project district offices and field offices, and for carrying out strategic and feasibility studies for pilot activities.

B. PROJECT COST AND FINANCING

23. Table 1 summarizes the project cost and financing plan by component. The project cost does not include an amount of about US$60 million (equivalent) contributed by the Government of Sindh for permanent staff salaries and overheads that will be assigned to the project.

Table 1: Project Cost and Financing Plan (US$ million)

Project Components	Project cost	IDA Financing	Percent IDA Financing	Farmers' Financing	Percent Farmers' Financing
A. Community Water Infrastructure Improvement	120.20	95.90	80	24.30	20
B. Promotion and Installation of High Efficiency Irrigation System (HEIS)	65.80	40.10	61	25.80	39
C. Improved Agriculture Practices	24.40	19.30	79	5.10	21
D. Project Management, and Monitoring and Evaluation	31.70	31.70	100	0	0
Total Project Costs Front-End Fees **Total Financing Required**	242.20 0.0	187.00 0.0 187.00	77	55.20	23
Taxes and Duties included in Total Project Costs	32.40				

C. LESSONS LEARNED AND REFLECTED IN THE PROJECT DESIGN

24. The design of the proposed project is based on lessons learnt from the past on-farm water management operations in Pakistan funded by the Bank and other donors; and Bank experience in irrigation and drainage sector operations in countries such as Mexico, Turkey and Uzbekistan, Kazakhstan, and the Kyrgyz Republic. In particular, the lessons learnt from the Sindh On-Farm Water Management Project are noteworthy. Major lessons incorporated in the project design are:

a) Water Course Associations have been made central to the project, given the demand driven nature. Multidisciplinary field teams with qualified specialists will be established to mobilize farmers and offer them the full menu of the activities under the project in a transparent and equitable manner, and to inform them of agriculture related technologies.

b) Sustainability of the water course associations would be strengthened by permitting the selection of water course association chairpersons from farmers at the tail-end of water course. This will ensure proper operations and maintenance, especially maintenance of the earthen section which constitutes 70 percent of the length of watercourse. Incorporation of water course associations into Farmer Organizations (FOs) at the distributary level will ensure sustainability of both organizations.

c) Given the enormous popularity of water storage tanks under the previous project, their provision will be selective and linked to the provision of HEIS. The size of the tanks will be rationalized based on the volume of water needed for the irrigation of 5-25 acre plots.

d) HEIS will be installed by professional service providers rather than government agencies or farmers themselves. This will ensure professional design, installation, and O&M, and training of farmers in O&M. Laser levelers and deep ploughs will be provided to the service providers instead of having the laser leveling done either by government agencies or individual farmers. This arrangement will be much more efficient as only laser levelers are purchased and service providers will use their own tractors. Utilization of, and coverage by, each piece of equipment will also be higher compared to operations by government or individual farmers.

IV. IMPLEMENTATION

A. INSTITUTIONAL AND IMPLEMENTATION ARRANGEMENTS

25. A specific Project Implementation Unit (PIU) consisting of appropriate experts headed by a Project Director within the Directorate General Agriculture Engineering &Water Management (DGAEWM) will have the overall responsibility for implementing the project and will report to the Agriculture Secretary of the Government of Sindh (GoSindh). The PIU will be responsible for all aspects of project implementation, including technical, operational, procurement, financial management, disbursement, and overseeing the technical assistance and training program. The PIU will be supported by a group of highly qualified staff at headquarters in Hyderabad and its regional implementation offices. The two Directors of On-Farm Water Management in Hyderabad and Sukkur will be responsible for the performance of the district teams and their associated field teams. The project will be implemented by 100 field teams consisting of various experts representing all project components. Three sets of consultants - Project Supervision and Implementation Assistance Consultants (PSIACs), Technical Assistance and Training Consultants (TATC), and Monitoring and Evaluation Consultants (M&EC) – will support the PIU.

26. The following committees will be established for project coordination: Steering Committee (PSC), to provide planning and strategic guidance and facilitate inter-agency coordination at the highest level; and Project Implementation Committee to review the physical and financial progress and ensure implementation of decisions of the PSC. A Grievance Redress Mechanism (GRM) will be established to deter fraud and corruption, mitigate risks, and provide project staff with practical suggestions to be more accountable, transparent, and responsive to beneficiaries needs. The project will undertake public information campaigns to promote demand for project activities and facilitate management and mitigation of project risks.

B. RESULTS MONITORING AND EVALUATION

27. A number of systems, such as GIS, MIS, ICT based monitoring and verification system and the GRM, would be developed and integrated to establish a robust implementation monitoring evaluation system and a social accountability system under the project. These would enable the PIU to prepare periodic reports (with assistance from various consultants) covering all aspects of project implementation, and monitoring and evaluation of project impacts. M&E will be conducted by a team of professional consultants, who will monitor and evaluate project performance and impact during and post construction, including environmental and social plans and the gender action framework. In addition, impact assessment studies will be undertaken to evaluate project performance and achievement of the PDO.

28. Quarterly and annual progress reports will be submitted in a format agreed with the Bank to the PIU, PIC and the Bank no later than 30 days after the end of each quarter and year. The annual progress reports will in addition provide information on indicators measuring achievement of the PDO. An in-depth review of the project will be undertaken within twelve months of effectiveness of the Financing Agreement. A mid-term review of the project will be undertaken by November 30, 2018. An Implementation Completion Report (ICR) will be submitted to the Bank no later than six months after the closing date. In addition, a number of performance review mechanisms have been built into the project to ensure close support to the

smooth implementation the Project and monitoring of its performance, especially through stability and availability of quality and empowered staff and consultants in the PIU.

C. SUSTAINABILITY

29. All project activities are well tried and tested, demand driven, and co-financed by the beneficiary farmers. Given that ownership of the tertiary irrigation canal system (water courses) and below lies with the farmers, and that the system is operated and maintained by them, there are no major sustainability issues. Experience from previous projects in improving water courses attests to this fact, as improved water courses are functioning well and are well maintained. Ownership of the tertiary irrigation system (and below) being with the farmers, the existing traditional water distribution arrangements would be formalized in creating Water Course Associations (WCAs). The WCAs would be led by tail-end farmers to ensure adequate irrigation water delivery and proper system O&M. The WCA Chairman would become a member of the Farmer Organization (FO) when and where the latter exist. Continuous support to the reform process is manifested by increasing the number of well-established FOs to further improve water distribution at tertiary level and below. It is worthwhile to note that those farmers who have obtained laser land leveling units under previous projects have established small enterprises providing the service to farmers in adjacent areas. Lining of water courses, provision of HEIS, laser land leveling, and deep ripping not only reduce water demand and increase water availability, but also reduce O&M costs and waterlogging. Farmers would also be trained in using the provided equipment such as HEIS, laser levelers and deep rippers. All these measures would enhance the sustainability of the provided assistance.

V. KEY RISKS AND MITIGATION MEASURES

A. RISK RATINGS SUMMARY TABLE

Risk Category	Rating
Stakeholder Risk	Moderate
Capacity	Substantial
Governance Risk	Substantial
Design	Moderate
Social and Environmental	Low
Program and Donor	Low
Delivery Monitoring and Sustainability	Moderate
Overall Implementation Risk	Substantial

B. OVERALL RISK RATING EXPLANATION

30. The overall project risk rating is “Substantial” owing to risks associated with governance and implementation capacity both of which are interrelated. Although the implementing agency has been involved in carrying out similar operations in the past, the sheer scale of this operation, spread over the entire province involving thousands of farmers and water users, hundreds of field teams and staff raises concerns regarding technical and management capacities for carrying out the program. Efficiency and transparency in procurement could also pose a risk, particularly given the large number of contracts. The complex implementation arrangements, involving several layers of government and spanning across 24 districts in the province, could lead to weak oversight, uneven performance, and pose governance challenges.

31. Mitigation measures have been devised to address many of the project related risks including the large number of transactions involved. These include (i) augmenting capacity of the implementing agency in overall project management by provision of implementation support and technical assistance consultants; (ii) providing regular training of all project staff to handle staff turn-over in PIU through knowledge sharing and exposure to other Bank operations; (iii) establishment of a rigorous Monitoring and Evaluation system to ensure monitoring of project performance through users' satisfaction surveys and other means to provide feedback to the implementing agencies for timely actions; (iv) beneficiary co-financing in almost all project activities to ensure ownership and mitigate governance risks; (v) internal checks and balances in implementation of works such as rehabilitation of watercourses where both procurement of materials for water course improvement and implementation of works will be carried out by the communities, making sure procurement is carried out properly.

32. There are a number of exogenous risks related to the overall country operating environment including the security situation, and the occurrence of natural disasters such as floods, cyclones, and heavy monsoon rains. However, implementation of other recent projects in Sindh has not been compromised by security so far. Security concerns are more likely to affect missions rather than implementation. The project will have flexible implementation arrangements in order to quickly adapt to changing circumstances on the ground. In case of the unlikely event of a severe local security threat, implementation activities can be switched to more secure areas, since the project covers all areas of the Sindh province. In case of a natural disaster, the impact on farmers' incomes would likely affect construction activities since all such activities under the project require co-financing. Farmers would likely need to re-direct resources towards more urgent matters of disaster recovery. However, the longer implementation period for project activities and provision of flood shelters will help in mitigating these risks.

VI. APPRAISAL SUMMARY

A. ECONOMIC AND FINANCIAL ANALYSIS

33. **Economic benefits.** The economic benefits of project interventions that have been included in the analysis comprise: (i) increased area under irrigation and cropping intensity; and (ii) increased crop yields. Benefits will be primarily due to: (i) improved water delivery efficiency in the project water courses (WC) resulting in faster delivery of more water to the farmers' fields for the entire irrigation cycle and ensuring a more equitable water distribution; (ii) precision land leveling, resulting in water savings, reduction in the time farmers spend on irrigation, uniform seed germination, and increased fertilizer use efficiency; (iii) high Efficiency Irrigation Systems (HEISs) for orchards and row crops, increasing water delivery efficiency, and improving utilization of agriculture inputs; and (iv) adoption of improved agronomic and irrigation techniques.

34. **Economic viability and sensitivity analysis.** The economic internal rate of return (EIRR) of the project for the base case is 36.7 percent with a net present value (NPV) of PKR28.4 billion (US$268.1 million). On the basis of an opportunity cost of capital of 12 percent, the proposed project is justified on economic grounds. The results of sensitivity analysis show that the project's economic viability is robust to adverse changes in project costs and benefits (see Annex 6 for more details).

35. **Financial analysis** has been carried out on the basis of crop budgets for 14 crops. Farm-budget analysis was undertaken to determine the impact of project interventions on farm income and the extent to which farmers would be able to cover O&M and recover the investment costs of structures and equipment. The analysis shows that net farm incomes (i.e., after full O&M costs have been deducted) increase considerably in all cases. However, the calculated farm incomes are not sufficient to recover investment costs for 2 ha and 4 ha HEIS farms with row crops in unimproved WC.

36. **Financial cost-benefit analysis** has been carried out for the various HEIS models. While on-farm HEIS for orchards is generally financially viable (with Financial Internal Rates of Return [FIRR] of above 12 percent, the opportunity cost of capital), except for the 2 ha and 4 ha farms in unimproved WC, HEIS for row crops only generates a FIRR above 12 percent for the largest (10 ha) farm model in improved WC. The analysis points to the need to assess the financial viability of each HEIS farm prior to the investment. The existence of a business plan presenting such an analysis will thus be one of the selection criteria.

37. **Benefit distribution, poverty analysis and employment impact.** The project will primarily benefit smallholder farmers (with farm areas of less than 12.5 acres (5.1 ha) [estimated to account for 83% of the 198,000 farmers in the project WC]) and 1,750 farmers cultivating 2 or 4 ha under HEIS. Furthermore, the project will support 5,000 female headed households and 5,000 landless farmers with HEIS sets for kitchen gardens. The benefits expected to be generated were distributed among these main categories of beneficiaries and the net benefits of the project to be gained by poor households were estimated by applying the percentage of households assumed to be living below the poverty line to the overall net benefits within the different beneficiary categories. The analysis shows that around 66 percent of total project benefits go to the poor.

38. **In addition to the direct beneficiaries, a large population would also benefit indirectly from the project**, such as landless farm laborers for agricultural operations, and temporary and permanent labors engaged in construction and manufacturing sectors. As a consequence of increased crop production, agricultural employment is expected to rise by about 30 percent or 19.3 million person days per annum. This is equivalent to around 80,690 additional full time jobs (at 240 person days per year). It is estimated that hired labor accounts for around 88 percent of the increase, creating opportunities for the landless poor who are mainly employed in agriculture as wage workers. In addition, substantial employment will also be generated for handling incremental production, processing and marketing as well as during project implementation for construction works, and staffing by HEIS and laser leveling/deep ripping service providers would be significant.

39. **Fiscal impact.** In the short term, the fiscal impact of the project will be neutral, as the government's contribution to project costs primarily comprises salaries of existing district office staff and field team members. The maintenance cost of basically all of the structures and equipment provided by the project would be borne by the private sector (WCAs, FOs, individual farmers and service providers). The only major incremental recurrent cost to be borne by PDMA is the O&M cost of flood shelters (with contributions from the communities). In the medium to long term, the potential positive fiscal impact of the project will be substantial, mainly due to: (i) increased output, income, and employment, resulting in increased tax revenues; and (ii) multiplier effects due to increased disposable income of project beneficiaries, resulting in increased demand for goods and services. Some foreign exchange earnings/savings can also be expected from an increase in exports and/or a reduction in imports.

B. TECHNICAL

40. Technically, the project works are simple. Many of them have been tried, tested, and improved in Pakistan before. Works associated with the improvement of water courses have been carried out successfully before. In Sindh province, there are mainly two types of lining that farmers use, masonry brick lining and Precast Concrete Parabolic Lining (PCPL). In the northern areas of Sindh where the quality of brick is good, farmers are using brick lining, however in the southern Districts PCPL was introduced, being widely used because of high soil salinity and the inferior quality of bricks. Given the numerous advantages of PCPL including better hydraulics, ease and duration of construction, and low costs, efforts will be made to spread the technology in other parts as well. Nevertheless, quality control of the facilities producing PCPL and all precast outlets and gates are very crucial and will be closely monitored by the client and consultants. In addition, joining of the PCPL sections and compaction of soil will be monitored. Other appropriate lining methods would be tested during implementation. Flood shelter designs are based on similar shelter designs already implemented by PDMA and others successfully in Sindh.

41. In the case of HEIS, a range of materials of different quality can be obtained from the market. If some or all of the technology can be successfully manufactured in Pakistan, this will reduce the cost. To bring the cost down, a combination of buried PVC and low density polyethylene pipes (LDPEs) will be used which will also reduce the O&M cost. The PVC pipes are available in the market and given the demand generated under the project, different thicknesses of the pipes can be manufactured to make them suitable for burying in the ground. Also, pipe factories will be encouraged to manufacture LDPEs specifically for drip irrigation system. In areas with fresh ground water, the existing pumping units will be used with modification to minimize the cost of the units and better O&M. The technical assistance and training will provide value to the farmers, service providers that will help in use of new systems, and crop diversification etc.

42. While laser land levelers are available in the market, as the technology was introduced under the previous project in Sindh, deep rippers are not available. Due to its soil conditions, in Sindh Chisel Plough is used to break the 13-18 centimeters (5-7inches) of compacted top crust of the soil, but hard pans are generally located half a meter to one meter (2-3 feet) down which needs to be broken periodically to improve uptake of water and nutrients by deep-rooted crops and improve productivity. The agriculture machinery manufacturers in the project area will be able to produce the particular implement, however, higher horsepower tractors and machinery will be required to carry out the task. For introduction of this technology, five demonstrations along with farmers' and service providers' training will be carried out throughout Sindh. During and after completion of the project, the number of different service providers involved in high efficiency irrigation system, laser land leveling, and deep ripping, and the manufacturers of lining materials are expected to expand. Improved technology should bring costs down.

C. FINANCIAL MANAGEMENT

43. This is the third consecutive Bank project supporting on-farm water management implemented by DGAEWM since 2004. Staffing and monitoring gaps were identified during an assessment of the financial management capacity. The assessment concluded that the use of country system, implementation of enhanced internal control arrangements and capacity building of the project's FM staff will address the present gaps in the FM arrangements. The Project Operational Manual includes a detailed chapter on FM arrangements. The action plan below

indicates the actions to be taken for the project to strengthen its financial management system and the dates that they are due to be completed by.

	Action	Date due by	Responsible
1	Recruitment or nomination of FM additional staff (one FM officer and one accountant at the Provincial office and one assistant for each of the two Regional offices	1 month after effectiveness	DGAEWM
2	Recruitment of two Internal Auditors	1 months after effectiveness	DGAEWM
3	Roll out Govt FMIS to the DGAEWM/Regional Directorates	As soon as possible after Loan signing	DGAEWM
4	Training of project accounting and auditing staff at DGAEWM.	1 months after effectiveness	WB

44. Project financial statements audited by and received together with the audit report from the Auditor General of Pakistan will be provided to the Bank within six months of the end of each fiscal year. DGAEWM shall also prepare and furnish to the Bank not later than forty five (45) days after the end of each calendar quarter, interim financial reports (IFRs) for the project covering the quarter, in form and substance satisfactory to the Bank. The IFRs shall also form the basis of disbursement. Detailed FM arrangements are available under Implementation Arrangements (Annex 3) and the complete Assessment is available in project files.

D. PROCUREMENT

45. The Project will be carried out in accordance with *World Bank Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants*, dated January 2011, revised July 2014, and *Guidelines for Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers*, dated January 2011, revised July 2014. The *IBRD/IDA Guidelines On Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants* ("Anti-Corruption Guidelines") will apply. The sample bidding documents for procurement under National Competitive Bidding (NCB); which are already being used in various Bank financed projects will be used. International Competitive Bidding (ICB) is not envisaged. However, if the situation so requires, the Bank's standard bidding documents will be used for procurement of Goods and Works. The Bank's Standard Request for Proposal (RFP) document will be used in the selection of consulting firms. As the Project includes extensive community participation, simplified and best-fit procurement processes and associated documents will be developed during implementation, balancing community participation and acceptable fiduciary assurances.

46. Component A1 of the project will be implemented through the community participation approach whereby payments will be linked to completion of a specific milestone before the beneficiary becomes eligible to receive the next tranche of disbursement. The implementation arrangements for this sub-component have been finalized. Detailed designs of flood shelters and various options for HEIS and deep plowing have also been finalized. The strategy, pre-selection parameters and contract formats for the Sales, Supply & Services Companies (SSSC) have been established.

47. The procurement responsibility rests with PIU within the DGAEWM. DGAEWM has been the implementation unit for several Bank projects in Sindh and has considerable experience of working according to the Bank's procurement rules and Sindh Public Procurement Rules 2010

(SPPR-2010). An assessment of the capacity of the implementing agency to implement procurement actions for the project was carried out. The assessment reviewed the organizational structure for implementing the procurement under the project and the interaction between Project staff responsible for procurement. The Director General is vested with some financial powers; delegated by the Principal Accounting Officer to perform support to the functions of procurement. Presently the DGAEWM has staffing capacity constraints as the key procurement staff is not on board. The procurement functions will be performed in an environment which is marked by governance challenges and a general economic slowdown. It would therefore be essential to have a well-developed internal procurement function that detects and rectifies possible deviations in procurement process. Moreover, a culture of accountability needs to be nurtured to ensure that prospective bidders have faith in the procurement proceedings. The identified mitigation measures for dealing with procurement risks are presented in Annex 3. The Project Operational Manual provides details of collaborative workflows of all of the specialists and staff that will directly or indirectly facilitate efficient implementation of procurement. At the implementation level, support shall be provided by the field teams and Project Supervision & Implementation Assistance Consultants (PSIAC). The Bank will conduct procurement training sessions to facilitate efficient procurement and contract implementation.

48. A Procurement Plan containing activities planned for the first eighteen (18) months of project implementation is ready and acceptable to the Association. Moreover, the procurement process for three large consultancies has been initiated and the contracts are expected to be awarded in April 2015.

