Environmental and Social Management Framework
(ESMF)

Punjab Resilient and Inclusive Agriculture Transformation (PRIAT)

Department of Agriculture, Government of Punjab

Final

March 17 2022

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Acronyms

BDS	Business Development Services
BOQ	Bill of Quantities
BP	Business Plan
CBD	Convention on Biological Diversity
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CCI	Council of Common Interests
CCMP	Construction Camp Management Plan
CDM	Clean Development Mechanism
CFC	Chlorofluorocarbon
CIA	Cumulative Impact Assessment
CITES	Convention on International Trade in Endangered Species
DCR	District Census Report
DESC	District Environmental and Social Coordinators
DGOFWM	Director General On Farm Water Management
DIC	District Implementation Committee
DP	Dechlorane Plus
E&S	Environmental and Social
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
ERP	Emergency Response Plan
ESA	Environmental and Social Assessment
ESCP	Environmental and Social Commitment Plan
ESMF	Environmental and Social Management Framework
ESMMP	Environmental and Social Mitigation and Monitoring Plan
ESMMP	Environmental and Social Mitigation and Monitoring Plan
ESMP	Environmental and Social Management Plan
ESS	Environment & Social Standards
FAO	Food and Agriculture Organization
FD	Finance Department
FEG	Farmer Enterprise Group
FHH	Female Headed Households
GBV	Gender Based Violence
GHGs	Greenhouse Gases
GII	Gender Inequality Index
GOP	Government of Punjab
GRM	Grievance Redress Mechanism
GRM	Grievance Redressal Mechanism
HBFC	Hydrobromofluorocarbon
HCFC	Hydrochlorofluorocarbon
HEIS	High Efficiency Irrigation System
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HEIS	High Efficiency Irrigation System
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ILO	International Labor Organization
IMR	Infant Mortality Rate
IPMF	Integrated Pest Management Framework
IUCN	International Union for Conservation of Nature
LAA	Land Acquisition Act
LFPR	Labor Force Participation Rates
LG	Local Government
LSP	Local Service Provider
MAF	Million Acre-feet
MARPOL	Convention for the Prevention of Pollution from Ships
MICS	Multiple Indicators Cluster Survey
MPI	Multidimensional Poverty Index
MRL	Maximum Residue Limit
MSDS	Material Safety Data Sheets
NER	Net Enrolment Rate
NHDR	National Human Development Report
NOC	No Objection Certificate
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHSAS	Occupation Health and Safety Assessment Series
OP	Organochlorine Pesticides
ORAF	Operational Risk Assessment Framework
P&D	Planning and Development
PA	Productive Alliances
PAFDA	Punjab Agriculture, Food and Drug Authority
PAMRA	Punjab Agriculture Marketing Regulatory Authority
PBs	Polychlorinated Biphenyls
PCPS	Precast Concrete Parabolic Segments
PCPS	Precast Concrete Parabolic Segment
PD	Project Director
PDE	Polybrominated Diphenyl Ethers
PDO	Project Development Objectives
PDO	Project Development Objectives
PEPC	Punjab Environmental Protection Council
PEQS	Punjab Environmental Quality Standards
PEQS	Punjab Environmental Quality Standards
PG	Producer Group
PGA	Peak Ground Acceleration
PGs	Producer Groups
PIC	Prior Informed Consent
PIPIP	Punjab Irrigated Agriculture Productivity Improvement Program
PIPIP	Punjab Irrigated Agriculture Productivity Improvement Program

PISC	Project Implementation and Supervision Consultant
PMU	Project Management Unit
PMU	Project Management Unit
PN	Polychlorinated Naphthalenes
POM	Project Operation Manual
PP	Productive Partnership
PPE	Personal Protective Equipment
PSC	Project Steering Committee
PSHA	Probabilistic Seismic Hazard Assessment
RAP	Resettlement Action Plan
RNR	Renewable Natural Resources
RoW	Right of Way
RPF	Resettlement Policy Framework
SBC	Seismic Building Code
SEA/SH	Sexual Exploitation and Abuse/Sexual Harassment
SEP	Stakeholder Engagement Plan
SESMP	Specific Environmental and Social Management Plan
SMART	Punjab Agriculture and Rural Transformation P4R
SRA	Security Risk Assessment
SSCs	Supply and Service Companies
SSESMP	Site Specific Environmental and Social Management Plan
SSHSP	Site Specific Health and Safety Plan
SSHSP	Site Specific Health and Safety Plans
SSU	Shared Service Unit
STD	Sexually-Transmitted Disease
TDS	Total Dissolved Solid
TMP	Traffic Management Plan
TSS	Total Suspended Solid
U5MR	Under 5 Mortality Rate
UBC	Uniform Building Code
UNCLOS	UN Convention on the Law of the Seas
UNFCCC	United Nations Framework Convention on Climate Change
VLD	Voluntary Land Donation
WMOs	Water Management Officers
WMRF	Water Management Research Farms
WMTI	Water Management Training Institute
WUAs	Water User Associations

Executive Summary

Pakistan's agriculture sector plays a central role in the economy as it contributes 20 percent to GDP and absorbs 40 percent of labour force. Despite its importance, there is wasted water resources and low productivity by farmers. PRIAT's main objective is to enhance on-farm water productivity and farmers' income in proposed subproject areas. The entire province of Punjab would be covered under the project, where relevant interventions would be carried out in various regions. The main beneficiaries will include rural households and small farmers and the focus will be on improving their agriculture growth. The project uses integrated approach that combines the promotion of the agri-food sector's competitiveness and inclusiveness with increased climate resilience and water and energy efficiency.

The project will cover all 36 districts of Punjab with special focus on South Punjab, which is historically an underserved region. The Director General Agriculture (Water Management or WM) would be responsible for implementation of the project and will act as the Project Director.

Content of the ESMF

The focus of this report is on the project ESMF which sets out modalities to be followed in assessing the potential adverse environmental and social impact associated with subprojects to be implemented under PRIAT. The ESMF has been prepared by using primary and secondary information collected through a literature review, reconnaissance surveyand institutional stakeholder consultations.

The ESMF describes the process of how environmental and social impacts will be assessed, addressed and managed during the project implementation; as well as a set of measures for mitigation, monitoring and institutional responsibility that should be taken during the project implementation to eliminate adverse environmental and social impacts, their neutralization or reducing up to acceptable levels.

ESMF also identifies the responsibilities of project stakeholders, procedures for environmental and social management, screening, review and approval, monitoring and reporting requirements, as well as plans to enhance institutional capacity through capacity building activities.

Legislation and World Bank Standards

To ensure the complianc with national and provincial legislations and World Bank Environmental and Social Framework (ESF), a detailed analysis of applicable environmental policies, laws, guidelines, acts and legislations of Government of Pakistan and Government of Punjab has been done. PRIAT will follow Punjab Environmental Protection (Amendment) Act, 2017 and Punjab Environmental Quality Standards (PEQS), 2016 as well as World Bank's Environmental and Social Standards (ESSs) and guidelines. The WB ESSs currently relevant for this project are ESS1 Assessment and Management of Environmental and Social Risks and Impacts; ESS2 Labor and Working Conditions; ESS3 Resource Efficiency and Pollution Prevention and Management; ESS4 Community Health and Safety; and ESS10 Stakeholder Engagement and Information Disclosure.

To complement these, additional mitigation measures for environmental and social impacts will be implemented as part of various plans such as Site Specific Environmental and Social Management Plan (SSESMP), Site Specific Health and Safety Plan (SSHSP) Emergency Response Plan (ERP), Occupational Health and Security Risk Assessment (SRA) including Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH) risks & Gender Based Violence (GBV) action framework.

Baselines

To compare the pre and post situation after the construction phases of the project, an environmental baseline has also been established for Punjab which will be used as a benchmark for comparison of the physical, ecological and socio-economic condition. The data for the baseline has been collected from primary and secondary sources. For primary data acquisition, the environment and social team conducted the field visits while the secondary data was collected from published sources/reports, District Census Report (DCR), and relevant departments.

The baseline data shows that the mean maximum and minimum temperatures increases from north to south whereas contrary to mean temperatures the average rainfall decreases from north to south. The province of Punjab is vulnerable to natural disasters, especially monsoon floods since we have witnessed floods of various intensities in the last few years due to climatic changes. The southern districts are more vulnerable to and droughts due to lack of rain.

Most parts of the Punjab are under very intensive irrigated cultivation. In addition, livestock rearing is also practiced extensively, and milk animals are common. The use of the chemical fertilizers and pesticides is very common. Due to rich surface irrigation in the central Punjab, the fertile soils of the floodplains give a good per unit yield and consequently contributes a major volume in country's total export earnings through agro-based products.

Indus River and its tributaries are the main source of surface water in the Punjab Province. About 79 percent of the area is underlain by fresh groundwater. This is mostly used as supplemental irrigation water and pumped through tube-wells. Some groundwater is saline. The quality of groundwater ranges from fresh (salinity less than 1000 mg/l TDS) near the major rivers to highly saline farther away, with salinity more than 3000 mg/l TDS. About 79 percent area of the province has fresh groundwater. All the parameters for surface water / wastewater are within the stringent limits (PEQS 2016 and FAO standards.)

Punjab is Pakistan's largest province and has a diversified economy and a rich resource base. Nevertheless, the province is characterized by significant socioeconomic disparities across its different regions. In the 10 poorest districts of the province, all of which lie in South Punjab, multidimensional poverty incidence is as high as 42 percent, compared to 19 percent for the rest of the province on average, as per estimates given in the Punjab Growth Strategy 2018. Food insecurity is also the highest in southern districts of Punjab with 53.6 percent of households being food insecure followed by 43.8 percent in Central

Punjab and 30.2 percent in North Punjab.[1] Similar disparities are apparent in other socioeconomic indicators on education and health. In terms of gender-based violence and harassment, higher reporting takes place from Punjab compared to other provinces, which in itself is a positive trend, but also indicates that gender-based violence occurs frequently.

Environmental and Social Impacts

Environmental and social screening that was conducted to identify the potential adverse impacts subprojects shows that these can potentially cause negative environmental and social impacts. However, exact nature, extent, and location of these subprojects are not known at this stage. The potential impacts of generic nature have nonetheless been screened.

The components of PRIAT which may have adverse E&S impacts are: Sub-Component 1.1. Upgrading Community Water Conveyance Infrastructure (Improvement of unimproved watercourses, complete partially improved watercourses, reconstruct and complete outlived watercourses, improvement of irrigation conveyance systems outside canal command and riverine areas), Sub-Component 1.2: Improving Community Water Management (pilot community-based groundwater recharge schemes), Sub-Component 2.1: Improving the Market Integration of Producer Groups for Increased Production, Diversification, and Value Addition (Application of pesticide/fertilizer harvesting/processing equipment and other infrastructures[2]) and Sub-Component 2.2: Supporting Individual Producers for Climate Smart Production and Diversification (Installation of HEIS, solar systems for operating HEIS and Development of on-farm water storage ponds). Risks of social exclusion, and use of child labor are among possible impacts that can occur during implementation of all components.

In general, there are no direct impacts on the biodiversity and natural resources anticipated as construction activities will be carried out in already transformed/ cultivated area in shape of watercourse improvements (lining/rehabilitation) or introduction of HEISs (drip/ sprinkler) along with climate smart interventions such as utilizing renewable energy resources (solar panels). However, national parks, wildlife sanctuaries and game reserves exist in the project area.

It has been noted that the operational activities may potentially cause intensification of cultivation, thus increasing the usage of crop inputs including fertilizers, pesticides, and herbicides by the farmers. This in turn can potentially cause water and soil contamination having negative impacts on people, as well as on natural flora and fauna. Similarly, improper construction camp location and mismanagement of construction camp activities can lead to various social and environmental impacts which include health and safety, traffic problems, soil degradation, loss of vegetation and assets on the selected land, solid waste and water pollution. It is important to be mindful of temporary interruption of

1 Yousaf, H. Zafar, M., Zafar M., Ahmad, S. and Q. Raza (2018). "Regional distribution of food security and its determinants across regions of the Punjab, Pakistan," Pakistan Journal of Agricultural Sciences, 55(03), pp. 711-717. The study uses primary data collected from 576 households across six districts (two in each region) of Punjab.

2 Warehouses, collection center and pack houses.

irrigation water supply during construction works that may also affect water availability for crops in the command area and can potentially cause local conflicts among the communities due to unavailability of water to downstream users.

It is important to note that, large populations of workers will generate increased amounts of waste, for which no sufficient local waste management capacities may exist. The surface water may also get contaminated due to the surface runoff during construction phase. Furthermore, municipal and hazardous wastes are likely to be generated during the construction phase which may degrade hygienic condition of the project area if the wastewater is not properly treated or disposed of. Consequently, quality of groundwater and surface water resources available in the nearby local communities may be affected due to the construction activities, oil spillage and leakage, roadside accidents.

Excessive use of agrochemicals by farmers may also lead to soil pollution and destruction of soil fertility. This phenomenon may be more likely in central and southern Punjab where rainfall is too scanty and therefore little natural leaching of salts takes place. Furthermore, increased application of irrigation water may also result in exacerbated waterlogging and salinization. Reduction in water seepage from the water courses can also potentially reduce the groundwater recharge thus affecting among others the drinking water source for the local population. Operation of irrigation schemes can potentially cause water borne and water-related diseases. In particular, the ponds constructed to store water can provide breeding areas for mosquitoes, potentially causing malaria and dengue.

The subprojects may also affect local climate through rise in evapotranspiration losses from intensified Irrigation, modification in water use on the field. Moreover, the improvement in water availability may encourages the farmers switch to more water intensive crops like rice that could increase emission of GHGs: methane and nitrous oxide. Increase in agricultural production may entail more burning of agricultural waste in the fields. Furthermore, the farmers may interpret the improved availability of irrigation water as a new permanent condition and plant crops with high water requirements, it would most likely lead to a direr situation in a few years.

The project in general carries risks of social exclusion given that subprojects will be implemented on cost-sharing arrangements and will necessarily involve farmers with medium sized landholdings who can afford to work with OFWM. As such, the project risks adding to income inequality in Punjab's rural areas. Key mitigation measures in this regard include implementing, as far as possible, subprojects which also benefit the community at large (like water storage) and ensuring that the works undertaken by the subprojects employ local labor to the extent possible. Risks of gender based violence also run throughout the project's implementation period whenever women farm laborers are employed, or there is labor influx near communities.

Despite the presence of possible adverse impacts, most of these will become insignificant through proper application of mitigation measures suggested in the report for each of them. Overall, it is safe to assume that there is minimal to no risks to ecological and social environment. There are some potential risks for

physical environment but they will be mitigated through implementation of E&S mitigation measures, continuous monitoring, reporting and proper training of labour and construction workers. However, even when the negative environmental or social impacts of individual subprojects may be insignificant, cumulative impacts of a cluster of small subprojects may be quite significant.

Implementation of ESMF

Since the exact extent and precise location/footprints of individual interventions are yet to be decided, a framework approach has been adopted for the present E&S assessment. Under this approach, each subproject will be screened for the severity and extent of E&S impacts. The outcomes of the screening process will guide the selection and preparation of E&S instrument. Subprojects having some negative but localized environmental and or social impacts will require generic ESMPs to be prepared.

As an environmental enhancement measure, afforestation will be done in those areas in which there is low forest cover or in areas which have been clearly felled and leave barren since it is highly important to maintain the biodiversity and ecological balances. Furthermore, it will also prevent global warming, soil erosion and pollution.

Health risks and work safety problems may result at the workplace/sites if the working conditions provide unsafe and/or unfavorable working environment due to storage, handling and transport of construction material. Therefore, it is suggested that the workers are provided with safe and healthy working environment taking into account risks inherent to the particular sector and specific classes of hazards in subproject areas. To ensure that, Contractors/WUAs and/or Farmers will be responsible for all to comply with WBG EHS Guidelines.

Emergency Response Plan (ERP) provides an overview of the procedures to mitigate and control the impacts on community, on occupational health and safety, on the environment and on the project in the event of emergency situations and to respond in life threatening situations usually occurring suddenly and unexpectedly during the construction and operational phases of the proposed subprojects under PRIAT. Furthermore, a comprehensive Traffic Management Plan (TMP) will also be developed mentioning routes to be followed for transportation of construction machinery and materials e.g. cement, gravels, sand, PCPS, HEIS, solar system etc. A Community Health and Safety Plan has been prepared as part of this ESMF, which will be reviewed and possibly enhanced in the project inception phase. Similarly Operational Health and Safety Plans will be drawn up which will be applicable to all activities. A Gender Based Violence Action Framework has also been prepared which is attached as an Annex to this ESMF (see Annex Y).

To ensure the successful implementation of ESMF and compliance of the E&S mitigation measures, strengthening capacity of relevant PMU/ District Office technical staff and Contractors/WUAs/Farmers is essential. Furthermore, visual observations and checks will be undertaken to ensure the compliance with ESS plan. Any environmental condition that is disagreeable to the public and causes an avoidable nuisance can be addressed with additional provisions through establishment of a dedicated GRM system that will field and respond to all

complaints from potential stakeholders and those affected. A detailed stakeholder engagement plan has been prepared which delineates how the project will reach out to all stakeholders, what information will be disclosed, and at what stages of project implementation. A grievance redress system is also going to be established with systems of grievance recording extending from the field level all the way up to the project ESMU. The system will record grievances of the general public as well as project staff, and will operate through an online portal in addition to accepting complaints by letter or phone calls etc. Once again, details of how the system will be implemented will be worked out at the inception phase, while an outline is given in this ESMF.

In order to provide the periodic inspection, data compilation, and reporting of results, regular and comprehensive reporting will be conducted during the subprojects execution. All the data and communication recorded and maintained by the Contractor/WUAs/Farmers will be periodically reviewed and checked by PISC and DESCs and necessary actions will be recommended for Contractor/WUAs/Farmers to improve the recording and documentation. In case any Contractor/WUAs/Farmers fails to comply with the implementation of ESMF including ESMP, deductions will be made from the payments to the ESMF including ESMP claimed under the heads of environmental components.

Mitigation strategies in the planning and design phase will be implemented by Design Consultant and DG-OFWM and monthly reporting will be done. Whereas, the mitigation strategies in the construction and implementation phase will be implemented by Contractor/WUAs/ Farmers and will be reported monthly/weekly. Mitigation in the completion phase will be done by WUAs / DG-OFWM and will be reported Biannually / As and when required basis.

Stakeholder Engagement and Disclosure

A stakeholder engagement plan (SEP) has been prepared for the project. It focuses on the identification of, and engagement with project stakeholders, and provides guidance on inclusive and meaningful engagement. It is a 'live' document, and will be updated through the life of the project, as required, to include newly identified stakeholders, engagement methods, and the changing needs of the project. Institutional stakeholders consulted during project preparation included representatives from related government departments, including district level staff, NGOs, CSOs, private sector companies, and think-tanks. Private sector stakeholders were engaged through a dedicated consultation session held in late January 2022. Community stakeholders were primarily consulted during project design through face-to-face group interviews conducted at the district level by OFWM field staff. Government and community participants in general agreed that the previous PIPIP project had overall positive impacts. For on-farm water management technology provision, many participants agreed that the cost-sharing scheme in PIPIP did not benefit smaller and poorer farmers. Maintenance cost was also raised as a challenge. Water Users Associations (WUAs) were mentioned as a positive outcome of the PIPIP project, and it was observed that the frequency of disputes over water had reduced since these were initiated.

Institutional Arrangements

A dedicated Project Management Unit (PMU) will be established by the Director General On Farm Water Management (DGOFWM), who will act as the Project Director (PD), for the PRIAT project. The DGOFWM, reporting to the Secretary Agriculture, would be responsible for the implementation of the project. The DGOFWM will be supported by three headquarters-based Deputy Project Directors responsible for (a) marketing and value addition; (b) HEIS and solar; and (c) watercourse improvement respectively. At each of the nine administrative divisions of Punjab, Director Agriculture (OFWM) offices will act as the Divisional Project Coordination Units (DPCUs). These units will help coordinate and supervise project activities at the district and tehsil level. The DPCU will be headed by a Director Agriculture (OFWM), supported by one Assistant Director (Technical), Financial Management staff, and other support staff. District and tehsil level staff of the Agriculture Department will likewise be assigned to project activities. Project supervision and coordination will also be carried out through a number of committees, including a Policy Committee (chaired by the Chairman Planning and Development Board, Punjab), Steering Committee (chaired by Secretary Agriculture), and Implementation Committee (chaired by Project Director, PRIAT). Additional committees will be formed at district level for project supervision and for vetting of quotations for works.

For implementation of ESMF, required budget of PKR 335 million has been estimated and will be made available as part of overall project cost.

The ESMF once finalized, cleared by the Bank will be disclosed on the official websites of DGOFWM and WB.

1 Introduction

Agriculture plays a major role in the economy of Pakistan in general, and Punjab in particular. Nationally, agriculture accounts for 20 percent of GDP, employs 40 percent of the labor force, and directly or indirectly delivers nearly 80 percent of the total value of Pakistan's exports. Of the total agricultural exports, about 60 percent are contributed by Punjab.[3] Agriculture in Punjab is central to the country's economy and food security. Punjab encompasses 73 percent of the national cropped area and 78 percent of the national irrigated area. The province provides large shares of the country's primary crops: maize (78 percent), wheat (77 percent), cotton (73 percent), sugarcane (63 percent), and rice (52 percent). Agricultural growth in Punjab has, however, decreased since 2008 from 3.3 percent to under 3 percent per year.[4]

Despite its importance, the agriculture sector in Punjab is plagued by structural problems, which leads to wasted resources and low production by farmers across the province. The Punjab Resilient and Inclusive Agriculture Transformation Project (PRIAT) looks to build upon the recent successes in the sector, and also to address the gaps that remain after the successful implementation of the Punjab Irrigated Agriculture Productivity Improvement Program project (PIPIP, P125999) and the Punjab Agriculture and Rural Transformation P4R program (SMART, P162446)

PRIAT looks to reduce the incidence of poverty in rural households associated with agriculture by improving agricultural growth, especially among small farmers. Some key constraints which are common to most small farmers are (a) limited crop diversification; (b) limited market access; (c) low security of tenure; (d) poor access to credit; and (e) limited ability to adapt to climate change and water scarcity.[5] Inefficient use of water is also one of the key factors which hampers optimal agricultural production in the province and the country. Pakistan is ranked as the 14th most water-starved country globally, with water shortages experienced every year to meet irrigation requirements. Water scarcity is compounded by the inefficient use of water in Pakistan, and the country ranks 8th lowest in the world in water productivity. In the context of a lack of efficient collaboration between the Irrigation Department and the Agriculture Department to address both demand and supply cohesively, the major reasons for this low water productivity are (a) the low efficiency of the water conveyance system; (b) the lack of on-farm efficient water resource management technologies; (c) the low capacity of farmers to adopt climate smart, water saving interventions; and (d) the very limited crop diversification away from water-intensive crops, among others.

Agriculture growth and modernization in Pakistan is also hampered by limited value addition and commercialization of the agri-food sector. With increased urbanization and changing lifestyles, the demand for higher value, more nutritious food, such as fruits and vegetables, is growing, but the domestic production is currently ill-equipped to meet this demand, despite the country's versatile climate and rich genetic diversity.

The World Bank supported PIPIP and SMART programs have been successful in promoting modern irrigation practices and in fostering an enabling policy environment

3 Punjab Agriculture Policy. 2018. Punjab Agriculture Department, Government of Pakistan. Lahore.

4 Ibidem.

5 World Bank (2020). Islamic Republic of Pakistan: Leveling the Playing Field (Systematic Country Diagnostic)

for rural economic transformation, respectively. PIPIP has significantly contributed to upgrading the community water conveyance infrastructure (watercourses) and equipping farmers with modern irrigation technology, such as high efficiency irrigation systems (HEIS) and laser land leveling services. With the support of SMART, the PAMRA Act 2020 lifted some of the regulatory constraints that had been encumbering the agricultural marketing system. As such, both projects have contributed towards building a strong base for the future development of agriculture in Punjab.

1.1 Project Background

PRIAT seeks to build upon the successful earlier interventions of PIPIP and SMART, and aims to enhance on-farm water productivity and farmers' income in project areas. The project would work through an integrated approach that combines the promotion of the agri-food sector's competitiveness and inclusiveness, with increased climate resilience and water and energy efficiency. The project will contribute to addressing (a) low water delivery efficiency of watercourses and inefficient on-farm water management practices; (b) low on-farm productivity, limited crop diversification toward high value crops and away from water intensive crops, and low adoption of climate smart production practices; and (c) limited market opportunities for smallholder farmers, which results in low incomes and high vulnerability to external shocks.

1.2 Purpose of the ESMF

The PRIAT project is supported by the World Bank through *Investment Project Financing* for which compliance with Environmental and Social Standards (ESSs) is the responsibility of the project proponents. As per ESS-1 (Assessment and Management of Environmental and Social Risks and Impacts), the client (DGOFWM) conducted the environmental and social assessment of the proposed project to help ensure that the project is environmentally and socially sound and sustainable, and prepared the Environmental and Social Management Framework (ESMF) for all activities to be undertaken in PRIAT. PRIAT has been assigned an environmental and social risk rating of Moderate by the World Bank, indicating that the project is unlikely to have significant harmful effects.

The ESMF is an instrument that examines the risks and impacts when a project consists of a program and/or series of subprojects, and the risks and impacts cannot be determined until the program or subproject details have been identified. The ESMF sets out the principles, rules, guidelines, and procedures to assess the environmental and social risks and impacts. It contains measures and plans to reduce, mitigate and/or offset adverse risks and impacts; provisions for estimating and budgeting the costs of such measures; and information on the agency or agencies responsible for addressing project risks and impacts; including on their capacity to manage these risks.

This ESMF will be an integrated part of the Project Operation Manual (POM) and is applicable to all linked investments/subprojects financed in the project areas, regardless of their funding source or implementing agency.

The Project Management Unit (PMU) of the PRIAT project has, in close coordination with Bank, prepared this ESMF. The document is based on a literature review, secondary data, and consultations with stakeholders both in OFWM offices and with communities in the field. Community interactions were carried out by field staff of the DGOFWM who ventured out for meetings in spite of COVID-19 risks. The ESMF includes a chapter on how to undertake stakeholder engagement in the future, but a more

detailed Stakeholder Engagement Plan (SEP) is also part of the ESMF package of documents.

The PMU-PRIAT will use this ESMF during the planning, designing, construction and operational phases of the project to ensure E&S instrument compliance, and to mitigate environmental and social impacts at all the stages of the project.

1.3 Project Proponents

Key project proponents for PRIAT include the Director General On-farm Water Management (DGOFWM) of the Government of Punjab (GoP); who would also act as Project Director (PD); and senior officials from the Departments of Agriculture, Irrigation, and the Planning and Development Board. Other departments such as the Finance Department, Local Government Department and the Board of Revenue will provide support as required. Details are provided in the section on Project Implementation in the next chapter.

2 Project Description

The proposed project will contribute to transforming conventional agriculture practices into more inclusive, water-efficient, climate-smart, and market-oriented practices in Punjab. PRIAT will continue the successful efforts made by PIPIP to upgrade the community water conveyance infrastructure and promote adoption of climate-resilient irrigation and water saving technologies. It will also capitalize on the progress made under SMART, i.e., the passing of the PAMRA Act 2020 which significantly improved the policy environment for agricultural produce commercialization. PRIAT will support greater market inclusion for producers and producer groups (PGs) following a productive partnership (PP) approach. The main beneficiary groups of the project include water users' associations (WUAs), individual producers, and producer groups.

Although PRIAT will be a province-wide project, emphasis will be placed on South Punjab given its relatively lower economic development level, and higher degree of poverty incidence. Women will receive focused support to improve their inclusion into formal value chains, and they will be amongst groups trained to adopt climate-smart practices and technologies.

2.1 Project Development Objectives (PDO)

The Project Development Objective (PDO) is to enhance equitable access to and productivity of agricultural water, and farmers' income for farmers supported by the project[6].

2.2 Project Beneficiaries

The project's main beneficiaries are rural communities, including growth-oriented small and medium farmers and their groups. The project will directly benefit over 420,000 farm families and over 2.5 million acres of irrigated area. About 400,000 families will benefit from investment in watercourse lining under Component 1. While the benefits will be proportional to each farmer's landholding's size, watercourse improvement will increase the reliability and availability of water for the farm households at the end of the watercourses, who tend to belong to more disadvantaged groups. About 20,000 of these families are also expected to adopt climate-smart agriculture (CSA) practices under Subcomponent 1.2. The project will provide support under Component 2 to commercially oriented small and medium farmers with the potential to achieve higher incomes through aggregation and more sustainable and climate resilient production. The project will also undertake dedicated sensitization and implementation support tailored to female farmers' needs to ensure their participation in the project. Based on the experience of PIPIP, the project is expected to generate 3 million person-day daily jobs resulting from the diversification toward high value crops thanks to HEIS implementation.[7] Thirty percent of the beneficiaries of these jobs are expected to be women.

Three other groups are expected to benefit from the project. First, relevant government institutions will benefit from strengthened institutional capacity for managing Punjab's water resources and for providing higher quality public services. Second, domestic private sector companies will be able to benefit from the project by serving as suppliers

[6] PRIAT PAD (v January 29, 2022)

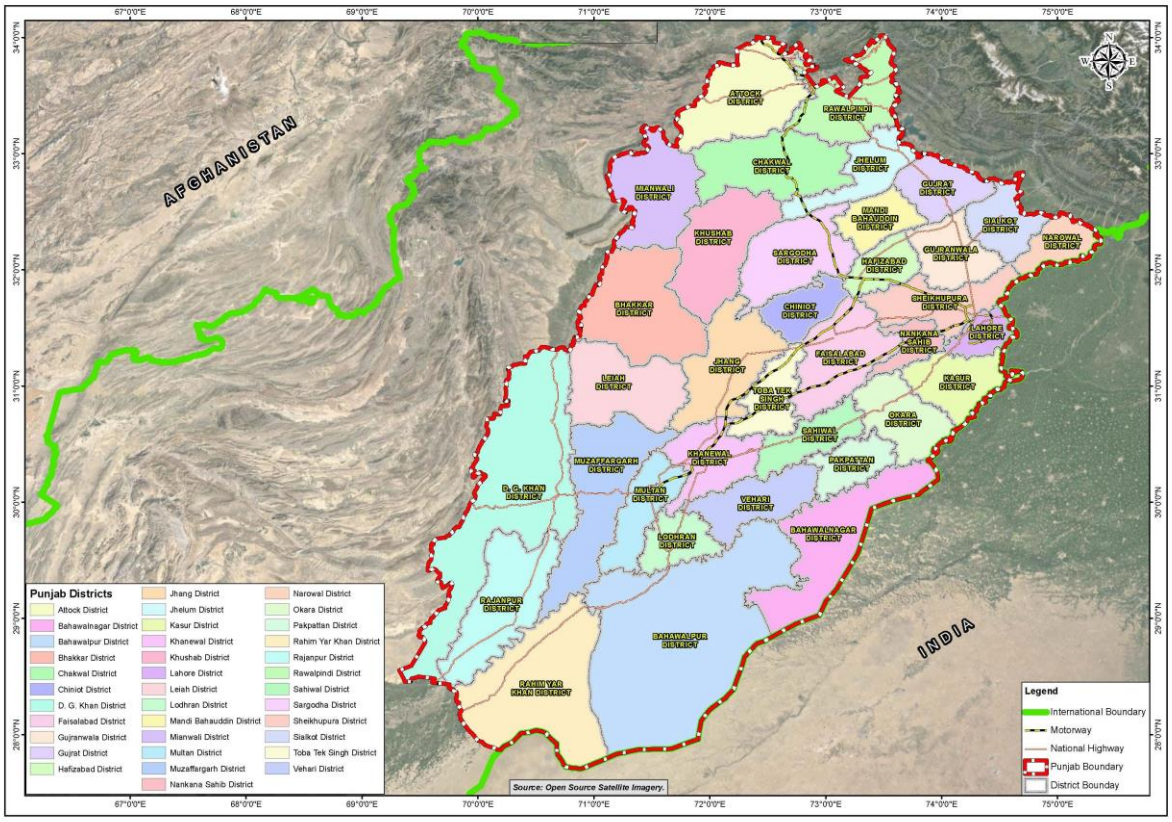
7 Fruits and vegetables harvesting tends to be more labor intensive.

of materials, equipment, and services that will be procured by the project to implement watercourse improvements under Component 1, and investments made by producers and PGs with financial support from the project under Component 2. The project is expected to mobilize around US$15 million of investments from private firms for watercourse improvements and HEIS installation services. The increase in demand for locally sourced goods and services will also create job opportunities for local skilled and unskilled laborers. Third, agri-processors and other off-takers will benefit from lower transaction costs in sourcing higher quality products from producers and PGs thanks to the project's support to these producers and PGs in diversifying their production, and in investing in their ability to add value to and market their production.

2.3 Project Location

The entire province of Punjab would be covered under the project, and relevant interventions would be carried out in various regions/districts. It is expected that watercourse improvements would primarily be carried out mainly in South and Central Punjab, and more than 50 percent of watercourses benefitting from the project will be in Southern Punjab, as per government policy. HEIS installation, on the other hand, would be more focused in the Potohar region and other *barani* or rainfed areas. Other interventions proposed in Component 2 would be carried out throughout the province, with the aim of value addition to the farmers' produce.

Figure 2.1: PRIAT Locations



2.4 Project Components

Component 1: Community-driven Improvement of Water Conveyance and Application : This Component has two objectives: : (a) Improve the equity of water access within the

watercourse command area by improving the conveyance efficiency; and (b) improve agricultural water productivity by promoting the adoption of climate smart water management practices at community and farm levels.

Sub-Component 1.1. Upgrading Community Water Conveyance Infrastructure: This sub-component will (a) improve 500 unimproved watercourses; (b) complete 3,500 partially improved watercourses so that the optimal lining can be achieved for each watercourse (i.e., lining 50 percent of the watercourse length); (c) reconstruct and complete 4,000 outlived watercourses; (d) improve 3,000 irrigation conveyance systems outside canal command and riverine areas; and (e) train WUAs on the maintenance of the conveyance system. The project will finance goods and services related to training WUAs and to watercourse improvements, which support improved, sustainable water use and climate resilience. Farmers will contribute in-kind to improve the unlined sections of the watercourses.

Sub-Component 1.2. Improving Community Water Management: This sub-component will pilot innovative mechanisms to ensure effective irrigation scheduling and water budgeting and support the adoption of efficient on-farm irrigation practices. The project will finance goods and services needed to (a) train WUA members on improved, climate smart irrigation and agronomic practices and provide the required farm implements; (b) develop and deploy ICT-based on-farm irrigation advisory services for better irrigation scheduling; (c) install water monitoring devices (soil moisture meters, flow meters, piezometers), conduct water budgeting and accounting across selected watercourses for improved monitoring of water resources, and build community-based awareness on groundwater management; and (d) pilot community-based groundwater recharge schemes.

Component 2: Promotion of Climate Smart Production, Diversification, Value Addition, and Inclusive Access to Markets . This component seeks to support growth-oriented farmers[8] to (a) diversify, intensify, and add value to their production through a market-driven and climate smart approach; and (b) establish and/or upgrade market linkages with off-takers in a sustainable and profitable way. Producers and PGs (i.e., farmers entrepreneur groups[9] (FEGs)) will receive both TA from local service providers (LSPs) and direct financial support.

Subcomponent 2.1 Improving the Market Integration of Producer Groups for Increased Production, Diversification, and Value Addition: This subcomponent aims to (a) establish/upgrade market linkages between buyers and growth-oriented producers organized in FEGs; and (b) help these FEGs intensify, diversify, and add value to their production in a water smart and climate resilient way. This sub-component will (a) finance goods and services needed to establish Productive Alliances (PAs) and develop Business Plans (BPs) as part of PAs; and (b) provide matching grants for investments in productive assets, working capital, and TA.

8 Growth-oriented producers are those interested in increasing the commercialization of marketable surplus. Global experience shows that market integration support tends to be most successful when targeting such types of farmers.