E. SOCIAL (INCLUDING SAFEGUARDS)

49. The Social Assessment (SA) concluded that there is a strong demand for the Project by farmers, as the interventions (improvement of water courses, promotion of HEIS particularly in water deficient areas, laser land leveling and deep ripping , improvement in crop and irrigation agronomy practices) will benefit directly land owners (small and medium size), sharecroppers and tenants. The project beneficiaries will include vulnerable male and female small farmers. The lining of water courses will reduce conflicts and promote social cohesion among farmers. Continuous consultations and transparency in selection of beneficiaries are key to a successful implementation of the social safeguard aspects under the project, as are awareness and information dissemination, proper institutional arrangements for social and gender activities and monitoring, evaluation, including beneficiary feedback mechanisms.

50. **Social Safeguards:** No adverse social impacts are anticipated due to project interventions and the project is not expected to result in any resettlement. Under Component A2, the Implementing Agency will need land for the construction of flood shelters. The required land will be donated by communities or district governments. The Implementing Agency does not have any plans to acquire private land for this purpose. However, to address any potential loss of livelihood OP 4.12 on involuntary resettlement has been triggered, a Resettlement Policy Framework has been developed after extensive consultations, approved and disclosed on March 4, 2014. The limited social risks due to construction activities will be mitigated as per the social management plan, developed under the project. The World Bank Policy on Indigenous People will not be triggered as no indigenous people reside in Sindh.

F. ENVIRONMENT (INCLUDING SAFEGUARDS)

51. The project interventions are expected to have significant environmentally positive impacts including increased water use, reduction in loss of arable land due to use of water high in salinity and reduction in pesticide usage. Nevertheless, Project interventions need to be screened for any negative localized impacts. The Project has therefore been categorized as 'B.' A detailed Environmental Impact Assessment (EIA) has been conducted. The Project design includes adequate institutional arrangements for addressing and implementing all aspects of environmental safeguards. Extensive stakeholder consultations were conducted during the EIA preparation process. After completion of the draft report and the analysis of key concerns expressed, mitigation measures were included in project design. The approved safeguards documents were disclosed on March 4, 2014.

52. The EIA analyzed project alternatives including alternative methods for irrigation, land leveling, water conservation, and civil works to assess their potential environmental impacts. It was determined that the proposed methodologies provide the optimal solutions for meeting the Project objectives while eliminating environmentally negative impacts. The project benefits far outweigh the "without project" scenario. Potential environmental impacts include decreases in groundwater recharge, loss of flora or cutting of trees, increases in siltation due to improper disposal of excavated material or inadequate design or construction of water courses, and impacts on inclusive access to resources for both genders. Mitigation measures have been proposed for all the potential impacts, none of which are expected to be intense, expansive, or irreversible. Mitigation measures include compensatory tree planting by the ratio of 1 to 4 trees for each tree felled, construction of washing bays to continue ensured access to resources for women and measures for adequate disposal of excavated material.

53. Although the project interventions do not involve distribution or use of any pesticides, changes in water use may affect the pesticide use regime in the Project area. The Integrated Pest Management policy is thus triggered, and an Integrated Pest Management Plan (IPMP) has been prepared. Activities to be undertaken as part of the IPMP include biological and social control methods (capacity building) highlighted under Component C of the Project, as well as monitoring and testing to be carried out. In addition, the use of organic fertilizers would be promoted.

G. OTHER SAFEGUARDS POLICIES TRIGGERED

54. Because the project area is located on the Indus basin part of the Pakistan territory, which is an international waterway, the International Waterways Policy (OP 7.50) is triggered. Consistent with the policy notification exception provisions, the Project does not involve works and activities that would exceed the original scheme, change its nature, or alter or expand its scope and extent to make it appear a new or different scheme. In addition, the nature of works envisaged under the proposed project: (a) will not adversely affect the quality or quantity of water flows to other riparians; and (b) will not be adversely affected by other riparians' water use. Therefore, the Project falls within the exception to the notification requirements of OP 7.50, set forth in paragraph 7(a) of OP 7.50. RVP approval has been obtained for the exception.

H. WORLD BANK GRIEVANCE REDRESS

55. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

ANNEX 1: Results Framework and Monitoring

PAKISTAN: SINDH IRRIGATED AGRICULTURE PRODUCTIVITY EHNANCEMENT PROGRAM PHASE-I PROJECT

Project Development Objective (PDO): The project development objective is to improve irrigation water management at tertiary and field levels in Sindh.

PDO Level Results Indicators	Core	UoM	Baseline	Cumulative Target Values						Frequency	Data Source/ Methodo-logy	Responsi-bility for Data Collection	Comments/ Definitions
				PY1/d 2016	PY2 2017	PY3 2018	PY4\ 2019	PY5 2020	PY6 2021				
1. Water courses with an increase in water course conveyance efficiency of at least 15%.		Number	0	0	2,000	3,000	3,900	4,600	5,500	Bi-annually	M&E Report	M&E consultant	Based on a sample of representative water courses - by size and location (10% of total).
2. Direct project beneficiaries (number), of which female % /a	☒	Number/ Percentage	0/0	285,000/ 25%	619,000/ 25%	980,000/ 25%	1,323,000/ 25%	1,685,000/ 25%	2,000,000/ 25%	Annually	M&E Report	M&E consultant	Core indicator 1. /a
3. Water users provided with new/improved irrigation and drainage services, of which female %	☒	Number/ Percentage	0	30,000/ 25%	65,000/ 25%	103,000/ 25%	139,000/ 25%	177,000/ 25%	210,000/ 25%	Annually	M&E Report	M&E consultant	Core indicator 2. Will be gender disaggregated.
4. Increase in cropping intensity (CI) in water course areas. /b		Percentage	0 (baseline CI=115%)	0	0	20	20	20	20	Annually	M&E Report	M&E consultant	Measured in year 2 after improvement. Sample size: 10% of WC, 6 farmers/WC (2 each head/middle/ tail of canal, on each side)
5. Increase in cropping intensity through HEIS. /c		Percentage	0 (baseline CI=115%)	0	0	0	50	50	50	Annually	M&E Report	M&E consultant	Measured in year 2 after establishment. Sample size: Average of all HEIS: 10% of project WC with HEIS, 3 farmers per WC; 10% of non-project WC with HEIS, 3 farmers per WC; 10% of tubewell HEIS farmers. Excluding small HEIS kits. Baseline is same as WC baseline.

\a Number of farm households benefiting by sub-component: A1: 198,000; A2: 121,000 B1: 2,600; B2: 10,000; C1: 60,0000; C2: 37,500. Not added as some households benefit from more than one sub-component. Calculation of total direct project beneficiaries is based on 235,000 households and an average household size of 8.5.
\b Target values apply to WC improved in previous years, /c Target values apply to HEIS established in previous years. CI targets for row crops only (orchards CI remains 100%).
\d PY means Project Year which starts January each year.

Intermediate Results Indicators	Core	UoM	Base-line	Cumulative Target Values						Frequency	Data Source/ Methodology	Responsi-bility for Data Collection	Comments/ Definitions
				PY1 2016	PY2 2017	PY3 2018	PY4\ 2019	PY5 2020	PY6 2021				
Component A: Community Water Infrastructure Improvement													
Intermediate Result A1: Improved water courses are fully functional.													
1. Improved WC that are fully functional (including a functioning water course association).		Number	0	800	2000	3,000	3,900	4,600	5,500	Annually	M&E Report	M&E consultant	See definition /a.
2. Operational water user associations created and/or strengthened	☒	Number	0	800	1,700	2,700	3,700	4,600	5,500	Annually	M&E Report	M&E consultant	Core indicator 4.
3. Farmers benefitting from improved water courses, of which female headed households (%)		Number/ Percentage	0	28,800/ 25%	61,200/ 25%	97,200/ 25%	133,200/ 25%	165,600/ 25%	198,000/ 25%	Annually	M&E Report	M&E consultant	Part of core indicator 2: water users provided with irrigation and drainage services (not gender disaggregated.
4. Total command area of improved WC.		Hectares	0	80,000	170,000	270,000	370,000	460,000	550,000	Annually	M&E Report	M&E consultant	Reflects core indicator 3 : area provided with irrigation and drainage services – improved.
5. Area provided with irrigation and drainage services (i) New (ii) Improved	☒	Hectares	0	(i) 0 (ii) 80,000	(i) 4,380 (ii)174,380	(i) 7,050 (ii) 277,050	(i) 9,720 (ii) 389,720	(i) 12,290 (ii)472,290	(i) 14,000 (ii) 564,000	Annually	M&E Report	M&E consultant	Core indicator 3. Includes water course improvements and establishment of on-farm HEIS (indicator 9).
Intermediate Result A2: Flood shelters established by the project and providing access to vulnerable people in the targeted communities.													
6. Flood shelters established.		Number	0	0	87	180	283	380	380	Annually	M&E Report	M&E consultant	
7. People (households) having access to the shelters, of which female headed households (%).		Number/ Percentage	0	0	24,450 (2,876)/ 25%	50,550 (5,947)/ 25%	79,350 (9,335)/ 25%	106,650 (12,547)/ 25%	106,650 (12,547)/ 25%	Annually	M&E Report	M&E consultant	Based on avg. 150-300 people/shelter and 8.5 people per HH (Ag. Census 2010). In addition, 114,000 head of livestock will be accommodated by the shelters

\a Definition: Water course is fully functional if a WCA is fully functional and adequate resources are allocated for O&M of the WC.
A WCA is considered fully functional if the association is formed, registered, opened a bank account and carries out rehabilitation works.
It will be measured (a) 6 months after the completion of the improvements, which will provide a sense of the speed for the water course to be functional, and (b) at the end of the project, which will assess its sustainability over time.

Intermediate Results Indicators	Core	UoM	Base-line	Cumulative Target Values						Frequency	Data Source/ Methodology	Responsibility for Data Collection	Comments/ Definitions
				PY1 2016	PY2 2017	PY3 2018	PY4\ 2019	PY5 2020	PY6 2021				
Component B: Promotion and Installation of High Efficiency Irrigation Systems (HEIS)													
Intermediate Result B1: Small and medium-sized HEIS established.													
8. Farmers provided with HEIS, of which female headed households (25%)		Number/ Percentage	0	0/ 25%	770/ 25%	1,255/ 25%	1,740/ 25%	2,215/ 25%	2,600/ 25%	Annually	M&E Report	M&E consultant	Part of core indicator 2: water users provided with irrigation and drainage services (not gender disaggregated.
9. Area established under HEIS		Hectares	0	0	4,380	7,050	9,720	12,290	14,000	Annually	M&E Report	M&E consultant	Definition: "HEIS equipment is appropriately maintained and adequate resources are allocated for O&M".
Intermediate Result B2: HEIS established in kitchen gardens.													
10. Households provided with HEIS in kitchen gardens. (Total/female headed)		Number	0/0	1,000/500	3,000/ 1,500	5,000/ 2,500	7,000/ 3,500	9,000/ 4,500	10,000/ 5,000	Annually	M&E Report	M&E consultant	
Component C: Improved Agriculture Practices													
Intermediate Result C1: Service providers meet project farmers' demand for land leveling and deep ripping.													
11. Area covered by laser levelling.		Hectares	0	14,569	43,706	80,128	116,550	145,687	160,256	Annually	M&E Report	M&E consultant	
12. Area covered by deep ripping.		Hectares	0	9,712	29,137	53,419	77,700	97,125	106,837	Annually	M&E Report	M&E consultant	
Intermediate Result C2: Improved agriculture production technology applied by project farmers.													
13. Farmers trained on improved agronomic practices and technologies, of which female (20%)		Number/ Percentage	0	5,000/ 20%	12,500/ 20%	20,000/ 20%	27,500/ 20%	32,500/ 20%	37,500/ 20%	Annually	M&E Report	M&E consultant	
14. Area under improved agronomic practices.		Hectares	0	7,000	17,500	28,000	38,500	45,500	52,500	Annually	M&E Report	M&E consultant	Assumption: avg. 1.4 ha per farmer (50% of avg. farm size).
Component D: Project Management, Monitoring and Evaluation													
Intermediate Result D: Project efficiently and effectively managed to achieve planned results.													
15. Essential staff for project management fully operational and retained during project live, incl. 100 field teams.		yes/no	No	Yes All positions filled and staff fully operational.						Annually	Staff Report	M&E consultant	

ANNEX 2: DETAILED PROJECT DESCRIPTION

Pakistan: Sindh Irrigated Agriculture Productivity Enhancement Project (P145813)

Background Rationale of the Project

1. **Irrigated Agriculture in Sindh.** Sindh is the second most populated province of Pakistan. The province covers an area of 140,900 km^2 (over 14 million ha), and has a current population of over 43 million, out of which about 16 million live in Karachi city alone. Over 60 percent of the rest of the population lives in rural areas. The total Cultivable Command Area (CCA) is about 12.146 million acres (about 5.8 million ha excluding some parts of Baluchistan) and over 800,000 farms. The region extending from Guddu Barrage to the Arabian Sea constitutes a large and contiguous irrigation system. Major crops in Sindh include cotton (13.2 percent), rice (10.2 percent), sugarcane (6.5 percent), and wheat (33.0 percent), all of which are grown in areas which have been gradually expanding over the last decade. Fruits are raised on 148,000 ha, primarily mango (58 percent) followed by dates and banana (30 percent). Sindh province has three major barrages, 14 main canal commands and draws about 54 to 60.47 billion cubic meter of water annually. The canal system has an aggregate length of 19,070 km (11916 miles) serving a gross command area (GCA) of 5.71 million ha (14.09 million acres). There are about 46,699 water courses, with a combined length of about 120,000 km (75,000 miles). Sindh accounts for an estimated 30 percent of Pakistan's GDP, including a substantial share of agricultural GDP, specializing in the production of food crops like wheat, rice and fruits, which are grown mainly in irrigated areas. The growth in the agriculture sector and its growing commercial orientation has resulted in increased cropping intensity, crop diversification, and shifts to high yielding hybrid varieties that consume more water. Water savings has therefore become a critical issue for irrigated agriculture in Sindh.

2. **Agriculture Productivity.** Even with extensive irrigation infrastructure, widespread use of chemical fertilizers and pesticides, and availability of hybrid seeds in the market, agriculture productivity is low in Pakistan and in Sindh. Compared to other countries with similar agro-climatic and water availability conditions, average crop yields are 50-70 percent lower than those of for example Turkey, Egypt, and in case of cotton Uzbekistan. Low productivity is generally due to mis-management of irrigation water, inappropriate use of crop inputs such as fertilizers and especially pesticide, and low utilization of better and hybrid seeds. Given lack of enforcement of regulation and quality control over much of crop inputs, low R&D and low capacity of extension service providers, low agriculture productivity persists. The low levels of compliance with international quality standards impact the marketing and export of agriculture products abroad.

3. **Water Conservation Requirement.** With population growth and increasing demand for water, Pakistan has been expanding surface water supplies to the Indus River Basin System (IRBS) over time. Water diversion records indicate that water flows to the IRBS were increased from 67 million acre feet (MAF) in 1967 to 105 MAF in 1976. Diversions to Sindh province were also increased (average 44 MAF in the period 1976 to 2000). In the decade from 2001 to 2011, however, the volume of that diversion declined to 38.6 MAF (Ref. Report 63459 PK, PIAIPP Table 2.1 of Annex 2). This was the result of reduced storage capacity in the reservoirs, in part because of sedimentation, and in part because of a decade of relatively low flows. Major deficits took place during the Rabi season. Increases are only possible with some more storage dams on the Indus River, many of which are controversial owing to sedimentation and climate

change. With the water resources available for diversion now reaching their limit, reducing water losses and improving water conservation have become crucial for Pakistan.

4. Under the prevailing situation, substantial quantities of water saving will come from reducing surface water supply losses, particularly in the water course command and fields where losses are highest and do not contribute to groundwater recharge. The quantity of water that could become available with about a ten percentage point reduction in losses in the water course command is more than two sizable dams on the Indus River. The project is designed to capture this potential in addition to making water use more efficient at the farm level by introducing HEIS, crop diversification, and improved agronomic practices. With continued use of traditional (flooding) or surface irrigation alone, Pakistan will not have adequate water to meet future demand. A paradigm shift to more efficient way of irrigation is warranted.

Irrigation and Drainage Sub-Sector Issues

5. **Low Delivery Efficiency in Water courses.** An estimated 40 to 50 percent of the water that is delivered through community water course networks is lost. The main causes of these losses are seepage, spillage, and side leakage from the water course banks due to the following factors: (i) irregular profile and zigzag alignment of banks and weak sections of the earthen channels; (ii) variable cross section and bed slope of water channels, resulting stagnant water in channels; (iii) silt deposition, causing restrictions in flows, and resulting in overtopping; (iv) trees, shrubs, and vegetative growths in water courses; (v) damage caused by rodents and farm animals; (vi) frequent bank cutting and plugging for water abstraction unruly; and (vi) loosening earthen banks and beds over time without regular maintenance.

6. The water course improvement and renovation will consist of complete demolition of the community channel and its reshaping or realigning and compaction of banks according to the engineering design to increase conveyance efficiency by reducing seepage, spillage, and operational losses. A secondary benefit to the reduction in seepage will be reduced waterlogging in some areas.

7. **Low Field Application Efficiency.** Flood irrigation in field application is a traditional method adopted by most farmers in Pakistan. A significant amount (20 to 25 percent) of irrigation water is lost during its application due to unevenness in fields and poor field designs. This leads to excessive water application in low-lying areas and under-irrigation in more elevated areas of a field. Over-irrigation leaches soluble nutrients from the crop root zone, makes the soil less productive, and degrades groundwater quality. The under-irrigation of elevated parts of the fields results in accumulation of salts in such patches and causes water stress and de-osmosis due to applied fertilizer. The efficiency of the field irrigation method ranges from 40-70 percent, while the High Efficiency Irrigation System (HEIS) such as drip and sprinkler irrigation systems are up to 90 percent efficient, with water saving up to 68 percent as shown in the table 2.1 below. The main benefits of the HEIS system is to increase crop yield due to better water management practices and readily available plant nutrients through injection in the system i.e. nutrients are supplied directly to the plant root zone. Therefore, utilization of agriculture inputs is also enhanced.

Table 2.1 Comparison of Conventional Flood Irrigation vs Drip Irrigation System

Crops	Yield (t/ha)		% diff	Water supplied in cm depth		% of water saving
	Flood	Drip		Flood	Drip	
Banana	57.5	87.5	52	178	97	45
Grapes	24.4	32.5	23	53.2	27.8	48
Sweet Lime	100,000	150,000	50	166	64	61
Pomegranate	5.5	10.9	98	144	78.5	45
Tomato	32	48	50	30	18.4	39
Brinjal	28	32	14	90	42	53
Papaya	13.4	23.4	75	228	73.3	68
Chilly	4.2	6.1	44	110	41.77	62
Sweet Potato	4.2	5.9	39	63	25.2	60
Sugarcane	128	170	33	215	94	56
Cotton	23	29.5	27	89.53	42	53

8. The High Efficiency Irrigation System (HEIS) technologies have been developed and successfully adopted in countries such as the USA, Australia, China, Israel, and India. A major constraint to the adoption of these technologies is their high installation costs. Over time, the issue has been resolved through research and development on new construction materials, and low-cost efficient irrigation technologies, particularly in China and in India, where cost effective systems have been developed for orchards and all field crops and vegetables. The experience of other countries and studies conducted in the recent past suggests that introduction of high efficiency irrigation systems is highly effective in conserving water resources. This new practice has been introduced to Pakistan in the private sector and with the supporting mechanism under the proposed project its development will be faster.

9. The proposed project will thus be designed to deliver a combination of interventions: (a) water courses improvement to upgrade the efficiency of delivery the field; (b) precision land leveling to improve the applications in the field where flood irrigation will remain prevalent in the near future (e.g. wheat, rice, fodder etc); (c) HEIS – drip irrigation for orchard, vegetables, flowers, other high value row crops. The project is seen as a transformational operation geared to fundamentally changing how agricultural water is used and how the demand for this water is managed – with particular emphasis on its role in food production.