9 FEGs are producer groups that specialize in agribusiness development. This is a concept identified and used in the Planning Commission of Pakistan, Ministry of Planning, Development & Reforms (2020): "Agriculture Transformation Plan" https://www.pc.gov.pk/uploads/report/Transformation_Plan_2020.pdf

Sub-Component 2.2: Supporting Individual Producers for Climate Smart Production and Diversification: This subcomponent aims to increase crop intensification and diversification in a water smart and climate resilient way. It will (a) finance goods and services needed to sensitize farmers on the use of HEIS and to develop BPs; and (b) provide matching grants to individual producers for investments in HEIS, working capital (e.g., seeds, seedlings, fertilizer, and so on), and TA, notably to promote the proper adoption of HEIS and climate-smart agriculture and water management practices thereby maximizing the sustainability of investments.

HEIS implementation will include investment in a drip or micro-sprinkler irrigation system associated to a water pond and solar-powered pumping system for pressurization, when required. Solar-powered pumping will be used only to pressurize the irrigation system and not to abstract groundwater.

*Component 3: Project Management, Monitoring and Learning***.** The objective of this component is to ensure that all project activities are carried out effectively in a timely manner to achieve the project objectives. In addition to traditional project management and M&E, PRIAT will make efforts to facilitate the implementation of some new activities of the project, such as the market integration, community water resource budgeting, and groundwater management.

Component 4: Contingent Emergency Response Component: This component supports preparedness and rapid response to disaster, emergency, and/or catastrophic events, as needed. The provisional zero-cost for this component will allow for the rapid reallocation of credit proceeds from other components under streamlined procurement and disbursement procedures.

2.5 Project Implementation Arrangements

A dedicated Project Management Unit (PMU) will be established by the Director General On Farm Water Management (DGOFWM), who will act as the Project Director (PD), for the PRIAT project. The DGOFWM, reporting to the Secretary Agriculture, would be responsible for the implementation of the project. As the PD, the DGOFWM will be responsible for all aspects of the project, including implementation, procurement, financial management, social and environment management, and oversight of the Technical Assistance (TA) and training program, among others. Detailed implementation arrangements are described below:

Provincial Level: The DGOFWM will be supported by three headquarters-based Deputy Project Directors responsible for (a) marketing and value addition; (b) HEIS and solar; and (c) watercourse improvement respectively. Other support services will also be established, including specialists in procurement, financial management, accounting, public information & communication, and environmental and social (E&S) management[10], and Project Implementation and Supervision Consultant (PISCs), among others. Some positions will be assigned to staff from within the Department, and they will be provided with relevant training and assistance.

The capacity of the PMU will be strengthened in terms of supporting inclusive market integration activities, particularly through a Productive Alliances (PA) approach.

[10] In Section 7.8: Institutional Arrangement, the ESMU as well as implementation process of ESMF has been provided

Division Level: At each of the nine administrative divisions of Punjab, Director Agriculture (OFWM) offices will act as the Divisional Project Coordination Units (DPCUs) based in Lahore, Gujranwala, Sargodha, D.G. Khan, Bahawalpur, Multan and Rawalpindi. These units will help coordinate and supervise project activities at the district and tehsil level. The DPCU will be headed by a Director Agriculture (OFWM), supported by one Assistant Director (Technical), Financial Management staff, and other support staff.

District Level: The office of the Deputy Director Agriculture (OFWM) is present in all 36 districts of the province for supervision of water management activities. The Deputy Director Agriculture (OFWM) will be responsible for supervision, coordination, and internal monitoring through field and supporting staff.

Tehsil Level: The tehsil is the lowest tier of the administration where the office of Assistant Director Agriculture (OFWM) carries out the execution of works through field staff comprising of (a) Deputy Director Agriculture (OFWM) and one Water Management Officer (WMO); (b) two Water Management Supervisors (WMSs); and (c) support staff. Out of 133 tehsils in the province, offices of ADA (OFWM) have been established at 131 tehsil headquarters. The remaining may be established under the project as needed.

The execution of watercourse improvement works under PRIAT will be carried out through WUAs[11] with the same cost sharing arrangements as in the original PIPIP.

Project Supervision and Coordination

The following committees have been established to ensure provincial oversight and coordination in implementation at various levels:

1. **Project Policy Committee (PPC)**: Chaired by the Chairman, Planning and Development Board, Punjab with Secretaries of Agriculture, Irrigation, Local Government & Community Development and Finance Department as its members. DGOFWM will be the Member-Secretary of the PPC. The PPC will initially meet quarterly or as often as required. The PPC will, inter alia (a) provide planning and strategic guidance for project implementation as well as facilitate interagency coordination at the highest level; (b) make policy decisions for smooth project execution; and (c) constitute committees to resolve any policy-related issues.

2. **Project Steering Committee (PSC)**: Chaired by Secretary Agriculture, Government of Punjab with DGOFWM/PD-PRIAT as member secretary; and Chief (Agriculture) Planning and Development Department; Representatives of the Finance Department; and Irrigation Department as its members. The PSC will initially meet quarterly or as often as required. The PSC will, inter alia (a) ensure coordination among all stakeholders; (b) arrange bridge financing for local resources during any financial constraints from donors; (c) modify implementation mechanisms for project interventions, if needed; (d) annual work plans; (e) amend eligibility criteria of different project activities and project implementation mechanisms; (f) make necessary modifications/improvements in project implementation and modalities and (g) resolve issues constraining the smooth implementation of the envisaged activities.

11 Registered under On Farm Water Management & Water Users Association Ordinance [Act]-1981 (Amended 2001)

3. **Project Implementation Committee (PIC)**: Chaired by DGOWM/PD-PRIAT with Director (Headquarters), Director (Training), three Deputy Project Directors, concerned Divisional Directors, Deputy Directors (HQ), concerned Deputy Director Agriculture (OFWM), and Team Leaders of Project Implementation Supervision Consultants (PISCs) and M&ECs as its members. The Deputy Project Director will act as the Secretary of the Committee. The PIC will meet every month or as and when required to review physical and financial progress as well as to suggest means to overcome constraints faced in the execution of project activities. The major functions of the PIC will, inter alia, be as follows: (a) Prepare an annual work plan; (b) Review physical and financial progress; (c) Coordinate and supervise project activities; (d) Ensure the implementation of decisions of the PSC; (e) Formulate mechanisms for transparent external monitoring of project activities; and (f) Review monitoring reports and rectify shortfalls.

4. **District Implementation Committee (DIC)**: A DIC will be constituted in each district to implement the project at the district level and will include the following members: (a) Deputy Commissioner (DC) concerned (Chairperson); (ii) Additional Deputy Commissioner (F&P) concerned: (iii) Director Agriculture (OFWM) concerned: (iv) Representative of Revenue Department: and (v) Deputy Director Agriculture (OFWM) concerned (Member/Secretary). The DIC is expected to meet every month to review the physical and financial progress of the project, ensure effective project implementation, oversee the proper flow of funds to WUAs, arrange transparent internal monitoring of project activities, and make recommendations to the PIC for improving the pace of implementation.

5. **District Rate Committee (DRC)**: The DRC will be constituted under the DIC to decide the rates of construction materials, for clusters on a geographical basis, for improvement of watercourses and irrigation schemes. The DRC will consist of (i) Director Agriculture (OFWM) of respective division (Chairman); (ii) XEN Building Department; (iii) Field Engineer (PISC Consultants); and (iv) Deputy Director Agriculture (OFWM) concerned (Member/Secretary).

2.5.1 Project Implementation and Supervision Consultants (PISCs)

Project Implementation and Supervision Consultant (PISCs) will report to DGOFWM and check 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 DGOFWM in project planning and management, quarterly progress reporting, procurement planning, financial management and overall project management.

2.5.2 Monitoring and Evaluation Consultants (M&ECs)

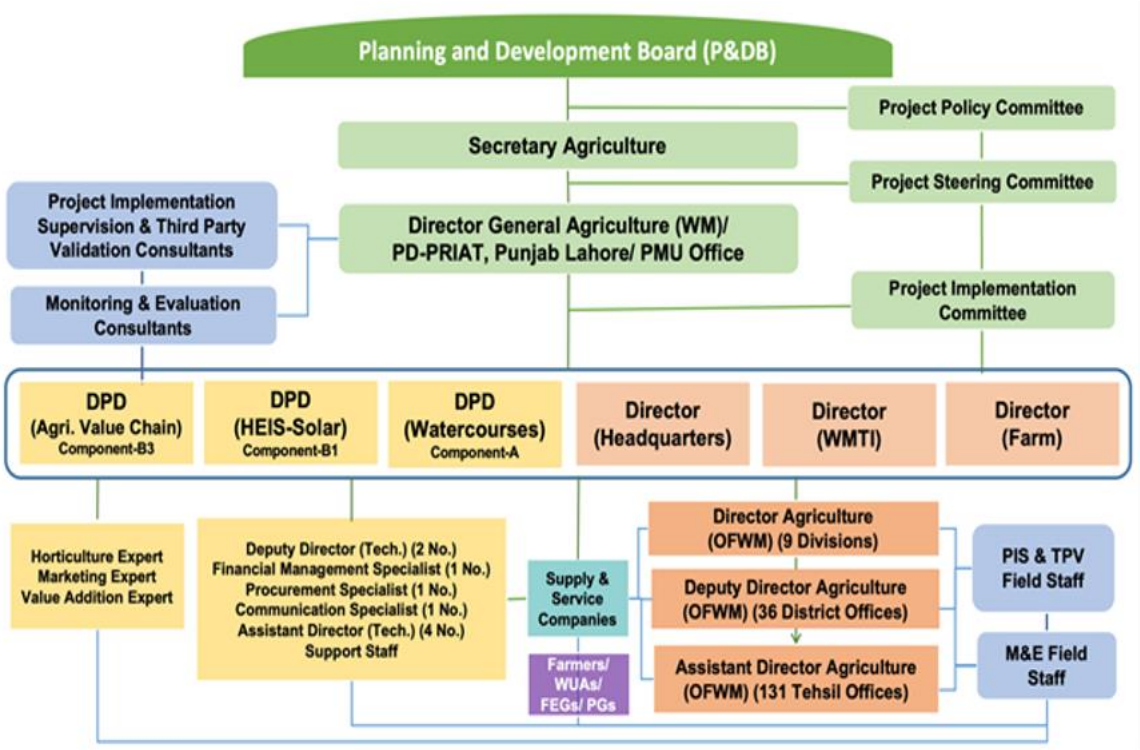
Monitoring and Evaluation Consultants (M&ECs) will help in (a) monitoring physical progress of project activities; (b) M&E of the project impact; and (c) supervision of the environment and social framework and the implementation of environmental and social management plans. The M&E activities will provide continuous feedback to the PSC, and the Bank on the project's performance, and on the mitigation of negative impacts under various components, so that mutually agreed actions can be undertaken in a timely manner if necessary.

DGOFWM will submit quarterly reports in an appropriate format to the PSC and the Bank no later than 45 days after the end of each quarter. The DGOFWM will also prepare annual reports by no later than September 30 of each year of project

implementation. In addition to the semi-annual reviews by the Bank, detailed annual reviews will be undertaken in October each year. A mid-term review of the Project will be undertaken by October 31, 2025. An Implementation Completion Report (ICR) will be submitted to the Bank no later than six months after the closing date. The implementation of ESMF (and other E&S instruments/tools) has been aligned and is synergized with the overall PRIAT implementation arrangements.

Implementation arrangements are summarized in the figure below.

Figure 2.2: Implementation Arrangements



3 Overview of Policy, Legal and Regulatory Framework

3.1 General

This chapter provides an overview of the policy framework and legislation that applies to control possible negative environmental and social consequences of project implementation and operation. The project needs to comply with all the applicable environmental policies, laws, guidelines, acts and legislations of Government of Pakistan and Government of Punjab. The proposed subprojects are being funded by the World Bank (WB), so WB Environmental and Social Standards (ESSs) and guidelines related to the proposed subprojects have also been discussed.

3.2 Relevant Strategies, Policies, and Legislation

The summary of major relevant strategies, policies, acts and legislation from social and environmental perspective are briefly described in the tables below:

Table 3.1: Main Social and Environmental Strategies / Policies Relevant to the Project

Sr. No.	*Policy/Strategy*	*Brief Coverage*	*Relevance to Project*
1.	National Conservation Strategy, 992	Pakistan National Conservation Strategy (NCS), which was approved by the federal cabinet in March 1992, is the principal policy document on environmental issues in the Country. The NCS outlines the Country's primary approach towards encouraging sustainable development, conserving natural resources and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment.	The core areas that are relevant in the context of the proposed subprojects are pollution prevention during construction and conserving biodiversity.
2.	National Environmental Policy, 2005	In March 2005, Government of Pakistan (GoP) launched its National Environmental Policy, which provides a framework for addressing the environmental issues. Section 5 of the policy commits for integration of environment into development planning as instrument for achieving the objectives of National Environmental Policy. It also provides broad guidelines to the Federal Government, Provincial Governments, Federally Administered Territories and Local Governments to address their environmental concerns and to ensure effective management of their environmental resources.	Clause (b) of sub-section 5.1: Integration of Environment into Development Project states that Environmental Impact Assessment related provisions in Environmental Protection Act, 1997, will be diligently enforced for all developmental projects.
3.	National Forest Policy, 2001	The goal of this policy is to foster the sustainable development of Renewable Natural Resources (RNR) in Pakistan, through maintenance and rehabilitation of these essential resources and enhancement of sustainable livelihoods of rural masses, particularly women, children and other deserving groups. The various components of the policy include:	The proposed subprojects under PRIAT do not pass through or affect any Reserve Forest or other notified areas. However, other relevant components like wildlife conservation, planting trees will be applicable.

Sr. No.	*Policy/Strategy*	*Brief Coverage*	*Relevance to Project*
		Reducing poverty, powerlessness and unemployment; Population planning in critical ecosystems; Reducing the impact of socio-economic factors; Providing substitutes to firewood in the mountain-woods; Reducing political interferences in Forestry and Wildlife Departments; Renovating and invigorating the institutions of RNR; Supporting Local Governments in the sustainable development of their RNR; Policies for fragile ecosystems; Riverside forests; Irrigated plantations; Preservation of sensitive and unique forests; Wildlife conservation; Rangelands and desert ecosystems; and Planting trees and fodder on farmlands.	
4.	Punjab Labor Policy, 2018	The main objective of the Labor Policy is the social and economic well-being of labor in Punjab. The policy covers health and safety, rationalization of remuneration etc	The provision of this policy will apply to all the labor employed.
5.	National Climate Change Policy, 2012	The National Climate Change Policy provides a framework for addressing the issues that Pakistan faces or will face in future due to the changing climate. In view of Pakistan's high vulnerability to the adverse impacts of climate change, in particular extreme events, adaptation effort is the focus of this policy document. The vulnerabilities of various sectors to climate change have been highlighted and appropriate adaptation measures spelled out. The policy cover measures to address issues in various sectors such as water, agriculture, forestry, coastal areas, biodiversity and other vulnerable ecosystems. Notwithstanding the fact that Pakistan's contribution to global Greenhouse Gas (GHG) emissions is very small, its role as a responsible member of the global community in combating climate change has been highlighted by giving due importance to mitigation efforts in sectors such as energy, forestry, agriculture and livestock. Furthermore, appropriate measures relating to disaster preparedness, capacity building, institutional strengthening; technology transfer; introduction of the climate change issue in higher education curricula; ensuring environmental compliance through IEE and EIA in the development process; addressing the issue of deforestation and illegal trade in timber; promoting Clean Development Mechanisms (CDM); and raising Pakistan's stance regarding climate change at various	This policy will accelerate due to the emissions from the construction machinery.

Sr. No.	*Policy/Strategy*	*Brief Coverage*	*Relevance to Project*
		international forums, have also been incorporated as important components of the policy. The policy thus provides a comprehensive framework for the development of Action Plans for national efforts on adaptation and mitigation.	
6.	National Water Policy 2018	This first ever water policy was unanimously approved in April 2018 by Council of Common Interest (CCI). The Policy aims at efficient management and conservation of existing water resources, optimal development of potential water resources, steps to minimize time and cost overruns in completion of water sector projects, equitable water distribution in various areas and canal commands, measures to reverse rapidly declining groundwater levels in low-recharge areas, increased groundwater exploitation in high-recharge areas, effective drainage interventions to maximize crop production, improved flood control and protective measures, steps to ensure acceptable and safe quality of water, minimization of salt build-up and other environmental hazards in irrigated areas, institutional reforms to make the managing organizations more dynamic and responsive. The policy covered all water related issues, including water uses, allocation of priorities, integrated planning for development, use of water resources, environmental integrity of the basin, impact of climate change, trans boundary water sharing, irrigated and rain fed agriculture, drinking water and sanitation, hydropower and industry, groundwater, water rights & sustainable water infrastructure, water related hazards, quality management, awareness, conservation, legal and capacity building of infrastructure.	This policy will be applicable as the proposed subprojects deals with water storage and distribution through watercourses. It also involves water conservation through installation of HEIS.
7.	National Drinking Water Policy, 2009	The National Drinking Water Policy provides a framework for addressing the key issues and challenges facing Pakistan in the provision of safe drinking water to the people. Drinking water is the constitutional responsibility of the provincial governments and the specific provision function has been devolved to specially created agencies in cities and Town and Tehsil Municipal Administrations under the Local Government Ordinance 2001.	This policy is applicable for the proposed subprojects during construction phase in terms of regular water quality monitoring.
8.	National Sustainable Development Strategy, 2012	The National Sustainable Development Strategy is an attempt to define sustainable development and the pathway to a “green economy” in Pakistan’s context. It lays out an adaptive system and approach that can be continuously improved, through regular updates, to respond to evolving challenges. The focus has been on integrating not only across the three overall dimensions of economic, social and environment but also	This strategy is applicable as the proposed subprojects involves the construction of water storage ponds, pilot community-based groundwater recharge schemes distribution through watercourses and conservation of water by installation of HEIS.

Sr. No.	*Policy/Strategy*	*Brief Coverage*	*Relevance to Project*
		integrating the goals with the existing development paradigm with the aim of shifting it on to a more sustainable pathway.	
9.	National Action Plan for COVID-19 Pakistan	Government of Pakistan has launched the National Action Plan for COVID-19 Pakistan to combat the challenge of prevailing virus, also available at https://www.nih.org.pk/wp-content/uploads/2020/03/COVID-19-NAP-V2-13-March-2020.pdf. The Government of Pakistan has launched the real-time data portal for COVID-19 http://covid.gov.pk/. These measures are mostly relating to the containment and awareness and capacity building. Besides this COVID-19 daily situation report is also available at https://www.nih.org.pk/wp-content/uploads/2020/04/COVID-19-Daily-Updated-SitRep-03-April-2020.pdf.	This Action Plan for COVID-19 is applicable to the proposed subprojects as it is being launched during this pandemic.
10.	Women Development Policy 2018 (relevant provincial policy provisions concerning women in farming and agriculture)	i. Women empowerment through increasing knowledge and capacity for crop diversification ii. Update knowledge and skills for efficient farming techniques iii. Increased linkages of women-owned businesses (hold exhibitions for women-owned and managed businesses; Creation of linkages with other businesses and Chambers for support, guidance, and opportunities for expansion) iv. Enhanced facilitation of SMEs for public service delivery (training course for employment opportunities for women and Training of officials from departments and field staff for sensitization on harassment laws) v. Poor and socially excluded women are able to generate sustenance/income through poultry vi. Increased understanding and knowledge of livestock husbandry.	The policy is clear about the need to acknowledge the role of women in agriculture and facilitate women farmers and farm workers

Table 3.2: Main Social and Environmental Legislation Relevant to the Project

Sr. No.	*Act*	*Brief Coverage*
	Punjab Environmental Protection (Amendment) Act, 2017	The Punjab Environmental Protection Act, 1997 (Amended, 2012 & 2017) is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The 'environment' has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the interrelationships between any of the factors specified in sub-clauses 'a' to 'f'.	The provision of the act is applicable to proposed subprojects for conducting an IEE/EIA according to section 12 and to obtain environmental approval from the EPA. The section 11 of the act is applicable in term of compliance with Punjab Environmental Quality Standards (PEQS). Similarly, section 13 of the act prohibits the import of hazardous waste. The provisions of section 16 are also applicable to comply with the discharge or emission of any

Sr. No.	*Act*	*Brief Coverage*
	The notable points of the law are: No proponent of a project shall commence construction or operation unless he has filed an IEE with the Provincial Agency designated by the Provincial EPAs an IEE, and has obtained an approval; Establishment and formation of the Punjab Environmental Protection Council (PEPC); Prohibition of certain discharges or emissions; Punjab Environmental Quality Standards (PEQS) for wastewater, air emissions and noise; and Provincial Government can issue notices and enforce them to protect the environment. In the recent amendment of 2012, legislatives powers related to environment and ecology are given to provincial governments from the Federal government. The provinces are required to enact their own legislation for environmental protection. Other amendments include increasing the penalties for violations. For the proposed subprojects, Environmental Protection Department (EPD)/Environmental Protection Agency (EPA), Government of Punjab (GoPb) is the concerned authority. The capability of regulatory institutions for environmental management is ultimately responsible for the success of environmental assessments and that development projects are environmentally sound and sustainable.	effluent, waste, air pollutant or noise or disposal of waste or handling of hazardous substance. Under section 17, penalties will apply if anyone fails to comply with the provisions of section 11, 12, 13 and 16.
	Review of IEE and EIA Regulations, 2000	These regulations set out: Key policy and procedural requirements for filing an EIA; The purpose of environmental assessment; The goals of sustainable development; The requirement that environmental assessment be integrated with feasibility studies; The jurisdiction of the Federal and Provincial EPA's and Planning & Development (P&D) Departments; The responsibilities of proponents; Duties of responsible authorities; Provides schedules of proposals that the project requires either IEE or an EIA; The environmental screening process of the projects under schedule I, II and III; and The procedure for the environmental approval for filing the case with the concerned EPA for the granting of the NOC.	The provisions of these regulations are applicable for environmental screening of the project, which implies that an EIA/IEE is required for the proposed subprojects. The process described in the regulation will be useful for DGOFWM, Punjab to follow the procedure to file an EIA/IEE with Punjab-EPA and to understand its review process along with timelines to be followed. An EIA/IEE study is needed to fulfill the local requirements.
	Punjab Environmental Quality Standards (PEQS), 2016	PEQS promulgated recently in 2016. Specified standards under PEQS are for: Drinking Water; Ambient Air; Noise; Industrial Gaseous Emissions;	All projects to be implemented in Punjab must conform to PEQS,2016 during all the phases i.e. construction and operation.

Sr. No.	*Act*	*Brief Coverage*
	Municipal and Liquid Industrial Effluents; Motor vehicle exhaust and noise; and Treatment of Liquid and Bio-Medical Waste.	
	Guidelines for Environmental Assessment	Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development Projects. The guidelines that are relevant to the proposed project are listed below. Guidelines for the Preparation and Review of Environmental Reports, Pakistan Environmental Protection Agency, 1997; Guidelines for Public Consultation, Pakistan Environmental Protection Agency, May, 1997; and Sectoral Guidelines: Pakistan Environmental Assessment Procedures, Pakistan Environmental Protection Agency, October 1997.	The guidelines are applicable for the preparation of the environmental assessment reports.
	Punjab Wildlife Act, 1974	The Punjab Wildlife Act (1974) is developed for the regulation of activities relating to protection, conservation and management of wildlife in Punjab.	Trees and natural vegetation may need to be cut to undertake the proposed interventions under PRIAT subprojects (where required). This tree cutting may result in loss of habitat, therefore, the provisions of this law are applicable. However, there are no direct impacts on the biodiversity and natural resources is not anticipated as construction activities will be carried out in already transformed/ cultivated area.
	Punjab Plantation and Maintenance of Trees Act, 1974	The Punjab Plantation and Maintenance of Trees Act, (1974) regulates tree plantations and enforces measures for their protection.	The requirements of this act are applicable in terms of planting new trees and their maintenance by the occupier of the existing land who would have the physical possession.
	Pakistan Antiquities Act 1975 & Punjab Antiquities Amendment Act 2012	The Punjab Antiquities Amendment Act, 2012 is adopted from the Pakistan Antiquities Act of 1975 with a few minor changes. The Antiquities Act, 1975 (amended in 1990) states the following: "Ancient" is any object that is at least 75 years old; All accidental discoveries of artefacts must be reported to the Federal Department of Archaeology; The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise; All new construction within a distance of 200 feet from protected antiquities is forbidden; No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and	The law will be applicable to the proposed subprojects mainly due to its two provisions: According to the law, any construction activity within 61 meter or 200 ft. of protected antiquities, are prohibited. The provisions of this act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed subprojects.

Sr. No.	*Act*	*Brief Coverage*
	The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and classification as monuments of national or world heritage.	
	Pakistan Penal Code, 1860	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents.	The provisions of the Penal Code, 1860 are applicable to the proposed subprojects in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.
	The Protection against Harassment of Women at the Workplace Amendment Bill 2022	The bill was amended in 2022 to expand the definition of workplace, and to include all forms and categories of labor, including those working on short term contracts	This Act will be applicable to the proposed subprojects and will be applicable to all project workers
	Labor Laws as part of Constitution of Pakistan, 1973	The Constitution of Pakistan contains a range of provisions with regards to labor rights, in particular: Article 11 of the Constitution prohibits all forms of slavery, forced labor and child labor; Article 17 provides a fundamental right to exercise the freedom of association and the right to form unions; Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone; and Article 37(e) makes provision for securing just and human conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment. Labor law is controlled at both provincial and national levels with compulsory employment agreements containing the terms set out by the labor laws. The labor laws are a comprehensive set of laws in Pakistan dealing with the following aspects: Contract of Employment; Termination of Contract; Working Time and Rest Time; Working hours; Paid Leave; Maternity Leave and Maternity Protection; Other Leave Entitlements; Minimum Age and Protection of Young Workers; Equality Pay Issues; Workers' Representation in the Enterprise; Trade Union and Employers Association Regulation; and Other Laws.	The labor laws will be relevant as they deal with employment of labor for construction activities of proposed subprojects. The following are the major labor laws which are applicable to the project: The Punjab Restriction on Employment of Children Act, 2016 Punjab Occupational Safety and Health Act 2019 Punjab Minimum Wages Act, 2019 The Workmen's Compensation Act, 1923

Sr. No.	*Act*	*Brief Coverage*
Punjab Protection of Women Against Violence Act, 2016	This act counters gender-based discrimination, violence against women, and economic and social empowerment of women.	This act will be invoked if gender based violence is observed in the subproject areas during proposed construction activities.
Punjab Fair Representation of Women Act, 2014	The Act amended statutes or governing laws of 66 public bodies, to increase representation of women to a minimum of 33 percent in each body.	The spirit of the legislation should be accounted for when hiring for the project takes place, and an effort should be made to hire women as project staff at all levels
Punjab Forest Act (Amended), 2010	The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. There is no protected forest situated in and around the project area.	This Act will not be triggered as no physical interventions will be carried out in designated reserve or protected forests.
Pakistan Climate Change Act, 2017	This Act aims to meet obligations under international conventions relating to climate change and to provide for adoption of comprehensive adaptation and mitigation policies, plans, programs, projects and other measures required to address the effects of climate change and for matters connected herewith and ancillary thereto.	This Act will accelerate due to the emissions from the construction machinery, application of pesticides, etc.
National Clean Air Act, 2000	The Act aims to control vehicular emissions, pollution from industry, and indoor air pollution in rural and urban areas.	This Act will trigger if vehicles and machinery used for construction activities emanate air pollutants above the permissible limit.
Seismic Building Code of Pakistan, 2007	This code stipulates the minimum requirements for seismic safety of building and structures and the provisions of the Building Code of Pakistan (Seismic Provisions-2007) shall apply for engineering design of buildings, like structures and related components. Construction of buildings shall be considered as violation of professional engineering work specified under clause (XXV) of section 2 of the Act.	This Code is applicable to the proposed project as it includes the formation of engineering structures and related components.
Land Acquisition Act (LAA), 1894 Including Later Amendments	The Land Acquisition Act, 1894, is a "law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition". The exercise of the power of acquisition has been limited to public purposes. The principles laid down for the determination of compensation, as clarified by judicial pronouncements made from time to time, reflect the anxiety of the law-giver to compensate those who have been deprived of property, adequately. The land needed for the construction of development projects will be acquired under normal conditions based on prevailing market prices or negotiated prices between client and the owners of land. Section 17(4) of the LAA will not be used in the absence of an emergency. Instead, the land will be purchased under willing-seller willing-buyer	This Act may not be triggered as the RoW required for the watercourses under the proposed subprojects is already available and owned by the Government, therefore, no land acquisition will be involved for the proposed subprojects. However, land required for the installation of HEIS, solar panels and construction of water ponds will be voluntarily donated by the farmers.

Sr. No.	*Act*	*Brief Coverage*
	deal at agreed upon market rates and the seller will have the option not to sell the land, in case an acceptable deal for both the parties is not reached.	
	Fisheries Act, 1897	This Act aims at the protection of fish in water bodies by rules of State Government.	No direct impact on fisheries in anticipated as most of the interventions are at farm level; so this Act will not be triggered.
	The Punjab Polythene Bag Rules, 2004	This rule prohibits the manufacturing, sale, use and import of polythene bags that is below 15-micron thickness.	This rule will be applicable if polythene bags with less than 15-micron thickness used during construction activities.
	Punjab Environmental Protection (Motor Vehicles) Rules, 2013	Subject to the provisions of this act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants and noise are being emitted in an amount, concentration or level which is in excess of the Punjab Environmental Quality Standards, or where applicable the standards established under clause (g) of subsection (1) of section 6 of the act.	This act will be elicited during construction and operational phase due to use of motor vehicles that produces air pollutants and noise.
	The Punjab Occupational Safety and Health Act, 2019	This Act entails provision of occupational safety and health of the workers at workplace and to protect them against risks arising out of the occupational hazards; to promote safe and healthy working environment catering to the physiological and psychological needs of the employees at workplace.	The Act will trigger during construction and operational phase to ensure health and safety of workers at workplace associated with the project activities.
	Punjab Restriction on Employment of Children Act, 2016	According to the sub-section 11(a) of this Act, an occupier who employs or permits a child (person under the age of 15 years) to work in an establishment shall be liable to punishment with imprisonment for a term which may extend to six months, but which shall not be less than seven days, and a mandatory fine between 10,000 and 50,000 rupees.	This Act will trigger if WUAs / Contractor hire skilled and unskilled labor under age 15.
	Electricity Act, 1910	The Act provides a legal basis for distribution of Power. It enables a licensee to conduct operations for supply of electricity and binds the license to payment of compensation in respect of any damages caused during the construction, Operation and Maintenance (O&M) of Power distribution facilities.	This act will be applicable if any damages occur to the power facilities during construction.
	Cutting of Trees (Prohibition) Act, 1975	The Act was enforced in 1975 to place restrictions on cutting of trees in order to restrain unchecked trend of tree felling without replacement plantations.	This act will be applicable to the subject project where the cutting of tree (if any) will be involved.
	The Canal and Drainage Act 1873, and amendment 2016	The Canal and Drainage Act 1873 (CDA) focuses on construction and maintenance of drainage channels and defines powers to prohibit obstruction or order their removal. It also covers issues related to canal navigation. It briefly addresses issues relating to environmental pollution. Section 70(5) of the CDA clearly states that no one is allowed to "corrupt or foul the water of any canal so as to render it less fit for the purposes for which it is ordinarily used." In addition, Section 73 of the CDA gives power to arrest without warrant or to be taken before the magistrate a	This Act will be applicable to the construction and O&M works to be carried out during the proposed subproject, as it involved rehabilitation / construction / lining of watercourses, improvement of irrigation conveyance system outside canal command and riverine areas, construction of water storage ponds, pilot community-based groundwater recharge schemes etc.

Sr. No.	*Act*	*Brief Coverage*
	person who has wilfully damaged or obstructed the canal or "rendered it less useful."	
	Punjab Irrigation and Drainage Authority Act, 1997	This Act aims to implement the strategy of the Government of Punjab for streamlining the Irrigation and Drainage System; to replace the existing administrative setup and procedures with more responsive, efficient and transparent arrangements; to achieve economical and effective operation and maintenance of the irrigation, drainage and flood control system in the Province; and to make the irrigation and drainage network sustainable on a long-term basis and introduce participation of beneficiaries in the operation and management.	This act will be applicable as the proposed subprojects as it involved rehabilitation / construction / lining of watercourses.
	Punjab On-Farm Water Management and Water Users' Associations Ordinance, 1981	The Ordinance provides for involvement of the irrigators in water management at the watercourse level through forming the Water Users Associations (WUAs). The Ordinance defines the procedures for establishing, registering, and running the WUAs.	The proposed activities under the proposed subprojects will be implemented in accordance with the provisions of this Ordinance.
	Punjab Agriculture, Food and Drug Authority Act, 2016	The salient features of the Act that are relevant to environmental impacts. The Punjab Agriculture, Food and Drug Authority (PAFDA) is instructed to make policies for: (a) carrying out forensic tests of fertilizers, pesticides, foods, and drugs and establishing and managing testing facilities for this purpose; (b) accrediting facilities for forensic examination and testing; (c) providing expert opinions; (d) establishing forensic examination and testing procedures and monitoring enterprises involved in collecting or handling fertilizers, pesticides, foods, and drugs; (e) conducting periodic forensic examinations and testing of samples; and (f) developing databases and conducting R&D.	The increase in water supply efficiency and the amount of water availability may lead to increase application of fertilizers/pesticides by the farmers. The application of chemicals may pose environmental risk, if not managed properly.
	Agriculture Pesticides Ordinance, 1971 and The Punjab Agriculture Pesticides (Amendment) Act, 2012	The main objective of the Ordinance is to regulate the import, manufacture, formulation, sale, distribution and use of pesticides whereas the Act deals with the amendments made in Ordinance in 2012 with respect to Provincial Government.	The increase in water supply efficiency and the amount of water availability may lead to increase application of fertilizers/pesticides by the farmers. The farmers and suppliers / distributors must respect the provision made under ordinance and subsequent amendments.
	The Punjab Agricultural Pesticides Rules, 2018	It deals with the registration of pesticides and associated conditions, packing, re-packing or re-filling, labeling, storage, precautionary measures, testing, disclosure of information and role of Government.	The increase in water supply efficiency and the amount of water availability may lead to increase application of fertilizers/pesticides by the farmers. The application of pesticides may pose environmental, health and safety risk while storing, handling and spraying, if the farmer/distributors not follow the precautionary measures.
	The Punjab Emergency Service Act, 2006	It deals with the establishment of emergency service for a purpose of maintaining a state of preparedness to deal with emergencies, to	This Act will be applicable to the construction and O&M works to be carried out during the proposed

Sr. No.	*Act*	*Brief Coverage*
	provide timely response, rescue and emergency medical treatment to the affected persons and recommending measures to be taken by related organizations to avoid any emergency situation. It describes procedures to establish emergency service, emergency board, emergency fund, emergency ambulance and rescue vehicles, offence and punishment, etc.	subproject, as it involved rehabilitation / construction / lining of watercourses, improvement of irrigation conveyance system outside canal command and riverine areas, construction of water storage ponds, pilot community-based groundwater recharge schemes, development of infrastructure etc.
	National Disaster Management Act, 2010	National Disaster Management Act, 2010 was passed by Parliament of Pakistan in 2010. The Act applies to whole Pakistan. The Act was passed in backdrop of 2010 Floods in Pakistan and strengthens Disaster Management system.	This act is applicable to the proposed subprojects. The proposed subprojects will require special consideration to disasters and risk management strategies as per the Act.
	Hazardous Substance Rule, 2003	The rule describes the procedure of handling, transportation and disposal of hazardous substances and hazardous waste. Inter alia, general safety precautions for handling hazardous substances as well as safety precautions for workers, and notification requirements in the event of an accident are described in these rules. Requirements for project waste management plans are also defined. These include a requirement for updating the plan every three years, the need to provide for management of hazardous waste in a manner that will prevent adverse environmental impacts and to ensure that hazardous and non-hazardous waste are not mixed.	This rule is applicable to the proposed subprojects due to involvement of hazardous waste handling, use and disposal during the construction phase.

3.3 The World Bank's Environment & Social Standards (ESS) and Applicable Operational Policies

The World Bank (WB) has defined specific Environmental and Social Standards (ESSs), provided in the Environmental and Social Framework (ESF) which are designed to avoid, minimize, reduce, or mitigate the adverse environmental and social risks and impacts of projects. These standards apply to projects supported through Investment Project Financing.

A summary of the applicable ESSs and WB policies and their relevance to the project is provided in the table below, followed by details and applicability of the relevant standards.

Table 3.3: World Bank ESF ESSs Relevance and Requirements

World Bank ESSs	*Relevance*	*Relevance of the Standard for the Project*
ESS-1 Assessment and Management of Environmental and Social Risks and Impacts	Relevant	Overall, the proposed subprojects would have positive environmental and social impacts in contributing towards resource efficiencies and livelihood improvements. However, adverse environmental and social impacts are anticipated due to proposed construction activities of subprojects under PRIAT (watercourse rehabilitation/improvement, improvement of irrigation conveyance system outside canal command and riverine areas installation of HEIS, solar systems, development of storage ponds and pilot community-based groundwater recharge schemes, development of infrastructure12). Most of these environmental and social impacts are temporary, site specific and largely reversible in nature and can be mitigated through appropriate mitigation measures provided in this ESMF. This ESMF will provide a detailed environmental and social assessment in line with ESS1 to identify the impacts resulting from the proposed subproject interventions along with their mitigation measures. There may also be some social impacts related to exclusion. PRIAT is designed such that only farmers who can manage cost sharing can benefit from the schemes. While the poor and landless will benefit from income opportunities generated, as well as from some infrastructure works that will benefit the larger community, there is a likelihood of some feeling of exclusion and disaffection in sections of the rural population
ESS-2 Labor and Working Conditions	Relevant	This standard is relevant to the proposed project intervention across all its staff involved in execution of the subprojects, including direct workers, contracted workers, community workers, and workers hired by project suppliers. This ESMF will address the ESS2 implications, including preparation of occupational health and safety plan which will further ensure COVID-19 related precautions, fair treatment, non-discrimination, and equal opportunity for workers including vulnerable, disabled and children, and would support freedom of association and collective bargaining, accessible means to raise workplace concerns. At a later stage of project preparation, Labor Management Procedures will be prepared for PRIAT as per the requirements of ESS2
ESS-3 Resource Efficiency and Pollution Prevention and Management	Relevant	This ESS is relevant to the project. The subprojects supported interventions would increase the water supply efficiency and the amount of water availability per farmer/unit area, that may lead to increase application of fertilizers/pesticides by the farmers for crop intensification or bringing fallow/waste land back into cultivation. Though the project is not financing pesticides/ fertilizers, yet the application of chemicals by farmers may pose environmental risk; if not managed properly. Besides identifying the construction related adverse risks and impacts such as: noise, air, soil and water pollution; unattended borrow pits; piling of excavated soil and inappropriate collection, disposal of surplus construction material. This ESMF provides a detailed Environmental and Social assessment as per ESS1. Moreover, an "Integrated Pest Management Framework (IPMF) has been prepared as a part of this ESMF.
ESS-4 Community	Relevant	This ESS is relevant, during construction and operation phase, the proposed subprojects may pose limited potential risks

[12] Warehouses, collection centers and pack houses.

World Bank ESSs	*Relevance*	*Relevance of the Standard for the Project*
Health and Safety		related to accidents related to civil works, roadside accidents, application of pesticides, spread of different transmittable and communicable diseases (HIV/AID, COVID-19, STD), conflicts with locals, use of child labor and forced labor, and gender based violence (GBV) etc. These risks will be addressed via measures proposed in the IPMF and a Community Health and Safety Plan included in the Annexes of this ESMF, and the Gender Mainstreaming and GBV, SH and SEA Action Framework prepared as a separate document.
ESS-5 Land Acquisition Restrictions on Land Use and Involuntary Resettlement	Not currently relevant	This ESS is not currently relevant as the RoW required for the watercourses under the proposed subprojects is already available and owned by the Government, therefore, no land acquisition will be involved for the proposed subprojects. Installation of HEIS, solar panels and construction of water ponds will be on land owned by the beneficiary farmers.
ESS-6 Biodiversity Conservation and Sustainable Management of Living Natural Resources	Not relevant	This ESS is not relevant as direct impacts on the biodiversity and natural resources is not anticipated as construction activities will be carried out in already transformed/ cultivated area in shape of watercourse improvements (lining/rehabilitation) or introduction of HEIS (drip/ sprinkler) along with climate smart interventions such as utilizing renewable energy resources (solar panels). As such the interventions shall not be carried out in any natural habitats and critical habitats. This ESMF ensures that no construction activity will be carried out in or near the vicinity of any natural habitats and critical habitats. This will be ensured through subproject E&S screening proposed in this ESMF.
ESS-7 Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Relevant	This ESS is not relevant as no indigenous people are found across the province of Punjab.
ESS-8 Cultural Heritage	Not relevant	This standard is not relevant. The construction/rehabilitation activities will be limited in space and time. The physical activities such as watercourse improvements and introduction of HEIS and solar systems will be largely confined to already transformed areas/cultivated areas. This ESMF has developed a chance find procedure to be followed during project implementation in case of any chance find of physical culture resource.
ESS-9 Financial Intermediaries	Not relevant	The PRIAT Project does not involve any activities with financial intermediaries hence ESS9 is not relevant to this Project.
ESS-10 Stakeholder Engagement and Information Disclosure	Relevant	The ESMF follows a structured approach to stakeholder engagement and public outreach that is based upon meaningful consultation and disclosure of appropriate information, considering the specific challenges associated with combating COVID-19. Stakeholder Engagement Plan (SEP) and Grievance Redressal Mechanism (GRM) have been developed as a part of this ESMF.

World Bank ESSs	*Relevance*	*Relevance of the Standard for the Project*
Legal Operational Policies that Apply		
OP 7.50 Projects on International Waterways	Relevant	Since the project is located on the Indus River, an international waterway, OP 7.50 on "Projects on International Waterways" (the Policy) applies to the project. The Policy states that for any projects that involves the "use or potential pollution" of international waterways, the borrower or beneficiary state is required to notify all other riparians unless an exception from this requirement is justified and granted. This exception applies "only to minor additions or alterations to the ongoing scheme; it does not cover works and activities that would exceed the original scheme, change its nature, or so alter or expand its scope and extent as to make it appear a new or different scheme." Consistent with the policy notification exception provisions, the project does not involve works and activities that would exceed the original scheme. In addition, the nature of the works envisaged under the proposed project will not (a) adversely affect the quality or quantity of water flows to other riparians; and (b) be adversely affected by other riparians' water use. Therefore, the project team believes that PRIAT falls within the exception to the notification requirements of OP 7.50 and has launched the internal process to seek this exemption.
OP 7.60 Projects in Disputed Areas	Not relevant	This OP is not relevant as there is no disputed area in the Punjab province.

3.4 Other Relevant World Bank Guidelines

3.4.1 Guidance Note on Labor Influx

A Guidance Note for "Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx" was issued by World Bank in 2016. This Note provides guidance on identifying, assessing, and managing the risks of adverse social and environmental impacts that are associated with the temporary influx of labor resulting from Bank supported projects. It contains guiding principles and recommendations to be considered as part of the design and implementation of projects with civil works that require labor from outside the subproject's area of influence. It does not introduce new requirements, but rather seeks to provide concrete guidance on how to approach temporary labor influx within the environmental and social assessment process.

(https://thedocs.worldbank.org/en/doc/497851495202591233-0290022017/original/ManagingRiskofAdverseimpactfromprojectlaborinflux.pdf)

3.4.2 World Bank Group Environmental, Health & Safety Guidelines

In addition to ESSs, the World Bank Group has also established its Environmental, Health and Safety (EHS) guidelines for all the interventions that are financed by the

group. These EHS Guidelines are technical reference documents with general and sector-specific examples of Good International Industry Practice (GIIP).

General EHS Guidelines: Issues associated with the construction and operation of maintenance facilities are addressed in the General EHS Guidelines with other key element like Environment and Occupational, Health and Safety (OHS) at workplace as well as for community. Summarized WB Group's Environmental and Health and Safety guidelines are provided in Annex A.

(https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines)

3.4.3 World Bank Group Gender Strategy (2016-2023)

The 2015 Gender Strategy recognizes that stronger and better-resourced efforts are needed to address gender inequalities in access to jobs as well as control over and ownership of productive assets are key levers of change for women, their communities and economies and fundamental drivers of economic growth and poverty reduction. Gender equality is central to the World Bank Group's own goals of ending extreme poverty and boosting shared prosperity in sustainable manner.

3.5 Gap Analysis of World Bank Requirements and National Laws

The identified gaps between ESSs, national and provincial laws for E&S management and how these gaps are addressed in the ESMF are given below in Table 3.4. Where gaps exist between national laws vis-a-vis ESF, the most stringent requirements will prevail and will be followed under the proposed subprojects.

3.6 Applicable International Treaties Signed by the Government of Pakistan

Pakistan is signatory to several multilateral environmental and social agreements. These agreements set requirements and restrictions to varying degrees to the Member States in order to achieve the objectives of these agreements. However, the implementation mechanism for most of these agreements is weak in Pakistan and the institutional set-up is largely non-existent. The agreements are summarized in the following sections.

3.6.1 Environmental Obligations

Pakistan has ratified major international treaties on the environment and human health which the project is obliged to respect. Their primary description/goals and relevance to the Punjab province are summarized in Table 3.5.

3.6.2 Social Obligations

Pakistan has ratified major international treaties on or related to human rights which the proposed subprojects must abide by. Their primary description/goals and relevance to the Punjab province are summarized in Table 3.5.

3.6.3 International Labor Organization (ILO) Conventions – Ratified by Pakistan

Pakistan has ratified 08 fundamental and 26 technical ILO conventions of which the following are relevant to the proposed subprojects and are summarized in the following table.

Table 3.4: Gap Analysis between ESSs and the National and Provincial Laws

Relevant ESS	*Relevant National and Provincial Laws*	*Identification of Gaps*	*Gaps Addressed in ESMF*
ESS-1: Assessment and Management of Environmental and Social Risks and Impacts	The Punjab Environmental Protection (Amendment) Act, 2017 and Review of IEE and EIA Regulations, 2000.	The criteria mentioned in the Acts for classifying environmental and social risk is different than in the ESF. The Punjab Environmental Protection (Amendment) Act, 2017 and Review of IEE and EIA Regulations, 2000 mainly focus on environmental assessment and management through Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE) whereas social assessment is cursory. The different methods and tools (ESIA, environmental and social audit, commutative impact assessment, ESMP, ESMF, regional and sectoral ESIA, SESA etc.) for environmental and social impact assessments, referenced in the ESF, are not part of the National and Provincial legislation. Third party monitoring is not covered in the national or provincial legislation.	As the proposed PRIAT Project is being funded by WB, hence, environmental and social risk classifying criteria mentioned in ESF is being followed. As environmental and social assessment will be/is carried out as per ESS-1 for the proposed subprojects. Additional, mitigation measures for environmental and social impacts will be implemented as part of various plans prepared by the Contractor/WUAs/Farmers based on the guidelines provided in this ESMF (guidelines for Tree Plantation / Reforestation Plan, Occupational Health and Safety Plan (OHS), Emergency Response Plan, Restoration and Rehabilitation Plan, Waste Management Plan, Traffic Management Plan, Integrated Pest Management Plan, Gender Based Violence (GBV) Action Framework etc. has been prepared as a part of this ESMF to mitigate the environmental and social risks). ESMF is inclusive of Third Party/ Monitoring and Evaluation Consultant (MEC).
ESS-2: Labor and Working Conditions	The major labor laws applicable to Punjab province are listed below: The Punjab Occupational Safety and Health Act, 2019; The Punjab Minimum Wages Act, 2019; Punjab Restriction of Employment of Children Act, 2016; Punjab Protection of Women Against Violence Act, 2016;; The Factories (Amendment) Act 2012, the Protection against Harassment of	National and Provincial laws address most of the requirements of the ESS-2. However, the implementation of these laws and the management of certain issues addressed under ESS-2, such as OHS, GBV/SEA and Violence Against Children (VAC), prohibition of children in hazardous work and child labor in general and protection against discrimination of religious minorities (many formal sector workers belong to religious minority groups) are not done effectively as detailed coverage of certain requirements is partial.	Labor Management Procedures (LMP) will be developed for the project which will include guidance on setting up a dedicated workers GRM which will provide an accessible means to raise workplace concerns and complaints for all types of project workers. . Under PRIAT Project the Contractor/WUAs/Farmers will develop an OHS Plan based on the guidelines provided in this ESMF and the Labor Management Procedures (LMP) to mitigate construction related OHS issues for contractor/community such as: the exposure to project-related traffic, machinery and material movements, handling of hazardous materials

Relevant ESS	*Relevant National and Provincial Laws*	*Identification of Gaps*	*Gaps Addressed in ESMF*
	women in the workplace (Amendment) Act 2022 .	There is no specific requirement for employers to establish a workers' grievance mechanism.	(oil/lubricants), excessive noise/dust etc. and will further ensure COVID-19 related precautions, adherence of most updated SOPs/ guidelines issued by the Government / WHO. The LMP will be noted in the legal agreement and in the Environmental and Social Commitment Plan (ESCP). All of this will be done in accordance to the national law and ESS-2 requirements.
ESS-3: Resource Efficiency and Pollution Prevention	National Energy Efficiency and Conservation Act, 2015, The Punjab Environmental Protection (Amendment) Act, 2017; Pakistan Climate Change Act, 2017; The Punjab Agriculture Pesticides (Amendment) Act, 2012; and Pakistan Penal Code, 1860 address the pollution aspect only.	National laws address most of the requirements of the ESS-3, particularly on pollution prevention	Resource efficiency requirements will be incorporated in the ESMP / relevant instruments. Keeping in view the proposed subprojects interventions under PRIAT, Greenhouse Gases (GHGs) emissions are not likely to be significant therefore these estimations will not be required. Further, to combat with the risks and impacts associated with the application and management of pesticides/fertilizers and use of other chemicals, an IPMF has been prepared. This ESMF will also ensure the use of relevant WBG Environmental, Health and Safety (EHS) Guidelines, 2007.
ESS-4: Community Health and Safety	Pakistan Penal Code, 1860 and National Disaster Management Act, 2010 address the community health and safety aspects.	Pakistan Penal Code, 1860 and National Disaster Management Act, 2010 address most of the requirements of ESS-4. ESS-4 recommends borrower to take measures to avoid or minimize the transmission of communicable diseases due to the influx of the temporary or permanent project labor. However, there is no law (national and/or provincial) dealing with transmission of water-borne, water based, water-related, and vector-borne diseases, communicable and non-communicable diseases that could result from project activities. A community health plan has been prepared to cover the requirements of ESS 4	Guidelines for Community Health and Safety Plan and Traffic Management Plan (TMP) has been prepared as part of the ESMF to manage and mitigate associated risks and impacts such as: exposure to project-related traffic, machinery and material movements, handling of hazardous materials (oil/lubricants), excessive noise/dust etc. Additional, mitigation measures for community related impacts will be implemented as part of various plans prepared by the Contractor/WUAs/Farmers based on the guidelines provided in this ESMF (guidelines for Tree Plantation / Reforestation Plan, Occupational Health and Safety Plan (OHS), Emergency Response Plan, Restoration and Rehabilitation Plan, Waste Management Plan, Traffic Management Plan, Integrated Pest Management Plan, Gender Based Violence (GBV) Action Framework etc. has been prepared as a part of

Relevant ESS	*Relevant National and Provincial Laws*	*Identification of Gaps*	*Gaps Addressed in ESMF*
			this ESMF to mitigate the environmental and social risks).
ESS-5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Land Acquisition Act (LAA), 1894 addresses the land acquisition and compensation by the Government.	Pakistan does not have any legal preview for preparation and approval of resettlement related documents e.g. Resettlement Action Plan (RAP) / Abbreviated Resettlement Action Plan (ARAP) / Resettlement Policy Framework (RPF). Scope of the LAA,1894 in comparison to the requirements of ESS-5 only partially take into account the resettlement of displaced populations. Coverage of LAA,1894 also does not provide any assistance for the poor and vulnerable PAPs, livelihood losses or resettlement costs for rehabilitation. Generally, it covers cash compensation policy for the acquisition of land and built-up property, and damage to other assets such as crops, trees, and infrastructure. LAA, 1894, does not require adequate consultation with affected parties; it simply requires that declaration and notice to be given about temporary use of land or acquisition and the purposes for which it is required and provide an opportunity for filing of objections. Nor does it require preparation of a RAP / ARAP / RPF. In Pakistan there is no Government body / organization who owns the resettlement related documents. Compensation for land and other assets is based on average values and schedule unit rates that do not ensure replacement market value of the property acquired. However, LAA, 1894 requires that a 15 percent compulsory acquisition surcharge supplement the assessed compensation. According to LAA, 1894, only title holders can get the compensation of their lands, while tenants and squatters who are considered as illegal occupants are forcefully removed overnight and project is started without considering the loss of livelihoods ad	RoW required for the watercourses under the proposed subprojects is already available and owned by the Government, therefore, no land acquisition will be involved for the proposed subprojects. Installation of HEIS, solar panels and construction of water ponds will be on land owned by beneficiary farmers. Furthermore, relevance of this ESS will be reassessed during the detailed design stage at subprojects levels when more information is available and upon the finalization of Project footprints. Although, the proposed subprojects do not involve any private land acquisition, however, there is a possibility of economic/ livelihood impacts. Subproject specific social assessments will identify and quantify such impacts. Compensation and/or livelihood restoration, if and as required, will be done in accordance with the site-specific resettlement planning document (where applicable).

Relevant ESS	*Relevant National and Provincial Laws*	*Identification of Gaps*	*Gaps Addressed in ESMF*
		means of livelihoods of the affected peoples neither any compensation of their losses in terms of properties is paid. There is no convenient GRM except recourse of appeal to formal administrative jurisdiction or the court of law.	
ESS-6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Punjab Forest Act (Amended), 2010; Punjab Wildlife Act, 1974; Punjab Plantation and Maintenance of Trees Act, 1974; and The Punjab Fisheries Act, 1897.	All aspects of ESS-6 are not covered under provincial laws. Major identified gaps are as below: The national system of protected areas does not align with the principles established by the International Union for Conservation of Nature (IUCN). The Punjab Forest Act (Amended), 2010 does not provide regulatory basis enabling to meet social needs of forest-dependent communities while preserving forest ecosystems, preventing forest degradation and depletion of its resources. The provincial legislation does not provide the categorization of habitats (natural, critical and modified). The provincial legislation does not provide definition of and/or requirement for biodiversity offset[13]. The provincial legislation is silent regarding the Biodiversity Management Plan that signifies risks and adverse impacts on biodiversity.	This ESS is not relevant as direct impacts on the biodiversity and natural resources is not anticipated as construction activities will be carried out in already transformed/ cultivated area in shape of watercourse improvements (lining/rehabilitation) or introduction of HEIS (drip/ sprinkler) along with climate smart interventions such as utilizing renewable energy resources (solar panels). As such the interventions shall not be carried out in any natural habitats and critical habitats. This ESMF ensures that no construction activity will be carried out in or near the vicinity of any natural habitats and critical habitats.

13 Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate avoidance, minimization and restoration measures have been taken.

Relevant ESS	*Relevant National and Provincial Laws*	*Identification of Gaps*	*Gaps Addressed in ESMF*
		The ecosystem services are not referred in the provincial legislation. The provincial legislation is silent regarding the internationally recognized areas of high biodiversity value. The provincial legislation is silent regarding an evaluation of the systems and verification practices used by the primary suppliers while purchasing natural resource commodities that are known to originate from areas where there is a risk of significant conversion or significant degradation of natural or critical habitats. Forest conservation practices do not meet with the international principles and criteria of sustainable forest management.	
ESS-7 Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	There is no law for indigenous people in Pakistan.	NA	This ESS is not relevant as no indigenous people are found across the province of Punjab.
ESS-8 Cultural Heritage	Punjab Antiquities (Amendment) Act, 2012	All aspects of ESS-8 are not covered under provincial law. Major identified gaps are as below: The provincial legislation is silent regarding Development of Cultural Heritage Management Plan. There is no provision related to tangible and intangible cultural properties. The provincial legislation is silent about the disclosure of information regarding cultural heritage due to the safety or integrity of the cultural heritage	This standard is not relevant. The construction / rehabilitation activities will be limited in space and time. The physical activities such as watercourse improvements and introduction of HEIS and solar systems will be largely confined to already transformed areas/cultivated areas. This ESMF however, has developed "Chance Find Procedure" to be followed during project implementation in case of any chance find physical culture resource.

Relevant ESS	*Relevant National and Provincial Laws*	*Identification of Gaps*	*Gaps Addressed in ESMF*
		or would endanger sources of sensitive information from public disclosure.	
ESS-9 Financial Intermediaries	NA	NA	The PRIAT Project does not involve any activities with financial intermediaries hence ESS-9 is not relevant to this project.
ESS-10: Stakeholder Engagement and Information Disclosure	The Punjab Environmental Protection (Amendment) Act, 2017; Review of IEE and EIA Regulations, 2000; and Punjab Transparency and RTI[14] Act, 2013	Stakeholder engagement in public sector development projects is not done effectively. It is also not carried out throughout the project lifecycle on issues that could potentially affect relevant parties. Also, there is no proper mechanism to record the grievances.	The ESMF follows a structured approach to stakeholder engagement and public outreach that is based upon meaningful consultation and disclosure of appropriate information, considering the specific challenges associated with combating COVID-19. The SEP and GRM have been developed as a part of this ESMF.

[14] Right to information

Table 3.5: International Treaties Relevant to Environmental and Social Aspects

	Treaty Name and Ratification/ Accession/Acceptance	*Description / Goal*	*Relevance to Project*
International Treaties Relevant to Environmental Aspects			
	Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention), 1971. Pakistan ratified the Convention in August, 1976	Halt the progressive encroachment on and loss of wetlands, which are among the most diverse and productive ecosystems and indispensable for sustainable management of freshwater and biodiversity.	Three (03) Ramsar sites exist in Punjab (Chashma Barrage, Taunsa Barrage and Uchhali Complex). All the above Ramsar sites are used by migratory birds. The subprojects should not degrade the ecological conditions along the migratory routes. As such the proposed interventions shall not be carried out in any natural habitats, critical habitats and the ESMF shall ensure that any surplus construction waste disposal sites are not located in or in close proximity to the natural and critical habitats.
	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1975. Pakistan ratified the Convention in April, 1976	The principal obligations of contracting parties to the CITES are to safeguard the trade in rare or endangered species and it established a permit system to control imports and exports of wild fauna and flora. Ensure that international trade in specimens of wild animals and plants does not threaten their survival.	During implementation of the proposed subprojects, construction activities may be carried out near the game reserve/protected areas. Since the project footprints are not finalized yet therefore, the applicability of this convention will be decided at subproject level. However, the proposed interventions shall not be carried out in any natural habitats and critical habitats.
	United Nations Framework Convention on Climate Change (UNFCCC), 1992 Kyoto Protocol, 1992 and Paris Agreement, 2015. UNFCCC was ratified by Pakistan in 1994. Kyoto Protocol was ratified by and entered into force in Pakistan in January and April, respectively, in 2005.	Stabilize GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. In Pakistan, the Climate Change Act, 2016 was passed in March 2017, establishing a policy-making Climate Change Council and a Climate Change Authority to prepare and supervise the implementation of climate change adaptation and mitigation projects.	The construction related activities under the proposed subprojects must avoid / minimize the GHG emissions through the implementation of mitigation measures proposed in this ESMF. Keeping in view the proposed subprojects interventions under PRIAT, Greenhouse Gases (GHGs) emissions are not likely to be significant therefore these estimations will not be required.

	Treaty Name and Ratification/ Accession/Acceptance	*Description / Goal*	*Relevance to Project*
	Paris Agreement was ratified by and entered into force in Pakistan in November and December, respectively, in 2016.		
	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1994. In Pakistan the convention was ratified in July 1994 and entered into force in October of the same year.	Protect human health and the environment from negative impacts of hazardous wastes by managing transboundary movements of hazardous wastes. In other words, its goals are to: minimize the amount and toxicity of hazardous waste at a point closest to the source assist developing countries in environmentally sound management of wastes and apply a regulatory system where transboundary movements are permissible.	Pesticides and other agrochemicals, which are banned in other countries and hence become waste, may be imported to be used as agrochemicals. The proposed subprojects must pay attention to importation of cheap agrochemicals, which are in fact hazardous waste in countries with stricter enforcement of environmental laws.
	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides, 1998. Pakistan signed the Convention in 2005 and it entered into force in the country in the same year.	Promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals for the ultimate purpose of protecting human health and the environment from potential harm.	Pesticides and industrial chemicals covered by the Convention require implementation of Prior Informed Consent (PIC) procedure before importation. If the proposed subprojects involve use of pesticides, however small the amount may be, the Convention may become relevant.
	Stockholm Convention on Persistent Organic Pollutants, 2004. Pakistan ratified and entered into force in the country in 2008.	Protect human health and the environment from chemicals that do not degrade easily. The Convention obligates its parties to eliminate or reduce the release of persistent organic pollutants into the environment.	A recent study[15] concluded that the country is highly contaminated with organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), dechlorane plus (DP), and polychlorinated naphthalenes (PCNs). The efforts to eliminate the chemicals from the environment and to prevent exposure to them are hampered by lack of environmental quality standards, food safety standards, and appropriate inventory of persistent organic

15 Khan *et al*. (2018).

	Treaty Name and Ratification/ Accession/Acceptance	*Description / Goal*	*Relevance to Project*
			pollutants as waste. The proposed subprojects must ensure that OCPs and other similarly harmful chemicals are not inadvertently promoted through its activities. It becomes relevant at later stages of proposed PRIAT Project due to increase in agricultural activities and use of pesticides
	Montreal Protocol on Substances that Deplete the Ozone Layer, 1987. Pakistan ratified the Protocol in 1992, and it entered into force in 1993.	The Protocol's goal is to protect the ozone layer by controlling global emissions of substances that deplete it and by precautionary measures to do so. Ozone depleting substances are: chlorofluorocarbon (CFC), which include halons, carbon tetrachloride; methyl chloroform; hydrochlorofluorocarbon (HCFC), hydrobromofluorocarbon (HBFC) and methylbromide.	The use of methyl bromide is exempted under the Protocol for quarantine and pre-shipment applications to control pests and pathogens in certain imported and exported commodities, and such consumption in Pakistan has shown rapid increase from nearly none in 2011, approaching 100 tons in 2017[16]. It is mainly used for cotton exports to control Boll weevil[17]. If cotton becomes one of the cash crops to be promoted by the project, application of methyl bromide must not be prohibited.
	UN Convention on the Law of the Seas (UNCLOS), 1982 International Convention for the Prevention of Pollution from Ships (MARPOL), 1973 and International Maritime Dangerous Goods Code, 2004. Pakistan ratified the UNCLOS in February 1997. Pakistan has accepted/approved MARPOL in 1984 (Pakistan has not signed the Convention).	UNCLOS defines the right and responsibilities of nations with respect to their use of the world oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The International Maritime Dangerous Goods Code requires that dangerous goods are in a correct and safe manner: classified and identified; packed; marked, labelled and placarded; documented; stowed on board the vessel; and, segregated from other goods with which they may react dangerously.	The increase in water supply efficiency and the amount of water availability may lead to increase application of fertilizers/pesticides by the farmers. Any import of agrochemicals could be subject to this obligation as the proposed subprojects may involve use of pesticides. The IPMF/P proposed in this ESMF provides guidelines for promoting integrated pests management practices in an environment friendly ways.

16 UNEP(2018)

17 Batchelor, T. and Alfarroba, F. (n.d.).

Treaty Name and Ratification/ Accession/Acceptance	*Description / Goal*	*Relevance to Project*
Pakistan became a member to the International Maritime Organization in 1958.		
United Nations Convention to Combat Desertification, 1994. Pakistan ratified the Convention in 1997	Combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, with a view to contributing to the achievement of sustainable development and with special attention to arid, semi-arid and dry sub-humid areas.	It is anticipated that with the implementation of proposed subprojects, portion of barren land may come under cultivation.
The Rio Declaration, 1992. Pakistan signed the treaty on 13th Jun 1992 and ratified on 1 June 1994	The Rio Declaration comprises 27 principles which address important issues such as; sustainable development to integrate environmental protection into the development process; common but differentiated responsibilities to conserve, protect and restore the earth's ecosystems; public participation and information access at the national level, reduce and eliminate unsustainable patterns of production and consumption.	It is relevant as these subprojects have been proposed with a focus on protection of natural environment.
UNESCO Convention on the Protection of the World's Cultural and Natural Heritage, 1972.	Convention concerning the Protection of the World Cultural and Natural Heritage - requires parties to adopt a general policy on the protection of the natural and cultural heritage, to set up services for such protection, to develop scientific and technical studies, to take appropriate legal, technical, scientific and administrative measures and to foster training and education for such protection.	The construction/rehabilitation activities will be limited in space and time. However, the proposed subprojects will ensure due attention to archaeological sites. This ESMF has developed a chance find procedure to be followed during implementation of proposed subprojects.

	Treaty Name and Ratification/ Accession/Acceptance	*Description / Goal*	*Relevance to Project*
	Pakistan ratified this convention on 23 July 1976.		
	Minamata Convention on Mercury, 2013 Pakistan ratified this convention on December, 2020.	This global treaty aims to protect human health and the environment from the adverse effects of mercury.	NA
	Vienna Convention for the Protection of the Ozone Layer, 1985 Accession of this convention was made by Pakistan December, 1992	This convention sets the framework for efforts to protect the globe's ozone layer by means of systematic observations, research and information exchange on the effects of human activities on the ozone layer and to adopt legislative or administrative measures against activities likely to have adverse effects on the ozone layer	The chemical substances of natural and anthropogenic origin are thought to have the potential to modify the chemical and physical properties of the ozone layer. Therefore, the proposed subprojects must ensure to avoid the use of chemical substances mentioned in this convention and minimize the emissions.
	Convention on Biological Diversity (CBD), 1994 Pakistan signed this treaty in 1992 and it was ratified by cabinet in 1994.	The CBD has three main goals: Conservation of biological diversity (or biodiversity); sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources.	Punjab is said to account for about 12.4 percent[18] of Pakistan's forests. Since the proposed subproject's footprints are not finalized yet therefore, the applicability of this convention will be decided at subproject level. However, the proposed interventions shall not be carried out in any natural habitats and critical habitats.
	Convention on Conservation of Migratory Species of Wild Animals, 197919	Convention on the Conservation of Migratory Species deals with the conservation and protection of the migratory species. It also acknowledges the need to take action to avoid any migratory species becoming endangered.	In Punjab, Chashma Barrage, Taunsa Barrage and Uchhali Complex are used by migratory birds. The proposed subprojects should not degrade the ecological conditions along the migratory routes. As such the proposed interventions shall not be carried out in any natural habitats, critical habitats and the ESMF

18 https://openknowledge.worldbank.org/bitstream/handle/10986/30936/131906-PN-P161071-PUBLIC-Pakistan-Forest-Policy-Note-16092018.txt?sequence=2&isAllowed=y

19 https://www.cms.int/

	Treaty Name and Ratification/ Accession/Acceptance	*Description / Goal*	*Relevance to Project*
	Pakistan signed this convention in 1981 and ratified it in December 1987.		shall ensure that any surplus construction waste disposal sites are not located in or in close proximity to the natural and critical habitats.
International Treaties Relevant to Social Aspects			
	International Covenant on Economic, Social and Cultural Rights, 1956. Pakistan ratified the Covenant in 2008.	Guarantee human rights related to economics, society and culture.	The proposed subprojects must fully respect the economic, social and cultural rights of the people, as defined by the Covenant, in the areas affected by intervention, directly and indirectly.
	International Covenant on Civil and Political Rights, 1966. Pakistan ratified the Covenant in 2010	Guarantee human rights related to civil and political life.	As with the Covenant above, civil and political rights of the people, as defined by the Covenant, must be respected in the areas affected by intervention, directly and indirectly.
	Convention on the Rights of the Child, 1989. Pakistan ratified the Covenant in 1990	Guarantee the civil, political, economic, social, health and cultural rights that should be enjoyed by any human being under the age of eighteen, unless the age of majority is attained earlier under national legislation.	The proposed subprojects should avoid, in particular, child labor that is mentally, physically, socially or morally harmful.
	Convention on the Elimination of all Forms of Discrimination against Women, 1979. Pakistan's accession to the Convention took place in 1996.	Eliminate discrimination against women in political and public life and to promote equal rights for women and men.	The proposed subprojects must make efforts to close the gender gap and not widen it through its intervention.
	Convention for Safeguarding the Intangible Cultural Heritage, 2003.	Safeguard the intangible cultural heritage; ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned; raise awareness at the local, national and international levels of the importance of the intangible cultural	The proposed subprojects are tasked as a signatory country of this Convention to protect intangible cultural heritage, including that of indigenous peoples.

Treaty Name and Ratification/ Accession/Acceptance	*Description / Goal*	*Relevance to Project*
Pakistan ratified the Covenant in 2006	heritage, and of ensuring mutual appreciation thereof, and provide for international cooperation and assistance.	The construction/rehabilitation activities will be limited in space and time. However, the proposed subprojects will ensure due attention to archaeological sites. This ESMF has developed a chance find procedure to be followed during implementation of proposed subprojects.
Codex Alimentarius, 1961 Pakistan is a member since 1970.	Protect consumers' health and ensure fair practices in the food trade. The Codex includes provisions on: food hygiene; food additives; residues of pesticides and veterinary drugs; contaminants; labelling and presentation; methods of analysis and sampling; and import and export inspection and certification.	The increase in water supply efficiency and the amount of water availability may lead to increase application of fertilizers/pesticides by the farmers. The agricultural practices recommended by the proposed subprojects should lead to products that respect these standards.

Table 3.6: Relevant ILO Conventions

Sr. No.	*ILO Conventions*	*Objectives*	*Relevance to the Project*
	C029 - Forced Labor Convention, 1930 (No. 29)	This convention states each member undertakes to suppress the use of forced or compulsory labor in all its forms within the shortest possible period. The convention also states that the term forced or compulsory labor shall mean all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily.	The proposed subprojects must abide by this convention to suppress the use of forced or compulsory labor in all its forms. Accessible means to raise workplace concerns and complaints will also be ensured for all type of workers through an effective GRM.
	C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	For the purpose of this Convention, discrimination includes any distinction, exclusion or preference made on the basis of race, color, sex, religion, political opinion, national extraction or social origin, which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation.	The proposed subprojects will ensure fair treatment, non- discrimination and equal opportunity for workers and would support freedom of association and collective bargaining. The proposed subprojects must make efforts to close the gender gap and not widen it through its intervention.
	C138 - Minimum Age Convention, 1973 (No. 138)	Article 1 of the convention states that each Member which ratifies this Convention shall specify, in a declaration appended to its ratification, a minimum age for admission to employment or work within its territory and on means of transport registered in its territory; subject to Articles 4 to 8 of this Convention, no one under that age shall be admitted to employment or work in any occupation.	The proposed subprojects should avoid, in particular, child labor that is mentally, physically, socially or morally harmful.
	C001 - Hours of Work (Industry) Convention, 1919 (No. 1)	The term industrial undertaking under this convention includes (c) construction, reconstruction, maintenance, repair, alteration, or demolition of any building, railway, tramway, harbor, dock, pier, canal, inland waterway, road, tunnel, bridge, viaduct, sewer, drain, well, telegraphic or telephonic installation, electrical undertaking, gas work, waterworks or other work of construction, as well as the preparation for or laying the foundations of any such work or structure; Article 2 of the Convention states that the working hours of persons employed in any public or private industrial undertaking or in any branch thereof, other than an undertaking in which only members of the same family are employed, shall not exceed eight in the day and forty-eight in the week. The limit of hours of work prescribed in Article 2 may be exceeded in case of accident, actual or threatened, or in case of urgent work to be done to machinery or plant, or in case of "force majeure", but only so far as may be necessary to avoid serious interference with the ordinary working of the undertaking.	The proposed subprojects may create wage labor, and if it does, the working conditions should respect this Convention.