10. Because most of the elements of the interventions are available in the country, the project will help bring them together in a manner that encourages their uptake by the private sector. Furthermore, these interventions help in improving agricultural productivity through appropriate application of inputs, increased water conservation, reduced water logging and salinity, and changes in cropping patterns, crop husbandry, and diversity. These interventions are synergetic, and provide an extremely potent package of solutions to improve irrigation efficiency, crop production, and diversification.

11. **Drainage, Water Logging and Storm Water Management.** Sindh is the furthest downstream province in the Indus basin, bordering the Arabian Sea and located at the delta of the Indus River. The delta is located in an essentially flat terrain in which the river in most places is higher than the surrounding lands. For this reason, the river cannot drain areas throughout much of Sindh, and the province is subject to drainage deposits from both upstream and semidiurnal oceanic tides. The average groundwater table is also very shallow, around 2.5 m

beneath surface. In 25 percent of the province the groundwater table is even shallower and the land is waterlogged. Around 78 percent of the province is underlain by saline groundwater due to its proximity to the sea and poor drainage. Surface and sub-surface drainage systems are inadequate, resulting in much of the drainage effluent being either retained in the basin or discharged into rivers and canals.

12. Only 2.5 million of 5.8 million ha of irrigated land are served by drainage systems. Even where drainage is in place, it cannot always drain the area properly, for instance during monsoons. Water logging is severe closer to the Indus River on both sides and the problem dissipates in lands close to the main drains. Inadequate and poor drainage is causing continuous land and environmental degradation. Every year thousands of hectares of valuable land are abandoned due to water logging, salinity, and frequent and prolonged flooding. Addressing the drainage issue in Sindh will require a comprehensive systems approach together with ample financial resources. Past World Bank engagement in the sector included the construction of the Left Bank Outfall Drain under the National Drainage Program with its problems which explains the Bank's understandable cautiousness about re-engaging in this area. Yet the critical importance of the drainage issue to agricultural and environmental sustainability in the province has made this re-engagement something of a practical imperative. Related to drainage is the management of storm water drainage which has far reaching implications, especially for the poor. Inadequate drainage is evidenced by the long period (more than 3-4 months) of submergence of agricultural land by heavy rain storms and flood waters during the flood of 2010, the cyclone of 2011, and heavy monsoon rains annually. Undertaking mitigating measures is essential for the poor to avoid total loss of livelihood.

13. **Natural Disasters and Sustainability of Farming for the Poor**. During the two successive 2010 and 2011 floods, farmers in many areas of Sindh experienced flooding followed by long periods during which standing, stagnating water destroyed crops, irrigation systems, food and seed stock, livestock, and homesteads. The direct and indirect losses to the agriculture sector was estimated to be over US$300 million in 2011, and over US$400 million in 2010 with reconstruction costs of much higher magnitude. These floods have disproportionately affected the very poor, small farmers and landless in rural Sindh, as the loss of livelihood was much greater given their limited assets. Poor communities, especially those who could not afford to improve their homesteads in these areas have been requesting raised flood shelters to avoid total loss of livelihood in the event of another disaster. To extend the benefits of the project to the rural poor, the project will include a component to support socially and culturally appropriate community flood shelters – community centers to be built in areas subject to frequent flooding. The program will be on a demand basis with communities and the public sector providing the land to facilitate construction. Under the project, these flood shelters will be built in seven vulnerable districts[2] and the facilities will be handed over to the District Administration and Provincial Disaster Management Agency, which has agreed to take over for O&M after the project.

Project Description

14. The proposed project is an important element of the Government of Sindh development program and the Bank's strategy in the water and agriculture sector for Sindh, supporting systemic infrastructure rehabilitation and modernization, improved service delivery in a socially

[2] The proposed seven districts which were severely affected are in 2010 and 2011 flooding are Tundo Muhammed Khan, Tando Allahyar, Shaeed Banazirabad, Mirpurkhas, Thatta, Badin, and Sanghar

and environmentally sustainable manner to support the long-term goal of food security and sustainable economic growth. The project supports efficient management of scarce water resources and is designed to augment adaptation under different climate change scenarios and population growth. Most of the project interventions are well tested and demand driven, with reasonable co-financing from beneficiary farmers. The project is low risk, low cost, and will generate high yield economic and financial returns. It will also generate substantial social as well as economic benefits. These include enhanced equity in water distribution between tail and head users in water course command, increased participation by farmers, and cooperation that leads to improved O&M of the system. It will generate jobs, provide flood shelters/community centers to mitigate flood risk, and strengthen social cohesion. The project will be implemented in six years and have the following components.

15. In addition, the project design is based on the lessons learnt from the Sindh On-Farm Water Management and the associated Additional Finance. The expected results including increase in conveyance efficiency, cropping intensity and crop yields are based on the actual results achieved under these projects. Similarly rates of cofinancing by the farmers in watercourse improvement and in laser land levelling equipment distribution are based on those projects. The Project is also to be compatible with the Punjab Irrigated Agriculture Productivity Improvement Project in terms of rates for subsidies for various activities, such as High Efficiency. The project is complementary to the WSIP where rehabilitation of the secondary canal system and the reform process in the irrigation sector is taking place. Other agriculture activities such as marketing and value chains for some of the crops are being addressed under Sindh Agriculture Growth project. The project background and rationale for implementation can be seen in the project description Annex 2 file in the Project File.

Component A: Community Water Infrastructure Improvement. (US$ 120.20 million, IDA US$ 95.90 million)

16. **Sub-Component A1: Community Water course Improvement.** The sub-component will assist Government of Sindh efforts to improve water courses (WC), which constitute the tertiary level water distribution system where water losses are highest. Of the 140,000 total water courses in irrigated areas of Pakistan, around 95,000 have been improved under various programs supported by donors including the Bank and the Government. In Sindh, there are 46,699 water courses out of which 28,856 have been improved so far. Of the remaining 17,843, about 5,500 water courses will be improved under the project through the provision of lining on average 30 percent of its length. The recent impact assessment of the lining of water courses in general, and in Sindh in particular has shown three advantages: (i) it decreases conveyance losses and prevents seepage to groundwater aquifers; (ii) it helps to deliver water faster to the farmers' fields, so they can take advantage of the full duration of an irrigation cycle under the *wara-bundi* system; and (iii) it ensures equity in water distribution. Activities under this component will include farmer mobilization, establishment of Water Course Associations (WCAs) and their registration, survey and design, and construction.

17. The work includes: (a) improvement and realignment of the entire earthen section of Water course (WC are usually in fill section), and compaction of embankment to the necessary requirement; (b) lining of 30 percent of water course either by precast concrete parabolic lining (PCPL) segments or rectangular brick masonry depending on choice of farmer and availability of construction material in the area. PCPL segments will be placed on leveled compacted earth with water tight joints, thus improving existing technology of brick lining; and (c) replacement of

water outlet structures with properly designed concrete structures (*pucca nakas*) on the entire length of WC. Water course Associations (WCAs) will be formed before any improvement and WCAs will share the cost through skilled and unskilled labor for shaping and compaction of WC earthen sections and the Project will provide the construction material for lining.

18. Farmer mobilization, survey and design will be carried out by the field teams based in all 24 districts. Training in farmer mobilization and other matters will be provided to the field teams by Technical Assistant & Training (TAT) consultants. Community agreements will be signed with Water Course Associations. Construction will be carried out by the Water Course Associations with their choice of material and contractors. Construction will be administered by the farmers as well, and supervised by design and supervision consultants. Designs verification and construction supervision and quality control will be done by Project Supervision and Implementation Assistance Consultants (PSIACs) who will perform the Engineer Role. Monitoring and Evaluation (M&E) consultants will carry out third party monitoring of physical progress, impact assessment, and implementation status of environmental and social management plans. Quality control of the construction material will be done by the DGAWM and the PSIACs.

19. The farmers will co-finance 24 percent of the costs through provision of skilled and unskilled labour. Estimated beneficiary farm families are about 198,000 covering about 550,000 acres in the 5,500 water courses in 24 districts of Sindh.

20. **Sub-Component A2: Mitigating Flood Risk for the Poor.** To extend the secured benefits of the project to the rural poor, this subcomponent will finance provision of approximately 380 flood shelters of three types in the most vulnerable seven districts of the Sindh. These flood shelters are especially important for the landless and the very poor, particularly women, children, elderly and disabled along with their belongings. Their life savings and belongings include the animals they own and food stock they consume. Current design provides shelter for 106,650 people and about 114,000 cattle in the most affected seven districts in Sindh. The design is such that some shelters, during non-flood seasons, can also be used for community activities where local population can exchange ideas on farming, animal husbandry, health, nutrition, and education - and where women can share their many talents in crafts for which Sindh is famous. Strong community participation and willingness to contribute in kind with strict norms will be used for wider community participation. As such, it is envisaged that these centers will change the current social dynamics in the rural areas and improve social cohesions which are urgently needed.

21. The designs of the three types of shelters are simple, low cost, and durable and are designed for easy access by the communities. Most of the construction material for making raised platform can be available from annual unsilting of sand and silt from irrigation canals. The land for construction will be largely public or community owned land located in non-cultivable areas preferably on higher ground. An agreement has been reached with the Provincial Disaster Management Authority (PDMA) that once constructed, these shelters will be officially transferred to them for operations and maintenance with additional agreement for some that will be used for community activities. The authority will be invited to be closely involved during implementation from site selection to construction and takeover. Linkages with developing partners such as UNICEF Mother and Child Program, the World Bank financed nutrition and education projects will be further explored to utilize these facilities for promotion of women's interests and to prevent potential capturing of these facilities by powerful land lords in these areas. Water Course Associations will also be encouraged to use these shelters as their meeting points/small offices. To implement this sub-component, NCB contract/s will be used to construct

the facilities with detailed design and construction supervision provided by the Project Supervision and Implementation Assistance Consultants.

22. Type 1 and Type II shelters are each of ordinary raised compacted earthen platforms protected on all sides by brick toe wall (0.7m high) bounded. The total height will be about 1.5 meter high earthen mound on relatively high, uncultivable land near irrigable area and will have about 50mx30m area on top. The earthen mound will have separate level ramp, the lower level for animals and the higher level for humans. The surface of the higher ramp will be covered with crushed rubble stone masonry to protect from wear and tear. Type I and II have similar specifications except in finished size for people area. The Type III is of similar earthen mound but the shelter will be facilitated with a raised hall building as mentioned above for off flood season use. The general features of the three types and capacity in each platform are mentioned below. Because of the public gathering amenities available in Type III, these shelters will be located near districts centers.

Table 2.2: Flood Shelters

Type (Numbers planned)	Area of Elevated Platform (each shelter) sq. meter	Capacity of Platform for people	Nos. of Livestock on lower ramp (2.5 m^2/animal)	Estimated unit costs Rupees Million
I (195 nos)	1,500	270	300	2.420
II (175 nos)	1,500	300	300	2.360
III (10nos) with bldg.	288 (raised floor)	150 (upper floor)	300 (ground level)	8.350

23. **Sub-Component A3: Project Supervision and Implementation Assistance Consultants (PSIAC).** Under this sub-component, the project will finance consultants for project design and construction supervision for all above components A and B, such as water courses improvements, flood shelters and HEIS. The consultancy contract includes reimbursable items and the consulting firm will be selected using QCBS. They will work closely with the Project Implementation Unit, other technical assistance and M&E consultants. They will also carry out, if required, various studies to be prepared under the project.

24. **Component B: Promotion and Installation of High Efficiency Irrigation Systems (HEISs) (Total US$ 65.80 million, IDA US$ 40.10 million)** This component will support the promotion and installation of high efficiency irrigation systems (HEISs) such as drippers and bubblers for growing, horticulture, vegetables, floriculture and other high value and row crops. This component will support (a) the introduction and installation of high efficiency irrigation systems (HEISs) such as drippers and bubblers for horticulture, vegetables, floriculture and other high value crops grown on small commercial farms, as well as (b) the introduction and distribution of kitchen garden drip irrigation kits for female headed households and landless farmers. The primary target groups of potential beneficiaries will be (a) vegetable/cash crop growers, owners of newly established and established orchards and other high value crop growers in irrigated areas, and (b) farmers living and producing in the outskirts of large metropo-litan areas where they have easy access to cities and markets (and where the demand for cash crops is high) in those areas not served by existing irrigation systems, the rainfed areas and where access to fresh ground water is available.

25. Eight capable service providers termed “sale supply and services companies” (SSCs) operate in Pakistan and in Sindh, and will be employed to install HEISs. They are successfully providing service under the on-going similar project in Punjab. It is expected that additional service providers would come to the market given the demand under these two projects. A

technical assistance package will be made available by the vendors to the farmers to promote adaptation of the new water saving irrigation technology to specific (but varying) site conditions. Additional training and technical assistance will be provided by the field teams' experts in HEIS and agronomy to promote crop diversification. Backstopping for the field teams would be provided by the TATC. HEIS equipment and material will be provided on a shared cost basis, in which the project will cover 60 percent of the cost and the farmers the remaining 40 percent in the case of commercial farms, and 90 percent versus 10 percent respectively in the case of kitchen gardens and demonstration plots. This component will comprise of the two following sub-components.

26. **Sub-component B1: Small and Medium-sized HEISs for 2 to 10 ha (5 acres to 25 acres) Farms.** This sub-component will assist small and medium sized farmers to install HEISs of different size, mainly in the form of drippers and bubblers. It is estimated that about 2,600 HEISs will be installed on about 14,300 ha (35,000 acres) of irrigated and irrigable land in Sindh.

27. The drip irrigation farms will be equipped with a pond or water storage tank, a head unit including pump, fertilizer tank, filters, and delivery fittings, as well as a main pipeline, delivery lines, and drippers. Wherever water is withdrawn from water courses, water storage tanks will be built to store a sufficient amount of water for a weekly irrigation cycle. The size of the storage tank will be proportionate to one week's supply of irrigation water to the field. Potential beneficiaries of this sub-component will be growers of vegetables and cash crops, newly established orchards and other high value and row crops such as pulses, flowers, and cotton. To a much lesser extent, tube wells will be used in rainfed areas that are not served by existing irrigation networks and along some water courses as well. Priority will be assigned to small but sufficiently large farms (because of economic reasons, see below) situated in the outskirts of large metropolitan areas for peri-urban agriculture. In these settings, farmers have easy access to the cities and markets where the demand for cash crops is high.

28. HEISs will be installed by Supply & Service Companies (SSCs) and given on a shared cost basis. The project will cover 60 percent of the equipment and installation cost and the farmers the remaining 40 percent. In Sindh, there are numerous capable SSCs qualified to render the necessary services. A tripartite agreement among the PIU, the SSC and the farmer who requests the HEIS will constitute the basis of operation, viz. spelling out rights and duties of the three partners when installing a HEIS. A technical assistance package will be provided by the vendors to the farmers to promote adoption of the water saving irrigation technology. In addition, technical assistance and training in crop production under the HEIS will be provided to individual farmers, farmers' groups and Water Course Associations (WCAs) through Project Component D. Given the fact that this technology is not yet well known throughout Sindh, a social awareness campaign and farmer mobilization will be initiated and carried out by the Project Supervision and Implementation Assistance Consultants supported by 100 field teams. In each field team responsible for the installation of HEISs, one person will be trained in operation and maintenance (O&M) by the PSIAC.

29. The sites for installation of HEISs will be selected based on at least the following *two sets of criteria*, one for the selection of the farm and the other one for the selection of the farmer.

The farm

a) is situated in an area without major ravines, deep ditches, flood evacuation courses or other obstacles which could not be overcome through an economic HEIS design.

b) has an adequate and reliable water source of suitable quality, e.g. through a water course or an operational tube well;
c) is preferably located in an area with adequate access to the road network in order to have good demonstration effect; and
d) has suitable soils for growing high value crops and/or is establishing an orchard under drip irrigation which is not severely degraded due to water logging, salinization, or alkalization.

The farmer

a) is expected to sign a tripartite agreement together with the Government of Sindh and the respective SSC which regulates all rights, duties and responsibilities of the three parties related to the HEIS installation. Those farmers who are eligible will:
   - agree to contribute at least 40 percent to the total HEIS installation cost.
   - agree to cover operation and maintenance expenditures after the installation of the HEIS;
   - agree to provide support and assistance to project staff, SSCs and PSIC during their activities pertaining to site surveys, installation of HEIS equipment and implementation of civil works;
   - not be a defaulter of any revenue/financial institution;
   - not remove or sell or transfer or hand over possession of an installed HEIS to any person in any form within three years after implementation completion;
   - agree to instruct the HEIS operator to undergo training in operation & maintenance including trouble shooting provided by the SSCs, and DGAWM staff, assisted by training consultants;
   - abide by the decision of the Allotment Committee; and
   - be liable to repay the full amount of financial assistance received in case of violating any of the conditions specified in the Tri-Partite-Agreement.

30. There is also a need to assess the financial viability of each HEIS farm prior to the investment which should be included in the selection criteria (in the form of a business plan). The financial analysis of various HEIS farm sizes and systems at appraisal shows that 4 and 10 ha farms are financially viable both for row crops and orchards (with Financial Internal Rates of Return (FIRR) of above 12 percent, the opportunity cost of capital). HEIS farms of only 2 ha generate a FIRR below 12 percent (9.1-11.5 percent), except row crops in unimproved WC (12.6 percent). The low financial viability is due to the relatively high investment cost that is around 65 percent of the cost of a 4 ha farm.

31. All criteria will be revised and updated every six months in light of the implementation experience and monitoring results in order to ensure that project objectives are met in accordance with results indicators.

32. This sub-component will assist small and medium sized farmers to install and operate HEISs of different size but mainly with the same irrigation technology, namely drippers and bubblers. About 2,600 HEISs will be implemented on about 14,300 ha (35,000 acres) of irrigated and irrigable land as follows:

Table 2.3: HEIS Farm Size

Type of crops	2 ha (5 acre)	4 ha (10 acre)	10 ha (25 acre)
Row crops	**300**	**500**	**250**
Orchards	**450**	**600**	**600**

33. **Sub-component B2: HEIS Demonstration Sites and Kitchen Garden HEIS Kits.** This sub-component will particularly strengthen the dissemination of the HEIS technology in Sindh. It will include approximately 48 demonstration sites of 2 ha (5 acres) each, two in each district, and finance the associated training of department staff and farmers including women in the installation, operation and maintenance of the HEISs.

34. It will address the poorest layer of the rural society: approximately 5,000 female headed households and 5,000 landless farmers. And it will support the promotion of HEIS technology through education and demonstration on approximately 100 demonstration sites, at least four in each district. At the demonstration sites, the project will finance training of Government staff and farmers including women and landless farmers in the installation, operation and maintenance of the kitchen garden HEIS kits.

35. A kitchen garden HEIS kit consists of drip irrigation equipment for a plot of 10m x 10m = 0.01 ha (0.025 acre) including a small water storage of 160 liter (40 gallon) with a conveyance pipe for the daily provision of water. It is expected that on such a plot three crops or 3 x 100 kg = 300 kg of vegetables could be produced annually. This will be a significant asset for a poor family and thus contribute to an increased income at increased water productivity.

36. Whereas the 100 kitchen garden HEIS kits for demonstration purposes will be provided free of charge, individual households will need to contribute 10 percent to the investment cost of US$ 150. Total sub-component cost for a total of 10,000 beneficiaries will be US$1.11 m (including training and technical assistance), shared by the project (1.01 m) and the individual households (0.1 m). Although only an area of 200 ha (500 acres) will be brought under irrigation through this sub-component, the expected promotional impact on spreading water saving irrigation technology throughout Sindh is considered to be important if not crucial.

37. All criteria will be revised and updated every six months in light of the implementation experience and monitoring results in order to ensure that project objectives are met in accordance with results indicators.

Component C: Improved Agriculture Practices (Total US$ 24.40 million, IDA US$19.30 million)

38. To increase the benefits of enhanced water availability from water course lining and high efficiency irrigation systems and to avert any negative developments such farmers starting to use excessive pesticides and synthetic fertilizers, this component will support farmers' training in improved crop production techniques and in acquiring relevant technologies for use on their farms. This component will support the following sub-components.

39. **Sub-Component C1**: **Laser Land Leveling and Deep Ripping.** Under this sub-component, the project will provide 1,100 units of precision land levelers to augment the existing limited capacity in Sindh. Laser land leveling benefits include 30 percent savings of irrigation water, uniform seed germination, uniform uptake of fertilizers, and thereby increased yields. Laser land leveling in Sindh was introduced in early 1990s and since has been supported by various programs by donors, including the World Bank and the Government.

40. The innovative approach, introduced under the recently completed World Bank funded project in the province supporting provision of laser land levelers, will be replicated under the

proposed project for further strengthening of laser land leveling services in Sindh. This involves provision of one-time financial assistance to service providers for procurement of equipment and their capacity building to carry out the envisaged task that proved to be quite successful.

41. The current number of operating levelers in the province is around 1,000 including about 50 purchased by farmers with their own resources. With this capacity, out of the total cultivated area of 7.64 million acres in Sindh requiring laser land leveling, about 0.5 million acres have been leveled so far. With estimated capacity of about 400 acres annually and the short window of time available for land leveling between the Rabi and Kharif crop seasons, the remaining area will require about 17,500 units to service all farms annually. It is therefore considered appropriate to add at least 1,100 more units to support the scaling up and help achieve a critical mass for sustainable market development in the province.

42. Given the sandy nature of soil in Sindh locating in the delta area of Indus and years of irrigation, two levels of compacted soil/hard pans in Sindh has been formed. One is the compaction of about 10 to 20 cm of top soil which is known to the farmers and they use chisel plough to break it. There are local manufacturers of the chisel plough in Sindh and the technology is known. However, only a limited number of farmers/agriculturalists know about the hard pan that exists about 0.50 to 1.00 m below ground surface. Given that Sindh grows deep rooted crops of cotton and sugarcane on a large scale, introduction of this technology will have a tremendous impact on crop yields. This technology has proven to boost crop yields by 20-25 percent under similar soil conditions in other parts of the world. Deep ripping followed by laser land leveling has proven most beneficial in water conservation and increase in crop yields. Deep ripping will be performed every three years. Given the novelty of the technology in Sindh, 5 demonstration plots will be established all over the province to pilot the activity here. Local manufacturers will be manufacturing deep ripping equipment for wider distribution to various service providers. It is planned that the project will provide about 1,100 units of deep ripping equipment on cost sharing basis to the service providers.

43. Under this component laser leveling and deep ripping equipment will be provided to service providers on a shared cost basis. The service providers will carry out laser land leveling and deep ripping for farmers on charge back basis as a business. A capacity for laser land leveling and deep ripping of about 330,000 acres annually will be developed, for which about 11,000 laser levelers and 1,100 deep ripper units will be provided. About 55 percent of the cost of laser land leveling equipment will be provided by the service provider who owns tractors capable of operating the laser and deep ripping units.

44. Management of the demonstration plots and provision of training of the operators will rest with TAT consultants.

45. **Sub-Component C2: Improved Agriculture Production Technology.** This sub-component will support improvement in crop and irrigation agronomy practices in the form of demonstration, and assistance in improved and modern technologies to increase the benefits of enhanced water availability from water course lining and high efficiency irrigation systems. The interventions will include:

(a) Establishing 1,500 farmers field schools (FFS) for about 10 crops on about 30 percent of the project renovated water courses with the members of the water course associations. This training will focus on proper land preparation; soil fertility and crop nutrition management; improved irrigation techniques and use of modern irrigation gadgets like soil moisture meter;

integrated pest management and safe handling of pesticides; and on-farm post-harvest losses management. Necessary training materials including brochures and training modules will be developed for training of facilitators and later for use of farmers in the FFSs. Curricula of these trainings be based on the outcome of Rapid Needs Assessment Surveys conducted with a representative sample number of Water Course Associations. These will also help to establish benchmarks on important aspects of the crop against which to measure the effectiveness of the FFS training program.

(b) Training 750 field facilitators to conduct training of the farmers in the FFS established. These trainers will be selected from the agriculture extension department, Water Management & Agriculture Engineering Department, local NGOs and lead educated farmers;

(c) Arranging exposure visits for 1,000 farmers, selected out of the FFS participants based on their active participation and contribution to the success of the FFS program. These visits will be within the country to best practice areas and exhibitions; and

(d) Establish 200 Natural Enemies Farm Reservoirs (NEFRs) as demonstration centers to promote rearing of beneficial insects on the farmers' fields. This will target mealy bug, pink bollworm and spotted bollworm for cotton and okra crops and fruit flies in mango and guava crops. Local Extension and Research will actively be encouraged to partner for their knowledge, information sharing and where needed capacity development.

46. **Sub-Component C3: Technical Assistance and Training (TAT) Consultants.** To implement these activities including necessary training under HEIS, the project will hire the services of a consultancy firm with expertise and experience in community mobilization, crop production technologies, irrigation agronomy, integrated pest management under the FFS methodology, biological control of pests, and on-farm post-harvest management technologies. Areas of training for HEIS will include HEIS installation and operation and repair and maintenance of HEISs in addition to above subject related to irrigation agronomy, crop diversification, crop production using HEIS, soil moisture availability, fertilizer application, salinity risk, and irrigation scheduling. For HEIS training, they will train the concerned staff of the field teams and other public sector staff a training of trainers. In addition, the consultancy will support management of the of various piloting activities such as HEIS, Deep Ripping and training of operators in laser land leveling and deep ripping.

Component D: Project Management, Monitoring and Evaluation and Strategic Studies (Total US$ 31.70 million, IDA US$ 31.70 million).

47. This component will support overall project management, M&E, studies and tours, and implementation of various management plans.

48. **Sub-Component D1: Monitoring and Evaluation (M&E) of Project Impact.** This sub-component will finance M&E of the Project results. The M&E activities will provide continuous feedback to the Government of Sindh on the project's performance and impact of its various components. To implement this sub-component, independent consultants will be recruited to monitor and evaluate: (a) implementation progress, including spot checking of works and quality of construction, and targeting of works as compared to agreed criteria; (b) project impacts; and (c) environmental and social impacts particularly on small and marginalized farmers and female farmers. The DGAWM will also have dedicated staff working in M&E activities and act as counterparts for these consultants. The consultancy contract includes reimbursable items and the consulting firm will be selected using QCBS. They will work closely with the PIU, other TA consultants and PSIAC consultants.

49. **Sub-Component D2: Management Plans, Strategic Studies, Incremental Expenditures.** This sub-component will include expenditures associated with (a) implementation of Environmental Management Plan, Social Management Plan, Gender Action Plan; (b) strategic studies and pilot projects for testing of new technologies in lining and others that will be identified during project implementation and study tours; and (c) incremental operating expenditures. The incremental operating and maintenance costs cover expenditures for project implementation and management units at the Project Director's office, 24 districts offices, and the field offices. The expenditure will include incremental subject specialist staffs' and incremental field team salaries and overhead, rent, office supplies, utilities, travel costs of staff, operating and maintenance expenditures of office equipment and vehicle etc. It also includes incidental expenses on mobilization of farmers, survey, design & engineering, supervisions, and implementation assistance to the farmers and suppliers, and coordination for quality of the works carried out by farmers and suppliers/venders.

Project Cost and Financing

50. **Project Cost.** The total project cost is estimated at about US$ 242.20 million for all the components. Cost by components is provided in Table 2.4 and cost by expenditure category is provided in Table 2.5. Detail costs of the project items under each project component and their year-wise investment schedule, cost sharing, expenditure category etc. are available in the Project Files. The taxes and duties are estimated around US$32.4 million equivalent.

51. **Project Financing.** Considering the cost sharing arrangements for the various components and that the project will finance full costs of components A-2, A-3, C-2, C-3 and D, the overall share of beneficiaries in the project is 22.80 percent or US$55,20 million (equivalent). US$187 million of the cost will be financed by IDA or about 77.20 percent of the total costs. The project cost, however, does not include an amount of about US$ 60 million (equivalent) contributed by the Government of Sindh for permanent staffs' salaries and overhead that will be assigned to the project.

Table 2.4: Tentative Financing Plan by Component
(US$ million)

A. Project Components	Project cost	IDA Financing	Percent IDA Financing	Farmers' Financing	Percent Farmers' Financing
A. Community Water Infrastructure Improvement					
A.1. Community Water Course Improvement	101.30	77.00	76	24.30	24
A.2. Mitigation Flood Risks for the Poor	10.60	10.60	100	0.00	0
A.3 Project Supervision & Implementation Assistance Consultants	8.40	8.40	100	0.00	0
Sub-Total A	**120.20**	**95.90**	**80**	**27.54**	**20**
B. Promotion and Installation of High Efficiency Irrigation System (HEIS)					
B.1.Small & Medium Size HEIS (2-10 ha)	64.00	38.40	60	25.60	40
B.2.HEIS Demonstration Sites & Kitchen garden HEIS Kits	1.80	1.60	90	0.20	10
Sub-Total B	**65.80**	**40.00**	**61**	**25.80**	**39**
C. Improved Agriculture Practices					
C.1.Laaser Land Leveling & Deep Plowing	9.60	4.50	47	5.10	53
C.2 Improved Agri. Production Technology	12.40	12.40	100	0.00	0

C.3 Technical Assistance & Training Consultants	2.40	2.40	100	0.00	0
Sub-Total B	**24.40**	**19.30**	**79**	**5.10**	**21**
D. Project Management, T.A. Studies, M&E					
D.1 M&E of Project Impact Consultants	2.70	2.70	100	0	0
D.2 Project Management Administrative Costs	29.00	29.00	100	0	0
Sub-Total B	**31.70**	**31.70**	**100**	**0**	**0**
Total Project Costs	**242.20**	**187.00**	**77.20**	**55.20**	**22.80**
Front-End Fees	**0.00**	**0.00**			
Total Financing Required		**187.00**			
Taxes and Duties included in Total Project Costs	**32.40**				

Table 2.5: Project Cost by Expenditure (Disbursement) Category
(US$ million)

A. Project Components	Project cost	Works	Equip. & Goods	Consult. Services	Training Studies	Increment. O&M
A. Community Water Infrastructure Improvement						
A.1. Community Water Course Improvement	101.30	101.30				
A.2. Mitigation Flood Risks for the Poor	10.60	10.60				
A.3 Project Supervision & Implementation Assistance Consultants	8.40			8.40		
Sub-Total A	**120.20**	**111.90**		**8.40**		
B. Promotion and Installation of High Efficiency Irrigation System (HEIS)						
B.1.Small & Medium Size HEIS (2-10 ha)	64.00	64.00				
B.2.HEIS Demonstration Sites & Kitchen garden HEIS Kits	1.80	1.80				
Sub-Total B	**65.80**	**65.80**				
C. Improved Agriculture Practices						
C.1.Laser Land Leveling & Deep Ripping	9.60		9.52		0.08	
C.2 Improved Agri. Production Technology	12.40		0.04		12.36	
C.3 Technical Assistant & Training Consultants	2.40			2.40		
Sub-Total B	**24.40**		**9.56**	**2.40**	**12.44**	
D. Project Management, T.A. Studies, M&E						
D.1 M&E of Project Impact Consultants	2.70			2.70		
D.2 Project Studies, Management and Administrative Costs	29.00	1.36		1.63	0.01	26.00
Sub-Total B	**31.70**	**1.36**		**4.33**	**0.01**	**26.00**
Total Project Costs	**242.20**	**179.06**	**9.56**	**15.13**	**12.45**	**26.00**
Front-End Fees	0.00					

ANNEX 3: IMPLEMENTATION ARRANGEMENTS

Pakistan: Sindh Irrigated Agriculture Productivity Enhancement Project (P145813)

Project Institutional and Implementation Arrangements

1. The Directorate General Agriculture Engineering & Water Management (DGAEWM) will be responsible for implementation of the project. A small Project Implementation Unit within the Directorate will be established exclusively for implementation of the project, and together with the Directorate of On Farm Water Management (OFWM) in the regions and in districts will be responsible for project implementation. The Directorate of OFWM in Sindh has demonstrated capacity to implement such programs. It has implemented several projects financed by the World Bank and other donors and the national programs for improvement of water course and high efficiency. The detailed implementation plan is described below and presented in Chart-I.

2. **Project Implementation Unit (PIU)** will have the overall responsibility for project implementation and the execution of project, including financial management, procurement, disbursement, and recruitment of staff. The PIU will consist of Field Teams, District Teams, On-Farm Directorates and Project Director Office. The PIU will be headed by a Project Director with Directors OFWM (Hyderabad and Sukkur), Deputy Director Procurement, Deputy Director HEIS & Laser Land Leveling, Deputy Director M&E, Deputy Director Agriculture, Deputy Director Social and Environment; communications Officer, Director OFWM (Hyderabad) will act as Secretary of the committee. The PIU will meet every month to review the physical and financial progress as well as to suggest means to overcome the constraints faced in execution of project activities.

3. **On-Farm Water Management Directorates.** For more effective and efficient management of field staff and achievement of progress of different components; and because crops grown and social interaction in upper and lower Sindh are different, it is required to setup at least two On-Farm Water Management directorates level in upper and lower Sindh (Upper Sindh at Sukker and Lower Sindh at Hyderabad). The field teams will report to the deputy director of district team and deputy directors will report to the directors. The directors will report to the project director.

4. **Field Teams.** For implementation of the project activities at the lowest level, about 100 field teams consisting of a water management specialist, survey and design engineers, high efficiency specialist, agriculturalist, and social mobilizer will be available serving all Sindh. The team composition is a combination of regular staff of the Agriculture Department together with a number of incremental staff. These teams are mobile and will be working all over within the north and south. Field teams will be headed by an assistant director and will be the primary contact between the farmers and the project. They will be responsible for farmer mobilization, establishment of WCAs, presenting the full menu of project activities to the associations and other interested farmers, training of farmers and water users in implementation of all project components and activities with backstopping from TAT.

5. The PIU will be supported by the following three consultants:

6. **Project Supervision & Implementation Assistance Consultants (PSIAC)** will be selected through international competitive bidding process under sub-component A3 of the project. They will report to the PIU director and prepare the implementation program, quality of works, delivery of works, and certify the quantities of work carried out and the payments. They will also help the PIU in project planning and management, quarterly progress reporting, procurement planning, financial management and overall project management are proposed for following activities. Their scope of work will include but not be limited to the following:

- Project management support for project launch, quality assurance, screening and clearance of sub-projects;
- Supervision and verification of survey, design and preparation cost estimates of water courses;
- Verification of site selection, design, bill of quantities and tender documents of flood shelters;
- Verification, facilitation of farm selection and design approval for HEIS-drip, sprinkler and rain gun;
- Preparation of detailed design and supervision of Flood Shelter;
- Prepare annual work plan for all component activities;
- Prepare annual financial requirements;
- Facilitate distribution of laser leveling and deep ripping equipment;
- Spot checking for quality assurance; and
- Construction supervision / assuming the "Engineer" role.

7. **Monitoring and Evaluation Consultants (M&E).** The regular monitoring of all project components and activities will be key to successful execution of the project. M&E consultants will be responsible for (a) monitoring of the physical progress; (b) monitoring and evaluation of the project impact; (c) review and supervision of the environmental and social aspects of the project; and (e) provision of guidance to the management in early identification and resolution of the project. The consultants will be selected using the QCBS procurement method.

Their general scope of work will include but not be limited to the following:

- Establishment of MIS, GIS and ICT-based monitoring verification system for all project components and activities it is monitoring;
- Responsibility for monitoring implementation and physical progress of the civil works including environmental and social safeguards.
- Ensuring that Project complies with any legal financial covenant;
- Monitoring that all component activities are placed in Annual Work Plan (AWP) to achieve desired objectives;
- Collection and analysis of data for project impacts including data on direct and indirect stakeholders under the project; and
- Identification and resolution of problems during implementation

8. **Technical Assistance and Training Consultants (TAT**). To enhance the project benefits from physical improvements, such as improved water courses and the introduction of HEIS, laser land leveling, and deep ripping, the project will support farmers and public sector staff training in management, operations and maintenance of physical infrastructure, improved agriculture practices in use and application of crop inputs including pesticide and fertilizers through the methodology of Farmers' Field School (FFS), crop diversification and provision of printed materials through six resource centers all over Sindh. The training will focus on proper land preparation; soil fertility and crop nutrition management; improved irrigation techniques,

use of instrument for measurement of soil moister; integrated pest management and safe handling of pesticides, fertilizer application, crop diversification; and on-farm post-harvest losses management. They will be managing the all pilot demonstration activities under the project. Necessary training materials including brochures and training modules will be developed for training of facilitators and later for use of farmers in the FFSs. The consultant will also establish two additional Resource Centers (Information Kiosks) for the Right Bank of Indus for access to the water users in variety of information in water management and agriculture production improvement. In addition, the consultants will provide training for the staff in the Field Teams in installation and O&M of High Efficiency Irrigation Systems, including advice on crop diversification. They will also facilitate training of field teams in social mobilization for formation of WCAs, additional training of the farmers in installation and O&M of HEIS, laser land leveling, deep ripping. They will design a Public Awareness Campaign for all project activities, especially those being newly introduced.

In addition, the following committees will be formed to provide guidance and coordinate project activities at various levels:

9. **Grievance Redress Mechanism (GRM) & Grievance Redress Committee (GRC).** To deter fraud and corruption; mitigate risks; provide project staff with practical suggestions/feedback that allow them to be more accountable, transparent, and responsive to beneficiaries; assess the effectiveness of internal organizational processes; and increase stakeholder involvement in the project, a GRM will be established at the district level under the project. This will include formation of an independent Grievance Redress Committees (GRC) to resolve complaints. It comprises o, DGAEWM, PIU Director, Team Leader of relevant Consultants and is chaired by a retired Judge of High or Civil Court. The chairperson will act as independent third party in GRC. All complaints, which could not be resolved by GRC, will be passed on by the GRC chairperson to the Project Steering Committee (PSC) for resolution; PSC will act as higher level Grievance Redress Committee to resolve major and complex grievances which could not be resolved at the GRC level. A copy of such complaints will also be sent to the World Bank.

10. **Communication Strategy.** Given the demand driven nature of most project components and activities, such as community mobilization for rehabilitation of watercourse, promotion of HEIS and adoption of new technologies for agriculture improvement and irrigation agronomy practices will require an integrated communication strategy. The Project will benefit from an effective public information campaigns strategy to (i) promote demand for project activities; (ii) facilitate management and mitigation of project risks; and (iii) strengthen the Government capacity in handling such communications. A Communication specialist will be recruited in the PMU to assist the DGAEWM and the district level teams. Sindh has an added advantage of a dynamic and robust Sindhi language media, both print and electronic. The implementation team will leverage it to enhance the project's outreach and communication efforts.