Sr. No.	*ILO Conventions*	*Objectives*	*Relevance to the Project*
	C011 - Right of Association (Agriculture) Convention, 1921 (No. 11)	Each Member of the International Labor Organization which ratifies this Convention undertakes to secure to all those engaged in agriculture the same rights of association and combination as to industrial workers, and to repeal any statutory or other provisions restricting such rights in the case of those engaged in agriculture.	The proposed subprojects may create wage labor, and if it does, the rights of association and combination should respect this Convention. Accessible means to raise workplace concerns and complaints will also be ensured for all type of workers through an effective GRM.

3.7 Comparison of International and Local Environmental Legislations

In order to select the most stringent standards applicable, a mix of local (PEQS, 2016) and international (IFC), USEPA regulations have been selected. Table 3.7 presents IFC workplace noise standards that are applicable to the construction workers. It should also be noted that IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the proposed subproject should not result in an increase of more than 3 dB (A) over existing ambient noise at the nearest receptor location off-site.

Table 3.7: IFC Work Environment Noise limits

Sr. No.	*Type of Work, workplace*	*IFC General EHS Guidelines*
1	Heavy Industry (no demand for oral communication)	85 Equivalent level Leq,8h
2	Light industry (decreasing demand for oral communication)	50-65 Equivalent level Leq,8h

A comparison of applicable local and international guidelines for ambient air quality has been provided in Table 3.8 below. In the case of CO, NO_2 and suspended particulates pollutants, the PEQS standards for ambient air quality are more stringent in comparison to USEPA and WHO/IFC standards, however, for SO_2, PM_{10} and $PM_{2.5}$ WHO/IFC standards are more stringent. The applicable and most stringent parameters for each respective pollutant are highlighted in blue. A comparison of International and Local Air Quality Standards is given in Annex B.

A comparison of noise standards (see Annex C) clearly shows that PEQS standards for noise are more stringent in comparison to the WHO/IFC standards for residential and commercial areas. The only exception is the daytime noise level standard for industrial areas where the WHO/IFC standard is more stringent i.e. 70 dB(A) in comparison to PEQS i.e. 75 dB(A). For this particular parameter, the WHO/IFC standard will be used.

The comparison of drinking water quality standards is given in Annex D, which clearly shows the comparison between PEQS and WHO standards.

The PEQS (2016) for ambient air quality, noise, water and wastewater are more stringent in comparison to USEPA and WHO/IFC standards, except for a few parameters of ambient air quality, noise, water which have been considered for these proposed subprojects. Based on the above comparison, only stringent values from the national and international standards shall be applicable for the proposed subprojects.

As far as regulations regarding other environmental parameters are concerned, such as acceptable effluent disposal parameters, the local regulations i.e. PEQSs 2016 are more stringent and would be preferred over any other international regulations. In Pakistan, there are no standards for surface water (used for irrigation), therefore, Food and Agriculture Organization (FAO) standards will be followed.

4 Environmental and Social Baseline Conditions

4.1 General

An environmental baseline study is intended to establish a database against which potential project impacts can be predicted and managed later. This chapter provides the description of the baseline conditions of the proposed project within the study area. Considering the potential impacts of the proposed project, existing baseline environmental conditions of the proposed project has to be used as a benchmark for comparison of the physical, ecological and socio-economic conditions before and after construction phases of the project.

4.1.1 Study Area

The study area is the area within which the potentially significant adverse environmental and social impacts of the proposed intervention are envisaged. The study area includes the actual proposed project boundary, or the area which is being considered for acquisition for the project, as well as the area in the surroundings in which potential adverse impacts may be foreseen due to the implementation of the proposed project. The proposed study area for PRIAT covers the entire Punjab province having thirty-six (36) districts (refer to Figure 2.1 for location map).

The proposed project is essentially a linear project (watercourses) with some components which are of non-linear nature such as irrigation schemes outside canal commands and riverine areas, installation of High Efficiency Irrigation System (HEIS) and solar systems, water storage ponds, pilot community-based groundwater recharge schemes, development of infrastructure and soil moisture meters. At this stage, the footprints of the project, including subprojects, are not finalized yet, therefore, a tentative study area of fifteen to twenty feet (15'-20'), for both linear and non- linear components, as buffer from the actual project boundary on either side is recommended for indirect impacts. However, at detailed design stage when the project footprints will be finalized at subprojects level, the study area will be demarcated as per advice of environment specialists after field reconnaissance.

4.1.2 Baseline Survey

Agricultural performance is directly linked with climatic conditions. Punjab has different agro-climatic zones offering the diversity to cultivate different types of crops, corresponding to different temperatures and rainfalls levels.

In Punjab, the mean temperatures increase from north to south whereas the average rainfall decreases from north to south. Average rainfall in northern districts like Rawalpindi, Sialkot etc. is the highest. It is lower in the districts of central Punjab such as Lahore, Faisalabad, Sargodha etc. and it decreases further in southern districts like Multan, Bahawalpur, Rahim Yar Khan etc. For high rainfall zones, groundwater use is low compared to small and medium rainfall zones. Groundwater level and cropping mainly depend upon mean temperatures and average rainfall in that region.

The following districts (two from each region) have been selected for collection of baseline information based on the trend of average rainfall and temperature for upper, central and lower Punjab.

1. Rawalpindi (northern/ upper Punjab);

Rawalpindi is the fourth-largest city in Pakistan by population, while the larger Islamabad Rawalpindi metropolitan area is the country's third-largest metropolitan area having seven (07) tehsils (Taxila, Rawalpindi, Gujar Khan, Kallar Syedan, Kahuta, Kotli Sattian and Murree). Rawalpindi district has an area of 5,286 km2. The terrain mainly consists of plains and mountains (reaching an elevation of over 1,175 m) traversed by ravines and nullahs originating from the mountains. The geology of the district consists of the high hills of Murree, Kahuta and Kotli Sattian Tehsils which are composed of tertiary sandstone, limestone and alluvial deposits. The sandstone in this region belongs to the Sirmar and Siwalik series of the sub Himalayan system. Limestone is found in the Margalla Range, and this is the main cause of soil fertility of the villages which lie at its base.

Clay soils in Rawalpindi exhibit five distinct strata, from bottom to top: an alluvial stratum deposited, alluvial deposits of the present river system, an air-borne top layer of silt or clay (loess), conglomerate, and loose gravel deposits.

Rawalpindi features a humid subtropical climate with hot summers, and cool to cold winters. The temperatures often exceed 40 °C in summers. Its climate is classified as very similar to its twin city Islamabad.

In terms of socioeconomic conditions, Rawalpindi is a relatively developed district in Punjab, and in Pakistan in general. With a population of over 5.4 million as per the last census (2017), more than half of the population lives in urban areas, educational indicators are amongst the best for Punjab, and health facilities are functional for the most part. The socioeconomic indicators of the sample districts are given in Table 4.? and show the favorable position of the district.

2. Chakwal (northern/ upper Punjab);

Chakwal is situated in the Dhani region of Potohar in northern Punjab. The district is bounded from the north by districts Attock and Rawalpindi, from the east by district Jhelum, and from the south district by Khushab and Mianwali. Chakwal district has five Tehsils (Kalarkahar, Choha Saiden Shah, Chakwal, Talagang and Lawa). The district, which has an area of 1,864,934 acres also encompasses the Salt Range. The elevation of Chakwal is 498 m above sea level. The south and south-east region of the district is mountainous and rocky, covered with scrub forest, interspaced with flat lying plains. The north and north-east consists of softly undulating plains area with patches of rocky areas, known as khuddar in the local dialect, in addition to ravines and gorges and some desert areas.

The soil of the area has developed from water and wind transported materials consisting of loess alluvial deposits, mountains outwash and recent stream valley deposits. A part of the soil has also been derived from shales and sandstone.

The climate of Chakwal is considered to be a local steppe climate. May and June are the hottest months with day temperature usually ranging from 40 to 45°C. January is the coldest month with a mean minimum temperature of 1°C. Most of the rain falls in July, August and September during summer months and in January, February and March during the winter months.

While Chakwal has a small population of just over 1.4 million, it is, like Rawalpindi, one of the higher ranked districts in Punjab in terms of positive socioeconomic conditions and relatively low incidence of poverty. Although less than 20 percent of the population lives in urban areas, education and health indicators for Chakwal are generally favorable, as seen from the table below.

3. Sargodha (Central Punjab);

Sargodha lies in central Punjab, bounded on the north by Jhelum district, on the east by the Chenab river, on the south by Jhang district and on the west by Khushab district. It comprises seven (07) Tehsils (Sargodha, Kot Momin, Bhalwal, Shahpur, Sillanwali, Sahiwal and Bhera). The district has an area of 5,864 km2. It mainly consists of plains and lies between 150 to 200 m above sea level. Three major geographological surfaces have been recognized in Sargodha: The youngest and the lowest are recent flood plains where deposition of fresh sediments is still going on or has stopped only recently. The middle surface (sub recent flood plains) belongs to the early and middle Holocene age. The recent and the sub recent flood plains are collectively called the Jhelum Flood Plains. The highest and oldest (old river terrace) is most probably of Pleistocene age and comprises the highest strip of land locally known.

The Sargodha district has gradually been filled up by alluvium brought by the Indus and its tributaries from the North. The alluvial deposit is generally more than 300 meters thick and extends down to several hundred meters at some places. Towards the south of Sargodha this alluvium is locally interrupted by rock out crops of a buried hill.

The city has a climate of extreme heat in the summers and moderate cold in the winters. The maximum temperature reaches 50 °C (122 °F) in the summer while the minimum temperature recorded is as low as freezing point in the winter.

Sargodha is very densely populated, although only 30 percent of the population is urbanized. The socioeconomic profile of the district indicates that the population is generally badly serviced with regard to health and education. Sargodha also scores poorly on the multidimensional poverty index[20] estimated for Punjab in 2018, which showed that more than a quarter of the population could be classified as MPI poor.

4. Faisalabad (Central Punjab);

Faisalabad is the second most populous district in Punjab. It is bounded on the north by Jhang, Hafizabad and Sheikhupura districts, on the east by Sheikhupura, Okara and Sahiwal districts, on the south by Sahiwal and Toba Tek Singh, and on the west by Toba Tek Singh and Jhang districts. It has six (06) Tehsils (City

[20] The multidimensional povery index takes into account income earned, but also access to basic social services.

Faisalabad, Chak Jhumra, Jaranwala, Tandianwala, Samundri and Sadar Faisalabad). The district is a flat alluvial plain formed by the Chenab and Ravi Rivers, between the Himalayan foothills and the central core of the Indian subcontinent. The alluvial deposits are typically over a thousand feet thick. The interfluves are believed to have been formed during the Late Pleistocene and feature river terraces. The total area of the district is 5,856 km2. It lies at an elevation of 605 feet above sea level.

The soil of Faisalabad comprises alluvial deposits mixed with loess having calcareous characteristics. The soil is generally fertile. Lower Chenab canal is the main source of irrigation water. It meets the requirements of 80 percent of the cultivated land.

The climate of Faisalabad is hot and dry in the summer season while in winter the city is usually dry and cold. The average annual temperature is 26.2°C. The average rainfall in this city is about 100 mm.

Faisalabad is the largest district in the sample in terms of population, with almost 8 million people resident here as per the 2017 census. The main city in the district is known for its industrial base, and Faisalabad provides employment to a number of industrial workers, particularly in the textile sector. Faisalabad's socioeconomic indicators are close to the average for Pakistan, but do not reflect any exceptional gains. This is in spite of the district's economic dynamism, which is reflected in the relatively low rate of MPI poverty.

5. Multan (lower / Southern Punjab);

Multan is located in the southern part of the province. It lies in a bend made by five confluent rivers. It is bounded on the east by Lodhran and Khanewal districts, on the north by Khanewal district, on the south by Bahawalpur district and ono the west by Chenab across which lies the Muzaffargarh district. It comprises four Tehsils (Jalalpur Pirwala, Multan City, Multan Saddar and Shujabad). The total area of Multan is 3,721 km2. The elevation of Multan is 400 feet above sea level. Geographically it is located in the center of the country. Saltpetre (potassium nitrate) is manufactured in the district.

The soil of the district is alluvial and sand is everywhere, just a few feet below the surface. The district is part of a vast flood plain of River Chenab, River Ravi & Sutlej on which the debris of numerous streams have mingled, to create thick alluvial material, originally derived from the Himalayas.

The climate in Multan is called a desert climate. There is virtually no rainfall during the year in Multan. The average annual temperature is 25.6 °C in Multan. In a year, the average rainfall is 175 mm.

Multan is the largest city in south Punjab and the nerve center of the Seraiki region. Multan district has a population of over 5 million, and almost a third of the population is classified as MPI poor, as shown in the table below. Education indicators for the district are generally lower than the average for Punjab.

6. Rahim Yar Khan (lower / Southern Punjab).

Rahim Yar Khan is a famous city in the south of Punjab, which lies between the Indus basin and the Cholistan Desert. It is bounded on the north by Muzaffargarh

district, on the east by Bahawalpur district, on the south by Jaisalmir (India) and the Ghotki district of Sindh, and on the west by Rajanpur district. It comprises four Tehsils (Khanpur, Liaquatpur, Rahim Yar Khan and Sadiqabad). The total area is 11,880 Sq Km. The approximate height of the irrigated area is 150 to 200 meters (490 to 655 ft) above sea level. Geologically, the district lies on Indian plate rock with a recent sedimentary cover.

The soils in the district generally range from loamy sand to sandy. The lands are extensively cultivated under irrigation from canal systems off-taking from Indus River. The major soils are loamy clay and loamy sandy soils.

The climate of Rahim Yar Khan is extremely hot and dry in the summer season, while in winter the city is quite pleasant and is usually dry and cold. The average annual temperature is 26.2°C. The average rainfall in the city is about 100 millimetres.

The seismicity of all the sample districts is classified as 2A, with the exception of Rawalpindi which is 2B.

Rahim Yar Khan is one of the least developed districts in Punjab, with an MPI poverty incidence of 43 percent. Almost 80 percent of the population lives in rural areas, and the district has a strong agricultural base. But the sector has not generated sustained economic benefits for the majority of the people who depend upon it. Educational and health indicators in the district reflect the low levels of socioeconomic development.

The table below summarizes the socioeconomic situation of the sample districts, and also highlights the diversity across Punjab, particularly between the north (Rawalpindi, Chakwal), and the south (Multan, Rahim Yar Khan), with central Punjab literally placed in between with respect to development indicators.

Table 4.1: Key Socioeconomic Indicators for Sample Districts

S.No.	*Indicator*	*Rawalpindi*	*Chakwal*	*Sargodha*	*Faisalabad*	*Multan*	*Rahim Yar Khan*
1	Population	5,402,380	1,495,463	3,696,212	7,882,444	4,746,166	4,807,762
2	Population density	1022.21	229.19	3,696,212	1345.82	1275.85	404.69
3	Urban proportion	55.64	18.96	29.44	47.79	43.38	21.44
4	Multidimensional poverty index (percent of people who are MPI poor)	8.1	10.2	26.0	17.9	31.4	43.4
5	Percent of population that is literate (15-49 years)	77.2	69.2	56.1	66.6	57.1	41.3
6	Percent of out of school children of primary school age	7.9	5.3	7.5	9.7	14.8	29.2
7	Percentage of children age 12-14 years involved in economic activity	2.7	2.8	7.2	8.7	10.5	10.0

S.No.	Indicator	Rawalpindi	Chakwal	Sargodha	Faisalabad	Multan	Rahim Yar Khan
	for 14 hours a week or more						
8	Infant mortality rate (per 1000 live births)	35	38	72	63	59	56
9	Under 5 mortality rate (per 1000 live births)	41	43	78	72	70	66
10	Antenatal care coverage - Percentage of women who were attended at least once by skilled health personnel	93	92.7	82.2	92.5	94.5	65.5

Sources: Indicators 1, 2 and 3 from Pakistan Census of 2017. Indicators 4 to 10 from Government of Punjab, Multiple Indicators Cluster Survey 2018.

The following tables show flora and fauna species for the sample districts.

Table 4.2: Flora Species for Sample Districts

Name of District	*Flora Species*
Chakwal	Phulai (*Acacia modesta*), Kahu (***Olea ferruginea***), Sanatha (*Dodonaea viscosa*)
Faisalabad	Van (*Vachellia nilotica*), Karil (*Capparis decidua*), Jhand (Prosopis cineraria), Beri (*Ziziphus Jujuba*)
Multan	Bahera (*Terminalia bellirica*), Saru (*Casuarina equisetifolia*) Neem (*Azadirachta Indica*), Shisham (*Dalbergia sissoo*)
Rahim Yar Khan	Katran (*Calotropis procera*), Chapri (*Vachellia nilotica*), Kikar (*Acacia nilotica*), Phag (*Salvia officinalis*), Pelu (*Sophora cassioides*)
Rawalpindi	Shisham (*Dalbergia Sissoo*), Kikar (*Acacia nilotica*), Shareen (*Albizzia lebbck*), Beri (*Ziziphus jujuba*)
Sargodha	Shisham (*Dalbergia sissoo*), Kikar (*Acacia nilotica*), Phulai (*Acacia modesta*), Simal (*Bombax ceiba*), Siris (*Albizia lebbeck*),Toot (*Morus nigra*), Neem (*Azadirachta indica*), Jamman (*Eugenia jambolana*)

Table 4.3: Fauna Species for Sample Districts

Name of District	*Wildlife/Fauna*	*Conservation Status -IUCN*	*Avifauna*	*Conservation Status -IUCN*
Chakwal	Jackal (*Canis aureus)*	LC	Partridges (*Melanoperdix niger)*	VU
	Porcupine *(Hystrix indica)*	LC	Quail (*Coturnix coturnix)*	LC
	Bengal Monitor Lizard (*Varanus bengalensis)*	NT	--	--
	Urial (*Ovis vignei)*	VU	--	--
Faisalabad	Fox (*Vulpes vulpes)*	LC	*Pigeons (Columba livia)*	LC
	Pig *(Sus scrofa)*	LC	Dove (*Spilopelia chinensis)*	LC
	Jackal (*Canis aureus)*	LC	Parrot (*Melopsittacus undulatus)*	LC

Name of District	*Wildlife/Fauna*	*Conservation Status -IUCN*	*Avifauna*	*Conservation Status -IUCN*
	Wild cat (*Felis silvestris)*	LC	--	--
Multan	Jackal *(Canis aureus)*	LC	Quail *(Coturnix coturnix)*	LC
	Hare *(Lepus nigricollis)*	LC	Owl *(Glaucidium cuculoides)*	LC
	--	--	Pigeons *(Columba livia domestica)*	LC
Rahim Yar Khan	Hog Deer *(Axis porcinus)*	EN	Partridges (Melanoperdix niger)	LC
	Pig *(Sus scrofa)*	LC	Dove (Spilopelia chinensis)	LC
	Jackal *(Canis aureus)*	LC	Myna (Acridotheres tristis)	LC
	Wolf *(Canis lupus)* Porcupine (Hystrix indica)	LC	Bulbul (Luscinia megarhynchos)	LC
	Wild rat *(Rattus rattus)*	LC	--	--
	Mongoose *(Herpestes javanicus)*	LC	--	--
	Lizard *(Cnemidophorus spp)*	LC	--	--
	Toad *(Bufo bufo)*	LC	--	--
	Frog *(Rana tigrina)*	LC	--	--
Rawalpindi	Jackal *(Canis aureus)*	LC	Dove *(Spilopelia chinensis)*	LC
	Rabbit *(Lepus nigricollis)*	LC	Quail *(Coturnix coturnix)*	LC
	Fox *(Vulpes vulpes)*	LC	Pigeons *(Columba livia)*	LC
	Wild cat *(Felis silvestris)*	LC	Crow *(Corvus splendens)*	LC
	Wild boar *(Sus scrofa)*	LC	Parrot *(Melopsittacus undulatus)*	LC
	Raho *(Labeo rohita)*	LC	Nightingale *(Luscinia megarhynchos)*	LC
Sargodha	Wolf *(Canis lupus)*	LC	Chukor *(Alectoris chukar)*	LC
	Jackal *(Canis aureus)*	LC	Partridges *(Melanoperdix niger)*	VU
	Fox *(Vulpes vulpes)*	LC	Teal *(Anas crecca)*	LC
	Wild cat *(Felis silvestris)*	LC	Quail *(Coturnix coturnix)*	LC

The data presented in the following sections has been collected from the primary and secondary sources. For primary data acquisition, the Environment and Social team conducted field visits during the month of February 2022. The secondary data was collected from published sources/reports, District Census Report (DCR), and relevant departments.

4.2 Physical Environment

The environmental baseline study describes the physical conditions and characteristics in the defined study area around and within the project areas.

This study includes topography, geology, hydrology, land use, climate and weather patterns, air quality, noise, surface water and groundwater quality. Physical features of the proposed area are given in the following sections.

4.2.1 Topography

Punjab is Pakistan's second largest province by area after Balochistan with an area of 205,344 square kilometers (79,284 square miles). It occupies 25.8 percent of the total landmass of Pakistan. Punjab is bordered by Sindh to the south, the province of Baluchistan to the southwest, the province of Khyber Pakhtunkhwa to the west, and the Islamabad Capital Territory and Azad Kashmir in the north. Punjab borders the Indian states of Punjab and Rajasthan to the east. Punjab's landscape mostly consists of fertile alluvial plains of the Indus River and its four major tributaries in Pakistan, the Jhelum, Chenab, Ravi, and Sutlej Rivers. The Indus River and its many tributaries traverse the Punjab from north to south. The landscape is amongst the most heavily irrigated on earth, and canals can be found throughout the province.

Topographically, Punjab can be divided into following five landforms:

- Upper hilly region;
- Potohar (or Potwar) plateau;
- Central plain lands (Doab);
- Desert like plains; and
- Cholistan and Thal deserts.

The upper hilly region is a southward continuation of the Himalaya foothills of Kashmir. High rainfall, coniferous trees, and cold weather characterize the region. Murree, with an altitude of 2,300 meters, is a popular hill station and a summer resort. The Potohar Plateau, which also includes the Salt Range, is a land of undulating terrain. It lies between rivers Indus and Jhelum. Besides a number of important archaeological sites, the region is distinguished by diverse wildlife. The central part of the province comprises low-lying floodplains along the rivers. This geographical relief has facilitated large-scale cultivation, development of an extensive irrigation network, construction of roads, railways, and other infrastructure. The desert like plains are transition zones between the floodplains and the deserts of Cholistan and Thal. Development of surface irrigation, to some extent, has transformed their morphology into irrigable tracts. Thal and Cholistan exhibit true desert features. Cholistan, locally known as Rohi, spans an area of over 16,000 km^2. It continues into Sindh under the name “Thar” and into India as “Rajhastan.” The elevation of Punjab varies from 2,212 to 69 meters . The map showing the topography of Punjab is shown in Figure 4.1.

4.2.2 Geology and Geomorphology

The general slope of the land is from northeast to southwest, but it rises in the areas between rivers. Approximately 70 percent of the land area of the province comprises the floodplains of the Indus Basin. Geologically, lands in the floodplains are lightly mantled with alluvial deposits transported from the

Himalaya foothills. The underlying bedrock is composed of Precambrian metamorphic and tertiary consolidated rocks. The overlying alluvium consists of Pleistocene to recent unconsolidated deposits of sand, clay and silt. The formation age of the alluvium also relates from Pleistocene to recent, the latter being predominant near the riverbanks and the former around the central part of the plains. The alluvial plain has a diversity of landforms: its active floodplains are flooded every rainy season and contain changing river channels, while meander floodplains lying adjacent to the active floodplain are marked by relict and abandoned channels. The geological map of Punjab is shown in Figure 4.2.

Geology of the sample districts is given in the table below.

4.2.3 Soil Morphology

The texture, morphology, and moisture holding capacities of the soils in the province vary from region to region. The surface crust soils are composed of alluvial deposits consisting of silt, clay, sand, and loam. Clay and silt formations occur in discontinuous layers with limited lateral extent. Their thickness is generally less than five meters. Due to rich surface irrigation in the central Punjab, the fertile soils of the floodplains give a good per unit yield. The soil map of Punjab is shown in Figure 4.3. Details of soil morphology of the sample districts are given in the table below.

Figure 4.1: Topographical Map of Punjab Province

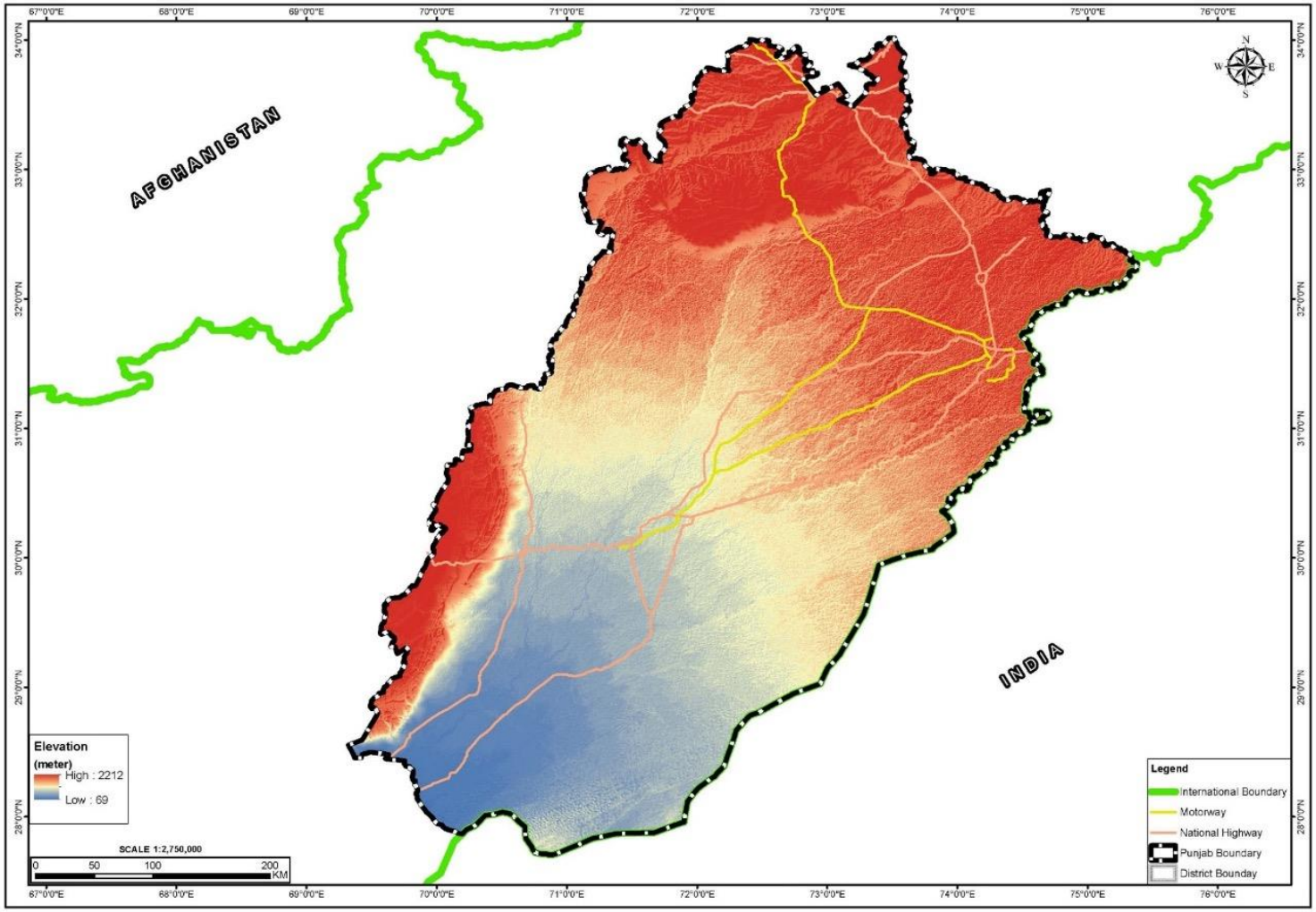


Figure 4.2: Geological Map of Punjab Province

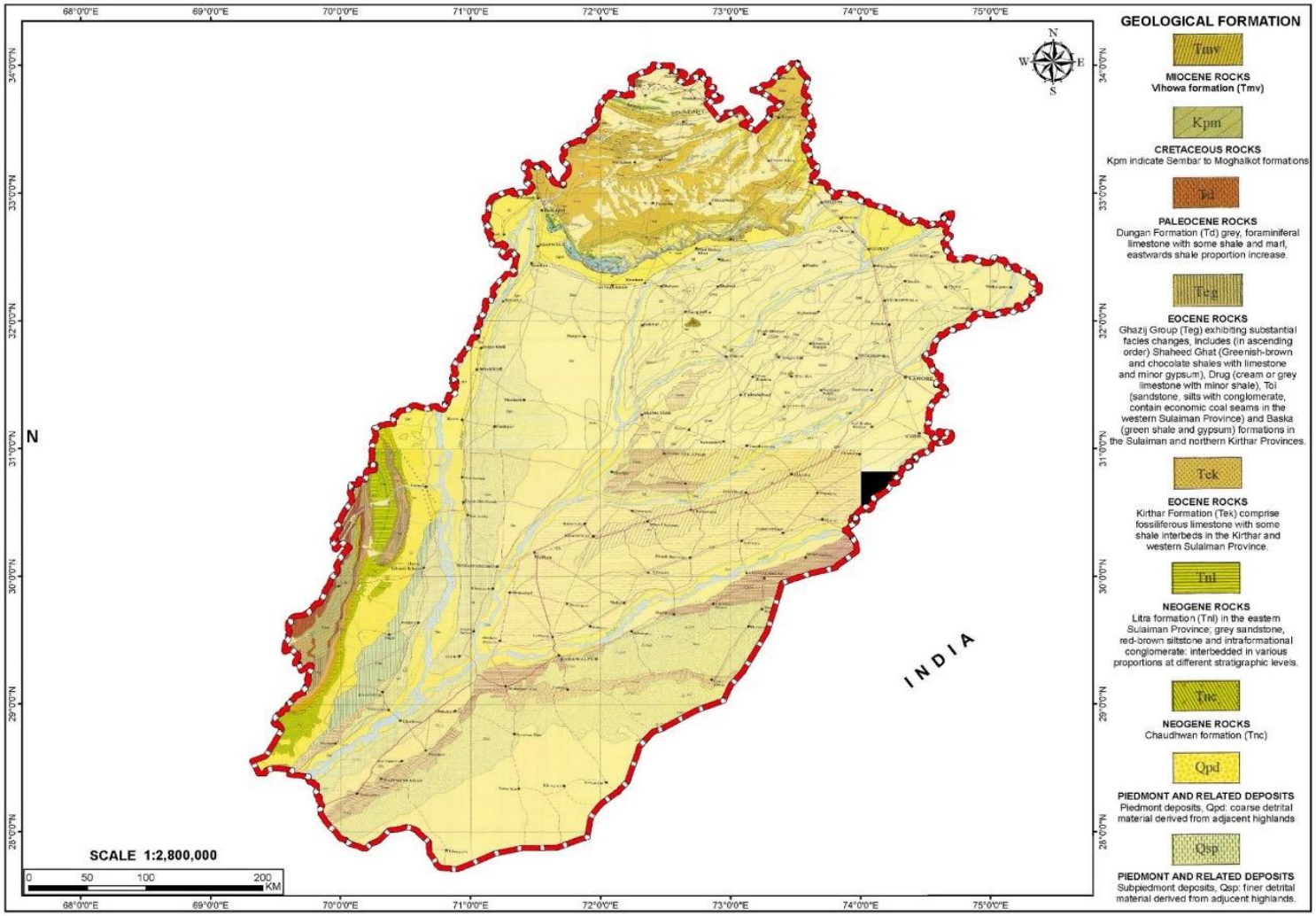
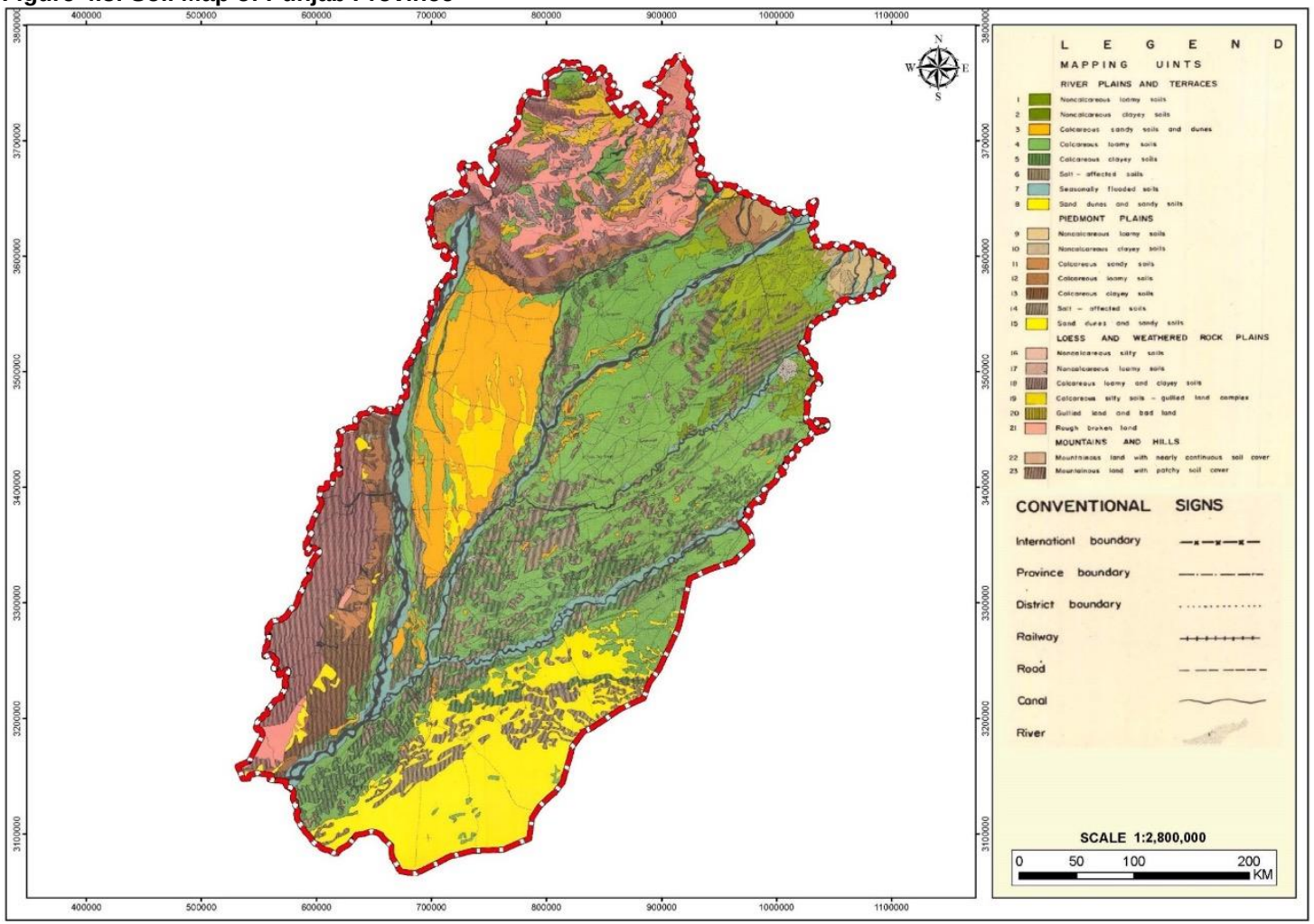


Figure 4.3: Soil Map of Punjab Province



4.2.4 Seismicity

On the basis of Peak Ground Acceleration (PGA) values obtained through Probabilistic Seismic Hazard Assessment (PSHA), Pakistan is divided into five (05) seismic zones in line with the Uniform Building Code (UBC), 1997 of Pakistan. The boundaries of these zones are defined on the basis as shown in Table 4.4.