11. **Project Implementation Committee (PIC).** The Project Implementation Committee (PIC) will be chaired by Director General Agriculture Engineering and Water Management, with the Project Director-Project Implementation Unit and Deputy Director Coordination as members. The Deputy Director coordination will be secretary of PIC and will:

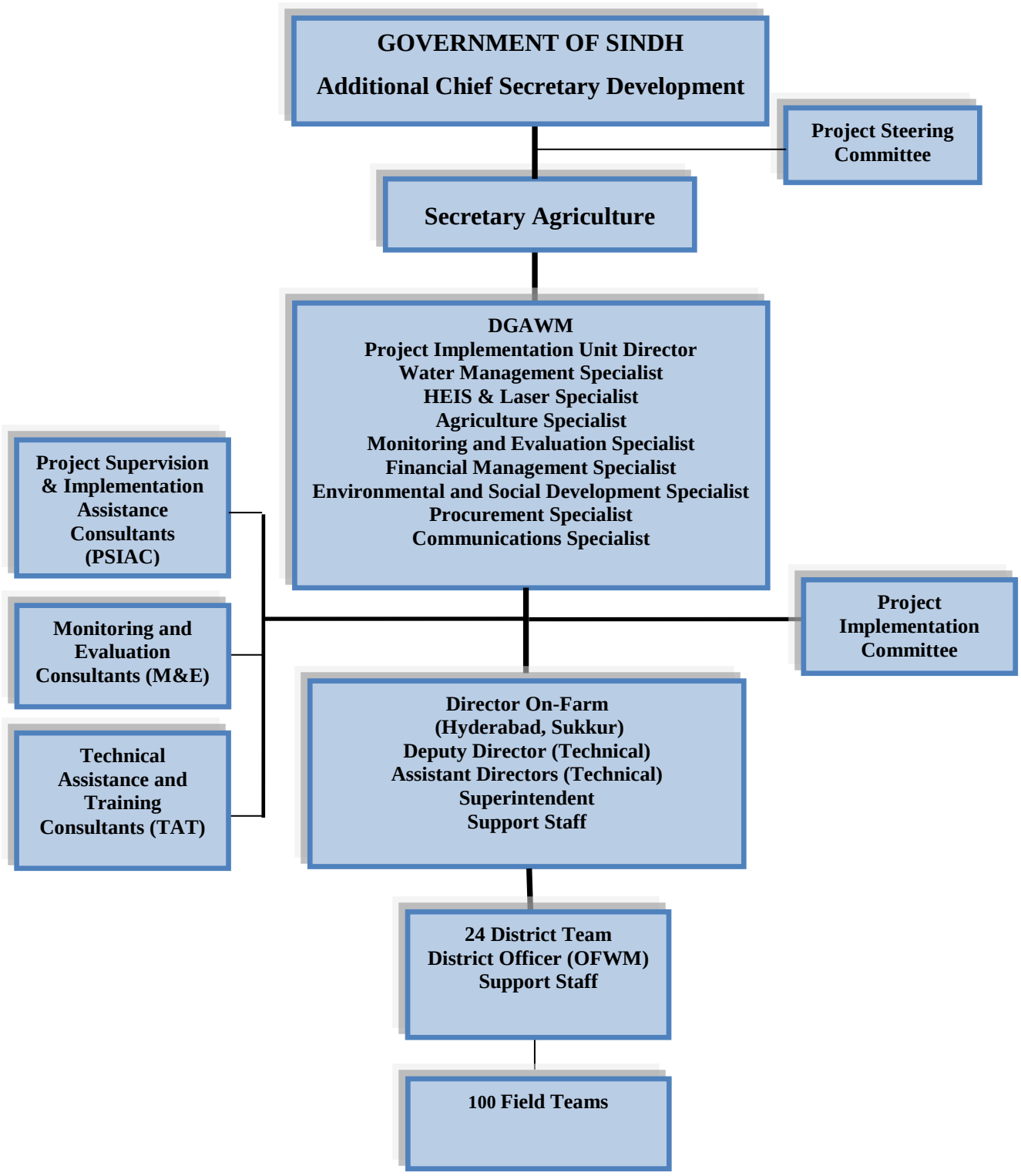
- Approve annual work plans and streamline flow of funds;
- Monitor physical and financial progress;
- Approve the criteria for selection of beneficiaries under various project components;
- Identify the constraints in achieving targets and devise strategies for their solutions;

- Review monitoring reports and take appropriate actions;
- Constitute committee/s for approval of equipment specifications /standards, prequalification of supply & services companies for Laser land leveling units, HEISs etc., preparation of technical Performa etc.;
- Formulate committee/s to resolve specific issues relating to civil works, unspent funds, rates of construction materials, and make recommendations for decision by the Project Policy Committee (PPC);
- Approve work plan (targets, financial requirements etc.) for awareness, irrigation demonstration sites, pilot testing, research activities, trainings etc. on annual basis or as required for smooth execution of envisaged activities:
- Ensure implementation of decisions of Project Policy Committee;
- Devise mechanism for transparent monitoring of project activities;
- Review Audit Reports for smooth running of financial management;
- Review subsidy slabs/financial assistance level and modify for smooth implementation of project activities; and

12. **Project Steering Committee (PSC).** The project steering committee (PSC) will provide planning and strategic guidance for project implementation as well as facilitate inter agency coordination at the highest level. The PSC will be chaired by the Additional Chief Secretary Sindh with Secretaries of Agriculture, Irrigation, PDMA, Local Government and Finance Department as its members. The PSC will meet quarterly to review the physical and financial progress as well as to suggest means to overcome the constraints/bottlenecks faced in the field for execution of project activities. The major functions of PSC will be as follows:

- Make policy decisions for smooth project execution;
- Ensure coordination among all stakeholders;
- Arrange bridge financing for local resources during any financial constraint from donors; and
- Constitute committee/s for resolving any policy related issue.
- Resolve complaints that have been brought by Chairman GRC.

Chart I: Overall Institutional Arrangements



FINANCIAL MANAGEMENT

13. The financial management responsibilities for the project will remain with the DGAEWM's Project Implementation Unit established to implement Bank's funded project. The objective of the FM assessment was to determine whether the DGAEWM has adequate FM arrangements in place to ensure that the Project funds will be used only for the purposes for which the financing was provided, with due attention to considerations of economy and efficiency. Staffing and monitoring gaps were identified during an assessment of the financial management capacity during pre-appraisal. The assessment concluded that the use of country system, implementation of enhanced internal control arrangements and capacity building of the project's FM staff will address the present gaps in the FM arrangements.

14. The action plan below indicates the actions to be taken for the project to strengthen its financial management system and the dates that they are due to be completed by.

Table 3.1: Financial Management Covenants

	Action	Date due by	Responsible
1	Recruitment or nomination of FM additional staff (one FM officer and one accountant at the Provincial office and one assistant for each of the two Regional offices	1 month after effectiveness	DGAEWM
2	Recruitment of two Internal Auditors	1 months after effectiveness	DGAEWM
3	Roll out Gov. FMIS to the DGAEWM/Regional Directorates	As soon as possible after Loan signing	DGAEWM
4	Training of project accounting and auditing staff at DGAEWM.	1 months after effectiveness	WB

15. Based on the outcome of the FM risk assessment, the following is the FM implementation support plan. The objective of the plan is to ensure that the project maintains a satisfactory financial management system through the project's life:

Table 3.2: Financial Management Reporting

FM Activity	Frequency
Desk Review: - Interim Financial Reports Review - Audit Financial Statement reports review	 Quarterly Annually
On site visits: - Review of overall operation of the FM system including transaction reviews. - Monitoring of actions taken on issues highlighted in audit reports, auditors' management letters, and other reports	 Semi-Annual As needed
Capacity building support: FM training sessions	At the start of Project and as and when needed during implementation

16. The overall Financial Management risk for the project is *Substantial* and is expected to become *Moderate* after implementation of the mitigation measures.

Financial Management Arrangements

17. **Budgeting Arrangements.** Budgeting for the project is in line with the Government budgeting cycle of **July** to June. IDA will finance 100% project cost of GoSindh share, inclusive of taxes, except for cost elements of salaries and allowances of the regular staff and communities' contribution. National chart of accounts (National Accounting Modules) used by the Government shall be used for Project accounting.

18. **Flow of Funds**: PIU will be using the report-based disbursement procedure and funds flow arrangements for the project will be as follows; (i) PIU will prepare a six monthly cash flow forecasts for project based on the work plan and submit the Withdrawal Applications and cash forecasts together with the cash request to the Bank after the effectiveness of the project. Subsequent withdrawal applications should be submitted quarterly with Interim Financial Reports (IFRs) within 45 days after the end of the quarter accompanied by cash forecast for the next six months. The quarterly periods follow the calendar year quarters hence IFRs should be prepared as of end of March, June, September and December. (ii) IDA will make an advance disbursement from the proceeds of the Credit based on the cash flow forecast by depositing into a Borrower-operated Designated Account held at National Bank of Pakistan denominated in US Dollars. However, the use of advance method will be available to the project only when the issue of lapsed loan in the Pakistan portfolio is resolved.
19.

20. **Accounting and Maintenance of Accounting Records:** Project accounts will be maintained on a cash basis, supported with appropriate records and procedures to track commitments and to safeguard assets. Separate books of accounts will be maintained for the Project using Chart of Accounts under the New Accounting Model. Interim quarterly financial reports and annual financial statements will be prepared providing details of receipts and expenditures by Project component and disbursement categories/description of expenditures. All efforts shall be made to put the Project on the Government FMIS from the inception of Project.

21. **Internal Control and Internal Audit Arrangements:** All payments would be made by crossed cheques jointly signed by two officials and adequately vouched with relevant invoices and claims approved by the competent authority before the assigned accounting staff could initiate a payment request.

22. Internal Audit Unit consisting of two qualified Internal Auditors shall be set up at DGAEWM. The Internal Auditors will be required to conduct quarterly internal audit reviews on the project and submit the reports to the Project Implementation Committee headed by the Secretary Agriculture with a copy to the Bank within 45 days after the end of each quarter. The resources for the internal audit reviews by the DGAEWM will be provided for under the project. TOR for the Internal Auditors agreed with the Bank shall are included in the Project Operational Manual.

Periodic Financial Reporting Arrangements:

23. The Recipient shall prepare and furnish to the Association not later than forty-five (45) days after the end of each calendar quarter, interim financial reports for the Project, in form and substance satisfactory to the Bank.

24. The Audited financial statements for each period shall be furnished to the Association not later than six (6) months after the end of the project fiscal year.

External Audit Arrangements:

25. Annual financial statements for the Project should be prepared in accordance with International Public Sector Accounting Standards (which inter alia includes the application of the cash basis of recognition of transactions). The financial statements will include details of expenditures incurred both by disbursement category/description and Project components.

26. The external audit conducted by the Supreme Audit Institution, i.e., the Office of the Auditor General of Pakistan, will be acceptable to the Bank. Acceptable audited financial statements together with the Audit Report together and the Management Letter should reach the Bank within six months (December 31) after the end of each financial year (June 30).

27. There is no outstanding audited financial statements for other projects implemented by the DGAEWM.

Disbursement Arrangements:

28. PIU will open a Designated Account denominated in US dollars in National Bank of Pakistan in which disbursements from the IDA Credit will be deposited. It will also open Assignment Accounts denominated in local currency at the Regional Directorates into which transfers against three months cash forecast from the Designated Account will be deposited. The Regional Assignment Accounts shall be replenished on the basis of monthly expenditures statements. Designated and Assignment Accounts shall be operated by joint authorized signatories.

29. To finance expenditures associated with project preparation processing, retroactive financing of SDR15,924,000 (or $22,450,000 equivalent) is allowed for eligible expenditure under category 1and 2 from April 1, 2014.

30. The Project will have the following four components with the following financing details:

i. Improvement of Water related Infrastructure: 100% cost of material for ***completed works*** duly certified by the Verification Agent shall be eligible for withdrawal. At least 75% of agreed works (e.g., length of water course in technical sanction) will be categorized as "completed".

ii. Promotion of High Efficiency Irrigation System

iii. Improved Agriculture Practices

iv. Project management support: 100% incremental operating cost of the Project. GOSindh will finance the salaries and allowances of civil servants including field teams working on the project.

v. The following table specifies the categories of Eligible Expenditures that may be financed out of the proceeds of the Financing ("Category"), the allocations of the amounts of the Financing to each Category, and the percentage of expenditures to be financed for Eligible Expenditures in each Category:

Table 3.3: Disbursement

Category	Amount of the Financing Allocated (expressed in USD)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Goods, works, non-consulting services, consultants' services, training, and land acquisition if needed	161,000,000	100% of amounts disbursed
(2) Incremental Operating Costs	26,000,000	100%
TOTAL AMOUNT	187,000,000	100%

PROCUREMENT

31. **Sub-Component A1: Community Water Course Improvement.** In this component about 5,500 watercourses will be improved through the provision of lining for up to 30 percent length using various materials; based on combination of sound sourcing and technical solutions, Watercourses will be improved through community participation. Upon request of WCAs, when qualified, Taluka Level field teams of DGAEWM along with Project Supervision & Implementation Assistance Consultants (PSIAC) will carry out surveys and prepare the design and cost estimates for material along with the breakdown of each item, labor cost etc. These will be checked and certified by PSIACs. The Consultants will be visiting the site during various incremental stages and certifying payments after completion of relevant milestones and ensuring quality control.

32. **Sub-Component A2: Mitigating Flood Risk for the Poor -Construction of Flood Shelters.** Three different designs of shelters have been prepared for providing relief in emergency. Different options are recommended according to site conditions, number of families and live stocks to be accommodated. Most of the construction material for making raised platform can be made available from annual un-silting of sand and silt from irrigation canals. The land for construction will be largely public or community owned land located in non-cultivable areas preferably on higher ground. The single procurement package consists of all three options, thus they could be procured on NCB basis with top supervision; rather than resident supervision, from PSIAC.

33. **Sub-component B2: Small and Medium-sized HEISs for 2 to 10 ha (5 acres to 25 acres) Farms.** About 2,600 HEISs; drippers and bubblers, will be implemented on about 14,300 ha (35,000 acres) of irrigated and irrigable land.

34. Employing transparent and efficient criteria, it is proposed to preselect Sales, Supply & Services Companies (SSSC) that have the capability to deliver the full package of survey, design, delivery of material, installation and post installation O&M services relating to HEIS. Companies will be required to describe relevant previous work and give details of their managerial, technical and financial capacity. SSSCs will install the HEIS on a turnkey basis. SSSCs will also be responsible for providing technical support to farmers for operation and maintenance of HEIS as well as irrigation agronomy and crop production techniques with HEISs. PSIACs will provide technical input during pre-qualification process to select capable SSCs and standard equipment including cost estimates.

35. Details of private sector firms working in this field in Pakistan in general and in Sindh in particular have been collected. A shortlisting criterion has also been prepared. However, based on the novelty of the intervention and the need to keep options open, this pre-selection shall be updated periodically (annually or as agreed). If a national company does not have the experience required to work in partnership (joint venture or sub-contracting) with an international company, the experience and capacity of that company will be considered. Companies having capacity to locally manufacture pumps, pipes, or drip components shall be given preference. Companies will be required to establish demonstration plots in the province on the areas to be selected. In a roll-out stage, the farmer will deposit his contribution before issuance of work order and signing of Tri-partite Agreement (i.e. between PD as the First Party, SSC as Second Party and Farmer as the Third Party) through a demand draft / pay order in favor of the Project Director. A comprehensive implementation process plan has since been developed and shall be provided in the Project Operational Manual**.**

36. **Sub-Component C1**: **Laser Land Leveling.** It is estimated that within the twenty four districts of the province about 1,100 (eleven hundred) sets of laser equipment with scrapers can be acquired by FOs/WCAs, Community Organizations and Individual Farmers to undertake PLL at their farms. The cost of 1,100 units comes to US $6.8 million. The subsidy to farmers shall be 45 percent.

37. Laser Land Levelers shall be procured based on community participation. PIU will advertise and invite applications from interested farmers. Applications received / collected in PIU, will be scrutinized against approved criteria by the designated committee. PSIACs will assist the committee to carry out scrutiny for short listing of applications. Farmers meeting the criteria will be allowed to purchase the equipment. In parallel, the PIU shall also pre-select the firms for supplying the equipment, based on a disseminated transparent criteria, evaluating their performance and technical specifications of the equipment. The PSIAC will support PIU to approve specification of the equipment and the list of qualified firms. The farmer will place an order with the approved supplier who will have to supply the equipment in 90 days. PSIACs will inspect and certify the equipment that has been supplied, based on which PIU will release the Government's share of the cost to the supplier. Formats of agreements with farmers as well as the supplier have been finalized.

38. **Sub-Component C1**: **Laser Land Leveling and Deep Ripping.** To overcome the cost problem of deep ripping operations, it is recommended that alternatives to this equipment could

be made available on a local basis. Cost of equipment is about US$2,000 which is reasonable. In addition to this, for operating and using the chisel plough a heavy duty tractor is required. In general cost of theses tractors ranges between PKR1 to 1.2 million. This can be added to the cost of plough and the total cost becomes US$14,000 per unit. The project envisages procurement of about 1,100 units. The sourcing plan will be commensurate with the capacity of the local industry.

39. **Other Goods** procured under this project will include: office equipment, vehicles, furniture, printing of training material field equipment and heavy equipment, instruments, hydraulic water measuring equipment and others identified during the project. Following procedures will apply for procurement of goods:

i. ICB procedures shall be followed for each Goods contract estimated to cost more than US$600,000 equivalent. Domestic Preference will be allowed to local manufacturers on ICB contracts;
ii. Goods estimated to cost up to US$600,000 per contract may be procured through NCB procedures acceptable to the Bank;
iii. All vehicles for project use; regardless of the value, and other goods estimated to cost up to US$50,000 equivalent per contract may be procured following procurement procedures in accordance with the Bank's procurement guidelines;

40. **Improvement of Bidding Procedures under National Competitive Bidding.** The following improvements in bidding procedures will apply to all procurement of Goods and Works under National Competitive Bidding, in order to ensure economy, efficiency, transparency and broad consistency with the provisions of Section 1 of the Guidelines:

i. Invitation to bid shall be advertised in at least one national newspaper with a wide circulation, at least 30 days prior to the deadline for the submission of bids;
ii. Bid documents shall be made available, by mail or in person, to all who are willing to pay the required fee;
iii. Foreign bidders shall not be precluded from bidding and no preference of any kind shall be given to national bidders in the bidding process;
iv. Bidding shall not be restricted to pre-registered firms;
v. v. qualification criteria shall be stated in the bidding documents;
vi. Bids shall be opened in public, immediately after the deadline for submission of bids;
vii. Bids shall not be rejected merely on the basis of a comparison with an official estimate without the prior concurrence of the Bank;
viii. Before rejecting all bids and soliciting new bids, Bank's prior concurrence shall be obtained;
ix. Bids shall be solicited and works contracts shall be awarded on the basis of unit prices;
x. Contracts shall not be awarded on the basis of nationally negotiated rates;
xi. Single bid shall also be considered for award;
xii. Contracts shall be awarded to the lowest evaluated and qualified bidder;
xiii. Post-bidding negotiations shall not be allowed with the lowest evaluated or any other bidders;
xiv. Draft NCB contract will be reviewed by the Bank in accordance with the prior review procedures;
xv. Government-owned enterprises shall be eligible to bid only if they can establish that they are legally and financially autonomous, operate under commercial law, and are not a dependent agency of the Recipient;

xvi. A firm declared ineligible by the Bank, based on a determination by the Bank that the firm has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for or in executing a Bank-financed contract, shall be ineligible to be awarded a Bank financed contract during the period of time determined by the Bank.

xvii. The Bank shall declare a firm ineligible, either indefinitely or for a stated period, to be awarded a contract financed by the Bank, if it at any time determines that the firm has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for, or in executing, a contract financed by the Bank; and

xviii. Each contract financed from the proceeds of a credit shall provide that the suppliers, contractors and subcontractors shall permit the Bank, at its request, to inspect their accounts and records relating to the performance of the contract and to have said accounts and records audited by auditors appointed by the Bank. The deliberate and material violation by the supplier, contractor or subcontractor of such provision may amount to obstructive practice.

Selection & Employment of Consultants

41. Major consulting services under the project will be required for PSIACs, M&ECs and TATCs as described below:

Table 3.4: Consultant Selection

Ref	Description of Assignment	Estimated Cost US$ m	Selection Method	Review by Bank	Expected Date of Submission of Proposals
1	Project Supervision & implementation Assistance Consultants (PSIAC)	8.2	QCBS	Prior	June 2015
2	M&E Consultants	2.7	QCBS	Prior	June 2015
3	Technical Assistance & Training Consultants	2.3	QCBS	Prior	June 2015

42. Contracts with consulting firms will be procured in accordance with Quality and Cost Based Selection (QCBS) procedures or other methods given in Section III of the Consultants‟ Guidelines, such as quality based (QBS), fixed budget (FBS), least cost selection (LCS),consultants qualification (CQS) or single source selection (SSS). For contracts with consulting firms estimated to cost less than US$500,000 equivalent per contract, the shortlist of consultants may comprise entirely of national consultants in accordance with the provisions of paragraphs 2.7 of the Consultant Guidelines.

43. **Selection of Individual Consultants:** World Bank provides guidelines on selection of individual consultants in Section V of the Consultant Guidelines. Services for assignments that meet the requirements set forth in the first sentence of paragraph 5.1 of the Consultant Guidelines may be procured through contracts awarded to individual consultants in accordance with the provisions of paragraphs 5.2 through 5.3 of the Consultant Guidelines. Under the circumstances described in paragraph 5.4 of the Consultant Guidelines, such contracts may be awarded to individual consultants on a sole-source basis.

44. **Single-Source Selection:** Specific consultants‟ services through firms, satisfying Consultants Guidelines (paragraph 3.9 to 3.13), with Bank’s prior agreement may be procured following single source selection procedures.

45. **Engagement of NGOs, Public Sector Universities/Research Institutes:** If needed, project may engage services of NGOs, Public Sector Universities/Research Institutes using appropriate procurement process as per Consultants Guidelines.

46. **Incremental Operating Costs:** The incremental operating costs for covering incremental staff salaries, rent, office supplies, utilities, operating and maintenance expenditures of office equipment and vehicle etc. will be disbursed on the basis of annual budgets to be prepared by implementing agencies and agreed with the Bank.

47. **Assessment of Agency's Capacity to Implement Procurement:** ` DGAEWM office has been vested with overall procurement and contract administration responsibilities. DGAEWM has been the implementation unit for several Bank projects in Sindh and has considerable experience of working according to the Bank's procurement rules. An assessment of the capacity of the implementing agency to implement procurement actions for the project was carried out by the procurement specialist on the team. The assessment reviewed the organizational structure for implementing the procurement under the project and the interaction between the project's staff responsible for procurement. Entity has a documented legacy of independently performing the procurement function through Bank's procurement regulations and Sindh Public Procurement Rules 2010 (SPPR-2010). The Director General is vested with some financial powers; delegated by the Principal Accounting Officer to perform support the functions of procurement. Presently the entity has staffing capacity constraints as the key procurement staff is not on board.

48. The procurement functions of this entity will be performed in an environment which is marked by governance challenges and a general economic slowdown. It would therefore be essential to have a well-developed internal procurement function that detects and rectifies possible deviations in procurement process. Moreover, a culture of accountability needs to be nurtured to ensure that prospective bidders have faith in the procurement proceedings. The special measures for dealing with procurement risk proposed below are based on this review.

49. **From procurement and contract management standpoint, the project is rated has having "Substantial risk."** While the implementing agency's performance in carrying out procurement under the ongoing/previous Bank-financed projects has been satisfactory, the present rating corresponds to the inherent complexity of project design. In order to minimize the risk this complexity entails, several measures are introduced for procurement in general and for management of consultancy contracts in particular. These measures include:

i. **Procurement Capacity:** PIU will have overall responsibility for carrying out procurement under the project, including; procurement of consulting services, works, and goods. The Bank shall conduct a procurement training session for the project staff. The Standard Operating Procedures (SOPs) covering internal approval procedures of the Borrower have been agreed and documented during appraisal. A Procurement Oversight Committee consisting of representatives of Finance, P&D, Agriculture, DG Agriculture Engineering and Water Management; and Project Director PIU shall be notified. POM contains details of various procurement arrangements for planning, solicitation, evaluation award etc.

ii. Community procurement arrangements for goods shall be agreed and disseminated to the participating communities. The PSIACs shall spot check compliance of the agreed arrangements. Contracts for community based works, as well as goods have also been

agreed and documented during appraisal. All of the community driven procurement processes are fully described in the Project Operations Manual.

iii. DGAEWM's website will be used for providing procurement plan, procurement notices, invitation to bid, bid documents and RFPs as issued, latest information on procurement contracts, status of evaluation, complaints and actions taken, contract award and performance under contracts and other procurement information. The website will be accessible to all bidders, firms and other stakeholders at large, free of charge. The website will be supported by a filing system and a procurement database as explained below. The web-site is operational however the link to the Project needs to be developed as soon as competitive procurements for the project commence;

iv. **Complaints Management System** has been developed and implemented during the ongoing project and will continue to remain in place. For ICB/QCBS / selection of consultants the Bank prescribed complaint redressal mechanism will apply. However, for CDD procurements under project will be managed through the project's Grievance Redress Mechanism (GRM).

v. In addition to the objective of systemizing procurement's implementation arrangements and due to long-term capacity building objectives are presented in POM. Simplified procurement procedures to support community driven development with due consideration to existing commercial practices will be employed.

50. With these above arrangements, procurement is likely to be effective and transparent, resulting in smooth implementation of the Project. At this stage procurement risk rating of the project is kept "substantial". Procurement process and implementation of the contracts will be reviewed every six months by the PIU and PSC in collaboration with the Bank and; where needed adjustments will be made.

51. Summary of the agreed actions is tabulated below:

Table 3.5: Procurement Actions

Issues		**Action**	**Timeline**	**Responsibility**
(a)	Upfront Actions	(i) Hiring/identification of Procurement Specialist (ii) Procurement orientation training	(i)) one month after effectiveness (ii) Within three weeks of hiring	DGAE&WM /PIU Bank
(b)	Systemizing Procurement Implementation Arrangements	(i) Development and Notification of detailed procurement section in POM including Contract Agreements to be employed for community driven development interventions	Done	PIU PIU
(c)	Transparency	Link on a functional project web site Disclosure on website	After effectiveness As required	PIU

Procurement Planning

52. The procurement plan for key contracts for goods, works and consultants' services expected under the project was prepared by the DGAEWM. Whenever possible, procurement of works, goods and services were packaged into large packages to attract good contractors. Procurement under the project will be carried out in accordance with the procurement plans which will be closely monitored and updated on a quarterly basis, or as required. No procurement, regardless of the value, will be done by the implementing agency unless it has been approved under the procurement plan by the Bank. Any change in the estimated cost of any contract will promptly be conveyed to the Bank for its approval. No changes will be accepted after bidding documents have been made available to the bidders.

Prior Review

53. Thresholds for prior review are given below. These thresholds will be reviewed in 18 months and adjustments upwards or downwards will be made based on implementation experience:

i. All ICB contracts for works and goods;
ii. All single source selection or direct contracts;
iii. First NCB contract for works and goods irrespective of value;
iv. First contract procured through shopping, for goods as well as works, and through community based contracting procedure;
v. The first Consultants' Services contract with consulting firms, irrespective of value, and thereafter all contracts with firms estimated to cost US$300,000 equivalent or more;
vi. First consulting services contract with individual consultants, irrespective of value, and thereafter all contracts with individuals estimated to cost US$50,000 equivalent or more.

Post Review

54. All other contracts will be subject to post review by the Bank and PIU will send to the Bank, a list of all contracts that are subject to post-review on a quarterly basis. Post reviews as well as the implementation reviews will be done quarterly for the first 18 months or until the credit disbursements reach US$30 million and thereafter become bi-annual. Such review of contracts below threshold will constitute a sample of about 25 percent of the contracts.

55. As project will involve a very large number of small contracts, the Borrower would also appoint independent entities to carry out post procurement reviews, in accordance with terms, conditions, and reporting procedures acceptable to the Bank. However, the Bank will retain its right to directly conduct post reviews during project implementation as may be needed.

Procurement Information and documentation - Filing and Database

56. Procurement information will be recorded and reported as follows:

i. Complete procurement documentation for each contract, including bidding documents, advertisements, bids received, bid evaluations, letters of acceptance, contract agreements,

securities, related correspondence etc., will be maintained by the implementing agencies in an orderly manner, readily available for audit;

ii. Contract award information will be promptly recorded and contract rosters as agreed will be maintained by each implementing agency;

iii. Comprehensive quarterly reports by PIU, indicating: (i) revised cost estimates, where applicable, for each contract; (ii) status of on-going procurement, including a comparison of originally planned and actual dates of the procurement actions, including preparation of bidding documents, advertising, bidding, evaluation, contract award and completion time for each contract; and (iii) updated procurement plans, including revised dates, where applicable, for the procurement actions; and

iv. A Procurement Database will be developed supporting the procurement website that will register relevant information in a database format that will be suitable for analysis.

Frequency of Procurement Supervision

57. Bank supervision will be carried out every six months, however, more frequently in the early stages of the project. In addition to prior review, Bank supervision missions, which will include a procurement specialist, will carry out post review of procurement actions. The Bank's procurement specialist based in the Country office in Pakistan will be available to discuss procurement issues with the PIU as and when needed.

Environment and Social Assessment Summary

Environment

58. **The World Bank requires environmental impact assessment (EIA) of projects proposed for Bank** financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The OP defines the EIA process and various types of instruments. The proposed project consists of activities which can potentially have environmental and social consequences, including; changes in land use, damage crops, deterioration of air quality, water contamination and consumption, damage to top soil, land erosion, cutting of trees Safety hazard. Since none of the potential impacts of the project are likely to be large scale, unprecedented and/or irreversible, the Project has been classified as Category B, in accordance with OP 4.01. An EIA has been carried out in accordance with this OP, to identify the extent and consequences of these impacts, and to develop an Environmental Management Plan (EMP) for their mitigation. Environmental Assessment (OP 4.01), Pest Management (OP 4.09) and Projects in International Waters (OP 7.50) are the environmental safeguards policies triggered.

59. **Pest Management (OP 4.09).** The high efficiency irrigation methods such as drip system generally results in reduction in the usage of pesticides and fertilizers. Other project components such as water course improvement and laser land leveling though related to cultivation do not have any significant bearing on the need or quantity of chemical inputs for cultivation. The policy is triggered though to help improve the pesticide usage regime in the province.

Environmental Baseline

60. The province is divided in three distinct ecological regions i.e. Thar Desert, Kohistan zone and the canal irrigated zone. Most parts of Sindh are covered either by recent alluvium or

wind-borne sand. Salinity is one of the major soil problems confronting agriculture in Sindh. Rainfall varies from north to south. Poor rains are encountered after every three to four years and a complete drought occurs once in every eight to ten years. Sindh is almost entirely dependent on the Indus River for its survival and development. About 95 percent of the farmland in Sindh obtains its water from the irrigation system, while the rest is cultivated with the help of tube wells. The limited fresh groundwater (less than 5 million acre feet or MAF – about 6.17 billion cubic meters or BCM) in the province is available in only 22 percent of the entire area. Rainfall is only in the range of 100 to 200 mm per annum, while evaporation rates between 1,000 and 2,000 mm, depending on climatic conditions. Sindh is rich in natural resources, having diverse and productive habitats, ecosystems and faunal and floral resources. Some of the wetlands in the province are internationally recognized Ramsar sites. The wildlife consists of marine and terrestrial species and migratory birds visiting the area every year.

Stakeholder Consultations

61. Meetings and consultations were held with a range of key informants, as well as government and civil society stakeholders at different levels. The focus group discussions with smaller groups of grassroots stakeholders were held, whereas discussions with the institutional stakeholders were arranged in consultation workshops. These discussions were held with project affected people, project beneficiaries and other local communities.

62. Following were some of the key recurring stakeholder concerns; the capacity building and awareness program of farmers should be conducted on regular basis, the issue of water-borne diseases caused by over irrigation and use of pesticides should be addressed, effective investment is needed for the bed-furrowing with the help of laser leveling, tree cutting caused by the water course improvement should be compensated through plantation of appropriate tree species at appropriate locations.

Environmental Impacts and Mitigation Measures

63. The positive environmental and social impacts of the project include increased water conservation, enhanced social mobilization (i.e. establishment of WCAs), and increased employment opportunities for skilled people. In addition, the project interventions such as high efficiency irrigation techniques will help discontinue usage of sewage water to irrigate crops particularly vegetables in the peri-urban areas – a practice that poses health risks to the population consuming these vegetables.

64. **Water course improvement.** The potentially negative impacts of water course improvement can include changes in land use/land form include: pollution of irrigation water by deterrents and soaps due to increased sanitary and washing use, increased use of pesticides due to availability of additional water and crop cultivation. Mitigation measures for above environmental issues include; washing bays to be designed as part of water courses lining, Integrated Pest Management Plan including trainings, residue testing and capacity building activities to be implemented to reduce the impacts of pesticides, mandatory restoration of land condition after diversion channels for water courses improvement, compensatory tree plantation.

65. **High Efficiency Irrigation Systems.** Impacts could include use of water stored in small water tanks for drinking purposes (when potable water is not available) as well as safety concerns for animals and small children. Salt buildup can also be a potential impact. Proposed

mitigation measures include construction of fences around the storage tanks and social awareness and capacity building for stakeholders in proper sanitation and public health. To avoid salt buildup in the soil, flooding the field periodically should be considered.

66. **Flood Shelters.** Potential environmental impacts could include cutting of trees for construction of the shelters. To mitigate, four trees shall be planted as compensation for each tree felled.

Institutional Arrangements

67. The DGAEWM will appoint a dedicated "Senior Environmental and Social Specialist" (ES) for the proposed project at the provincial level. Water Management Officers (WMOs) will compile the Environmental and Social data in the field. The WMOs will in turn supervise and coordinate with the Water Courses Associations (WCAs) and farmers for the actual implementation of the environmental and social guidelines and other Environmental Management Plan (EMP) requirements during the project implementation.

Reporting and Documentation

68. The ES will be responsible for capacity building on documentation required for the project, as well as for monitoring and preparation of Quarterly Environmental Monitoring reports (E-QPR). These will be compiled and submitted by the end of each project quarter. At the end of every two year period, ,the M&E consultant will conduct a Third Party Validation (TPV) of EIA implementation and shall submit a detailed TPV report commenting also on the effectiveness of the EIA towards ensuring compliance with Bank safeguards policies.

Environmental Management Plan

69. A comprehensive Environmental Management Plan provides a summary of the proposed mitigation measures, assigns responsibility for implementation, supervision and monitoring and prescribes the monitoring and documentation protocols. Mitigation measures have been proposed for all the potential impacts, none of which are expected to be intense, expansive, or irreversible. Mitigation measures include compensatory tree planting by the ratio of 1 to 4 trees for each tree felled, construction of washing bays to continue ensured access to resources for women and measures for adequate disposal of excavated material.

Integrated Pest Management Plan

70. The "Pest Management Plan (PMP)" is embedded mainly in the project activities and investments for the productivity enhancement of crops targeted under the SIAPEP. Capacity Building is covered under Component C2 of the project. Under this sub-component the project will invest heavily in training of farmers to improve their crop and irrigation agronomy practices. Interventions will include: (a) establishing Farmer Field Schools with a focus on Integrated Pest Management (IPM); (b) training of FFS facilitators; (c) in-country exposure visits of farmers; (d) demonstration of beneficial insects rearing on the farm; and (e) training in crop production under High Efficiency Irrigation System (the drip system).

71. **Annual Sample Based Pesticide Residue Testing.** Samples will be collected from control and experimental plots of the on-going and future National IPM programs under the

Farmers Field School (FFS) system, or from such plots which may come into existence from year 2 of the SIAPEP in association with FFS groups. The test results will thus establish the usefulness of adopting IPM practices. Monitoring of pesticide use and residues will be carried out throughout the project period and efforts made to bring down the level of residue to below Minimum Reporting Level (MRL).

Social and Gender Assessment

72. A Social Assessment (SA) has been conducted for the project to assess socio-economic and cultural factors that could jeopardize success of the project or enhance social performance of it. SA identified the barriers faced by small and landless farmers and women to effectively participate and benefit from the project interventions. SA concluded that there is a strong demand for the project interventions by farmers. Potential stakeholders include (i) the land owners, small and landless farmers (sharecroppers) and female farmers; (ii) local communities in the project area; and (iii) provincial government departments and NGOs.

73. **Impact on Poverty and Social Structure of Rural Sindh:** Half of the Sindh population lives in rural areas and about 37 percent of the rural population lives below poverty line. Rural households including the landless derive 56 percent of their income from agriculture directly or indirectly. Around 70 percent of the rural population is landless and is mainly employed as agriculture wage workers. Agriculture growth will have a strong indirect impact on rural poor in Sindh. The improvement of water courses, promotion of HEIS particularly in water deficient areas, laser land leveling and deep ploughing , improvement in crop and irrigation agronomy practices will benefit directly to land owners (small and large), sharecroppers and tenants, who are the primary beneficiaries of the project. The benefits of water course lining will go to farmers at the tail end, who are often deprived of irrigation water and thus excluded from benefits. Poor people and socially excluded will directly benefit from the increased water availability. Indirectly they will benefit from the impact of the project on irrigation and agricultural production which is expected to increase on farm and off farm job opportunities for the landless. The project will have a strong impact on the small farmers who cannot afford to bear the cost of these improvements themselves and also lack technical knowhow.

74. The project will also impact positively on social dynamics of the rural society in Sindh; it will support social mobilization of farmers and organization in the form of Water Course Associations which will be registered under Sindh Irrigation and Drainage Authority Act under Sindh Water Management Ordinance 2002 and 2004. Social mobilization activities of the project will enhance participation of small farmers, landless and female farmers in agriculture and irrigation. The lining of water courses will ensure equity in water distribution between head and tail farmers, which will reduce conflicts and promote social cohesion and reduce stealing of water by big land owners. The provision of shelters to the communities during floods, will serve communities in a number of ways. Communities particularly landless and very poor can shelter their livestock and food stock. They can use these shelters for community development activities where the population can exchange ideas on farming, animal husbandry, health, nutrition, and education and where women can share their many talents in crafts for which Sindh is so famous. Strong community participation and willingness to contribute in kind with strict norms would be used for wider community participation. A total of seven districts would be covered under the component. Once constructed, the Provincial Disaster Management Authority will take over the operations and maintenance of these facilities.

75. **Consultation and participation**: Famers participation is a key to the success of this project. Formal and informal community consultations were conducted particularly with potential beneficiaries in the field to discuss and determine the design of project interventions. Consultations with stakeholders particularly the direct beneficiaries of the project interventions will be conducted throughout the project implementations. Besides this, an ICT based M & E system will be established to improve monitoring of project outputs delivery, enhance transparency and gather feedback of the project beneficiaries. This system will be managed by an independent third party M & E consultants' team hired from the market. While delivering the project outputs it will be made sure that these also reach to woman farmers where possible. An estimated target of 25 percent share is set for woman farmer beneficiaries.

76. **Transparency in selection of project beneficiaries:** In view of the power structures in rural Sindh, the selection of beneficiaries could be influenced as a result of political interference and social pressures that may not benefit the neediest communities/beneficiaries. To mitigate this, beneficiary selection will be guided by strict multi-dimensional selection criteria that include social considerations and benefits to the small and landless farmers, and women. These criteria are agreed with the Government, and selection of beneficiaries will be monitored throughout the project.

77. **Awareness/Information Dissemination:** A gender sensitized awareness / information dissemination campaign will be designed and implemented in all project districts throughout the Project implementation to provide an opportunity of equal access to farmers to benefit from the Project, particularly the small, landless and female farmers. Information dissemination will enhance transparency in selection of beneficiaries against developed criteria. Awareness campaigns will also be used as a tool to disseminate knowledge to improve irrigation and agriculture practices. The campaign will include production and distribution of printed material in the form of information brochures and leaflets, use of electronic and print media, display of tickers on local cables in rural Sindh, radio programs, farmer field days, male and female farmers information kiosks, information dissemination seminars and male and female farmers field schools. Information dissemination will also include messages to encourage women farmers to access project benefits. The IA had established a **Grievance Redressal Mechanism (GRM)** under SOFWMP which has been further improved in the light of experiences. The objectives are deterring fraud and corruption; mitigating risks; providing project staff with practical suggestions/feedback that allow them to be more accountable, transparent, and responsive to beneficiaries; assessing the effectiveness of internal organizational processes; and increasing stakeholder involvement in the project. **Beneficiaries Feedback Mechanism:** In addition to GRM, the project will take additional measures to take beneficiary feedback through consultations, web site of the project, GRM, periodic survey and use of ICT.

78. **Institutional Arrangements for Social and Gender Activities including Capacity Building Supervision and Monitoring:** The Department of Agriculture, represented by PD PIU, would be overall responsible for social mobilization for establishing and building capacity of WCAs: providing technical support to WCAs for watercourse improvement; High Efficiency Irrigation and the productivity enhancement components. There are about 186 Field Teams of OFWM based in each District consisting of five experts in community mobilization, which will be assisting the farmers' group mobilization, establishment of WCAs, and implementation of all components of the Project. Their capacity will be improved through training and technical assistance. A Sr. Social Mobilization / Gender Specialist and eight Social Mobilizers will be hired under PSIAC who will facilitate social mobilization with the help of the OFWM team. The Consultants team would provide training to project staff including field staff in social

mobilization and capacity building of WCAs; and promoting participation of women, small farmers and *haris* (share croppers) in on-farm activities.