Table 4.4: Values of Seismic Zones of Pakistan

Sr. No.	*Zone*	*PGA (g)*
1	1	0.05 to 0.08
2	2A	0.08 to 0.16
3	2B	0.16 to 0.24
4	3	0.24 to 0.32
5	4	> 0.32 g

According to the seismic map of Pakistan, most parts of the province lie in zone "2A" of the Earthquake Zones Classification of the Uniform Building Code (UBC – 1997) of the United States. This zone is associated with unknown geologic conditions and the **earthquake damage is "moderate**." However, earthquakes of magnitude up to five on the Richter scale, which generate ground acceleration up to 0.1g, have been reported for this zone. The seismic zoning map of Punjab province is shown in Figure 4.4.

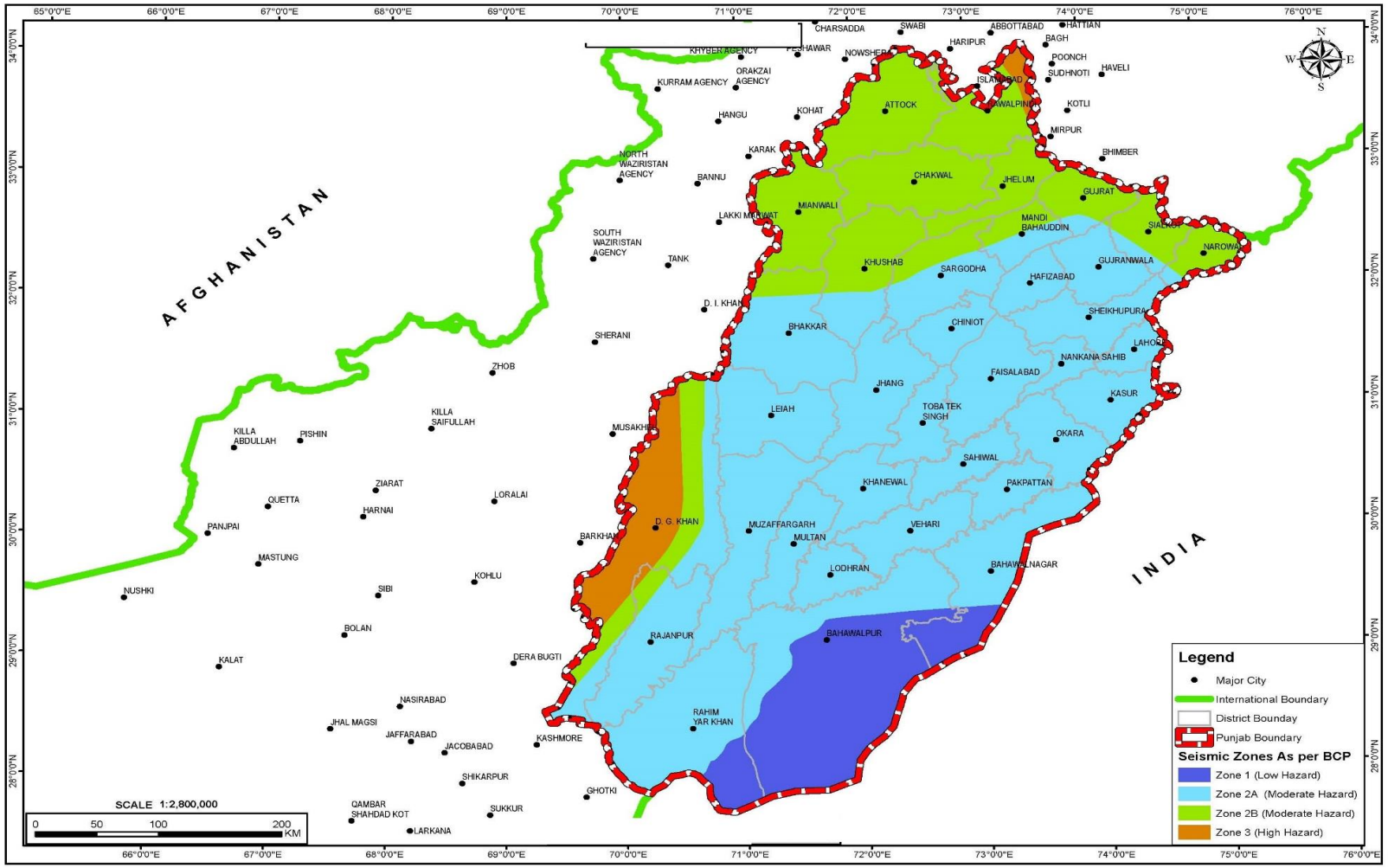
4.2.5 Natural Hazards

The province of Punjab is vulnerable to most kinds of disasters, with floods in rivers and hill torrents frequently occurring since 2010. Punjab faces floods in varying intensity almost every year. There have also been examples of tornadoes and earthquakes in the province, but their frequency has been quite low, with most of the Punjab being relatively safe with regards to vulnerability to earthquakes. Some areas such as Murree and parts of the Rawalpindi Division are located on a fault line hence vulnerable to earthquakes. Apart from above mentioned areas, an old fault line is activated near Nankana Sahib. Tornadoes too are a rare happening in Punjab.

Punjab's geographic location and climatic conditions make it more vulnerable to monsoon floods and droughts in the southern areas. The effects of climate change and associated variability in the monsoons means that the occurrence and intensity of floods have significantly been increased in the last few years. The worrisome facts are that different rivers have caused flooding in different areas of the province including riverine, urban and flash floods (hill torrents) during last few years.

Figure 4.4:

Seismic Zoning Map of Punjab


AFGHANISTAN
INDIA
CHARSADDA
SWABI
ABBOTTABAD
HATTIAN
HARIPUR
BAGH
POONCH
SUDHNOTI
HAVELI
KHYBER AGENCY
PESHAWAR
NOWSHERA
ORAKZAI AGENCY
KURRAM AGENCY
ISLAMABAD
RAWALPINDI
ATTOCK
KOTLI
HANGU
KOHAT
MIRPUR
KARAK
BHIMBER
NORTH WAZIRISTAN AGENCY
BANNU
CHAKWAL
JHELUM
GUJRAT
MIANWALI
LAKKI MARWAT
MANDI BAHAUDDIN
SIALKOT
NAROWAL
SOUTH WAZIRISTAN AGENCY
TANK
KHUSHAB
SARGODHA
GUJRANWALA
HAFIZABAD
D. I. KHAN
SHEIKHUPURA
BHAKKAR
CHINIOT
LAHORE
SHERANI
NANKANA SAHIB
ZHOB
FAISALABAD
JHANG
KASUR
KILLA SAIFULLAH
LEIAH
TOBA TEK SINGH
KILLA ABDULLAH
PISHIN
MUSAKHEL
OKARA
SAHIWAL
ZIARAT
KHANEWAL
PAKPATTAN
QUETTA
LORALAI
HARNAI
D. G. KHAN
MUZAFFARGARH
VEHARI
PANJPAI
BARKHAN
MULTAN
MASTUNG
LODHRAN
BAHAWALNAGAR
KOHLU
NUSHKI
SIBI
RAJANPUR
BAHAWALPUR
BOLAN
DERA BUGTI
KALAT
NASIRABAD
RAHIM YAR KHAN
JHAL MAGSI
JAFFARABAD
KASHMORE
JACOBABAD
SHIKARPUR
GHOTKI
QAMBAR SHAHDAD KOT
SUKKUR
LARKANA
SCALE 1:2,800,000
0 50 100 200 KM
Legend
Major City
International Boundary
District Bounday
Punjab Boundary
Seismic Zones As per BCP
Zone 1 (Low Hazard)
Zone 2A (Moderate Hazard)
Zone 2B (Moderate Hazard)
Zone 3 (High Hazard)

4.2.6 Climate

As mentioned earlier, agricultural performance is directly linked with suitable climatic conditions and ground water levels. Districts located in northern Punjab (e.g. Rawalpindi, Sialkot, Attock, Chakwal etc.) have lowest mean temperatures, while the districts located in central Punjab (e.g. Lahore, Faisalabad, Sargodha, Hafizabad, Chiniot etc.) have relatively higher temperatures, whereas the districts located in southern Punjab (e.g. Multan Bahawalpur, Bahawalnagar, Rahim Yar Khan etc.) have the highest temperatures in the province. Average rainfall in the northern districts is the highest. It is lower in the districts located in central Punjab, and it decreases further in southern districts.

Mean temperatures (maximum and minimum) and rainfall data of the selected metrological stations across the Punjab province (year-2019) is presented in Table 4.6 and graphical presentation is shown in Figure 4.5 and 4.6 for mean temperatures (maximum & minimum) and rainfall respectively.[21]

Table 4.5: Mean Temperatures (minimum & maximum) and Rainfall

Meteorological Gauging Station	*Mean Minimum Temperature (°C)*	*Mean Maximum Temperature (°C)*	*Rainfall (mm)*
Bahawalnagar	18.6	32.3	361
Bahawalpur	18.9	31.5	297
Faisalabad	18.1	30.3	411
Jhelum	17.2	29.8	985
Khanpur	18.9	32.7	225
Lahore	19.2	29.7	898
Multan	19.5	31.2	288
Rawalpindi	13.3	27.6	1514
Sargodha	18.6	30.7	437
Sialkot	17	28.7	1022

Source: Director, Regional Meteorological Centre, Lahore

21 Director, Regional Meteorological Centre, Lahore and Punjab Agriculture Statistics 2020, Bureau of Statistics Planning & Development Board, Government of the Punjab.

Figure 4.5: Mean Maximum and Minimum Temperatures (2019)

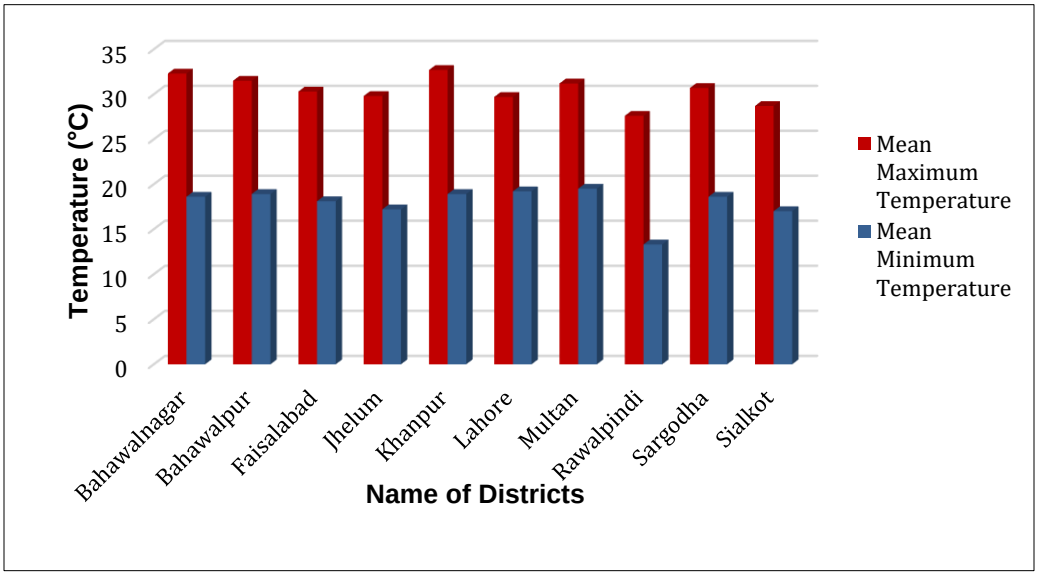
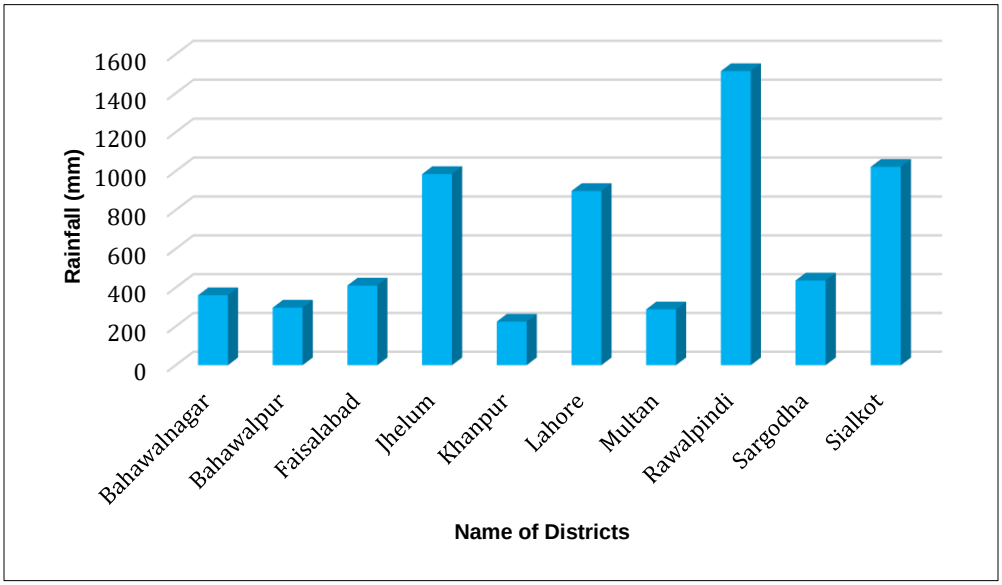


Figure 4.6: Average Rainfall (2019)



The mean minimum temperature is observed in district Rawalpindi while the mean maximum temperature is observed in Khanpur near district Rahim Yar Khan. Similarly, the mean maximum and minimum rainfall are observed in district Rawalpindi and Khanpur near district Rahim Yar Khan respectively.

4.2.7 Water Resources

Surface Water

The River Indus and its tributaries constitute the surface water resources of the area. These are briefly described below.

Indus River: The Indus River and its tributaries are the main source of surface water in the Punjab province (and in the country). The length of the Indus River in the country is about 2,750 km. Five main rivers that join the Indus from the eastern side are Jhelum, Chenab, Ravi, Beas and Sutlej. The Indus River and its tributaries on an average bring about 190 billion cubic meters (bcm) (154 million acre-feet - MAF) of water annually.

Chenab River: The Chenab River is one of the major left bank tributaries of the Indus River. The total length of the river is about 1,242 km, of which approximately 729 km The length of the river in Pakistan is about 679 km. India has full rights over the Ravi waters in accordance with the Indus Basin Water Treaty of 1960, and diverts all of its base flow for irrigation purposes.

Sutlej River: The Sutlej River originates in Western Tibet in the Kailas mountain range, near the source of the Indus, the Ganges and the Brahmaputra. The total length of the river is about 1,551 km of which only 529 km runs in Pakistan. India has full rights over Sutlej waters as well, according to the Indus Basin Water Treaty.

Jhelum River: The total length of River Jhelum is around 774 km, which makes it one of the longest rivers of Pakistan. It is a very famous tributary of the River Chenab (which ultimately falls in River Indus), which originates in the south-eastern region of the valley of Kashmir and runs through the city of Srinagar before making its way into the Azad Jammu & Kashmir.

Figure 4.7 shows the surface water resources in Punjab.

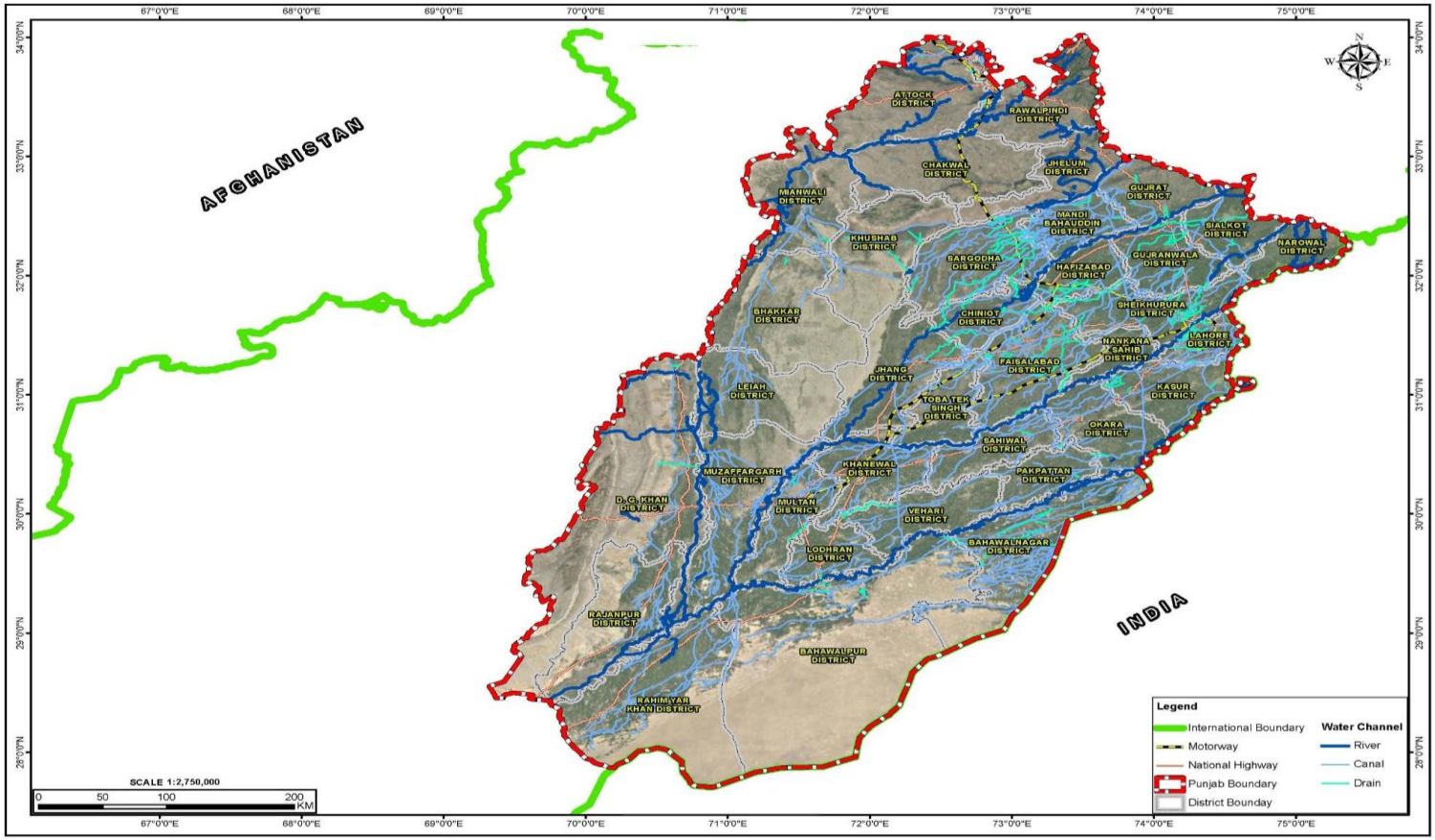
Groundwater

Punjab can be divided into four hydro-geological zones: Potohar plateau and Salt Range, piedmont areas, alluvial plains, and the Cholistan desert. The total groundwater potential in the province (52.7 bcm or 42.75 MAF) is based upon rainfall recharge (12.2 bcm or 9.90 MAF), groundwater recharge (8.7 bcm or 7.08 MAF), recharge from rivers (4.3 bcm or 3.5 MAF), and recharge from the irrigation system (26.7 bcm or 21.70 MAF)[22].

About 79 percent of the area in Punjab 28 percent of the area in Sindh is underlain by fresh groundwater. This is mostly used as supplemental irrigation water and pumped through tube-wells. Some groundwater is saline.

[22] Source: Pakistan's Groundwater Reservoir and its Sustainability. Muhammad Amin, Member Water, WAPDA.

Figure 4.7: Surface Water Resource in Punjab



The quality of groundwater ranges from fresh (salinity less than 1000 mg/l TDS) near the major rivers to highly saline farther away, with salinity more than 3000 mg/l TDS. About 79 percent area of the province has fresh groundwater.[23] The water table varies from as low as 1 meter in the waterlogged areas to as deep as 90 meters in desert areas.[24]

4.2.8 Environmental Monitoring, Sampling and Testing

In order to determine the ambient air, background noise levels, water and wastewater quality of the study area, one sample each from northern/ upper Punjab (Rawalpindi), central Punjab (Sargodha) and lower / southern Punjab (Multan) were selected to get data for the baseline.

The summary of ambient air, noise and water analysis are provided in the following sections. The details of results are attached in Annex-E.

Ambient Air

Ambient air quality data for SO_2, NO, NO_2, CO_2, VOC, PM_{10} and $PM_{2.5}$ was monitored at three (03) points, one from each district. The results were compared with the PEQS and WHO/IFC standards and guidelines for ambient air. **The results reveal that the PM_{10} & $PM_{2.5}$ are exceeding the stringent limits.**

Background Noise Levels

The background noise level monitoring results were monitored at three (03) points, one from each district and compared with the PEQS, 2016 and WHO/ IFC values. **The results reveal that the background noise levels are exceeding the stringent limits** as these values were measured near the road.

Surface Water / Wastewater

In order to document the existing quality of surface water/ wastewater, three (03) grab samples of surface water/wastewater from each district were considered. The results were compared with the PEQS, 2016 and FAO standards for surface water / wastewater. **All the parameters are within the stringent limits.**

Drinking Water/ Groundwater

In order to document the existing drinking water / groundwater quality, three (03) grab samples from each district were considered. These samples were tested against all parameters. The results were compared with PEQS, 2016 and WHO standards. **All the parameters are within the stringent limits except TDS, Taste, Fecal Coliform and Total Coliform Bacteria**.

4.2.9 Solid Waste and Wastewater Situation

In urban areas, a proper solid waste management system exists. However, in rural areas, there is no proper sewerage and sanitation system available in the study area and only a few villages were observed to be connected with the proper sewerage system. In

23 Water Quality Status in Pakistan, Pakistan Council of Research in Water Resources, Islamabad, 2003

24 Punjab Sustainable Development Strategy, Environment Department, Punjab, 2008

a majority of the cases, the village's wastewater is disposed off into open spaces or nearby ponds. Ultimately, wastewater is drained into a pond/nullah, becoming a source of pollution. The same is the case with solid waste - there is no proper arrangement for its disposal. Most of the solid waste exists in the form of heaps near the villages. The remaining organic and livestock waste is collected in the designated areas which is used to prepare compost utilized by local farmers in their agriculture fields. The major constituents of solid waste in the area are paper, plastic, and organic waste (food waste and animal waste) and waste from the nearby houses.

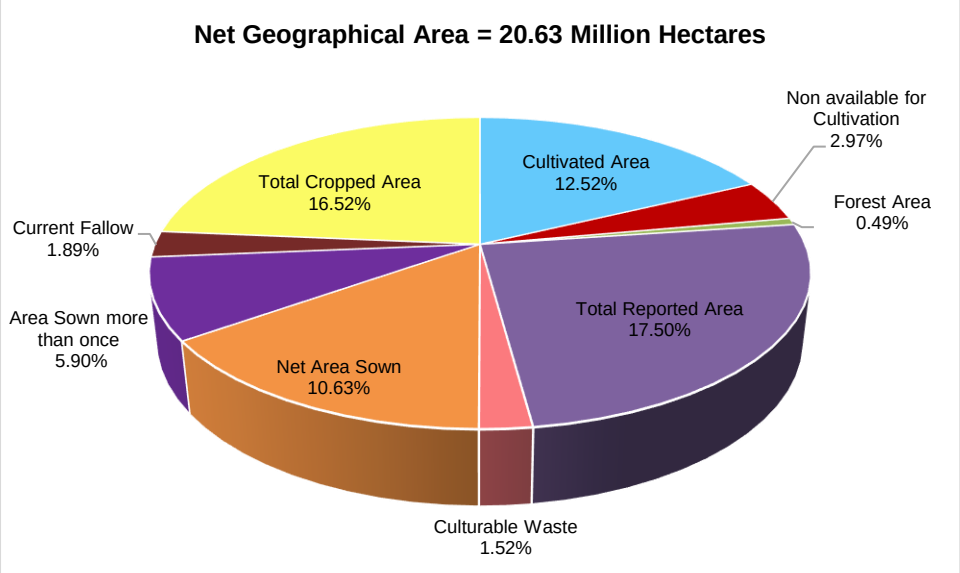
4.2.10 Land Utilization

Agriculture is the mainstay of Pakistan's economy. The most populated province (Punjab) provides the largest share in national agricultural production. Agriculture offers 19 percent of the estimated provincial GDP and gives employment to 48 percent of the population in the province.[25]

Punjab is the second largest province in Pakistan in terms of land area, comprising 25.9 percent of the country's total land, with its area of 20.63 million hectares. Land utilization status data is available for 86 percent of the aggregate territory; while 14 percent land stays unreported. About 14 percent of the area is not available for agriculture due to either being totally infertile or being occupied by infrastructure. Consequently only 72 percent of the land is available for cropping. About 10.81 million hectares (53 percent) is the net sown area; or area that is cultivated at least once in a year. About 9 percent of the land is categorized as current fallow; or area that is not used for cultivation during a year, whereas around 8 percent of land is marked as culturable waste or area that is not cultivated for more than three years.[26]

Land utilization in Punjab is shown Figure 4.8

Figure 4.8: Land Utilization in Punjab



[25] Government of Punjab, Planning and Development Board. (date of publication unknown). Punjab Growth Strategy 2023.

26 Agriculture Department, Government of Punjab (www.agripunjab.gov.pk/overview)

4.2.11 Places of Cultural/Archeological Importance

All the districts of Punjab have very rich cultural and archeological distinctions. It is anticipated that there will be no direct impacts on archaeological sites due to PRIAT as construction/rehabilitation activities will be limited in space and time. Physical activities such as watercourse improvements and introduction of HEIS will be largely confined to already transformed areas/cultivated areas.

However, during excavation, there is always a chance of finding artifacts. Therefore, this ESMF has developed a "Chance Finds Procedure" to be followed during project implementation if an archeological site is discovered. Moreover, if any archaeological site and monument is near (within 200 ft as per Punjab Antiquities Amendment Act, 2012) to the proposed subprojects, the provincial Archeological Department will be contacted for the issuance of no objection certificate (NOC). As per guidelines for sensitives and critical areas issued by Government of Pakistan, 1997, there are 147 cultural and archeological sites in Punjab. Detail of important cultural and archeological sites of the province is attached as Annex F.

4.3 Ecological Environment

The biological environment baseline study describes the floral and faunal conditions and characteristics in the targeted region. Punjab is divided into six agro-climatic regions viz., sub-mountain undulating plain region, central plain region, western plain region, western region, and flood prone region[27].

4.3.1 Forest Resource Situation

According to recent statistics (1999) the present condition of the forestry sector resources in the public sector is tabulated below, according to which the plantable blank area is 130,000 ha (321,307 acres) in compact public forests. About 2.6 mha of Cholistan is not plantable in the present scenario due to non-availability of sweet water sources and is being used only as a poorly stocked rangeland. This potential also needs to be exploited through survey and research. The blank plantable strips in the linear plantations in the public sector add another 11,798 km equivalent of about 100,000 ha of compact area.

The province of Punjab, with an area of 50.96 million acres has meager forestry resources over only 1.58 million acres in the public sector. The resources managed by the Forest Department include compact plantation i.e. Coniferous, Coniferous/Scrub Forests (80129 acres), Scrub Forests (679663 acres), Range Lands (241575.37 acres), Irrigated Plantations (440052.71 acres) and Riverain Forests (143343.33 acres). Moreover, the Linear Plantations of the province i.e. canal side plantations (33795.37 km), roadside plantations (10665.15 km) and rail side plantations (2580.50 km). In addition to the public sector forestry resources, tree covers exist in farmlands both in the form of woodlots and linear avenues along the field boundaries and watercourses.[28]

27 Academic Editor: John Walsh *Atmosphere* 2021, *12*(8), 939

28 https://fwf.punjab.gov.pk/compact_plantation

The forests of Pakistan reflect the country's physiographic, climatic and edaphic diversity. Punjab has a diversity of climatic and soil conditions that support various forest types. The types of forests in the province are described below.[29]

Himalayan Moist Temperate Forest

These are evergreen forests of conifers occasionally mixed with oaks and broadleaved species. These forests occur in Azad Kashmir, Punjab (Murree), part of district Abbottabad, Mansehra, Swat, some tribal areas (Hazara and Malakand civil division) and Naran/Kaghan valleys at an elevation ranging from 1700 to 3350 meters above sea level. These forests extend into dry temperate and occasionally into sub-Alpine forests. Winters are long and cold with snow and hailstorms and summers are short mild and moist. Mean annual temperatures and precipitation are around 12°C and 650 to 1500 mm. Vegetation is characterized by a small number of dominant species mainly conifers, but good canopy cover. Tree heights vary between 25 to 50 meters and stem girth may rise to 4.5 meters. These forests are considered as the most productive forests of the country. On flat ground with deep soils and in depression areas, deciduous broad-leaved forests are also found that are subject to a great extent of lopping, grazing, and cleaning for cultivation.

Coniferous Forests

The natural high hill Coniferous Forests grow 765 meters above sea level. The forest areas are situated in Murree and Kahuta Tehsils of Rawalpindi District. An area of 80129 acres is under Coniferous, Coniferous / Scrub Forests in Transition Zone of Rawalpindi District i.e. Murree Forest Division. The main species are Chir, Fir and Spruce.

Subtropical Chir Pine Forest

Subtropical Pine forests are mainly located in Kashmir, Abbottabad, Mansehra, Ghoragali (Muree Hills), Margla Hills, and Kahuta at an elevation from 920 to 1700 meters above the sea level. These occupied regions have hot and moist summer with severe winter with some snowfall. Rainfall is received mainly during Monsoon season and means annual temperature and precipitation ranges around 15-20°C and 700-1500 mm respectively.

These forests are composed of pure strand of Chir pine that comprises of almost even-aged individuals. However, in depression as well as flat areas evergreen oaks and some deciduous species are also found. Tree growth is reasonably good with average tree height up to 36 m and average stem girth up to 2.5-3.5 m. Forest fires are relatively common in these forests, especially in the months of May-June due to heavy needle fall that are full of oils and resins conducive to fire catching.

Sub-tropical Broad Leaved Evergreen Scrub Forest

These forests are found throughout the country at suitable elevation especially in the foothills of Murree, Margalla Hills (Islamabad), Potohar Region, Kalachitta Hills (Attock), Salt Range (Jehlum), and Suleiman Mountain Range. They mostly occur below

29 Hafiz MA-UoF-Department of Forestry, Range Management and Wildlife)

the Subtropical Chir pine forest at an elevation of 460 to 920 meters above the sea level mostly along the foothills and lower slopes of Himalayas. Hot and long summers and a definite cool short winter characterize the climate. Long and dry months are common features of these forests. Mean annual temperatures ranges from 20-25°C where summer temperature may rise to 40°C. Mean annual precipitation ranges from 250- 750 mm. Terrain of these forests is stony and difficult. Forest merges upwards with sub-tropical Chir Pine forest and downwards with the Tropical thorn forests. Species present are xerophytic with thorns and small evergreen leaves mostly broad leaved. The typical species include Kao and Phulai, the two species occurring in mixed or pure form and the shrub Sanatta that is particularly abundant in most degraded areas. Total area of these forests is estimated to be 1,108,826 ha.

Scrub Forests

Scrub forests consisting of natural low yielding thorny vegetation occur in the Potohar area of Rawalpindi Division and also in the low dry hills of Mianwali and Khushab Districts. The scrub forests cover an area of 679663 acres and are the least productive.

Tropical Thorn Forests

This forest type occurs throughout the Indus plains except the driest regions. The vegetation is dominated by short and predominantly xerophytic species that are mostly leguminous in nature with small leaves. The species composition varies from evergreen to deciduous mixture depending upon the geographical location. Climate is dry and hot in these forests. Mean annual temperature ranges from 20- 26°C with the hottest months of June where temperature may rise to 51°C in some areas. Mean annual rainfall is from 120 to 500mm with large temporal variations from year to year. The major tree species found in these forests are *Prosopis cineraria* (Jhand), *Capparis decidua* (Karir, Karil), *Zizyphus mauritiana* (Ber), *Tamarix aphylla* (Farash) and *Salvadora oleoides* (Pilu, wan) along with large number of shrubs species with individuals of all sizes. Heavy grazing and browsing is a major problem in these forests that result in the tree climax at short stature especially for the palatable species. Edaphic and other biotic factors also contribute to the poor state of trees in these forests where salinity, water scarcity and soil shallowness is becoming more intense due to climate change. Average height of trees is between 20 to 30 ft. prior to the extension of agricultural lands the forest area extended from the foothills of the Himalayas and low-hills in the south-west Punjab plains and Balochistan to the Arabian sea.

The climax species of these forests depends upon the various soil properties like soil textures, type and depth that vary from region to region. Resultantly, climax species are *Salvadora oleoides*, *Capparis decidua*, *Tamarix aphylla* and *Prosopis cineraria*, which grow on a wide range of soils.

Tropical Habitats of Thal and Cholistan Deserts

These deserts are characterized by undulating sand dunes with occasional trees such as Kikar (*Acacia nilotica*), Jhand *(Prosopis cineraria),* Karir, Karil *(Capparis decidua)* and Farash *(Tamarix aphylla*).

The key mammals of these areas include Chinkara Gazelle, Nilgai, Blackbuck, Caracal, Desert Cat, Civet Cat and Desert Fox. Wild birds of the area include Grey Partridge,

Houbara Bustard, Great Indian Bustard, Indian Courser, species of Sandgrouse, Little Brown Dove, Shrikes, Larks and Finches. The key reptiles of the ecozone included Cobra, Krait, and Russel's Viper, Saw-scaled Viper, Yellow Varanus and many other small lizard species.

Rangelands

Rangeland is normally considered to be any naturally vegetated land in low rainfall areas grazed by domestic livestock and game animals. In Punjab such lands cover 241,575.37 acres. Rangelands are situated in Chakwal RM, Bhakkar RM, D.G Khan RM and Cholistan RM Forest division.

Rakhs and Irrigated Plantations

Rakhs are areas where inundation water reaches and the trees grow in good condition. Usually *Prospis spiciger* may grow with closed canopy. Chichawatni Rakh is one such plantation in the project area. Irrigated plantation consists of 440,052.71 Acres. Tree species usually planted are Shisham (*Dalbergia sissoo*), Kikar (*Acacia nilotica*), Eucalyptus (*Eucalyptus camaldulensis*), Siris (*Albizia lebbeck*), Simal (*Salmalia malabarica*) etc.

Riverine Forests

The Riverine or Bela Forests covering 143,343.33 acres occur in varied sized patches along different rivers of the Punjab. The original vegetation consists mostly of Obhan, Kikar (*Acacia nilotica*) and Frash etc.

Linear Plantations

These are avenues of trees planted along roadside, canal side and rail side. Linear plantations over 47041.02 km are managed by the Forest Department. It consists of 10665.15, 2580.50 and 33795.37 km of road, rail and canal side plantations respectively. Tree species usually planted are Shisham (*Dalbergia sissoo*), Kikar (*Acacia nilotica*), Eucalyptus (*Eucalyptus camaldulensis*), Siris (*Albizia lebbeck*), Semal etc.

Wetlands

The wetlands of the region include rivers, canals, ponds and water logged areas. These areas provide great resources for human needs, while providing good habitat for water related species as well. Reeds, water reeds, Typha, Lotus, Water nut and Bladderworts grow in these habitats. These habitats also support a large variety of fish.

Some of the threats these wetlands currently face include: polluted waters in rivers and canals; burning of reed; and cutting of typha for commercial purposes.

Agricultural Habitats

Most parts of the Punjab are under very intensive irrigated cultivation. In addition, livestock rearing is also practiced extensively, and milk animals are common. The use of the chemical fertilizers and pesticides is very common. Several species of wildlife have adapted to the changed habitat. These include: Jackal; Jungle Cat, Bengal Fox, Small Indian Mongoose, Shrew, Rodent pests including Porcupine, Fruit Bats and Wild Boar. The avifauna which survived the modified habitat include Doves, Black Partridge,

Cuckoos, Koel, Woodpeckers, Parakeets, Bulbuls, Babblers, Black Drongo, Bee-eaters, Finches and House Sparrow. The reptilian species of this modified habitat include Krait, Cobra, Saw-scaled Viper, Rat Snake and Monitor Lizard.