79. A Social and Gender Specialist will be hired under the Monitoring and Evaluation Consultants to carry out: monitoring of environmental and social impacts and broader social and economic impacts of the Project. The M&E Consultant will report the total number of women that have become members of the WCAs. The consultants will report (i) number of small farmers that are members of the WCAs; (ii) number of small farmers that have benefitted from each of the project interventions. The M&E Consultant will make appropriate additions to the current set of forms and questionnaires for the collection of gender disaggregated data. The above indicators for gender development and inclusion of small farmers will be reported under an additional heading, to be added to the current list of indicators.

80. **Social Safeguards:** There will be no adverse social impacts anticipated due to project interventions and the project will not cause any resettlement impacts. Under Component A1, the Implementing Agency will need land for the construction of flood shelters, for the communities residing in areas subject to frequent flooding, on demand basis. The land for construction of these shelters will be donated by communities or district governments. The Implementing Agency does not have any plans to acquire private land for this purpose but in case of land acquisition, a Resettlement Policy Framework has been developed.

81. The IA is not familiar with the Bank's Involuntary Resettlement Policy but have knowledge of country laws, rules and regulations of land acquisition. In case of land acquisition, efforts will be made to build the capacity of social staff. The limited social risks due to construction activities will be mitigated with social management plan, developed under the project. Most of the potential impacts will be temporary and reversible in nature and can be mitigated with the help of appropriate mitigation measures, such as avoiding impacts on cropping area and tree cutting. IA ensured avoiding occurrence of resettlement impacts, but in case of such impacts, the IA will prepare Resettlement Action Plan(s) to fully compensate the resettlement impacts by following the Involuntary Resettlement Policy 4.12 of the World Bank and the Government laws, and implement RAPs prior to initiation of civil works. The World Bank Policy on Indigenous People will not be triggered as no indigenous people reside in Sindh.

Gender Mainstreaming:

82. According to OP/BP 4.20 it is crucial for the Bank operations to periodically assess the gender dimensions of development. Moreover under IDA commitments, gender considerations are to be incorporated into the analysis, content, design of the programs and results frameworks. In the context of Sindh it is crucial to address gender dimensions both from economic reasons and an efficiency point of view. This is especially true in the agriculture sector, where large number of women is participating in the labor force and gender inequalities in access to and control over resources are persistent, undermining a sustainable and inclusive development of the sector. Gender differences, arising from the socially constructed relationship between men and women, affect the distribution of resources between them and cause many disparities in development outcomes. Sindh has an increasing demand for high-value products such as local crops in expanding urban markets, however the challenge is to ensure that women retain control over their production, processing, and marketing; product quality and reliability must be enhanced.

83. As part of the social assessment of the project a Gender Assessment (GA) was carried out during the appraisal to identify the gender inequalities in resources and voice addressed (agency of women) and to identify differential needs of women and men and to design accordingly. The objectives of the assessment were (a) to provide a situation analysis of gender related issues in agriculture and water management in Sindh to identify the gender asymmetries in participation and power in labor and resource access; (b) to explore opportunities for engagement of women and vulnerable groups in the Project design and implementation as part of the decision making forums; and (c) to provide a detailed gender action plan with gender sensitive indicators and mitigations to ensure equitable access of women and men. The assessment provides an overview of Sindh concluding that engagement and participation of women farmers is one of the major challenges that need to be mitigated in the project design due to the socio economic and cultural limitations and challenges associated with their participation.

84. **Gender Equality and Social Inclusion Action Framework**- GESIAF: A detailed Gender Action Plan (Gender Equality and Social Inclusion Action Framework- GESIAF) with gender responsive qualitative and quantitative indicators have been drafted to capture gender based results of the project. Led by the PD, PIU in the Department of Agriculture the GESIAF will be the roadmap for social inclusion and engagement of women and marginalized groups in the Project implementation. This plan will be monitored by a gender specialist who will ensure that gender is mainstreamed during implementation of the project. The Action Plan is not designed to replace the gender mainstreaming strategy of the Department, but rather to advance its implementation. The Action Plan defines concrete one-year actions to intensify the implementation of gender mainstreaming of the Project. Execution of this plan with multi-pronged strategies would give gender issues more traction institutionally and would position the department to incorporate women concerns in the project effectively.

85. **Mainstreaming Gender into Agricultural Extension Services.** Sindhi women face socio cultural obstacles to interacting in public forums with men. Although the majority of them work in the fields (70 percent), when it comes to decision making forums their participation is limited. Under sub component A 1 Women Groups (WGs) will be formed that will be linked to the Water Course Associations (WCAs). WGs will provide a unique opportunity for women to build human and social capital and increase their capacity in the long run to participate fully in the local level decision foras (village and municipal governments) where decisions on production and marketing strategies will be made. Gender specific trainings (operational and financial matters) will be organized for the WCAs along with a gender sensitive awareness campaign to sensitize men and women about gender related issues.

86. Under sub component A2 formation of Vulnerable Community Groups will be one of the mechanisms to address elite capture and encourage engagement of women and vulnerable segments. Gender sensitive design elements have been included e.g. segregated latrines and kitchens in the Elevated Platforms flood shelters to ensure privacy for women and children. In the context of an emergency situation where gender based violence is prevalent, such mitigations would ascertain protection of vulnerable beneficiaries including women. Component B will provide opportunity for affirmative action and women would be targeted and encouraged to get technical training and participate in the use of technical machinery. The objective is to help women divert time from subsistence activities and domestic chores into more productive technologically advanced activities. Engagement of community leaders and men would be the strategy that will be followed to create ownership and to address the limitations placed by the men in the community in terms of women's participation in technical aspects.

87. During the appraisal meetings, IA acknowledged that there are gaps in capacity in mainstreaming gender into project operations. Staff sensitization trainings will include components on gender and recruitment of a specialist will fill those gaps and will also build the capacity of the Department to address such concerns.

ANNEX 4. OPERATIONAL RISK ASSESSMENT FRAMEWORK (ORAF)

Pakistan: Sindh Irrigated Agriculture Productivity Enhancement Project (P145813)

Stage: Negotiation

1.1 Stakeholder Risk	**Rating**	**Moderate**
Description: Potential lack of demand by farmers for the proposed interventions, especially in the event of another natural disaster when farmers may not be able to afford cost sharing during the following season and in the case of adoption of new irrigation technologies such as HEISs; and Reduction of project benefits through potential interventions of powerful land owners at the expense of small and medium farmers. However, these risks are considered to be moderate given the strong ownership and that project interventions have high returns and are extremely popular among farmers.	**Risk Management:** • Provide community shelters in 7 flood prone districts where farmers can store their seed, agriculture inputs, food stock, and livestock to avoid total loss of livelihoods and give opportunities to the farmers to quickly overcome the impacts, in the event of a natural disaster such as flooding. • In the irrigated areas, provide a flexible program for the new intervention with reasonable cost sharing where farmers' financial capacity and ownership of the technology is balanced to help make the intervention sustainable in long run. For provision of the new technology, HEIS, a comprehensive support system ranging from early identification of suitable areas, TA and Training packages, and needed demonstration, and flexible approach will ensure successful implementation. • In targeted areas, use a variety of communication channels and an awareness campaign to sensitize and inform the farmers about the advantages of HEIS technology and crop diversification. • Develop selection criteria for each intervention to ensure participation of the small and medium size farmers as well as the larger farmers; thus everyone can be satisfied while the agriculture sector benefits. **Resp:** Bank & Borrower| Prep & Impl **Due Date:** Throughout **Status:** Not yet Due	

2.2 Sector and Multi-Sector	Rating	Moderate
Description: The ongoing irrigation sector reform program remains challenging in Pakistan and in Sindh and progress on this is likely to take time. Furthermore, the irrigation sector still suffers from institutional weaknesses, particularly poor O&M of the irrigation systems at the upper tiers, and because of inequities in water distribution to the water courses, which can adversely affect irrigation water supply to water courses targeted by the Project.	Risk Management: • Continuous support and monitoring of the reform program for the upper tiers of the system through the ongoing WSIP. • Special focus under the ongoing WSIP to sensitize the concerned sector institutions on the need of ownership and commitment to the reform, including their roles and responsibilities Project design has in place measures that will ensure that the water courses being improved have adequate water supply from the canal systems, and that the HEISs have sufficient water supply from the water course or groundwater wells where feasible. The provision of storage tanks in combination with the HEISs will ensure constant water supply. Resp: Bank and Borrower| Stage: Impl | Due Date : Throughout project implementation Status: Not yet Due	

3. Implementing Agency (IA) Risks (including Fiduciary Risks)		
3.1 Capacity	**Rating**	**Substantial**
Description: The sheer scale of the operation, spread over the entire province and dealing with thousands of farmers and water users, hundreds of field teams and staff raises concerns regarding technical and management capacities for carrying out the program. Efficiency and transparency in procurement could also pose a risk, particularly given the large number of contracts. However, the implementing agency has years of experience working with the farmers and water users associations in implementing similar projects.	**Risk Management:** • Provide technical assistance to the implementing agency (OFWM Directorate) under the project. This will enhance its capacity to deal with an operation spread over such a vast area. • Ensure the monitoring and evaluation consultants will monitor the project performance, users' satisfaction and any issues regarding implementation, and will provide feedback to the implementing agencies. If any issues emerge, they will be dealt with at the management and project steering committee level, which will be chaired by the highest authority in the province. • Pay particular attention to supplementing/building the capacity for procurement, contract management, safeguards, M&E, FM, and technical and managerial issues for delivery of various components. Regular training of all project staff will be provided to handle staff turn-over in PIU through knowledge sharing and exposure to other Bank operations. **Resp:** Bank and Borrower **| Stage:** Implementation **| Due Date:** Throughout **Status:** Not yet Due	
3.2 Governance	**Rating**	**Substantial**
Description: Complex implementation arrangements, involving several layers of government and spanning across 24 districts in the province, could	**Risk Management:** • Leveraging substantial investments from the beneficiaries which will mitigate governance risks. • Ensure that the procurement of materials for water courses will be carried out by the communities who will also implement the works. Therefore, there will be internal check and balance and self- interest to	

lead to weak oversight, uneven performance, and pose governance challenges.	carry out procurement properly. • Assign two consultants to oversee the works. Supervision consultants will supervise on a regular basis, and certify the quantity and quality of works; M&E consultants will carry out spot check and technical audits. • Because that the financial transactions will be in thousands at any given time, additional financial staff is added and a good system of financial management will be used. Establish a GRM to ensure preferences for allocation of project interventions are applied only to those who are eligible. **Resp:** Bank and Borrower **| Stage:** Impl **| Due Date:** Throughout **| Status:** Not yet Due
4. Project Risks	
4.1 Design	**Rating** **Moderate**
Description: The proposed project is complex, including a large number of various beneficiaries living in a vast area. Several layers of government are involved and fine tuning implementation among the many stakeholders may not always be smooth and without problems. The new HEIS technology is little known. Its introduction must be supported by government agencies and the private sector, the latter to be encouraged (subsidized) to start producing HEIS equipment locally.	**Risk Management:** • Most project activities such as lining of water courses have been implemented since late 70s with good results and on farmer demand. The project design and implementation reflects extensive consultations with farmers and users, including lining by their own hands (farmers' association contract) and with their choice of material but with technology advices by the project consultant. Government agencies are encouraged to improve their coordination among each other. • The technology will be provided to the farmers based on demand and according to their needs and on cost sharing basis which ultimately ensuring farmers' ownership. • The project design draws on lessons learned from previous projects in Pakistan and similar projects in other parts of the country. Major lessons incorporated in the project design include (a) beneficiary participation is made central to the project, (b) laser levelers and HEIS are provided via service providers instead of Government agency to ensure close and continuous contact farmers and the private service providers; (c) output based operations with disbursements to be made on unit rates instead of traditional procurement and contracting of works and materials. • All new technology based HEIS such as drip/bubbler/ and sprinkler irrigation introduction are being planned with full support mechanism to make provision, adoption and expansion of the technology sustainable in Sindh. • The private sector will be informed and supported with the necessary know-how to initiate local HEIS equipment production **Resp:** Borrower **| Stage:** Impl **| Due Date:** Throughout **| Status:** Not yet Due

4.2 Social and Environmental	**Rating**	**Low**
Description: There are no adverse social or environmental impacts anticipated. The project has positive environmental benefits, including reduction in water losses and reduced degradation of land and water resources.	**Risk Management:** • The limited risk under the safeguards will be mitigated with each social and environmental management plan under the project. • Experience from past and ongoing projects shows that the implementing agencies are familiar with the Bank's Safeguard and Environmental Impact Assessment rules and regulations. **Resp:** Bank **| Stage:** Impl **| Due Date:** Throughout **| Status:** Not yet Due	
4.3 Program and Donor	**Rating**	**Low**
Description: Program and donor risks are minimal. The Government of Sindh made a conscious decision to leave the activities under the proposed program for financing to the World Bank on a long term basis. The development budget for the Ministry will be spent on other priority activities and with involvement of other donors and partners. Further, the project is fully financed by the Bank and the Government and is not affected by the financing of other projects by donors.	**Risk Management:** The Bank is currently engaged with the government in the implementation of Additional Financing to the Sindh On-Farm Water Management Project. Project preparation is therefore being financed by the ongoing project, representing a natural progression into a more elaborate and longer term engagement with the government of Sindh. **Resp:** Bank **| Stage:** P Impl **| Due Date :** Throughout **| Status:** Completed	
4.4 Delivery Monitoring and Sustainability	**Rating**	**Moderate**
Description: The scale of the project involving installation of irrigation systems at several thousand sites can pose a risk in terms of ensuring the quality of works. However, the O&M at the water course level rests with the farmers and they have done a comparatively adequate job in maintaining the system.	**Risk Management:** • Farmers and users who participate in the project will be provided training to enhance their capacity and experience in managing project works. • Supervisory consultants will ensure the quality of works undertaken under the project. Both the Project Management and the Project Steering Committee will ensure that corrective actions are taken to ensure quality as identified by the farmers as well as the supervisory and M&E consultants. • The O&M of the works improved under the project will be reduced and carried out more easily, thus improving the sustainability of the works and helping to improve the sustainability of irrigation system overall. **Resp:** Bank **| Stage:** Prep **| Due Date :** None **| Status:** Completed	

7. Overall Risk		
	Implementation Risk Rating:	Substantial

ANNEX 5: Implementation Support Plan

Pakistan: Sindh Irrigated Agriculture Productivity Enhancement Project (P145813)

1. **Strategy and approach for Implementation Support.** The strategy for implementation support has been developed to address the specialized needs of the Project. The objective is to provide relevant, efficient, and timely support to the client for implementation of various activities under the Project with an aim to promote flexibility in implementation and mitigate project risks as defined in the ORAF. The following implementation support strategy and associated plan consistent with Project design and risks is drawn for the Project. The plan is tentative and flexible and will be revised during implementation and adjusted based on actual developments and needs on the ground. More importantly, the implementation plan should be adequately resourced.

- **Technical Aspects**: The Bank team has been providing and continues to provide implementation support for the technical aspects of the project. The Bank will also support provision of independent technical experts consisting of internationally renowned experts in the fields of HEIS expertise, agriculture and irrigation agronomy.

- **Procurement**: There will be numerous small contracts procured by participating communities under this project particularly under components A and B. The Bank procurement team have been providing under the recently completed Additional Finance to On-Farm Water Management Project and continues to provide procurement expertise; training to members of the procurement committee and related staff in the regional project offices, as well as the project management consultant; reviewing procurement documents and providing timely feedback to the procurement committee; providing detailed guidance on the Bank's procurement guidelines to the procurement committee; and monitoring procurement progress against the detailed procurement plan developed by the Project Implementation Unit.

- **Financial management**: Supervision will review the project's financial management system, including but not limited to accounting, reporting and internal audit and controls. Supervision will also cover sub- projects on a random sample basis. The Bank team will also work with the project management consultant to assist the PIU, district offices and field teams in improving coordination among different departments and units for financial management and reporting.

- **Environmental and social safeguards**: The Bank team will supervise and provide support to PIU and field offices for the implementation of the agreed environmental and the social issues and safeguards.

- **Anti-Corruption**: the Bank team supported by the Governance Team will supervise the implementation of the agreed Governance, procurement aspects and plans.

- **Coordination with the Development Partners:** The Bank team will help Government with coordination among the Development Partners, and help in addressing project management, procurement, disbursement, financial management and safeguard issues.

Implementation Support Plan

2. Some of the Bank team members will be based in the country office, some in Washington and others in country offices in the region to ensure timely, efficient and effective implementation support to the Client. Supervision and monitoring support to PIU will be mainly provided by the team members in the country office, especially for the first 18 months. Formal supervision and field trips will be carried out semi-annually. The supervision missions will be coordinated with the other Development Partners (DPs) such as USAID and FAO who are also involved in the water sector in Sindh.

Detailed inputs from the Bank team are outlined below:

- **Technical inputs**. Irrigation, agronomy, water engineering and drip electro-mechanical equipment expertise are required to review of project plans, implementation and specification of the goods etc. The task team will contract individual consultants for these skills. Specialist and high level procurement skills are required for review if the major works contracts as well as the three consulting services PSIACs, M&E and TA&T. During construction and commissioning, technical supervision is required to ensure contractual obligations are met on technical grounds. Field visits by the team's irrigation, agriculturist, and agriculture economist will be conducted on a semi-annual basis throughout project implementation.

- **Fiduciary inputs**. Training will be provided by the Bank's financial management specialist and procurement specialist. The team will also help PIU identify capacity building needs to strengthen its financial management capacity and to improve procurement management efficiency. Both financial management and procurement specialists will be based in the country office to provide timely support. Formal supervision of financial management will be carried out semi-annually, while procurement supervision will be carried out on a timely basis as required by the Client. PIU will be provided with consulting services in this area and assistance by PSIAC, M&E consultants. In addition under component D, project funds are available for recruitment of specialized skills as needed in fiduciary areas.

- **Safeguards Inputs.** An environment, a social, and a gender specialist are required, though the project's social and environmental impacts are limited and the client capacity is generally adequate. Training is required on environment monitoring and reporting. On the social side, the supervision will focus targeting of the project activities to the small farmers and women farmers as agreed under the implementation plan. Field visits are required on a semi-annual basis. Both social/gender and environmental specialists are country office based. The M&E consultants will help in independent monitoring of the safeguard issues and highlighting to the Bank team any issues, possible alternative solutions in a timely manner.