In these modified habitats, the winter bird species from Himalayas have reduced due to the extensive use of pesticides in these areas, since these species feed on the insects. These birds play an important role in controlling insects particularly in the forests.

Almost all of the project interventions will be undertaken in this habitat type.

Rural and Urban Habitats

These include human habitations within agriculture areas, as well as the urban centers. Scavengers like Jackals are attracted to the garbage dumps and human feces for food. House Sparrows breed in the houses. Bank Mynas and Cattle Egrets feed on grasshoppers in the rangelands with cattle and buffalos. Banyan and Peepal trees still grow in villages. Green Pigeons and barbets feed in these trees.

Some of the oldest trees still stand in the old British era colonies. Some rare species of birds such as hornbills, Green Pigeon, Barbets still live on them. Large populations of Pigeons breed in urban houses. Kites, Crows, Mynas, House Sparrows, and Alexandrine Parakeets breed in the urban areas.

Usually Shisham and Kikar trees are planted alongside the roads and canals. Mostly Doves breed on such trees.

4.3.2 Flora

Comprehensive data regarding the floral species of the study area have been acquired through secondary sources. Annex G shows district wise floral resources detail.

4.3.3 Fauna

Comprehensive data about the wildlife species of proposed project area have been obtained through secondary data as mentioned below in Annex H.

4.3.4 Fisheries

Punjab has an extensive expanse of fisheries resources with great potential. The major natural resources are rivers, canals, reservoirs, lakes, and waterlogged areas etc. covering a total area of about 3 million hectares (7.5 million acres). Besides sustainable exploitation of natural resources, fish culture activities in private sector have considerably increased in the last two decades. At present about 81,350 acres have been brought under fish culture and total fish production is 113,500 metric tons annually.

The culturable fish species of Punjab are Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*), Thalia (*Catla catla*), Kalbans (*Labeo Kalbasu*), Silver Carp (*Hypophthalmichthys molitrix*), Grass Carp (*Ctenopharyngodon idella*), Big Head (*Aristichthy nobilis*), Nile Tilapia (*Oreochromis niloticus*), Gulfam (*Cyprinus carpio*), Basa (*Pungasius sp*.), African Cat Fish (*Clarias gariepinus*) and Shrimp (*L. Vannamei*) 30.

4.3.5 Protected Areas

Protected areas help maintain the integrity and diversity of ecosystems, protect flora and fauna, and facilitate ecological processes such as water flows, soil regeneration, nutrient cycling and so on, which are vital for all life.

There are no direct impacts on the biodiversity and natural resources anticipated as construction activities will be carried out in already transformed/ cultivated area in shape of watercourse improvements (lining/rehabilitation) or introduction of HEISs (drip/ sprinkler) along with climate smart interventions such as utilizing renewable energy resources (solar panels). However, no intervention under this PRIAT project shall be carried out in any protected areas and natural habitats.

However, national parks, wildlife sanctuaries and game reserves exist in the project area. A list of these protected areas is provided in Annex I.

4.4 Socioeconomic Environment

Punjab is Pakistan's largest province by population and has a diversified economy and a rich resource base. Nevertheless, the province is characterized by significant socioeconomic disparities across its different regions. This assessment of Punjab's socioeconomic environment looks at key socioeconomic indicators in the province.

4.4.1 Structure of Governance

The provincial government of Punjab oversees a vast administrative structure consisting of over 40 departments, and more than 300 autonomous bodies.31 Both Irrigation and Agriculture are provincial subjects.

The local government system in the province has been in a flux in recent years. The current government suspended the Punjab Local Government Act 2013 and dissolved the

30 Forest, Wildlife and Fisheries Department - https://fwf.punjab.gov.pk/

31 See https://punjab.gov.pk

then local bodies in May 2019, saying that new local bodies elections would be held after new legislation is enacted. The Local Government Act 2021 (which follows an earlier Act of 2019) envisages a system of fiscally empowered sub-district level local governments, responsible for service provision in health, education and water supply and sanitation amongst other sectors. While the legislation was enacted in May 2019, elections have yet to be held. In the interim, the government has appointed civil servants as administrators under the existing local government system. While local governments will not be responsible for works carried out under PRIAT, they will make it easier to ensure consultation on the project, given that local councilors act as links to the community.

4.4.2 Demography

According to the census of 2017, Punjab's population was 110 million, with an annual average growth rate of 2.13 percent.32 The population density in the province is high, at 535 persons per square kilometer, and about 37 percent of the population was estimated to be resident in urban areas. The census found that the province had about 25,321 rural localities, of which 51 percent had between 1000 and 5000 residents. About 14 percent of rural localities had populations of over 5000. About 61 percent of Punjab's population (or just over 68 million people) is aged over 15, while 21 percent is aged between 15 and 24 – the province thus has a "youth bulge" and a high dependency ratio.

The census also gives a linguistic distribution of Punjab's population, showing that Punjabi speakers constitute almost 70 percent of the population, while Seraiki speakers (based mainly in South Punjab constitute close to 21 percent. Smaller populations resident in the province are native Urdu speakers (almost 5 percent), Pashto speakers (2 percent) and others. Almost 98 percent of the population of the province is Muslim, and Christians make up the largest religious minority at almost 2 percent of the population, while Hindus constitute 0.2 percent.

4.4.3 Economy

The Government of Pakistan does not publish estimates of sub-national GDP, but the Government of Punjab estimates that the province contributes about 54.2 percent of the national GDP in 2017-18.33 The same report (i.e. the Punjab Growth Strategy 2023) also estimated that the sectoral distribution of GDP in the province was such that 62.4 percent derived from services, 17.6 percent from manufacturing and 20 percent from agriculture.34 The structure of Punjab's economy mirrors that of the national economy, with agriculture contributing about a fifth of GDP. While more recent estimates are not available, it is unlikely that the structure of the economy has changed significantly in the last two to three years.

32 Population Census Organization. (2019). Census of Pakistan, 2017. Census results are downloadable at: https://www.pbs.gov.pk/content/final-results-census-2017-0

33 Government of Punjab, Planning and Development Board. (date of publication unknown). Punjab Growth Strategy 2023. Section 01.

34 Ibid.

Punjab's prominent position in Pakistan's economy is also apparent from other indicators, notably its share in different sources of national income. According to a recent report from UNDP, Punjab accounts for 54.7 percent of Pakistan's population, but 60.7 percent of the country's household income; 67.4 percent of the value of crop production; 75.7 percent of the value of livestock production and 64.5 percent of non-agricultural activities.35

Employment

Employment indicators in Punjab are slightly unfavorable compared to the national average. The unemployment rate for Pakistan as a whole was recorded at 6.9 percent in 2018-19, while in Punjab it was 7.4 percent.36 However, (refined) labor force participation rates (LFPR) in Punjab were higher than the national average.37 LFPRs for Pakistan as a whole were 44.8 percent in 2018-19, while for Punjab they were 47.4 percent. Similarly, LFPRs for females were 21.5 percent for Pakistan, but were estimated at 26.3 percent for Punjab.38

About 40 percent of Punjab's employed population was working in the agriculture sector in 2018-19 – almost the same as the national average, which showed that 39 percent of Pakistan's population worked in the sector.39 Amongst employed people in rural areas in Punjab, 57 percent were employed in agriculture.40 Amongst women, 81 percent of those who were employed in rural areas were working in the sector.

Poverty and Inequality

According to the Punjab Growth Strategy, data from the Multiple Indicators Cluster Survey (MICS) carried out in Punjab in 2018 was used to construct a multidimensional poverty index (MPI) for Punjab. Using this methodology, wherein poverty is not measured from income alone, but includes variables for health and education status amongst others, poverty in Punjab stood at 26.1 percent in 2018.41 However, this average conceals significant regional disparity. A district breakdown showed that in the 10 poorest districts of the province, all of which lay in South Punjab, MPI poverty incidence was as high as 42 percent, compared to 19 percent for the rest of the province on average. At 65.8 percent,

35 See UNDP. (2020). Pakistan: National Human Development Report – The Three Ps of Inequality, Power, People and Policy. Table 3.2.

36 Pakistan Bureau of Statistics. (2020). Labor Force Survey 2018-19. Ministry of Planning, Development and Special Initiatives.

37 The refined labor force participation rate is defined as the percentage of economically active population in the total population aged more than 10 years. In contrast, the crude activity rate is the percentage of economically active population in the total population.

38 Pakistan Bureau of Statistics. (2020). Labor Force Survey 2018-19 – Final Report. Ministry of Planning, Development and Special Initiatives. Table 9.

39 Pakistan Bureau of Statistics. (2020). Labor Force Survey 2018-19 – Final Report. Ministry of Planning, Development and Special Initiatives. Tables 17 and 17.2.

40 Calculated from Pakistan Bureau of Statistics. (2020). Labor Force Survey 2018-19 – Final Report. Ministry of Planning, Development and Special Initiatives. Table 17.2.

41 Government of Punjab, Planning and Development Board. (date of publication unknown). Punjab Growth Strategy 2023. Page 131.

Rajanpur had the highest percentage of MPI poor followed by D.G. Khan (54.6 percent) and Muzaffargarh (54.2 percent).

Food insecurity is also the highest in southern districts of Punjab with 53.6 percent of households being food insecure followed by 43.8 percent in Central Punjab and 30.2 percent in North Punjab.42 For Central and South Punjab, livestock assets, ownership of agricultural land and family size were found to be significant determinants of food security. Greater family size, less educated household heads and greater number of joint families, as compared to other regions, have contributed to South Punjab's food insecurity status.

Income inequality in Punjab is significant. The GDP per capita of the richest quintile was estimated in 2019 to be over 5 times as high as that of the lowest quintile.43 In terms of human development, households falling into the two lowest income quintiles in Punjab have human development indicators concomitant with those of least developed countries, while those in the third and fourth quintile correspond to middle income countries in terms of human development.44

4.4.4 Socioeconomic Indicators

Education

About 66 percent of the population of Punjab has attended school at some stage – higher than the average for Pakistan which stands at 60 percent.45 Punjab scores better than the national average on other educational indicators also. According to the same source, 56 percent of the total population in the province has completed primary school, as compared to an average of 51 percent for Pakistan as a whole. The gap is particularly clear for females – 50 percent of women in Punjab had completed primary school as compared to 42 percent for Pakistan. Similarly, net enrolment rates (NER) in the province were estimated at 70 percent in 2019-20, whereas the NERs for the country as a whole was 64 percent.46 Having said that, the disparity in education indicators across Punjab is considerable. Indicators for the least developed districts in South Punjab fall far below the provincial average. In Rajanpur, for example, primary school completion rates were just 37.9 percent in 2018, and the literacy rate for females (aged 15 to 49) was just 26 percent.47 Other districts like Dera Ghazi Khan and Rahimyar Khan were similarly placed, with primary completion rates of well below 50 percent, and female literacy barely touching 35 percent.

42 Yousaf, H. Zafar, M., Zafar M., Ahmad, S. and Q. Raza (2018). "Regional distribution of food security and its determinants across regions of the Punjab, Pakistan," Pakistan Journal of Agricultural Sciences, 55(03), pp. 711-717. The study uses primary data collected from 576 households across six districts (two in each region) of Punjab.

43 See UNDP. (2020). Pakistan: National Human Development Report – The Three Ps of Inequality, Power, People and Policy. Figure 3.8.

44 Ibid. Figure 3.10.

45 Pakistan Bureau of Statistics. (2021). Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20. Table 2.1.

46 Ibid. Tables 2.2 to 2.6 (a).

47 Punjab Bureau of Statistics. (2019). Multiple Indicator Cluster Survey (MICS) 2018.

Health

Health indicators for Punjab follow a similar pattern in that intra-provincial disparities persist. According to the Multiple Indicators Cluster Survey (MICS) carried out in the Punjab in 2018, the average Infant Mortality Rate (IMR) and Under-Five Mortality Rate (U5MR) in the province was 60 deaths per 1000 live births, and 69 deaths per 1000 live births respectively.48 However, the average IMR for the poorest 10 districts was 64.5 deaths per 1000 live births; while the under 5 mortality rate for these districts was 74.3 deaths per 1000 live births.49 According to the MICS 2018 data, the percentage of women (aged 15-49 years) who had delivery assisted by a skilled attendant was 62.5 percent on average for the ten least developed districts as against the provincial average of 76.4 percent.

Gender Inequality

Pakistan ranked extremely poorly on the World Economic Forum's Global Gender Gap Index for 2021, coming in at 153 out of 156 countries.50 The National Human Development Report (NHDR) for 2021 also included a computation of a Gender Inequality Index (GII) which gauged gender inequality through three aspects of human development: reproductive health, empowerment, and economic status.51 The GII for 2018-19 was estimated at 0.548, where 0 represents perfect equality and 1 perfect inequality. When GIIs were calculated for provinces, Punjab's GII was estimated at 0.5, a marginal improvement on the national estimate.[52] The gender disparity in labor force participation and educational indicators has already been discussed above, and the same is also apparent in asset ownership.

Of total landholdings whose ownership is recorded, 68.7 percent of owners are men, while only 31.3 percent are women – and whether the women are active owners with decision-making power over land use is also debatable.[53] Although there are inheritance laws, property rights (e.g., the Punjab Enforcement of Women's Property Rights Act, 2021), and positive caselaw to facilitate women and girls' rightful ownership of land and other productive assets, inheritance deprivation is common across Pakistan. Access to finance reflects similar disparity. While 87 percent of loan beneficiaries are men, only about 13 percent are women.[54]

48 Punjab Bureau of Statistics. (2019). Multiple Indicator Cluster Survey (MICS) 2018.

49 Calculated from MICS 2018.

50 World Economic Forum. (2021). Global Gender Gap Report 2021. March.

51 See UNDP. (2020). Pakistan: National Human Development Report – The Three Ps of Inequality, Power, People and Policy. Page 88.

52 Ibid. Page 91.

53 Government of Punjab, Planning and Development Board. (date of publication unknown). Punjab Growth Strategy 2023. Table 5.5.

54 Ibid.

In terms of gender based violence and harassment, higher reporting takes place from Punjab compared to other provinces, with South Punjab having higher reporting within the province, and a dedicated Violence Against Women Center (VAWC) established in Multan in March 2017 under the Punjab Protection of Women Against Violence Act, 2016. The VAWC is a one-window operation providing police, medico-legal, prosecution and rehabilitation services. Higher reporting of GBV in South Punjab go along with lower socio-economic indicators, and numerous gaps in the realization of women's legal rights. These factors warrant further investigation, including discussions with women farmers and extension support workers, on challenges to women's equal participation, risk of violence, harassment, abuse and exploitation, access to equal opportunities and support under the project, and ways to overcome barriers pursuant to PRIAT's PDOs.

Women are ubiquitous in agriculture in Punjab. They work on all major crops, in different labor formations. In wheat crops, women are usually organized by family (husband, wife, children, and extended family working as one unit), and paid based on per acre harvested. While the young are frequently expected to help, elder women might also be given smaller and specific jobs when whole families work as units. For sugarcane and cotton crops, it is common for women farmers to organize as groups of women for hired labor. In some instances, women cotton pickers have organized in Punjab to protest and successfully negotiate equal or better pay, whereas economically better-off women are also involved in deciding division of labor, share of yield, and pay for women farm labor working on cotton. Rice is amongst those crops (apart from cotton) that heavily engages women. Most livestock related activities are undertaken by females. Females play a major role in barn cleaning, fodder cutting and chopping, stall feeding, watering, washing, milking, and processing milk by-products into useful food items (cheese, butter, yoghurt, etc.), manure collection and preparing dung cake. Grazing is the core responsibility of the males although females also graze animals in the periphery of villages and on fallow lands near homestead as they are not allowed to go far alone because of the community's norm. Women are concentrated in livestock management, but as Punjab does not have high milk and meat yielding species, women's incomes remain precarious. Despite this, women's contribution in livestock by-products is higher than men. They own livestock often as a safety net to issues of income, investment, food security, and drought. Livestock is a ready source of cash for many smallholder farmers to buy inputs like seeds, pesticides, and fertilizers, and besides income generation, livestock related income also serves other domestic needs including paying of the school fees of children, buying daily groceries, medicines, etc.

4.4.5 Irrigation and Land Distribution

Punjab is named for the five large rivers that flow through the province, merging with the Indus in the south of the province. But the province has a diverse topography including the Potohar Plateau in the north, alluvial plains irrigated through an extensive canal network in the center and south, and the vast Cholistan desert in the south-east. Prior to the colonization of Punjab in 1848, what are now the southern distrits featured small private canals. From the late 19th century onwards, the British began to build irrigation infrastructure, which now extends to about 4000 miles of main canals and branches, and

about 30,000 miles of tributaries, cultivating almost 21 million acres of land.55 About 70 percent of the total irrigated area in Pakistan, and about 60 percent of the canal irrigated area in the country falls in Punjab.

According to the last Census of Agriculture, there are about 5.25 million farms in Punjab, of which 82 percent are owner operated; 8.5 percent are farmed by owners along with tenants, and 9 percent are farmed only by tenants.56 About 92 percent of all farms in the province are small farms of less than 5 acres. Of the remaining 8 percent, the majority are farms of up to 25 acres, while large farms (of over 25 acres) constitute barely 2 percent of all farms.57 However, large farms cover almost a quarter of the available agricultural land, indicating how skewed the farm distribution is in the province.

As mentioned earlier, the socioeconomic features of Punjab are highly diverse. The table below gives key indicators for the sample district which help to illustrate this.

55 Government of Punjab, Irrigation Department.

56 Pakistan Census of Agriculture 2012, as quoted in Naseer, Asad. et al. 2016. Current Status and Key Trends in Agricultural Land Holding and Distribution in Punjab, Pakistan: Implications for Food Security. Journal of Agricultural Studies, Vol 4, No. 4. Table 1.

57 Ibid. Table 2.

5 Stakeholder Engagement and Disclosure

5.1 Objectives of Stakeholder Engagement

PRIAT has been prepared under the World Bank's Environmental and Social Framework (ESF). Through the Environmental and Social Standard 10 (ESS10: Stakeholder Engagement and Information Disclosure), the ESF requires the timely, relevant, understandable, and accessible disclosure of project information in a way that is free of manipulation, interference, coercion, discrimination, and intimidation.

The requirements of ESS10 are addressed through the Stakeholder Engagement Plan (SEP) which outlines the ways in which the project team will communicate with stakeholders and includes a mechanism by which stakeholders can raise concerns, provide feedback, and make grievances related to project activities. It does this by:

- Establishing a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build a constructive relationship with them, particularly with project affected parties (APs)
- Assessing the level of stakeholder interest and support for the project, and to enable stakeholder views to be taken into account in project design and environment and social performance
- Promoting and providing means for effective, inclusive engagement with project APs throughout the project lifecycle
- Ensuring that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner

The SEP focuses on the identification of, and engagement with project stakeholders, and provides guidance on inclusive and meaningful engagement. It is a 'live' document, and is updated through the life of the project as required to include newly identified stakeholders, engagement methods, and changing needs of the project.

5.2 Stakeholder Identification

5.2.1 Affected Parties (APs)

Affected Parties are the stakeholders that are likely to be affected by the project because of actual impacts or potential risks to their physical environment, health, security, cultural practices, well-being, or livelihoods. In the context of this project, these include provincial government departments, farmers, and communities residing in the project areas. The APs identified for this project are provided in Table 5.1.

Table 5.1: Affected Parties by Sector

Sector	*Stakeholder*	*Level of Impact*
Government/Institutional	Directorate General On-farm Water Management Punjab (OFWM)	+ High
	Punjab Agricultural Extension and Adaptive Research Department	+ High
	District level staff from DG OFWM	+ High
	Water Management Training Institute (WMTI)	+ High
	Water Management Research Farms	+ - High
	Academic/research institutions engaged by the project	+ Medium
Community/Private Sector	Small and medium farmers	+ - High
	Local communities	+ Medium
	Commercially oriented small land-holders	+ - High
	Private sector suppliers of material, equipment and services procured by the project	+ - High
	Agri-processors and off-takers	+ - High
	Farmers Organizations (FOs)	+ - High
	Water Users Associations (WUAs)	+ - High
	Large Farmers Associations of Punjab	+ - Medium
	Women farmers	+ - High
	Women farmers associations	+ - High
	Producer groups (PGs)	+ - High
	Farm labor	+ - Medium
	Construction labor working on watercourses and other interventions	+ - High

5.2.2 Other Interested Parties (OIPs)

Other interested parties are those stakeholders (individuals, groups, or organizations) with an interest in the project, which may be because of the project location, its characteristics, its impacts, or matters related to public interest. For example, these may include regulators, government officials, the private sector, the scientific community, academics, unions, women's organizations, other civil society organizations, and cultural groups.

In the context of the project, OIPs include provincial government departments, universities and academia, and local and international NGOs and CSOs working with farmers and other value chain stakeholders. Though these stakeholders are not directly involved in the project activities, they may have sector specific experience and knowledge that can assist informed decision making for the project.

The following OIPs have been identified for this project:

Table 5.2: Other Interested Parties by Sector

Sector	*Stakeholders*	*Level of impact*
Government/Institutional	Punjab Environmental Protection Department	+ Moderate
	Directorate General of Pest Warning & Quality Control of Pesticides, Punjab	+ Moderate
	Irrigation Department Punjab	+ Moderate
	SMART project team	+ Moderate
	Agricultural universities and academia (e.g. LUMS, NUST, UAF, PMAS, etc.)	+ Moderate
	Food and Agriculture Organization (FAO)	+ Moderate
	Punjab Commission on the Status of Women	+ Moderate
	Women Development Department Punjab	+ Moderate
Community/NGOs/Private Sector	Chambers of commerce and industry for small businesses	+ - Low
	Citizens' rights groups	+ - Low
	Agri-processor associations	+ - Moderate
	Construction/raw material/equipment suppliers	+ - Moderate
	Anjuman-e-arthian (arthi association)	+ - Moderate
	Center for Agriculture and Bioscience International (CABI)	- Low
	World Wide Fund for Nature (WWF)	- Low
	Rural Support Programmes Network (RSPN)	- Low
	Punjab Rural Support Programme	- Low
	Microfinance institutions	+ Low
	Transporter associations	+ - Low
	Anjum Muzareen Punjab	+ - Low
	Farmers Development Organization	+ - Low
	Pakistan Kissan Rabita Committee	+ - Low
	Punjab Bait-ul-mal	- Low
	Pakistan Forum for Disability	- Low
	Vision Pakistan	- Low
	HelpAge Pakistan	- Low
	AwazCDS-Pakistan	- Low
	Peasant Women Society	+ - Moderate
	Climate Launchpad	- Low
	Shirkat Gah Women's Resource Center	+ - Moderate
	Engro Corporation	- Low

5.2.3 Disadvantaged/Vulnerable Individuals and Groups

This category includes stakeholders who may be more likely to be adversely affected by the project impacts, and may be more limited than others in their ability to take advantage of a project's benefits. Such stakeholders are also more likely to be excluded from, or unable to fully participate in the consultation process, and may require specific measures and/or assistance to do so.

Their vulnerability may stem from ethnic or religious backgrounds, gender, age, health, disability, economic deficiency/financial insecurity, disadvantaged status in the community (e.g. ethnic and religious minority groups, indigenous peoples, women and girls, etc.) and dependence on other individuals or natural resources.

It is important to ensure that these stakeholders are able to safely and openly participate in the consultation process, and care must be taken to consider their sensitivities and cultural differences to ensure that they fully understand the project activities, risks, and benefits.

The following disadvantaged/vulnerable individuals and groups have been identified for the project:

Table 5.3: Disadvantaged/Vulnerable Groups or Individuals by Sector

Sector	*Stakeholders*	*Level of impact*
Government	Female staff from OFWM	- High
Community	Women and girls in beneficiary households	+ - High
	Illiterate farmers who may be unable to participate in trainings/capacity building	- High
	Female/child headed households	- High
	Female farmers	+ - High
	Female farm labor	+ - High
	Farm labor	- High
	Ethnic and religious minorities	- High
	Persons with disabilities	- High
	Transgender communities	- High
	Senior citizens	- High
	Sharecroppers	- High
	Water users at tail-end of watercourse	- High
	Economically marginalized groups	- High

5.3 Plan for Stakeholder Engagement

The method of consultation with stakeholders can play a significant part in ensuring comprehensive, inclusive engagement. Stakeholder engagement activities need to continue throughout the project life, and need to keep specific stakeholder groups updated on relevant information imperative for transparency and disclosure, successful implementation of project activities, provision of means to exchange and propose better ideas on ongoing activities, flag concerns, and stay updated on outcomes. It is therefore important to identify the most appropriate modes of consultation for each of the identified stakeholders. The project will apply the following principles for stakeholder engagement:

- **Openness and lifecycle approach:** public consultations for the project will continue throughout the duration of the project, and will be free from manipulation, coercion, and intimidation.

- **Informed participation and feedback:** project information will be widely distributed amongst all stakeholders using appropriate formats, languages, etc. Consultations will aim to provide the most up-to-date project information for stakeholder feedback. Opportunities will be provided for stakeholders to raise concerns, and processes will be built in to ensure that stakeholder feedback is taken into consideration during decision making.
- **Inclusiveness and sensitivity:** participation in stakeholder consultations will be inclusive, and all stakeholders will be encouraged to be involved. All stakeholders will have equal access to information, and special care will be taken to ensure that the project is sensitive to the particular needs of all stakeholders, including vulnerable groups.

The standalone Stakeholder Engagement Plan (SEP) document provides a detailed list of stakeholders consulted and to be consulted during project design and implementation, the mode of consultations, frequency and responsibilities. The SEP, being a live document is to be updated throughout the life of the project to ensure effective, robust and transparent stakeholder engagement

5.4 Consultations with Institutional and Private Sector Stakeholders

Institutional stakeholders consulted during project preparation included representatives from related government departments, including district level staff, NGOs, CSOs, private sector companies, and think-tanks. These stakeholders were interviewed through face-to-face and virtual group sessions. A list of institutional stakeholders consulted is provided below.

Private sector stakeholders were engaged through a dedicated consultation session held in late January 2022. Participants in this session included representatives from supply and service companies of PCPS yards, HEIS, and solar.

Table 5.4: Institutional Stakeholders Consulted

Stakeholder type	*Stakeholder*
Government	Directorate General, On-Farm Water Management Punjab Senior Officials – Lahore, Rawalpindi, Sargodha, Sahiwal, Khanewal
	Directorate General, On-Farm Water Management Punjab Field Staff – Rawalpindi, Sargodha, Sahiwal, Khanewal
	Directorate General, On-Farm Water Management Punjab Female Staff – Lahore, Rawalpindi and Sargodha
	Environment Protection Department Punjab
	Directorate General, Pest Warning & Quality Control of Pesticides
	Directorate General, Agriculture (Extension and Adaptive Research)
NGO/Private Sector	Potohar Organization for Development Advocacy
	Peasant Women Society
	Engro Corporation
	Shirkat Gah – Women's Resource Center
	Climate Launchpad
	Rah Center for Management and Development

	AwazCDS-Pakistan
	Haji Sons International
	AH International
	Murad Constructors
	Ranjha Constructors
	Jaffer Agro Services
	Sustainable Development Policy Institute
	Citrus Asia Enterprises
	Al Qamar Citrus

5.5 Consultations with Community Stakeholders

Community stakeholders were primarily consulted during project design through face-to-face group interviews conducted at the district level by OFWM field staff. 67 individuals (20 female, 47 male) were interviewed in six districts in north, central and south Punjab, over two weeks in February 2022. These included small and medium farmers, farm labor, female farmers and farm labor, and individuals from disadvantaged and vulnerable group. A list of the community consultation locations and dates are provided in the table below.

Table 5.5: Community Consultations

District	*Number of consultations*	*Total number of female participants*	*Total number of male participants*
Rawalpindi	1	4	9
Sargodha	2	4	15
Chakwal	1	3	6
Faisalabad	1	4	6
Chakwal	1	0	4
Rahim Yar Khan	1	5	7

5.6 Key Findings from Institutional and Community Stakeholder Engagement

A summary of topics discussed, and concerns raised as a result of the stakeholder consultations carried out in January and February 2022 is provided below:

- Government and community participants in general agreed that the previous PIPIP project had overall positive impacts by allowing productive farming to take place on lands which had previously been barren.
- Watercourse lining activities under PIPIP were successful and improved the lining of watercourses from 30% to 50% where activities were implemented. This resulted in better water supply for tailenders who were previously not receiving enough water. Some participants noted that while the situation had improved, there were still a portion of tailenders who still did not benefit from 50% lining, i.e., farmers at the extreme tail end of the watercourse. These participants suggested that improving the watercourses to 75% would have greater benefits.

- OFWM raised awareness of the PIPIP project by gathering farmers and conducting informational sessions. In Punjab overall, over 300 such sessions were conducted with 50-100 farmers at a time. The sessions focused on explaining the benefits of the project. Awareness was also raised by running advertisements in social media and local newspapers.
- Some participants pointed out that women are paid less than men when working in equivalent positions, especially as farm labor.
- OFWM had female teams at informational sessions to facilitate women's involvement. However, women's participation was still observed to be lagging significantly due to cultural norms. Participants suggested that dedicated informational sessions and farmer days should be held for women, as many were not able to attend mixed sessions.
- Women's participation is also impeded by land rights issues: women do not necessarily physically possess the land that they legally own. This particularly comes up in cases of inheritance. Widowed women with legal rights to land are at time unable to exercise ownership over inherited land.
- For on-farm water management technology provision, many participants agreed that the cost-sharing scheme in PIPIP did not benefit smaller and poorer farmers. Participants from Rawalpindi district noted that many farmers in the region own small parcels of land and that there are not many large landholders. For these farmers, even the cost-sharing scheme was prohibitively expensive. No commercial loans were available to farmers and they were reluctant to take loans from *arthis*.
- For farmers who were using tube-wells for water supply, the cost to run the tube-well can reach up to 30,000-40,000 PKR per month. Larger farmers reported costs of over 100,000 PKR per month. Solar tube well use is low in general.
- Participants suggested that the PRIAT project should have a 70/30 project-farmer split for cost-sharing schemes. It was also suggested that women landowners should have extra financial incentive to participate.
- Maintenance cost was also raised as a challenge for beneficiaries of PIPIP HEIS activities. For drip irrigation systems provided under HEIS, participants pointed to the warranty period of two years as being inadequate
- Some farmers who had already been using solar irrigation systems reported that the systems were in general adequate in terms of energy provided, however variability in weather conditions (cloud cover, fog, etc.) require that they have a backup power supply available at all times.
- It was recommended that service providers should be contractually bound to provide after-sales service to WUAs and farmers
- WUAs were mentioned as a positive outcome of the PIPIP project, and it was observed that the frequency of disputes over water had reduced since these were initiated. However, participants raised concerns with the makeup of WUA committees, particularly in areas with low land holding, Committee members

tended to be large landholders, and smaller farmers, women, and vulnerable groups were typically not represented.

- Some participants pointed out indirect benefits of solar systems provided under PIPIP: beneficiary households were able to use solar power for household and non-farming related activities.
- While some participants suggested that PIPIP benefits trickled down from farmer to farm labor, others observed that farm labor did not benefit directly from the PIPIP project; their benefits were limited to employment opportunities.
- Vulnerable groups in particular rarely directly benefited from the project. This was because women, and minorities typically worked as farm labor, and in most cases were not landowners
- Proper monitoring of contractor/WUAs/farmers should be carried out during installation of PCPS to avoid damage and economic loss to the service providers. For this purpose, hiring skilled labor is recommended
- Tailenders reported water loss, water theft and poor maintenance/cleanliness of the canal as being key issues faced. These significantly affect their crop productivity and livelihood. Waterlogging and salinity were also reported as issues faced by tail-enders.
- Most small farmers sell their produce to a middleman who goes on to sell it at the *mandi*. Those with their own transport are able to access *mandi* directly.

5.7 Multi-Stakeholder Workshop

A virtual multi-stakeholder workshop was organized and conducted by OFWM on 8th February 2022 to present the initial findings of the ESMF and receive feedback. The workshop was attended by around 25 participants from government departments, NGOs, and CSOs.

The workshop began with a presentation introducing the project, after which a summary of the environmental, social, and gender related risks was presented. Participants were then invited to provide feedback and insights on the identified impacts, for incorporation into revisions of the ESMF.

The issue of women's land rights was brought up, with one OFWM field staff member noting that widowed women who inherit land often have difficulty related to inheritance rights. Additionally, participants agreed that women are typically paid less than men for equivalent work as farm labor, and therefore might benefit less from the project's activities.

Some participants suggested that in addition to strengthening value addition activities and fostering improved market linkages, there is a necessity to provide farmers with seeds/saplings for export quality produce, as they currently only grow a limited number of crops that have demand internationally.

5.8 Proposed Strategy for Information Disclosure

Information disclosure will follow the World Bank disclosure protocol. The table below provides an initial outline of the information to be disclosed during design and implementation of the project. This list is likely to grow as the SEP is updated during project implementation.

The ESMF and its Executive Summary will be disclosed on the DGOFWM and WB websites as per the requirements of WB.

Table 5.6: Stakeholders and Methods for Information Disclosure

Project stage	*Target stakeholders*	*Information to be disclosed*	*Methods proposed*
Design	OFWM, APs, OIPs	Project description and impacts, SEP, ESMF	One-on-one or group meetings, FGDs OFWM website/newsletter Print, electronic, and broadcast media
Implementation	OFWM, and other government APs	Project description and impacts, E&S principles and implementation arrangements, SEP, ESMF, GRM procedures	One-on-one or group meetings, correspondence, training workshops Leaflets, reports, and brochures
	Potential project beneficiaries, local small and medium farmers, communities, vulnerable groups	Project benefits and impacts, guidance on receiving benefits, progress updates, SEP, ESMF, GRM, GBV mechanisms.	Outreach through local community organizations Community information sessions/workshops Public notices/signage Print, electronic, and broadcast media Social media
	Government OIPs	Project overview, project benefits and E&S impacts, progress updates, SEP, ESMF, GRM, GBV mechanisms	One-on-one or group meetings, correspondence, training workshops Leaflets, reports, and brochures
	NGOs, CSOs with mandates related to the project	Project overview, project benefits and E&S impacts, progress updates, SEP, ESMF, GRM, GBV mechanisms	OFWM website/project website Print, electronic, broadcast, and social media
	General public	Project overview, project benefits and E&S impacts, progress updates, SEP,	OFWM website/project website

	ESMF, GRM, GBV mechanisms	Print, electronic, broadcast, and social media

6 Potential Environmental and Social Impacts and Mitigation Measures

6.1 General

This chapter identifies the beneficial as well as the potentially significant adverse environmental and social risks and impacts envisaged during planning & design, construction / implementation and operation /completion phases of the proposed project on the physical, ecological and socio-economic domains. The appropriate mitigation and remedial measures of each environmental and social impact are also proposed in this chapter keeping in view the mitigation hierarchy. A brief qualitative description of each aspect and the affected environment in the study area is presented below.

6.2 Social and Environmental Screening

PRIAT has been classified as Moderate risk with regard to potential environmental and social (E&S) impacts. The components of PRIAT which may have adverse E&S impacts are: Sub-Component 1.1. Upgrading Community Water Conveyance Infrastructure (Improvement of unimproved watercourses, complete partially improved watercourses, reconstruct and complete outlived watercourses, improvement of irrigation conveyance systems outside canal command and riverine areas), Sub-Component 1.2: Improving Community Water Management (pilot community-based groundwater recharge schemes), Sub-Component 2.1: Improving the Market Integration of Producer Groups for Increased Production, Diversification, and Value Addition (Application of pesticide/fertilizer harvesting/processing equipment and other infrastructures) and Sub-Component 2.2: Supporting Individual Producers for Climate Smart Production and Diversification (Installation of HEIS, solar systems for operating HEIS and Development of on-farm water storage ponds). Risks of social exclusion, and use of child labor are among possible impacts that can occur during implementation of all components.

However, the exact nature, extent, and location of these subprojects are not known at this stage. Potential impacts of a generic nature have nonetheless been screened using the below mentioned checklist (Table 6.1).

Table 6.1: Environmental and Social Screening of Impacts

Screening Questions	*Yes*	*No*	*Remarks*
Physical Environment			
Would the project pose the risk of clearance of vegetation that may result an increase in level of suspended solids washing into the rivers / surface water bodies?	√		Construction phase activities may have potential to an increase in level of suspended solids of nearby surface water bodies. Anyhow all the activities will be monitored by the project staff team to ensure that proper mitigation measures are being taken and no such activities are carried out that may degrade the environment.

Screening Questions	*Yes*	*No*	*Remarks*
Will the proposed project involve the application of chemicals that may have a negative effect on the environment or human health?	√		The project will support improved irrigation infrastructure which would increase the amount of water availability; that may lead to crop intensification / expansion of area under cultivation; which in turn result into increased use of synthetic fertilizers / pesticides / chemicals. The excessive use of such chemicals may cause contamination of soil and water thus posing health hazards for the nearby communities and may also harm the natural flora and fauna including beneficial insects that are important for functions such as pollination.
Would the project pose a risk of contaminating drinking water sources	√		Use of pesticides during operational phase may have potential to impact the groundwater quality.
Would the project deplete the groundwater?		√	Installation of HEIS will help to reduce the rate of depletion of groundwater.
Would the project result in an increase in the level of dust and particulate matter in the air surrounding the site?	√		Temporary impact due to certain construction activities, including watercourses improvement/rehabilitation/extension of lining, development of ponds, community based groundwater recharge schemes, irrigation schemes outside canal command areas, infrastructures (warehouses, collection centers and pack houses) installation of HEIS and solar system which may generate dust and particulate matters.
Would the project increase the ambient noise level and vibrations?	√		Temporary impact due to certain construction activities. Anyhow all the activities will be monitored by the project staff team to ensure that proper mitigation measures are being taken.
Would the project include above ground installation that may alter the views to, from or beyond the site?	√		Installation of HEIS, solar panels, development of storage ponds, pilot community based groundwater recharge schemes and irrigation schemes outside the canal commands areas, construction of infrastructures (warehouses, collection centers and pack houses) may change the landscape of the area up to some extent.
Would the project result in the clearance of the vegetation that may increase soil erosion?	√		Small scale vegetation clearance may be required for the improvement / rehabilitation / lining of

Screening Questions	*Yes*	*No*	*Remarks*
			watercourses, improvement of irrigation conveyance system outside canal command and riverine areas and construction of storage ponds, pilot community based groundwater recharge schemes, irrigation schemes outside the canal command areas and
Would the project affect agricultural land?	√		Agriculture land may potentially be affected during improvement / rehabilitation / lining of watercourses, improvement of irrigation conveyance system outside canal command and riverine areas, construction of storage ponds, pilot community based groundwater recharge schemes and irrigation schemes outside the canal command areas, installation of solar panels, HEIS and construction of infrastructures (warehouses, collection centers and pack houses)
Would the project lead to landslides hazard?		√	NA
Will the proposed project result in significant greenhouse gas emissions or exacerbate climate change?	√		Some of the construction activities e.g. movement of construction machinery, etc. may release minimal amount of Greenhouse Gases (GHGs).
Would the proposed project potentially result in the generation of waste (both hazardous and non-hazardous)?	√		During construction and operation phase, the proposed subprojects activities would generate various types of wastes including construction, municipal, and hazardous. Anyhow the contractor and labor workers will be trained on these aspects and a site will be specified and designated by the project field staff for solid waste and debris collection. It will be monitored on daily basis and workers/laborers will not be allowed to throw or dump solid waste/debris etc. other than the designated site
Does the project include activities that require significant consumption of raw materials, energy, and/or water?	√		The construction/rehabilitation of watercourses, improvement of irrigation conveyance system outside canal command and riverine areas, construction of storage ponds, pilot community based groundwater recharge schemes and irrigation schemes outside the canal commands areas and installation of HEIS solar panels, construction of infrastructures (warehouses, collection centers and pack houses)

Screening Questions	*Yes*	*No*	*Remarks*
			will require raw materials energy and water.
Ecological Environment			
Would the project potentially cause adverse impacts to habitats (e.g. modified, natural, and critical habitats) and/or ecosystems and ecosystem services?		√	The direct impacts on the biodiversity and natural resources are not anticipated as construction activities will be carried out in already transformed/ cultivated area in shape of watercourse improvements (lining/ rehabilitation) or introduction of HEIS (drip/ sprinkler) along with climate smart interventions such as utilizing renewable energy resources (solar panels). As such the interventions shall not be carried out in any natural habitats and critical habitats.
Is there any project activity that may have potential impacts on parks, natural reserve or local community		√	The proposed subprojects do not have potential impacts on parks, natural reserve or local community.
Would the project activities pose risks to endangered species?		√	No impact on endangered species is anticipated due to the proposed subprojects.
Any project close or adjacent to any mangroves, estuarine, wetland or protected area?		√	The interventions under the proposed subprojects will not be carried out within or adjacent to any mangroves, estuarine, wetland or protected areas. Anyhow if any construction activity needs to be done near sensitive habitats of ecological resources and any negative environmental impacts on it are identified in it during construction activities, then an ESMP will be prepared and detailed mitigation measure will be taken, implemented and monitored.
Social Environment			
Would the project potentially involve temporary or permanent and full or partial physical displacement?		√	The proposed subprojects will not involve any land acquisition. .
Are indigenous peoples present in the project area (including project area of influence)? Any health impact to them?		√	No indigenous people are found across the province of Punjab.
Does the project pose high risk to the workers/laborers?	√		The proposed subprojects may pose risk to the workers / laborers like health and safety.
Will the proposed project result in interventions that would potentially adversely impact the religious / cultural heritage sites / values?		√	The proposed subprojects would not potentially adversely impact the religious / cultural heritage sites / values. Anyhow if any construction activity needs to be done near religious / cultural heritage sites and have any adverse impact on it, then an ESMP will be prepared and

Screening Questions	*Yes*	*No*	*Remarks*
			detailed mitigation measure will be taken, implemented and monitored.
Would the project pose potential risks to community health and safety due to the transport, storage, and use and/or disposal of hazardous or dangerous materials (e.g. explosives, fuel and other chemicals during construction)?	√		During construction phase, the proposed subprojects may pose limited potential risks while transporting, storing and disposal of hazardous waste. Anyhow the contractor and labor workers will be trained on these aspects to avoid the risks related to community health and safety.
Would the project result in potential increased health risks (e.g. from water-borne or other vector-borne diseases or communicable infections such as HIV/AIDS, COVID-19)?	√		The proposed subprojects may have potential to spread the water-borne or other vector-borne diseases or communicable infections such as HIV/AIDS, COVID-19. To avoid it, Contractor / WUAs / Farmers and labor workers will be trained on these aspects.
Will increased market integration of producer groups lead to social exclusion	√		There is a possibility that the project will foster social exclusion as it works with farmers with medium landholdings, who can afford the cost sharing arrangements demanded by PRIAT. The larger community will benefit only if integration leads to improved productivity, higher value production and more economic activity in general in rural areas.
Will farm labor, particularly those working on high value production be able to secure fair remuneration and safe work conditions	√		The project should generate employment opportunities, including for women, in high value agriculture, but this will only benefit the larger group of agricultural labor if the remuneration offered is a fair rate, preferably above minimum wage, and if work conditions are safe and secure for all workers, particularly women
Is there a danger of child labor being employed on the project	√		Agricultural labor often consists of groups of families, including children who approach contractors to work as a group. The project must be careful not to allow children below the age of 15 to work on any subproject sites.

6.3 Potential Positive Impacts

The positive impacts due to the proposed PRIAT project are mentioned below:

- PRIAT will help to meet the sectoral objectives, national and international commitments of water conservation, climate change adaptation and agricultural productivity enhancement.
- About 420,000 families will benefit in the form of increased income resulting from improved yield due to the improvement of watercourses.
- About 20,000 of these families are also expected to adopt climate-smart agriculture practices to achieve higher incomes through aggregation and more sustainable and climate resilient production.
- Over 2.5 million acres of land will benefit from the improved irrigation system which will increase the reliability and timely availability of water to the farmers.
- The project is expected to generate 3 million person-day daily jobs resulting from the diversification toward high value crops mostly due to HEIS implementation. About a third of the beneficiaries of these jobs are expected to be women.
- The project development objective is to enhance agricultural vis on-farm water productivity and profitability of farmers.
- The project would strengthen the efforts made under the PIPIP for upgrading the farm level water conveyance infrastructure and improving irrigation technologies together with creating an enabling environment for sustained technology transfer at the grassroots level for optimal and efficient management of available water resources as well as providing support for processing of the agricultural produce to get better returns.
- The proposed 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 consumer.
- The greenhouse gas (GHG) balance calculation shows that the project has a positive impact leading to a decrease in GHG emissions. The project leads to estimated annual climate change mitigation benefits of 290,179 tCO2e, when compared to the baseline scenario. This is equivalent to annually reduced GHG emissions per hectare of 0.161 tCO2e. After 20 years (a period commonly used for project GHG accounting in agriculture), GHG mitigation benefits amounting to a reduction of 7,254,474 tCO2e will be generated.[58]
- Local employment will increase due to the local assembly, manufacture and maintenance of solar systems.

Apart from positive impacts, there are some potential adverse environmental and social impacts on the local environment. The proposed subprojects are divided into three phases i.e. planning and design phase, construction / implementation phase and O&M phase. The

[58] PRIAT PAD January 29 2022.

planning and design phase includes all stages before the construction / implementation phase (i.e. site investigation works including topographical, seismic studies, etc.); construction / implementation phase includes all stages from mobilization of Farmers / Water User Associations (WUAs) / Contractor to the completion of Project and O&M/ implementation phase starts after the construction / implementation phase which includes the inspection and repair works.

Adverse impacts envisaged during the above-mentioned three phases of the proposed project along with their proposed remedial or mitigation measures are detailed in the following sections

6.4 Environmental Impacts and Mitigation During Planning and Design Phase

The following is the brief description of impacts envisaged and the recommended mitigation measures during planning and design phase.

6.4.1 Technical Design and Layout Planning

Potential Impacts

Incompatible layout plan and engineering design of the project's structures (improvement, extension of lining, reconstruction of outlived watercourses and irrigation conveyance system outside canal command and riverine areas pilot community based groundwater recharge schemes and irrigation schemes, development of storage ponds, installation of HEIS and solar system, construction of infrastructures (warehouses, collection centers and pack houses)etc.) can undermine the overall aesthetic beauty and ambience of the subproject areas. Construction of watercourses and development of water storage ponds may create seepage if construction, design, siting and material are inadequate. The solar panels and their support structure may be damaged by the windstorm with very high wind speeds.

Also, low utilization of the available spaces and designing the structures without considering the prospective and futuristic needs can result in structures with low social acceptability and functionality. Similarly, the locals may also face access problems for their land.

Temporary interruption of irrigation water supply during construction works may also affect water availability for crops in the command area of canal / distributary / channel, thus reduce the income of these farmers which shall have a negative impact on the socioeconomics of the impacted area. This aspect needs to be taken care during the design phase.

This impact is medium adverse in nature.

Mitigation Measures

- The technical design of the proposed project must consider all the above-mentioned factors for the final design and should meet all the local and international standards.

- While preparing the construction design, the maximum wind speed in the sub-project area will be considered. The supporting structure will need to be designed adequately to avoid any damage during the wind storms.
- The proponent must review and validate all the design considering the possible impacts (as mentioned) before the start of construction of proposed subprojects.
- Ponds and water storage tanks should be designed and located so as to avoid soil erosion and subsidence.
- Only shortlisted/pre-qualified service providers should be hired for the supply of materials like PCPS, HEIS, solar systems etc.;
- Appropriate measures must be considered to facilitate the locals so that they can access their land;
- The Contractor/WUAs/Farmers shall be prohibited from interrupting the water supply channel or provide diversion on the section where work is planned on priority basis;
- The Contractor/WUAs/Farmers shall program the works to utilize the low water demand periods in the command area;
- Proper monitoring of Contractor/ WUAs/Farmers should be carried while installation of PCPS to avoid damages and economic loss to the service providers. For this purpose, hiring of skilled labour is recommended otherwise one representative of service providers should be hired;
- The service providers should be contractually bound to provide after sale services to WUAs/Farmers; and
- Relevant legislations, conventions, ESSs (ESS 2,3,4) and guidelines must be respected.

Residual Impact: The impact of technical designing and layout planning is insignificant after taking the above-mentioned mitigations.

6.4.2 Hydrology and Water Resources

Potential Impact

Climate change has already increased the number and intensity of extreme events, affecting how and when rains arrive. The province exhibits wide ranges of altitude, climate, ecosystems and vegetation, and types and abundance of water resources.

With the rehabilitation / improvement of the watercourses, less water will escape from the irrigation system and more canal water will be available to the farmer for irrigation at the on-farm level.

Improved water availability may prompt less efficient water use, increase in cultivation of crops, in particular, high water consumption crops, such as sugarcane and rice. This is likely to lead to reduced water availability downstream. The farmers may also turn to groundwater, whose aquifers have been recharged more slowly due to climate change, and

quickly depleting it. Such scenario is more likely in the south, where water shortage is more chronic. This impact is medium adverse in nature.

Mitigation Measures

- Irrigation systems must use design (location, dimension, material, layout, consideration of contours of the slopes, etc.) to adapt to climate change and enforce flood and drainage control functions;
- Hydrology, including both surface water and groundwater, should be studied before project design and monitored. Groundwater studies carried out by various organizations in the country should be consulted;
- Water saving technology to be introduced must take into account the local, altitude, climate, ecosystems and vegetation, and types and water resources;
- Groundwater depletion should be avoided through ensuring surface water availability.
- Agricultural practices should be promoted, including selection of crops, must improve soil moisture retention.
- Irrigation and agricultural practices that reduce evapotranspiration of crops, including choice of crops, will be promoted;
- Awareness must be raised among the stakeholders on hydrological cycle, including climate change, especially in the south Punjab; and
- Relevant legislations, conventions, ESSs (ESS 3) and guidelines must be respected.

Residual Impact: The impact of hydrology and water resources will be insignificant after taking the above-mentioned mitigations.

6.4.3 Seismology

Potential Impact

As per Building Code of Pakistan, Seismic Provisions, 2007, most parts of the province lie in seismic zone 2A (moderate hazard), where 2A represents peak horizontal ground acceleration from 0.08 to 0.16 g. A low to moderate intensity earthquake impacting the project sites can adversely impact the development. This impact can be categorized as direct, medium, site-specific, short term and low probability.

Mitigation Measures The proposed subprojects should be designed and constructed as per Seismic Building Code of Pakistan, 2007 (SBC-07) to comply with minimum requirements for seismic safety of structures; and

Residual Impact: The impact of seismology will be insignificant after taking the above-mentioned mitigations.

6.4.4 Flora

Potential Impacts

Direct impacts are not anticipated on the biodiversity and natural resources as construction activities will be carried out in already transformed/ cultivated area in shape of watercourse improvements (improvement/extension of lining/reconstruction/development), improvement of irrigation conveyance system outside canal command and riverine areas, development of community-based groundwater recharge schemes, construction of infrastructures (warehouses, collection centers and pack houses), development of storage ponds and introduction of HEIS (drip/ sprinkler) along with climate smart interventions such as utilizing renewable energy resources (solar panels). As such the interventions shall not be carried out in any natural habitats and critical habitats.

However, activities such as installation of construction camps[59] and mobility of construction staff may damage the local agriculture land/vegetation/trees. As the construction machinery (excavator, tracer trolley etc.) and camps will be moved and installed respectively, which require significant space due to which available agriculture land/vegetation/trees is expected to be affected. This impact can be categorized as direct, medium and site-specific.

Mitigation Measures

- Sites, for the installation of construction camps (if required), should be properly selected to avoid or minimize the cutting of trees, shrubs and herbs;
- The installation of camps and mobility of construction machinery should be properly planned and well designed to avoid any loss to local green cover;
- It is recommended to establish the construction camps where minimum or no vegetation exists;
- Tree plantation must be formulated;
- No subproject should be located within environmental sensitive area. Moreover, the Contractor/WUAs/Farmers will ensure that any surplus construction waste disposal sites are not located in or in close proximity to the natural and critical habitats;
- Critical areas of animal breeding and nests should be avoided, if any; and
- Relevant legislations, conventions, ESSs (ESS-6) and guidelines must be respected.

Residual Impact: The impact on flora will be insignificant after taking the above-mentioned mitigations.

6.4.5 Fauna

Potential Impacts

[59] Mostly the local labor would be hired due to small works, the establishing regular construction camps by the contractor(s) is unlikely. However, given measures would be taken, if needed

The movement of construction machinery and installations of construction camps (if required) may cause habitat loss especially birds' nests. The routes of the available wildlife and other habitats may be affected due to camps set-up and construction machinery movements. This impact would be of moderate adverse in nature.

Mitigation Measures

- The standard measures must be studied prior to construction phase to minimize noise due to machinery movements and installations of camps;
- Wildlife movements and routes (if any) must be considered prior to start of construction phase;
- The alternate routes and points are recommended to avoid any damage to locally available fauna;
- Waste management plan of the camps must be considered at the planning stage to prevent damage to wild animals and birds;
- Extreme care should be taken to avoid mature trees and specially those providing nesting habitat to avifauna; and
- Relevant legislations, conventions, ESSs (ESS-6) and guidelines must be respected.

Residual Impact: The impacts on fauna will be insignificant after taking the above-mentioned mitigations.

6.5 Social Impacts and Mitigation During Planning and Design Phase

6.5.1 Land Requirement

Potential Impacts

No land will be acquired for watercourses (improvement/extension of lining/reconstruction) as land for the purpose is already available and owned by the Government. Construction of pilot community based groundwater recharge schemes, storage ponds, installation of HEIS, solar system and construction of infrastructures (warehouses, collection centers and pack houses) will take place on land owned by the beneficiary farmers. To ensure sustainability of these projects for individual farmers, the project must ensure land owned by the beneficiary farmer is free of any encumbrances or conflicts via an undertaking (refer Annex J). This impact will be low adverse in nature.

Mitigation Measures

No mitigations are required.

6.5.2 Conflicts in Water Supply Rights

Potential Impact

Increased irrigation water availability as a result of watercourse improvement and/or adopting high efficiency irrigation techniques can potentially cause local conflicts among

the communities due to unavailability of water to downstream users. The impact is medium adverse in nature.

Mitigation Measures

- Proper water distribution through "Warabandi System" engaging WUAs should be ensured;
- Conflict avoidance and resolution are some of the key functions of the WUAs. The social mobilization and capacity building components of the project will address formulation and sustainability of the WUAs;
- An important aspect to be taken into account at the design level is the traditional water rights. This will need to be minutely considered while carrying out the detailed designs. Coupled with this, continual two-way communication with the local population will be necessary, to ensure that their perceptions about the project remain realistic, rational, and positive; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.
- Communication materials must be issued, on social media in particular, explaining the purpose of the project

Residual Impact: The impact of conflicts in water supply rights will be of low significance after taking the above-mentioned mitigations.

6.5.3 Public Utilities

Potential Impact

Due to the proposed subprojects, telephone lines, electric poles, wires, water lines etc. within the project area of proposed subprojects locations may require to be shifted (if any). This impact can be categorized as direct, medium and site-specific.

Mitigation Measures

- During the design phase, maximum effort will be made to avoid the abovementioned public utilities, and if these are unavoidable than these will be relocated timely through the concerned department to avoid any public inconvenience; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Residual Impact: The impact of public utilities will be insignificant after taking the above-mentioned mitigations.

6.5.4 Risk of Social Exclusion

Given the complexity of Pakistani society, and the structural inequality in rural areas, the risk of exclusion from consultation of traditionally marginalized groups such as women (in general, and women from poor households in particular); the poor and landless; minority communities (who, in rural Punjab, are often poor and landless); and the disabled is high. PRIAT is designed to work with small and medium farmers/landowners, who are also key beneficiaries of the program. The poor and landless benefit mainly to the extent that PRIAT

generates on-farm employment. Having said that, some infrastructure works generate positive externalities which are beneficial to the wider community. For example, rainwater harvesting tanks are in use by all sections of society, while watercourse improvement has generated a need for unskilled labor. The proposed interventions in component 2, including sprinkler systems and drip irrigation are fairly technologically advanced and will likely only be accessible to farmers with near subsistence level (12.5 acres) or slightly larger landholdings. This concentration on better-off households can also generate further inequality in rural areas. There is a need to ensure that the subprojects generate local employment to the extent possible, and that this labor is given fair remuneration and provided safe working conditions.

HEIS systems have generated a demand for female farm labor given that women are believed to be better suited to harvesting fruits and vegetables that require gentle handling. Nevertheless, it is important to ensure that the benefits of the project are as widely distributed as possible.

Mitigation Measures

PRIAT has a strong focus on South Punjab, which is historically an underserved region. To some extent, social exclusion has thus been addressed.

Another key factor is to consciously include marginalized communities in project related consultations wherever possible. PIPIP had instituted a system of farmer gatherings, which operated more or less like *khuli katcheries* in which anyone could attend. PRIAT needs to continue with similar consultations, but with an added effort to ensure inclusion of traditionally marginalized groups, as well as women. These and other forums are potentially venues for those affected by project activities, either positively or negatively, to bring their experiences to the notice of project proponents. In addition, communication materials need to be issued on social media in particular explaining the objectives of the project, and project activities.

6.5.5 Gender Impacts

As women make up a large proportion of agriculture labor in Punjab and gender dimensions need to be reflected fully in project design, implementation, monitoring and review, to ensure equal opportunities for women, and the prevention of exclusion, discrimination, violence, abuse and exploitation in accessing or availing project benefits. The interventions of the project focusing on high value agriculture may generate employment for women, but it will be essential to ensure that women who are employed on the subprojects are provided a secure work environment.

Across project components, the following gendered risks have been identified under the Project Appraisal Document:

- Women's lack of access to resources as a barrier to higher farm productivity
- Women are generally excluded from important agriculture and irrigation management-related decision-making processes due to social norms
- Lack of women employees and professionals in the agriculture sector hinders women's access to extension services for farm productivity.

- Lack of gender disaggregated data (access to and management of resources, diversity of income sources, use of time and decision-making power).
- Climate change adversely impacts women and women's economic productivity.

Mitigation Measures

- Female social outreach teams to be active throughout sub-project areas, to the maximum extent possible
- Extension departments to hire trained women workers particularly for vegetable and fruit growing
- Training of all project staff on the Gender Mainstreaming and GBV, SH and SEA Action Framework

6.6 Potential Environmental Impacts and Mitigation During Project Construction / Implementation

The following is the brief description of impacts envisaged and the recommended mitigation measures during construction / implementation phase.

6.6.1 Soil Erosion and Contamination

Potential Impact

The proposed interventions are not likely to involve any large excavation or any other activity causing soil erosion at large scale. Some minor excavation is involved in the water course improvement, development of community-based groundwater recharge schemes, construction of infrastructures (warehouses, collection centers and pack houses), development of storage ponds, works, but the overall impact of this improvement is reduced soil erosion, which takes place along the unimproved water course.

The clearing of vegetation can loosen the soil and make it more susceptible to erosion due to wind and rain. There is also a possibility of silt runoff during rainy season causing soil erosion. During the rain, the eroded soil mix with stagnant water to transform into slush, which can affect movement of vehicles and machinery and construction work as well as limit the movements of locals. Soil erosion may occur at active construction sites and at contractors' camps (if required), as a result of uncontrolled run-off from equipment washing yards, excavation of earth/cutting operations and clearing of vegetation. Soil may also be impacted due to unauthorized use of borrow areas, resulting in degradation of landscape. Whereas contamination of soil may be caused by solid waste generated and by oil and chemical spills.

Some schemes under the proposed project may involve constructing a water pond as the water source for drip or sprinkler irrigation. Improper location/construction of ponds can potentially cause soil erosion/subsidence. Additionally, the surplus soil if inappropriately disposed can potentially cause blocked drainage, loss of cultivable land, and associated issues. This impact is medium adverse negative in nature.

Mitigation Measures

- The Contractor/WUAs/Farmers will be required to instruct and train their workforce in the storage handling and management of materials and chemicals that can potentially cause soil contamination.
- Material Safety Data Sheets (MSDS) will be strictly followed during handling and storage of chemicals.
- Provision of impervious platform with oil and grease trap for collection of spillages during equipment and vehicle maintenance.
- During the water course improvement works, earthen channels will not be left uncompacted for long durations.
- The soil excavated and silt removed during the water course improvement works will be disposed appropriately, ensuring that it is not dumped in the cultivation fields, and does not block the water courses, drains, or local routes and the site shall be restored back to its original conditions.
- The water ponds, infrastructures under the schemes will be appropriately located and designed, addressing all aspects including soil erosion, soil subsidence, and seepage.
- The scheme design involving excavation of water pond should include proper disposal of the surplus soil (e.g., for the embankment for the water pond itself);
- Solid waste generated at the camp sites will be properly treated and safely disposed only in the demarcated waste disposal sites/areas.
- If any contaminated soils are found, they shall be removed and deposited in a sealed pit in an area agreed/approved with the concerned department;
- Use of modern, well-maintained machinery and vehicles by the Contractor/WUAs/Farmers to avoid leakages;
- Soils removed during construction would be stockpiled for reuse where possible; and
- Relevant legislation, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact of soil erosion and contamination will be of low significance after taking the above-mentioned mitigations.

6.6.2 Excavation of Earth

Potential Impact

During construction, there is a chance of finding archaeological remains. Mismanagement of the archaeological remains may result in loss of a valuable asset. Further, excavation of earth from borrow areas and clearance of subproject area (where applicable) may result in erosion of soil. Erosion results in change of edaphic characteristics of soil. The impact is medium adverse in nature.

Mitigation Measures

- In case of finding archaeological remains during excavation, the Contractor/WUAs/Farmers shall immediately report to Project Implementation and Supervision Consultant (PISC) for onward reporting to Director General, Archaeology Department, Punjab through Proponent to take further suitable action to preserve those antiques or sensitive remains. Chance finds procedure given in Annex K and Antiquities (Amendment) Act, 2012 must be followed**.**
- The Contractor/WUAs/Farmers needs to obtain approval for excavation and submit the plan of rehabilitation of the site after excavation, if required;
- Time scheduling to avoid excavation during rain;
- Cover all exposed soil as soon as soil is exposed; and
- Relevant legislations, conventions, ESSs (ESS 3 & 8) and guidelines must be respected.

Residual Impact: The impact related to excavation of earth will be insignificant after taking the above-mentioned mitigations.

6.6.3 Surface and Groundwater Contamination

Potential Impact

The surface water may get contaminated due to the surface runoff during construction phase. Construction activities may result in debris entering water body resulting in sedimentation. Storage and transport of construction material may also result in spills of chemical and contamination of water bodies.

Groundwater may also get contaminated from wastewater generation from the construction camps, leachate from improper dumping of solid waste. Consumption of water for construction activities may also affect other designated uses of water especially drinking water due to less availability of drinking water in the area. The impact is medium adverse in nature.

Mitigation Measures

As a mandatory step, all the effluents will be disposed as per the requirements of PEQS, 2016 (if required or as advised by Environment Specialist). Moreover, to reduce the risk of surface and groundwater contamination, good management practices will be adopted to ensure that fuels, chemicals, raw sewage and wastewater effluent are disposed of in a controlled manner. These measures are described below:

- The proponent will ensure that the construction work is confined within the subproject areas and water bodies are prevented from pollution during construction;
- The solid waste will be disposed of in designated landfill sites to sustain the water quality for domestic requirements;
- Regular water quality monitoring according to determined sampling schedule;

- Water required for construction shall be obtained in such a way that the water availability and supply to nearby communities remain unaffected;
- The Contractor/WUAs/Farmers will ensure that construction debris does not find their way into the drainage or nullah, canals and nearby river (where applicable) which may get contaminated;
- Prohibit washing of machinery and vehicles in surface waters, provide sealed washing basins and collect wastewater in sedimentation/retention pond;
- Wastes will be collected, stored and taken to approve disposal site;
- The Contractor/WUAs/Farmers shall ensure compliance with PEQS, 2016 or international standards/guidelines, whichever is stringent will be followed (if required or as advised by Environment Specialist); and
- Relevant legislation, conventions, ESSs (ESS -3) and guidelines must be respected.

Residual Impact: The impact related to surface and ground water contamination will be insignificant after taking the above-mentioned mitigations.

6.6.4 Landscape Changes

Potential Impact

Visual intrusion from large piles of excavated and construction material is one of the possible adverse impacts. The improvement and rehabilitation of watercourses and irrigation conveyance system outside canal command and riverine areas, pilot development of community-based groundwater recharge schemes, construction of infrastructures (warehouses, collection centers and pack houses), development of storage ponds, installation of HEIS and solar system may cause damage to the agricultural land. In case of these subprojects there will be some minor agricultural land damage as the cultivated area is near the proposed interventions. Construction material left over may likely happen after the closure of temporary construction sites. The impact is considered to be medium adverse in nature.

Mitigation Measures

- Material stockpiles should be removed as soon as work is completed and the area re-landscaped.
- The Contractor/WUAs/Farmers' obligation not to cause such damage and strictly follow design to avoid such loss. If such damage occurs to crops and agricultural land compensation will be paid to the affected person. The land will be restored to its previous condition after completion of construction works. Avoid use of heavy machinery within or near the agricultural land as far as possible;
- The Contractor/WUAs/Farmers should ensure minimal footprint of construction activities; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact of landscape changes will be insignificant after taking the above-mentioned mitigations.

6.6.5 Traffic Issues

Potential Impact

Due to the proposed subprojects construction activities and movement of project vehicles for construction material supply, traffic problems may arise for the commuters and transporters travelling to the proposed areas. The problems will include traffic jams and inconvenience to the public passing through the subproject area. It may also increase traffic load on the existing road network or access roads ultimately deteriorating the existing condition of the roads. The movement of vehicles along the haulage routes will cause soil erosion, debris flow, dust emissions, vibrational impacts, etc. Considering these consequences, this impact can be categorized as medium adverse in nature.

Traffic issues are covered in ESS 4: Community Health and Safety.

Mitigation Measures

To minimize traffic problems in the proposed subprojects area, the following measures will be considered:

- Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the nighttime to reduce traffic load and inconvenience to the local population;
- Construction vehicles, machinery and equipment will be parked at designated areas to avoid unnecessary congestion along major roads;
- The speed of the vehicles will be controlled (at 15 to 25 km/hr) to reduce the probability of severe accidents, soil erosion, debris flows due to vibrations and dust emissions;
- Damage of roads due to construction vehicles will be instantly repaired and/or compensated after the completion of work;
- Proper signboards will be provided for a smooth flow of traffic;
- Period of construction and area / location of construction site shall be informed to public in general and specifically to local residents;
- Any closure of the roads (especially main roads) and deviations / diversions proposed should be informed to the riders through standard signs and displays, if required;
- Traffic Management Plan (where applicable) will be prepared by the Contractor/WUAs/Farmers and implemented to avoid traffic accidents, jams/public inconvenience; and
- Relevant legislations, conventions, ESSs (ESS-4) and guidelines must be respected.

Traffic Management Plan as part of ESMPs will be prepared based on the guidelines and implemented to avoid traffic accidents, jams/public inconvenience. (Refer Guidelines for TMP in Annex L)

Residual Impact: The impact of traffic issues will be insignificant after taking the above-mentioned mitigations.

6.6.6 Ambient Air Quality

Potential Impact

A decline in the ambient air quality within the vicinity of works is expected during the construction phase activities. Due to these activities release of exhaust emissions, containing carbon monoxide (CO), sulphur dioxide (SO_2), oxides of nitrogen (NO_X), and particulate matter (PM) is expected, which can deteriorate the ambient air quality in the subproject sites. The objectionable impacts of settling of the suspended dust would be its dry deposition on vegetation and tree covers, motor vehicles, structures, and other exposed surfaces. Exhausts from fossil fuel burning in the construction machinery (excavator, tractor trolley etc.) will also deteriorate local air quality. Similarly, exhaust from generators (if used) can also have impacts on air quality in the vicinity.

The overall impact on the quality of ambient air during the construction phase may be low adverse keeping in view the extent of developmental activities for all subproject sites, however, it will be temporary and limited to the project's implementation phase only.

Mitigation Measures

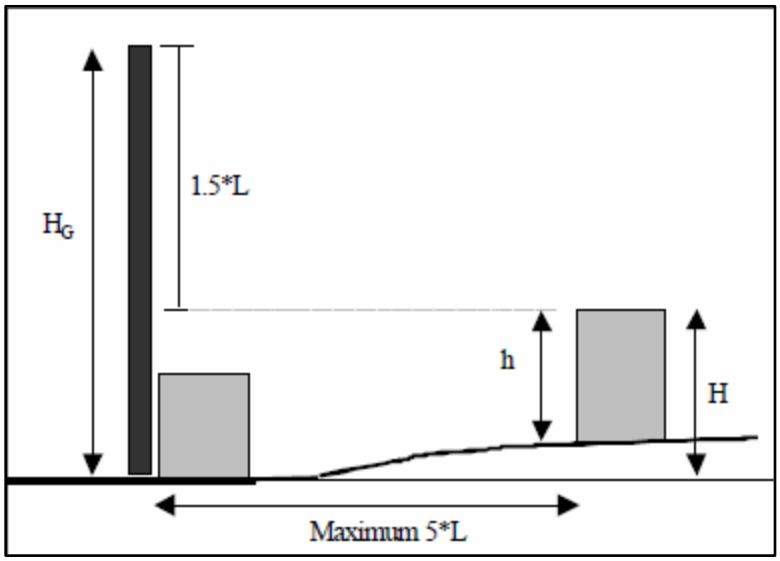
The impacts construction phase of the proposed subprojects could be effectively mitigated by the implementation of simple procedures by the Contractor/WUAs/Farmers including but not limited to the following:

- All vehicles, machinery, equipment and generators (if required) used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions.
- Open burning of solid waste from the Contractor's camps (if required) and at construction site should be strictly banned;
- Preventive measures against dust should be adopted for on-site mixing and unloading operations;
- Construction materials (PCPS, sand, cement, bricks, gravel etc.) and spoil materials will be transported through trucks covered with tarpaulins and all vehicles (e.g., trucks, equipment, and other vehicles that support construction works) may comply with the PEQS, 2016 and IFC/WHO guidelines whichever is stringent (if required or as advised by Environment Specialist);
- Regular water sprinkling of the site should be carried out to suppress excessive dust emission(s);

- Construction equipment is generally left idling while the operators are on break or waiting for the completion of another task. Emissions from idling equipment tend to be high. Existing idling control technologies, which automatically shut the engine off after a preset time can reduce emissions, without intervention of the operators;
- Service roads (used for earthmoving equipment and general transport) should be regularly sprayed with water during dry weather;
- All excavation work should be sprinkled with water;
- Diesel generator (if used) should be fitted with acouostic enclosure and stack of appropriate height for the proper dispersion of emission, refer Figure 1.1[60];
- Regular monitoring of air quality in accordance with the formulated environmental monitoring plan (given in ESMF); and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Figure 6.1: Minimum Generator Stack Height and Clearance

HG= H+1.5L



Where:

HG==Stack height measured from ground level

[60] Source: IFC General Environmental, Health and Safety Guidelines

H= Height of existing nearby structures above ground level at stack L= lesser dimension of h or w

h= Height of existing nearby structures w= Width of existing nearby structures

Residual Impact: The impact on ambient air quality will be insignificant after taking the above-mentioned mitigations.

6.6.7 Noise/Vibration

Potential Impact

Noise and vibration will occur due to the operation of construction machinery. Sources of noise and vibration during construction are machinery such as excavators, tractor trolley, water tanks and other equipment, unloading of Precast Concrete Parabolic Segment (PCPS) etc. cause some noise and vibration. Noise and vibration are perceived as one of the most undesirable consequences of construction activity. The above machinery is expected to generate noise levels that would be severe in the project area. The cumulative effects from several machines may be significant. However, these increased noise levels will prevail only for a short duration during the construction stage.