The main focus of implementation support is summarized below:

Time	Focus	Resource Estimate	Partner Role
First Year of the Project Implementation	Technical Expertise	Irrigation Engineer 4 SWs High Efficiency Spec. 4 SWs Agriculture/horticulture Spec. 5 SWs	NA
	Fiduciary Expertise	Procurement and FM Spec. 6 SWs	NA
	Social Expertise	Social/ Gender/ RAP Specialist 4 SWs	NA
	Environmental Expertise	Environmental Specialist 3 SWs	NA
	Institutional and capacity building	Institutional Dev. Specialist 2 SWs	NA
	Economics Expertise	Agriculture Economist 3 SWs	FAO
	Governance Expertise	Governance Specialist 2 SWs	NA
	Team Leader	TTL 10 SWs	NA
Year 2-6	Technical Expertise	Irrigation Engineer 4 SWs High Efficiency Engineer 4 SWs Agriculture/horticulture Spec. 5 SWs	NA
	Fiduciary Expertise	Procurement and FM Spec. 4 SWs	NA
	Social Expertise	Social/ Gender/ RAP Specialist 4 SWs	NA
	Environmental Expertise	Environmental Specialist 3 SWs	NA
	Institutional and capacity building	Institutional Specialist 2 SWs	
	Economics Expertise	Agriculture Economist 2 SWs	
	Governance Expertise	Governance Specialist 2 SWs	
	Team Leader	TTL 10 SWs	

The staff skills mix required is summarized below:

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Irrigation engineer	4 SWs annually	Fields trips as required	Inter/National
Agriculturist and Horticulturist	4 SWs Annually	Fields trips as required	Inter/National
High Efficiency Engineer w/ electro-mechanical expertise	4 SWs annually	Field Trips as required	International
Institutional Dev. Specialist	4 SWs annually	Field trips as required	International
Economics &Financial Spc	2 SWs annually	Field trips as required	International
Governance Specialist	2 SWs annually	Field trips as required	Inter/National
Social Dev. Specialist	3 SWs annually	Fields trips as required	Country office
Social Specialists (intern.)	2 SWS Annually	Field trips as required	International/Regional
Gender Specialist	2 SWs annually	Fields trips as required	Country office
Environmental Specialist	3 SWs Annually	Field trips as required	Country office
Environmental Specialist	1 SWs Annually	Field trips as required	International
Procurement	4 SWs annually	Fields trips as required	Country office
Procurement	2 SWs annually	Fields trips as required	International
Financial Mng. Spec.	3 SWs annually	Fields trips as required.	Country office
Task Team leader	8 SWs annually	Fields trips as required	International/ Country

ANNEX 6: ECONOMIC ANALYSIS

Pakistan: Sindh Irrigated Agriculture Productivity Enhancement Project (P145813)

A. Introduction

1. An economic and financial analysis (EFA) of the project was undertaken in order to assess the economic soundness of the project and the likely impact of project interventions on the beneficiaries. The analysis takes into account the project costs and project outreach assumptions at the time of appraisal. The findings of the analysis are summarized below. More details are provided in the EFA Appendix in the Project File. The EFA is linked to the project's Results Framework and its outcome indicators related to increased cropping intensity and yields, although the analysis is based on reduced targets and can therefore be considered conservative. It is expected that the EFA will be periodically updated as an integral part of the project's M&E System and as an input into the project evaluation at mid-term and completion stage. Consequently, adequate financial and human resources for EFA during implementation have been included in the project design.

B. Economic Analysis

2. **Overview.** The economic benefits of the project interventions that have been included in the analysis comprise: (a) increased area under irrigation and cropping intensity; and (b) increased crop yields. The benefits will be primarily due to (i) improved water delivery efficiency in the water courses (WC) resulting in more water available and faster delivery to the farmers' fields, thereby making water available during the full duration of an irrigation cycle and ensuring a more equitable water distribution; (ii) precision land leveling resulting in water savings, reduction in the time farmers spend on irrigation, uniform seed germination, and increased fertilizer use efficiency; (iii) High Efficiency Irrigation Systems (HEISs) for orchards, vegetables, flowers, other high value row crops with a water delivery efficiency of up to 90 percent, saving up to 68 percent water, and improving utilization of agriculture inputs; and (iv) adoption of improved agronomic and irrigation techniques.

3. The economic analysis attempts to quantify the economic benefits resulting from Sub-Components *A.1: Community Water Course Improvement, B1: Small and Medium-Sized HEISs and B2: HEIS Demonstration Sites and Kitchen Garden HEIS Kits*. While Sub-Components C1: Laser Land Leveling and Deep Plowing and C2: Improved Agriculture Production Technology (and related Sub-component C3) also have a direct impact on crop production, benefits from these sub-components have not been quantified separately as they would contribute to realizing the outcomes expected from A1, B1 and B2. No economic benefits have been calculated for Sub-Component A2: Mitigating Flood Risk for the Poor and Component D: Project Management, Technical Assistance, Studies, Monitoring and Evaluation, the latter being a precondition for the implementation of the technical components. However, the economic costs of all project components have been included in the overall project economic analysis.

4. **Increased cropping intensity**. Cropping intensity (CI) is defined as the fraction of the cultivated area that is harvested throughout the year including Kharif, Rabi and other short-duration off-season crops (in percent). While the overall cropping intensity for Sindh has been reported in the Agricultural Census 2010 as 164 percent for irrigated land and 113 percent for unirrigated land, these numbers may be an over-estimation. The Project Impact Assessment

Report (PIAR) of the Sindh On-Farm Water Management Project (OFWMP), on the basis of a sample of 280 improved WC, has actually estimated a CI in project WC at the end of the project of 137 percent while the baseline was 119.3 percent (increase 17.7 percent). Consequently, for the SIAPEP EFA, a CI of 115 percent has been assumed for the unimproved WC with an expected increase resulting from WC improvement of 10 percent (CI of 125 percent). For the analysis of on-farm HEISs, it is assumed that the CI would increase from 115 percent by 50 percent to 165 percent (which is around the officially reported average for irrigated land) and from 80 percent to 100 percent for orchards.

5. **Increased yields and production**. The OFWMP PIAR estimated yield increases resulting from the project for three major crops as follows: wheat (9.6 percent), cotton (10.8 percent) and sugarcane (13.1 percent). However, it should be noted that these figures are based on a before-after comparison and do not take into account the actual yields realized by farmers in comparable, but unimproved, WC in the same year. The economic analysis is based on the following yield assumptions: (a) the average increase of yields above the present situation in improved WC would range from 7 percent (dates) to 35 percent (rapeseed) after three years; (b) the average yield increases in HEISs after three years would be between 11 percent (tomato) and 49 percent (sunflower); (c) it is assumed that the yield increase that takes place without project intervention, resulting from adoption of improved seeds and cropping practices, would be on average 1.5 percent after three years; and (d) these yield differences between the "future without-project" (FWOP) and the "future with-project" (FWP) situation would be maintained thereafter. The assumptions regarding cropping intensity and yields are included in the EFA Appendix in the Project File while Table 6.1 presents the estimated impact of the project on crop production in Sindh.

Table 6.1: Estimated Project Impact on Crop Production in Sindh

Crop	Existing Production Sindh Province (MT) /a	Incremental Production expected from the Project (MT)			Incremental Production as Percentage of Existing Production
		W/C	HEIS	Total	
Wheat	4,287,900	193,885		193,885	5
Rice	1,230,300	187,705		187,705	15
Cotton	618,600	86,182		86,182	14
Sugar Cane	13,766,400	1,667,641		1,667,641	12
Sunflower	341,600	0	4,089	4,089	1
Rapeseed	50,200	8,530	2,377	10,907	22
Mango	381,300	22,704	17,159	39,862	10
Dates	268,600	10,887	9,114	20,001	7
Banana	113,400	16,703	14,859	31,561	28
Tomato	114,800	28,362	6,324	34,686	30
Chillies	158,200	22,622	5,051	27,673	17
Okra	na	17,365	3,016	20,382	NA
Onion	861,500	56,743	4,921	61,664	7
Fodder	4,980,700	29,684	0	29,684	1

\a Source: Agricultural Statistics, Year 2010/2011.

Note: It is expected that the area under tomato assumed for the purpose of analysis will include several other vegetables with similar returns for which no detailed crop budgets have been prepared.

6. Although a specific market analysis was not carried out, given the ever increasing demand particularly in urban areas as a result of population increase, it is safe to assume that incremental production resulting from the project will, for most crops, not depress producer prices. It should also be noted that Sindh captures the market for most products earlier than other parts of the country because of its relative warm climate and a number of products that are grown in Sindh cannot be grown in other provinces.

7. **Economic costs and assumptions made.** The financial project costs have been converted to economic costs, which exclude taxes and duties and price contingencies, using the COSTAB software and applying a standard conversion factor (SCF) of 0.89 (see SFC calculation in the Appendix). The analysis was carried out for a 20-year period, which is the estimated project life including the six-year project implementation period. The economic analysis was undertaken in 2013 constant prices, and a discount rate (i.e. opportunity cost of capital) of 12 percent was assumed. The Pakistan Rupee (PKR) was used as the unit of account and the official exchange rate of PKR 101 to USD 1.0 (January 2015) was applied when converting to USD.

8. The annual operation and maintenance (O&M) costs of the WC and HEIS structures/equipment, as well as the replacement costs of the HEIS equipment as appropriate, were included in the economic analysis as these costs will have to be incurred if the future benefits of the investment in irrigation are to be sustained. Although not contributing to the economic benefits quantified in the analysis, annual O&M costs of flood shelters have also been included (see details in Project File).

9. **Economic benefits.** In the estimation of the economic benefits, economic gross margins per acre were derived from the crop budgets (see Financial Analysis below) by valuing the physical input and output quantities in terms of their respective economic prices. Import or export parity prices have been calculated for major internationally traded commodities (wheat, rice, cotton, sugarcane) and chemical fertilizers using World Bank commodity price data. For all other commodities and inputs, a SCF of 0.89 has been applied. All prices are current (December 2014) prices. Taxes have been removed and family labor has been valued at an estimated opportunity cost of PKR 234 per person day (90 percent of the rate of hired farm labor). Details are provided in the Project File. The economic gross margins per ha were subsequently multiplied by the crop areas to determine the net benefits in the FWP and FWOP situations. The differences between the net benefits in FWP and FWOP situations were then calculated in order to determine the economic impact of the changes in cropping patterns and crop yields described above. Net incremental benefits were calculated for each project year, including replacement and O&M costs of WC and HEIS structures and equipment as appropriate. It is estimated that around 98 percent of the net incremental benefits will be generated by around 198,000 farmers in the improved WC while around one percent will be generated by the 2,600 HEIS farms. The contribution of the 10,000 kitchen farm households to total net incremental benefit is less than one percent.

10. **Economic viability and sensitivity analysis.** The economic internal rate of return (EIRR) of the project for the base case is 36.7% with a net present value (NPV) of PKR 28.4 billion (USD 268.1 million). This result indicates that, on the basis of an opportunity cost of capital of 12 percent, the proposed project interventions will generate a highly satisfactory EIRR and are therefore justified on economic grounds.

11. The results of the sensitivity analysis are summarized in Table 6.2. The project's economic viability is robust to adverse changes in project costs. The project is also robust to changes in incremental benefits and only becomes uneconomic if incremental benefits are reduced by 67 percent. Even when considering the possibility of a combination of 20 percent reduction in incremental benefits and a 20 percent increase in project costs, with a three-year delay in benefits, the project remains economically viable with an EIRR of 15.5 percent.

Table 6.2: Economic Viability and Sensitivity Analysis

Scenario			**EIRR**
Base Case			**36.7%**
Changes			
Project Costs	**Incremental Benefits**	**Benefits delayed by**	
+20% +40%			31.4% 27.4%
	-20% -40%		30.3% 27.4%
+20% +40%	-20% -40%		25.7% 16.5%
Base Case		1 year 2 years 3 years	28.7% 24.0% 20.6%
+20%	-20%	1 year 2 years 3 years	21.2% 18.0% 15.5%
Switching Values /a			
Costs	203%		
Benefits	67%		

\a Switching value: percent change in cost and/or benefit streams to obtain an EIRR of 12 percent, i.e., economic viability threshold.

C. Financial Analysis

12. **Crop budgets.** The financial analysis is based on crop budgets which were prepared for 14 crops using prevailing market prices on the basis of market surveys carried out during the feasibility study in 2013. While five crops are assumed to be grown only under conventional flood irrigation along WC (wheat, rice, cotton, sugar cane and fodder), for the remaining nine crops including fruits (mango, dates, banana), vegetables (tomato, chillies, onion, okra) and oilseeds (sunflower, rapeseed), crop models have been prepared for HEIS irrigation as well. The assumptions for yields and cropping patterns are presented together with the detailed financial crop budgets are presented in the EFA Appendix in the Project File. For all crops, three scenarios were prepared: the present, the future without-project (FWOP), and the future with-project (FWP) situation. In the FWP situation, increases in crop productivity will principally arise from increased water delivery efficiency, land improvements, better utilization of agriculture inputs and adoption of improved agronomic and irrigation techniques (see also paragraph 2). Based on the detailed financial crop budgets, gross margins have been calculated for the present, FWP, and FWOP situations (see Project File).

13. **Farm budgets and cost recovery.** Farm-budget analysis was undertaken to determine the impact of the project interventions on farm income and the extent to which farmers would be able to cover O&M and recover the investment costs of the structures and equipment. Farm

budgets were prepared for WC farmers (2 ha and 4 ha) and for HEIS farmers (row crops and orchards - 2, 4 and 10 ha) based on the cropping pattern presented in the Appendix. A summary of the net farm incomes in the present, FWP and FWOP situations is given in Table 6.3. Furthermore, the table presents the net farm income after deducting (a) the annual cost of O&M of the structures and equipment provided by the project, and (b) the O&M as well as the calculated annual cost recovery of the investment based on a 20 year period and an interest rate of 12%. While net farm incomes increase in all cases considerably even after full O&M costs have been deducted, the calculated net farm incomes of the 2 ha and 4 ha HEIS farms with row crops in unimproved WC are not sufficient to recover investment costs.

Table 6.3: Net Farm Income ('000 PKR)

		Present	FWOP	FWP		
				No O&M and cost recovery	O&M deducted	O&M deducted and cost recovery
Water course	2 ha	142,517	141,990	178,790	177,112	172,619
	4 ha	285,034	283,980	357,580	354,224	345,238
HEIS Row crops						
HEIS – unimproved WC	2 ha	122,613	128,180	277,085	244,613	64,583
	4 ha	245,225	256,360	554,170	502,715	216,812
	10 ha	613,063	640,901	1,385,424	1,283,639	723,228
HEIS – improved WC	2 ha	122,613	128,180	358,494	326,023	145,993
	4 ha	245,225	256,360	716,989	665,534	379,630
	10 ha	613,063	640,901	1,792,471	1,690,686	1,130,275
HEIS – tubewells WC	2 ha	122,613	128,180	365,007	332,536	152,505
	4 ha	245,225	256,360	730,014	678,560	392,656
	10 ha	613,063	640,901	1,825,036	1,723,250	1,162,839
HEIS Orchards						
HEIS – unimproved WC	2 ha	286,192	292,928	478,241	451,277	301,839
	4 ha	572,383	585,856	956,482	914,707	686,075
	10 ha	1,430,958	1,464,640	2,391,204	2,318,918	1,925,016
HEIS – improved WC	2 ha	286,192	320,134	638,968	612,004	462,566
	4 ha	572,383	640,268	1,277,936	1,236,161	1,007,529
	10 ha	1,430,958	1,600,671	3,194,839	3,122,553	2,728,651
HEIS – tubewells WC	2 ha	286,192	320,134	587,414	560,450	411,013
	4 ha	572,383	640,268	1,174,829	1,133,054	904,422
	10 ha	1,430,958	1,600,671	2,937,072	2,864,785	2,470,883

14. Financial cost-benefit analysis has been carried out for the various HEIS models, including the incremental agricultural benefits and costs of initial investment, replacement and O&M. As can be seen from the table below, on-farm HEIS for orchards is financially viable (with Financial Internal Rates of Return [FIRR] of above 12 percent, the opportunity cost of capital), except for the 2 ha and 4 ha farms in unimproved WC. HEIS for row crops only generates a FIRR above 12 percent for the largest (10 ha) farm model in improved WC. The analysis clearly shows the need to assess the financial viability of each HEIS farm prior to the investment which should be included in the selection criteria (in the form of a business plan).

Table 6.4: Financial Internal Rate of Return for On-Farm HEIS

	Size of farm		
	5 acres (2 ha)	10 acres (4 ha)	25 acres (10 ha)
	Row crops		
HEIS in unimproved WC	-0.5%	6.1%	6.8%
HEIS in improved WC	6.4%	10.9%	16.7%
HEIS with tubewells	1.9%	5.7%	10.4%
	Orchards		
HEIS in unimproved WC	4.2%	8.4%	15.6%
HEIS in improved WC	21.8%	31.0%	51.5%
HEIS with tubewells	15.6%	22.8%	37.8%

15. While introduction of HEIS in kitchen gardens will primarily improve the household food and nutrition security and reduce the women's workload, it has been estimated that the incremental financial benefits per 100m2 plot are at least PKR 7,000 per annum (see Appendix).

D. Benefit Distribution, Poverty Analysis and Employment Impact

16. The project will primarily benefit smallholder farmers (with farm areas of less than 12.5 acres (5.1 ha) [estimated to account for 83 percent of the 198,000 farmers in the project WC] and 1,750 farmers cultivating 2 or 4 ha under HEIS. Furthermore, the project will support 5,000 female headed households and 5,000 landless farmers with HEIS sets for kitchen gardens. The benefits expected to be generated were distributed among these main categories of beneficiaries as presented in Table 6.5 below. The net benefits of the project to be gained by poor households were estimated by applying the percentage of households assumed to be living below the poverty line to the overall net benefits within the different beneficiary categories. The analysis shows that around 67 percent of total project benefits go to the poor. It can therefore be concluded that the project will make a significant contribution to poverty reduction in Sindh Province.

Table 6.5: Benefit Distribution and Poverty Impact

	Smallholder WC Farmers /b (5 ha and less)	Larger WC farmers /b (>5 ha)	HEIS farmers	Female headed households/ landless farmers	Total
No. of farmers	178,200	19,800	2,600	5,000/5,000	210,600
Net benefits (PKR '000) /a	37,431,277	1,078,267	423,384	214,066	39,146,994
Percentage of total benefits	95.6%	2.8%	1.1%	0.5%	100.0%
Estimated proportion of poor (%)	*70%*	*0%*	*0%*	*100%*	*64%*
Estimated number of poor farmers	124,740	0	0	10,000	134,740
Estimated net benefits to poor (PKR '000)	26,201,894	0	0	214,066	26,415,960
% of total net project benefits	*66.9%*	*0.0%*	*0.0%*	*0.5%*	*67.5%*

\a NPV of incremental benefits, including investment costs.

\b It is assumed that 83% of WC farmers have a farm size of under 5.1 ha (cultivating on average avg. 1.4 ha); Based on Agric. Census 2010/2011.

Note: Impact on income of poor on-farm laborers not included.

17. In addition to the direct beneficiaries, a large population would also benefit indirectly from the project, such as landless farm laborers for agricultural operations, and temporary and permanent labors engaged in construction and manufacturing sectors. As a consequence of increased crop production, agricultural employment is expected to rise by about 30% or 19.3 million person days per annum (from 63.6 million days at present to 83.7 million days FWP). This is equivalent to around 80,690 additional full time jobs (at 240 person days per year). Table 6.6 below shows the expected increase in the level of agricultural employment in the project area. It is estimated that hired labor accounts for around 88 percent of the increase, creating opportunities for the landless poor who are mainly employed in agriculture as wage workers. In addition, substantial employment will also be generated for handling incremental production, processing and marketing as well as during project implementation for construction works, and staffing by HEIS and laser leveling/deep ripping service providers would be significant.

Table 6.6: Agricultural Employment in the Project Area - by family/hired labor

Crop	Annual Agricultural Employment (person days)				
	Present	**FWOP**	**FWP**	**Increase /a**	***%***
Family labour - person days	16,757,759	16,918,749	19,200,978	2,282,229	*13*
Family labour - no. of jobs /b	69,824	70,495	80,004	9,509	*13*
Hired labour - person days	46,918,114	47,437,241	64,520,588	17,083,347	*36*
Hired labour - no. of jobs /b	195,492	197,655	268,836	71,181	*36*
Total labour - person days	**63,675,874**	**64,355,990**	**83,721,566**	**19,365,577**	***30***
Total labour - no. of jobs /b	**265,316**	**268,150**	**348,840**	**80,690**	

\c FWP above FWOP.
\b At an average of 240 person days per year per job.

G. Fiscal Impact

18. In the short term, the fiscal impact of the project will be neutral, given that the government's contribution to project costs primarily comprises salaries of existing district office staff and field team members. The maintenance cost of basically all of the structures and equipment provided by the project (including WC improvement, HEIS and equipment for land improvement) would be borne by the private sector (WCAs, FOs, individual farmers and service providers). However, the head stream facilities will remain mainly in the public sector and are beyond this project's intervention. The only major incremental recurrent cost to be borne by PDMA is in the form of O&M of the flood shelters (with contributions from the communities).

19. However, in the medium to long term, the potential positive fiscal impact of the project will be substantial, mainly due to: (a) increased output, income, and employment, resulting in increased tax revenues, and (b) multiplier effects due to increased disposable income of the project beneficiaries, resulting in increased demand for goods and services, which is expected to generate additional income and employment effects. Furthermore, some foreign exchange earnings/savings can be expected, resulting from an increase in exports and/or a reduction in imports.