The likely impacts due to noise are:

- Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels;
- Noisy settings and higher background levels can cause temporary threshold shift and the consequent habit of speaking loud, which may cause damage to vocal cords in the persons exposed;
- Potential impact from vibration during the construction period may consists of damages to structures; and
- Moreover, vibrations from machinery and equipment may produce easy fatigability and generalized aches in the persons operating these machines.

This impact is negative, local, low and short term.

Mitigation Measures

- Selection of up-to-date and well-maintained plant or equipment with reduced noise levels;
- Confining excessively noisy work to normal working hours in the day, as far as possible;
- The Contractor/WUAs/Farmers working may be limited to daytime to reduce disturbance;
- Vehicles and equipment used shall be fitted, as applicable, with silencers and properly maintained;
- The Contractor/WUAs/Farmers s shall comply with submitted work schedule, keeping noisy operations away from sensitive points; implement regular

maintenance and repairs; and employ strict implementation of operation procedures;

- Personal Protective Equipment (PPEs) shall be provided and worn by the personnel involved in construction activities and training them in their use;
- All complaints will be recorded and responded to in a timely and professional manner;
- The Contractor/WUAs/Farmers shall ensure the compliance with PEQS, 2016 and IFC/WHO guidelines whichever is stringent (if required or as advised by Environment Specialist); and
- Relevant legislation, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact of noise / vibration will be insignificant after taking the above-mentioned mitigations.

6.6.8 Borrow Areas

Potential Impacts

The additional soil, if required, for the strengthening waters courses, irrigation conveyance system outside canal command and riverine areas, pilot development of community-based groundwater recharge schemes, construction of infrastructures (warehouses, collection centers and pack houses), storage ponds, the Contractor/WUAs/Farmers may excavate soil from the site. The excavating activities could place adverse environmental impacts including soil erosion, drainage problem, existing structure stability and health and safety of the workers and the local population.

Borrow areas may result in potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the project area. In particular, the ponds constructed to store water can provide breeding areas for mosquitoes, potentially causing malaria and dengue. This impact is medium adverse in nature.

Mitigation Measures

- Soil erosion along the borrow pit shall be regularly checked to prevent/mitigate impacts on adjacent lands;
- The Contractor/WUAs/Farmers would prepare material borrowing and disposal plan (if required);
- Obtain written consent of the landowner/concerned for material (soil) borrowing;
- Keep photographic record (before, during, after) for borrow and disposal areas;

- The Contractor/WUAs/Farmers will not leave the borrow pits in such a condition that they are unusable and could be filled with rainwater and cause the problems for the community;
- The capacity building component of the project will address the importance of hygienic practices and water borne diseases. In particular, ways and means to avoid malaria and dengue will be disseminated to the communities;
- The Contractor/WUAs/Farmers will ensure that selected borrow areas are clearly demarcated, including the allowable depth of the excavation, before starting any soil removing;
- The barren or unfertile land will be preferred to use as borrowing area rather than the agricultural land, otherwise compensation will be made to the landowner(s);
- The Contractor/WUAs/Farmers has to get approval from the Consultant's Environment Specialist / The Engineer; and
- Relevant legislation, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to borrow areas will be insignificant after taking the above-mentioned mitigations.

6.6.9 Construction Camps / Camp Sites[61]

Potential Impact

Improper construction camp location and mismanagement of construction camp activities can lead to various social and environmental impacts which include health and safety, traffic problems, soil degradation, loss of vegetation and assets on the selected land, solid waste and water pollution. Furthermore, cultural differences, behavior of construction workers, potential disregard for local cultural norms can lead to increased tension between local communities and workers residing in the construction camps. This impact is moderate negative in nature.

Issues arising from construction activity are discussed in ESS3: Resource Efficiency and Pollution Prevention and Management.

Mitigation Measures

- The project will seek to avoid sitting camps where their presence might contribute to any conflicts with locals;
- Employment policies which aim to maximize job opportunities for local people will help to minimize tensions caused by different socio-cultural values;

61 Mostly the local labor would be hired due to small works, the establishing regular construction camps by the contractor(s) is unlikely. However, given measures would be taken, if needed

- Camps will be designed to be self-contained to reduce demand on infrastructure and services of nearby communities;
- A comprehensive safety and security plan for the camps will be prepared which will comprise of a training manual, use of safety equipment and emergency preparedness;
- Training will be provided to all staff on camp management rules and overall discipline and cultural awareness;
- Ensure proper waste management practices including safe handling, storage, collection and disposal of construction/municipal/hazardous wastes (liquid and solid) and the training of employees who handle waste (as advised by Environment Specialist);
- Site for construction camp will be selected at least 500 m away from the settlements;
- There should not be any ecological sensitive areas e.g. wildlife sanctuaries, game reserves, national parks, forest areas, etc. near to the construction camp site.
- Compensatory plantation to be done when construction work near ends;
- Photographs will be taken before any activity to record the conditions of camp site and other construction activities that are likely to have adverse impacts;
- The Contractor(s)/ WUAs/Farmers shall ensure removal & rehabilitation of site upon completion; and
- Relevant legislations, conventions, ESSs (ESS-2 & 3) and guidelines must be respected.

Residual Impact: The impact of construction camps / camp sites will be insignificant after taking the above-mentioned mitigations.

6.6.10 Wastewater Generation at Construction Camps[62]

Potential Impact

Wastewater will be generated at the construction camps by the workers. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels, river etc. apart from soil contamination. This impact can be categorized as medium adverse in nature.

Mitigation Measures

To dispose the liquid waste generated from the construction activities, the following steps will be taken by the Farmers / WUAs /Contractors:

62 Mostly the local labor would be hired due to small works, the establishing regular construction camps by the contractor(s) is unlikely. However, given measures would be taken, if needed

- Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks (if required);
- Proper monitoring to check the compliance of PEQS, 2016 will be carried out (if required or as advised by Environment Specialist);
- Ensure proper and safe waste management practices including wastewater collection, transportation and its disposal and the training of employees who handle waste (if required or as advised by Environment Specialist); and
- Relevant legislations, conventions, ESSs (ESS-2 & 3) and guidelines must be respected.

Residual Impact: The impact related to wastewater generation at construction camp will be insignificant after taking the above-mentioned mitigations.

6.6.11 Solid Waste (Construction, Municipal and Hazardous Waste)

Potential Impact

Different types of waste including construction, municipal and hazardous wastes are likely to be generated during the construction phase of the subprojects. The improvement/extension of lining/reconstruction of watercourses, irrigation conveyance system outside canal command and riverine areas, pilot development of community-based groundwater recharge schemes, construction of infrastructures (warehouses, collection centers and pack houses), development of storage ponds, installation of HEIS and solar systems may also generate small quantities of wastes, such as plastic tubing, pieces of metal pipes, and pipe fittings, as well as left over construction material including excavated soil cement, sand and bricks can potentially cause soil and water contamination.

Insecure and unhygienic disposal of the solid wastes particularly garbage and trash may cause degradation of soil and land. Insecurely disposed off heaps of wastes containing kitchen garbage and food waste can serve as breeding grounds for the disease spreading vectors and rodents. Throwing away of solid wastes into water channels and the wastewater network can result into choking of the latter. All these, if left unattended, can become a source of nuisance and environmental pollution in the subprojects area. This impact can be categorized as medium in nature.

Mitigation Measures

- Solid waste generated during construction and camp sites will be safely disposed in demarcated waste disposal sites and the Contractor/WUAs/Farmers will provide a proper waste management plan (if required as per advice of Environment Specialist);
- Training of work force in the storage and handling of hazardous materials and chemicals Construction workers and supervisory staff should be encouraged and educated to practice waste minimization and reuse to reduce quantity of the waste;

- Emergency response plan shall be prepared to address the accidental spillage of fuels and hazardous goods;
- Immediate collection of spilled oils/fuels/lubricants by collection of contaminated soils and skipping oils from surface water by applying appropriate technologies;
- Construction waste such as cement, bricks, gravel and plaster should be crushed and reused in other sites, where possible;
- It will be ensured that no waste or left over construction material is left behind in the cultivation fields; and
- Relevant legislations, conventions, ESSs (ESS-2&3) and guidelines must be respected.

Residual Impact: The impact related to solid waste will be insignificant after taking the above-mentioned mitigations.

6.6.12 Emergency Response

Potential Impact

The construction of the proposed subprojects may encounter emergencies. In addition, disasters such as earthquakes, floods and fires may occur. Lack of Emergency Response Plan (ERP) or an inefficient response plan may lead to an accident or critical injury. This impact is moderate adverse in nature. The relevant guidelines are given in ESS-2& 4 Community Health and Safety.

Mitigation Measures

ERP attached as Annex M should be adopted in case of any emergency.

Residual Impact: The impact related to natural and man-made disasters will be insignificant after taking the above-mentioned mitigations.

6.6.13 Flora

Potential Impact

The proposed subprojects may involve destruction of vegetation cover while clearing RoW along the watercourses during the improvement/extension of lining/reconstruction rehabilitation activities. It is initially estimated that approximately 32,000[63] of trees / saplings including fruit trees (if any) may be affected during the clearance of RoW[64]. The provided number of trees is approximate and tentative which needs to be verified with the help of Forest and Agriculture departments during the detailed design stage upon the

63 Based on PIPIP experience, it is estimated that on average four (04) trees per watercourse may be affected. The PRIAT project involves improvement/extension of lining/reconstruction rehabilitation of eight thousand (8,000) watercourses. Therefore, 32,000 trees (4*8,000) are estimated to be affected.

64 No intervention under PRIAT project shall be carried out in the natural habitat/ protected / sensitive areas/ Notified sites (archaeological/culture/historical) or buffer zones thereof. All the potential interventions will be carried out in already transformed / cultivated areas. This aspect has also been covered under negative list of activities (Annex-W).

finalization project footprints. However, no tree cutting is anticipated for the development of irrigation schemes outside the canal commands, construction of water ponds, installation of HEIS and solar systems.

Exhaust of noxious gases from movement of construction machinery may pollute ambient air which will adversely affect health and vigor of plants. During construction activities the Contractor's workers may also damage the vegetation and trees (for use as firewood to fulfill the camps requirements, if established). This impact is moderate adverse in nature.

Mitigation Measures

- Ensure to minimize removal of trees/ saplings including fruit trees (if any), if possible;
- Cutting of trees and disturbance shall be avoided, as far as possible, so that adverse effects on the process of natural regeneration of species can be minimized;
- No Objection Certificate (NOC) must be obtained from concerned Forest / Agriculture Department (where required);
- Ensure the compensation of tree cutting to concerned parties i.e. local community, forest and other relevant departments (where applicable);
- A tree plantation program shall be formulated with the recommendations and technical support of concerned Agriculture and Forest Department;
- The proponent shall implement the program with the help of Forest Department;
- The Forest Department and agriculture department shall involve the communities for carrying out plantation;
- Plan for compensatory planting for three (03) trees against each fallen tree of similar floral function at the available spaces in/around the subproject area;
- Open fires should be banned in the area to avoid hazards of fire;
- Construction vehicles, machinery and equipment will remain confined within their designated areas of movement;
- The Contractor's/ WUAs/Farmers and labor shall be strictly directed not to damage any vegetation such as trees or bushes. They shall use the paths and roads for movement and shall not be allowed to trespass through farmlands or forested areas;
- Contractor's/ WUAs/Farmers shall provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel shall not be allowed;
- No schemes should be located inside any or within the vicinity of protected areas; and
- Relevant legislations, conventions, ESSs (ESS-6) and guidelines must be respected.

Residual Impact: The impact related flora will be low adverse after taking the above-mentioned mitigations.

6.6.14 Fauna

Potential Impact

During construction phase the existing population of mammals and reptiles of the subproject areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery, movement of labor, camping, etc. The existing animals may leave the directly affected areas due to construction activities and human intervention. Some animals particularly reptiles may get killed during the earthworks operations. Moreover, the movements of the mammals and reptiles will be restricted during the construction phase.

Birds as well will tend to move away from the construction areas and find shelter and food elsewhere due to the activities mentioned above for fear of being hunted / trapped.

Noise generated from construction machinery will even scare the wildlife residing in habitats located at some distance from the construction areas. Food and refuse at the Contractor's camps (if established) may attract animals that might in turn be hunted by the workers. The direct impact may be expected on different birds' species due to cutting of trees and some reptile and amphibian species due to the movements of vehicles and other construction activates. This impact is moderate adverse in nature.

Mitigation Measures

- Care shall be taken during construction activities for avoiding purposely or chance killing of animals;
- During construction care should be taken to avoid mature trees and specially those providing nesting habitat to avifauna;
- The speed of construction vehicles should be limited to in certain limits to avoid killings of reptiles and other fauna. If there is any species found of special concern, Wildlife department should be informed to take care of asset;
- If found any wild species and habitat during construing that must dealt carefully and local Wildlife department officials should be called;
- Hunting, poaching and harassing of wild animals shall be strictly prohibited, and Contractor shall be required to instruct and supervise its labor force accordingly and clear orders should be given in this regard;
- The Proponent must take NOC from the relevant department prior to construction phase (if required);
- Provision of culvert for the movement of different faunal species may be provided (where required);

- Special measures shall be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding;
- Noise generating activities shall not be carried out during the night by the work force, clear orders should be given;
- Similarly, wastes of the camps (if established) shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them; and
- Noise produced by the construction activities may be kept to acceptable level as per PEQS, 2016;
- Relevant legislations, conventions, ESSs (ESS-6) and guidelines must be respected.

Residual Impact: The impact related fauna will be low adverse after taking the above-mentioned mitigations.

6.7 Potential Social Impacts and Mitigation During Project Construction / Implementation

6.7.1 Occupational Health and Safety

Potential Impact

Occupational Health and Safety (H&S) related impacts may arise during construction phase due to activities including earthworks, installation of PCPS, development of pilot community-based groundwater recharge schemes, construction of infrastructures (warehouses, collection centers and pack houses), HEIS and solar system, construction of Contractor camps (if required), movement of machinery and manual handling during loading unloading operation, as result of these works there will be a direct impact on the health and safety of all staffs working in subprojects. Eye injury can be caused by stone or metal particles. Hazard of being hit by falling objects, major hand-arm and whole body vibration hazards, skin and respiratory tract irritation from exposure to cement dust, overexertion and awkward postures etc. will be another impact.

Other impacts will be falling in trench, contact with electrical and mechanical equipment, equipment failure, uncontrolled movement, unguarded moving mechanical equipment parts, fatigue, unbalanced load, falling objects, hand injury, slip and trip hazards, wind / storm activity, injury from releasing load too soon etc. Operating mechanical and electrical equipment will trigger the H&S issues e.g. struck by moving vehicles or other equipment, slips or trips, struck by flying objects, caught in pinch points, shear points, crush points, falling from machine etc. Considering these consequences, this impact can be categorized as medium adverse in nature.

The relevant guidelines are in ESS2: Labor and Working Conditions

Mitigation Measures

Following mitigation is given to avoid the accidental risks:

- The Contractor/WUAs/Farmers will be required to strictly follow Punjab Occupational Safety and Health Act, 2019 and World Bank Group EHS Guidelines, 2007 (refer Annex A). The Contractor/WUAs/Farmers will prepare the site specific occupational health and safety plan in compliance with relevant sections of the WBG General Environmental Health and Safety Guidelines (WBG 2007) and chosen methodology;
- Occupational health and safety monitoring programs of the Contractor/WUAs/Farmers(s) should verify the effectiveness of prevention and control strategies;
- Providing basic medical training to specified work staff and basic medical service to workers;
- The Contractor/WUAs/Farmers will ensure the provision of medicines, first aid kits, ambulance etc. at the camp site;
- Complying with the safety precautions for the construction workers as per applicable International Labor Organization (ILO) Conventions;
- Training of workers in construction safety procedures, environmental awareness, equipping all construction workers with safety boots, helmets, gloves and protective masks, goggles, shields and monitoring their proper and sustained usage;
- Moreover, proper planning should be done for food storage, setting up of kitchens, production of sewage and waste water may result in multiplication of rodents like rats, mice and shrew etc. and vectors like mosquitoes, bugs and flies which will have a negative impact;
- Work areas will be cordoned off where necessary;
- Ensure the provision of fire prevention and firefighting equipment;
- Ensure the provision of training related to emergency prevention, preparedness and response arrangements by the Contractor/WUAs/Farmers ; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the Contractor/WUAs/Farmers, at risk of penalty for noncompliance, as charges to be recovered from Contractor/WUAs/Farmers for unsafe act or condition.

Guideline for Contractor's/WUAs/Farmers Occupational Health and Safety Plan is attached as Annex N for the preparation of detailed HSE Management Plan by the Contractor's/WUAs/Farmers.

Residual Impact: The impact related to occupational health and safety will be insignificant after taking the above-mentioned mitigations.

6.7.2 Accessibility Issues

Potential Impact

During the construction activities of the project, local routes can potentially be blocked adversely affecting the local communities and their livestock.

Closure of existing road and other pathways (if required) during the construction phase of the subprojects may cause inconvenience to the nearby residents, visitors and will affect their daily life activities. This impact is short term, site specific and medium adverse.

Relevant guidelines are in ESS4: Community Health and Safety

Mitigation Measures

- Ensure provision of culverts at appropriate locations, if required;
- Any disruption of local routes will be minimized through astute planning;
- Any temporary blocking of local routes will be discussed in WUA meeting and agreement reached considering alternate routes;
- Ensure public awareness through media, appropriate sign boards and timely completion of the subprojects activities; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Residual Impact: The impact related to accessibility issues will be insignificant after taking the above-mentioned mitigations.

6.7.3 Cultural / Religious Sites

Potential Impacts

Social issues arise if sites of cultural, or religious significance sites affected during the construction phase, if any. This impact is categorized as moderate in nature.

Mitigation Measures

Due to the interventions of proposed project it is anticipated that no sites of cultural, or religious Significance will be impacted. However, if such sites encountered during construction following measures should be adopted:

- Proponent and the PISC to ensure that the construction staff is educated about the location and importance of the cultural sites that exist in the subproject areas;
- The Contractor/WUAs/Farmers to ensure that these sites are not affected by the construction related activities. These aspects will be included in the trainings to be conducted for the Contractor's/ WUAs/Farmers staff;
- Ensure no disturbance to Graveyards during the construction activities; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Residual Impact: The impact related to historical, cultural, archaeological or religious sites will be insignificant after taking the above-mentioned mitigations.

6.7.4 Coronavirus Disease (COVID-19)

Potential Impact

Coronavirus disease (COVID-19) may be introduced due to the immigration of workers associated with the proposed subprojects.

Ministry of National Health Services, Regulations and Coordination, GoP has issued guidelines in April, 2020 for Health & Safety of Building and Construction Workers during COVID-19 outbreak. These guidelines are prepared for the workers involved in building and construction work during the current epidemic of COVID-19. These guidelines provide the safety measure to be implemented at the construction site having a dusty environment, continuous flow of different materials and make-shift type of arrangements for storage, food and sanitation calls for implementation. This impact is site specific and high adverse. The relevant guidelines are in ESS 4: Community Health and Safety.

Mitigation Measures

- All workers must perform complete sanitization at the site as per updated / latest SOPs/guidelines issued by WHO and the national guidelines issued by the GoP[65];
- All workers must wear a mask and gloves as soon as they arrive at site and must keep wearing it at all times while present at the work site and their body temperature must be checked;
- Make alcohol-based hand sanitizer (at least 70%) available for the workers handling deliveries;
- At the work site(s), social distancing measures must be strictly implemented and gathering of workers at any location at the work site(s) must be strictly forbidden.
- All workers will be strictly advised to wash their hands as frequently as practicable and not to touch their face during work.
- COVID awareness sign boards must be installed at the camp clinic and at the work site(s);
- Contact details of all workers will be kept in a register on site in order to efficiently trace and manage any possible workers that might experience symptoms of COVID-19;
- Prohibition of entry for local community/any unauthorized persons at work sites;
- Proper hygiene practices in the toilets and washrooms will be implemented with proper and adequate use of soaps and disinfectant spray, where applicable;
- Everyone on the construction site must observe sneezing and coughing etiquettes;

65 https://covid.gov.pk/guideline

- The lunch breaks of the workers must be staggered to avoid the clustering of workers;
- Sick worker should immediately inform the focal person of health and safety and must get medical advice from nearby health center;
- The Contractor/WUAs/Farmers may ensure the vaccination of all working staff; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Measures for protecting staff and labor from exposure to, and infection with, the COVID-19 depend on the type of work being performed and exposure risk, including potential for interaction with infectious people and contamination of the work environment. Guidelines to combat with COVID-19 are attached as Annex O**.**

Residual Impact: The impact related to COVID-19 will be moderate significant after taking the above-mentioned mitigations.

6.7.5 Labor Influx

Potential Impact

This can be particularly acute in smaller communities hosting male workforce and/or a workforce from other regions which may result in conflicts between locals and non-locals concerning employment opportunities, wages and natural resources. Mobile workers can also contribute significantly to gender-based social impacts and risks.

Risk of social conflict: Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Tensions may also arise between different groups within the labor force and pre-existing conflicts in the local community may be exacerbated. Ethnic and regional conflicts may be aggravated if workers from one group are moving into the territory of the other.

Increased risk of illicit behavior and crime: The influx of workers and service providers into communities may increase the rate of crimes and/or a perception of insecurity by the local community. Such illicit behavior or crimes can include theft, physical assaults, substance abuse, prostitution and human trafficking. Local law enforcement may not be sufficiently equipped to deal with the temporary increase in local population.

Increased burden on and competition for public service provision: Presence of construction workers and service providers (and in some cases family members of either or both) can generate additional demand for the provision of public services, such as water, electricity, medical services, transport, education and social services. This is particularly the case when the influx of workers is not accommodated by additional or separate supply systems. If technologies and practices used or introduced by the project are not based on the local culture and capacity, they have a small chance of being understood and embraced by the farmers. Their willingness to maintain the infrastructure, machinery and equipment is likely to be low or unsustainable.

Increased risk of communicable diseases and burden on local health services: The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), COVID- 19 or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health resources. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical providers, thereby placing further stress on local resources. Local health and rescue facilities may also be overwhelmed and/or ill- equipped to address the industrial accidents that can occur in a large construction site.

Inadequate waste disposal and illegal waste disposal sites: Large populations of workers generate increased amounts of waste, for which no sufficient local waste management capacities may exist, which would likely lead to improper disposal practices.

In addition, the high efficiency irrigation techniques increase the demand of labor having better skills and know-how. The impact is moderate in nature.

The relevant guidelines are in ESS4: Community Health and Safety

Mitigation Measures

- Local population will be given preference in construction related jobs. Mostly unskilled workers will be hired from local communities, while for skilled manpower also, first choice will be given to local area residents. The WUAs will select the Contractors in accordance with the local norms;
- A grievance redress mechanism will be established to resolve disputes or conflicts related to employment and service provision with the consultation of the local population;
- The WUAs / Contractor will prepare the CCMP which, in addition to other components, will include the labor influx management plan. This will be reviewed and approved by the Client, if construction camp established;
- The Contractor/WUAs/Farmers will select the specific timings for the construction activities particularly near the settlements, so as to cause least disturbance to the local population, particularly women;
- The Contractor/WUAs/Farmers will take due care of the local community and observe sanctity of local customs and traditions by his staff. The Contractor/WUAs/Farmers will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions;
- Include Workers Code of Conduct in all contractor and workers contracts;
- Workers and service providers must be trained on cultural sensitivity;
- The Contractor/WUAs/Farmers will carry out the construction activities in such a way that the open defecation timings by the local community should not be affected. The normal defecation timings are early in the morning and at late in the evening. So, the Contractor/WUAs/Farmers will have to take care of these timings;

- Updated / latest SoPs related to the construction industry to control spreading of COVID-19 may be observed and should be implemented monitored by the Contractor/WUAs/Farmers (refer Annex-O);
- During construction activities, if privacy of the nearby households is affected, the Contractor/WUAs/Farmers will inform the house owner to make some arrangements. Similarly, Contractor/WUAs/Farmers will take care as much as possible that the construction activities should not affect the privacy;
- The Contractor/WUAs/Farmers will also ensure that solid waste and wastewater is disposed of in an environmentally friendly manner in designated areas and by approved methods only;
- The Contractor/WUAs/Farmers will explore alternative water sources, if required, and ensure that water usage by the project does not affect or compete with water requirements of the local community;
- The modern irrigation techniques also provide an opportunity for the unemployed rural youth to be gainfully employed. Most of the modern high efficiency irrigation techniques are being adopted by young, educated farmers. The capacity building and awareness raising component of the Project should target this aspect also;
- The Contractor/WUAs/Farmers will be prohibited from hiring minors to work on any sub-projects or on any project activity. If any transgressions are observed, project staff will intervene and ensure that minors are removed from project sites. A grievance redress system will be set up to address labor issues, and any instances of forced labor will be dealt with according to the law; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Residual Impact: The impact related to labor influx will be insignificant after taking the above-mentioned mitigations.

6.7.6 Child Labor and Forced Labor

Policy and legislation in Pakistan identifies different forms of child labor including bonded labor (which can also take place on farms); child labor in agriculture (where children are employed as paid/unpaid workers often along with their families; and child labor in hazardous employment, which can include work on farms if it involves dealing with machinery and equipment. Child labor is associated with a number of factors related not only to chronic poverty, but also transitory poverty - these include unemployment of parents, household size, and daily wage structures. Similarly, the phenomenon of bonded or forced labor in agriculture which is historically rooted in feudal agrarian relations is also to be found in Pakistan, on large landholdings.

Both forms of labor are prohibited in Punjab under legislation such as the Punjab Restriction on Employment of Children Act 2016, which restricts the employment of adolescents in certain occupations and processes" – defining a child as a person under 15 years and adolescent as a person between 15 and 18. Similarly, bonded labor is prohibited under the Punjab Bonded Labor System (Abolition) (Amendment) Act, 2012.

In spite of the legislation cited above, both child labor and forced labor have not been eradicated in Punjab.

Mitigation Measures

- PRIAT will prohibit contractors from hiring children below the age of 15 for any type of labor and hiring of person under the age of 18 years for hazardous work.
- PRIAT will prohibit hiring any person or group without first specifying terms of employment, preferably in writing. Project staff will liaise with labor representatives to ensure that wages are paid on time, and in the amounts specified
- Project staff will monitor sites to check for child labor, and will encourage communities, NGOs and the general public to report on instances of use of child labor for subprojects.
- Project staff will conduct spot checks and consult with labor representatives to ensure that wages are paid on time and in amounts agreed upon.

6.7.7 Gender Issues

Potential Impact

The overall assessment suggests that women and girls, are at moderate risk of being targeted for GBV, SH and SEA in the project, while also being least able to access support and protection mechanisms. The risk of GBV, SH and SEA are heightened due to the deployment of external personnel, including agricultural extension workers, contractors, suppliers, civil works labor, etc., whereas the ability to respond to such complaint within concerned departments is low. Risks related to exclusion of women, girls and gender minorities as well as gender-based violence (GBV), sexual harassment (SH) and sexual abuse and exploitation may arise or be exacerbated by several factors, and their confluence across different parts of Punjab where the project is implemented. There are clear threats to and high risks related to human safety and security in the event of escalation of personal or communal conflict, crime, or violence related to water distribution and management, which will disproportionately effect small farmers, and women/girl agriculture workers and farmers. Gender minorities, female-headed household, women with disabilities, elderly or widowed women and those suffering from debilitating diseases and other socially marginalized groups would be more adversely affected or unduly deprived because of their limited resource ownership and control, and lack of social capital or social disadvantage based on gender, age, class, ethnicity, religion.

As women are typically not counted as farmers unless they own land or have a tenancy agreement, they are likely to face more prejudice or discrimination in accessing development resources and project benefits. Special arrangements will be required to reach, include, and involve women in all their diversity as equal partners and beneficiaries in the Project.

Increased support for male farmers will likely push women, girls, children and the elderly towards increased contributory and unpaid work, with limited ability to control financial gains made by the farming unit as a whole. Refusal to participate or comply with demands

for increased farming activity can also lead to interfamilial violence, with women, children and the elderly bearing the brunt of abuse and violence.

Lack of effective and secure tracking of changing intrafamilial/ household power dynamics because of project interventions would render the project's full impact on transforming/ reinforcing gender norms & roles unknowable. It may then be important to track how and if the burden of shared work between farming couples and age-appropriate activity for their children shift with Project interventions, while also tracking the impact on men and women's/girls' time use and health, safety and security during the course of the Project.

Further, transitions to high-value crops that relegate women to manual labor only, or exposes them to harmful farming practices, will off-set the gains made in farming productivity by increased health hazards, which may be difficult to monitor. It may also be necessary to track any changes in incomes derived from both farming and non-farming sources amongst project beneficiaries, by gender, over the course of the project, pursuant to the project PDO.

There is a risk that tenurial arrangements and land-use decisions based on water allocation may deteriorate working conditions for local farmers as large landowners employ cheap farm labor (including women and children), to cut costs and improve farm earnings.

While risk of GBV, SH and SEA are heightened due to the deployment of external personnel, including agricultural extension workers, contractors, suppliers, civil works labor, etc., whereas the ability to respond to such complaint within concerned departments is low. In addition to this and related to the issue of due diligence in hiring of contractors, consultants, spray teams, etc., there is currently no system in place that provides information on persons with previous record of violence, harassment, etc., and a sex offenders' registry has been committed in the Anti-Rape Act, 2021, although a system for doing so is yet to be defined and set up in all provinces, including in Punjab.

Related to women's labor and working & living conditions, the following GBV risks are expected during the Project:

- GBV, SH and SEA may be triggered by labor influx (including minor or major influx, depending on population density, choice of construction/repair sites for water courses, availability of local labor - e.g., the Potohar region having less local labor and more migrant labor), or working on any of the project components involving contractors, evaluators, suppliers, etc.
- SEA may result from increased incomes amongst male laborers in project sites, leading to money exchange for sexual favors
- GBV may also be triggered due to pre-exiting exploitative relationships between large landowners and landless peasant farmers.
- With any loss or degradation of pastures and grazing lands for livestock which gets converted into farming land with increased availability of water, women might need to travel further to collect food, fodder, fuel, and plants, increasing their workload, time-use for home/homestead chores and vulnerability to harassment and violence.

- Girls may be married earlier to alleviate economic hardships and gain security against sexual harassment, due to conflict over water or land, and livelihood losses that may result from small or large-scale climate change- induced disasters, especially along water sources.
- It is likely that female laborers will work alongside men without adequate supervision and in the absence of separate WASH facilities, the chances of sexual harassment, abuse and violence will increase.
- Unless the landowner or Thekedar is held to account, women and girl farmers will have no recourse to legal remedies against GBV, SH, and SEA, particularly tenant and sharecropping landless women and gender minorities.
- Concerned departments will not be able to respond to GBV, SH and SEA adequately and in a survivor-centered manner due to weak implementation of relevant laws, high levels of impunity for GBV/SH/SEA perpetrators, trivialization & minimization of GBV, SH and SEA by concerned authorities, and lack of appropriate onward referrals to concerned authorities.
- Sexual Harassment Inquiry Committees and complaint mechanisms will be underutilized due to insensitive handling, discouragement/disincentives to report, and "false report" findings.
- GRM at the provincial level may not be able to provide or coordinate a multisectoral and integrated response to GBV, SH, and SEA cases unless concerned departments are also linked (e.g., Provincial Ombudspersons - for transgressions by government functionaries, e.g., the Women Development, Health, Labor, and Home Departments; the Federal Investigation Agency (FIA) - in cases involving cybercrime and trafficking of women/girls- and the Punjab Commission on the Status of Women), and unless confidential referral pathways are clearly delineated at the very local level.
- Unpaid work burden or contributory work is likely to increase for women belonging to households where men are occupied/targeted under project activities. Uneven and/or shifting burden of work could further trigger/exacerbate conflict within the home, lead to discord, violence, and emotional, psychological, physical, and mental distress amongst women in general (of all ages).

Mitigation Measures

- PRIAT will ensure implementation of the Gender Mainstreaming and GBV, SH and SEA Action Framework and set up systems to address any GBV, SEA/SH related complaints
- All project staff will be trained on the Gender Mainstreaming and GBV, SH and SEA Action Framework
- The Contractor/WUAs/Farmers will be required to provide a nominated person to address the specific risks identified;

- The bidding documents will include specific requirements that minimize the use of expatriate workers and encourage hiring of local workers, thereby minimizing labor influx;
- The Contractor/WUAs/Farmers will be required to establish anti-sexual harassment policies that governs conduct in the workplace;
- The Contractor/WUAs/Farmers will be required to provide mandatory and repeated training to workers on sexual exploitation and abuse and HIV/AIDS prevention and on the content and obligations derived from the code of conduct;
- A sociologist or an anthropologist must be engaged to identify vulnerable groups in target districts and their role and contribution in local livelihoods;
- Project activities must ensure that gaps in access to resources and opportunities, capacities and wealth between the vulnerable groups and the rest of the community are reduced through project implementation; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

For a detailed Action Framework for Gender-based Violence, Sexual Harassment and Sexual Exploitation and Abuse, see Annexure Y.

Residual Impact: The impact related to gender issues will be insignificant after taking the above-mentioned mitigations.

6.7.8 Stakeholder Engagement

Potential Impacts

Social issues may arise due to improper dissemination of subprojects progress and benfits. This would generate moderate significant impact.

Mitigation Measures

- Ensure proper implementation of the Stakeholder Engagement Plan (SEP) throughout the life of the project.
- Ensure information on accessing the project Grievance Redress Mechanism (GRM) is disseminated and grievances are lodged and addressed in a timely manner.
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Residual Impact: After this measure, impact would be of low significance.

6.8 Potential Environmental Impacts and Mitigation on Operation / Completion

The anticipated environmental and social impacts related to the proposed subprojects have been studied for the operational / completion phase of the project as discussed hereunder.

6.8.1 Loss of Soil Productivity

Potential Impact

The flood irrigation helps in leaching of salts present in the irrigation water (particularly where groundwater is used) from the soil thus avoiding salt build up in the crop root zone.

Soil fertility may be lost, depending on the agricultural practices, excessive use of agrochemicals, tilling, and inadequate crop rotation would result in decrease in soil organic matter, reduction in aggregate stability, damage to soil structure, and reduction in mineralization. Excess use of agrochemicals will also lead to soil pollution and destruction of soil fertility.

However, the proposed HEIS may potentially lead to salt build up in the crop root zone since the leaching is unlikely to take place with the controlled irrigation. This phenomenon may be more likely in central and southern Punjab where rainfall is too scanty and therefore little natural leaching of salts takes place.

Increased application of irrigation water may also result in exacerbated waterlogging and salinization. The impact is moderate adverse in nature.

Mitigation Measures

- Drip irrigation system should be preferred for row crops;
- Agricultural practices to be promoted should enhance soil fertility;
- Use of hazardous chemical substances should be avoided as much as possible by adopting integrated pest management;
- Soil analyses should be carried out in the fields, using HEIS, to detect any salt build up in the crop root zone;
- In the fields using drip irrigation systems in areas with little or scanty rainfall, occasional (say, once a year) flood irrigation may be considered to avoid salt build up in the soil, particularly where groundwater is used for irrigation;
- Soil testing must be conducted before selection of subproject sites to avoid exacerbation of waterlogging, salinity and other undesirable characteristics;
- Concrete lining over well compacted ground would minimize water leakages and therefore minimize potential for water logging;
- Installation of HEISs help in minimizing water loss and potential water logging and result in efficient water use; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to loss of soil productivity will be insignificant after taking the above-mentioned mitigations.

6.8.2 Reduced Groundwater Recharge

Potential Impact

The improvement of watercourse while conserving water by reducing the water seepage from the water courses can also potentially reduce the groundwater[66] recharge thus

66 The sources of groundwater recharge are: seepage from the irrigation systems, including ponds; application of irrigation water, rainfall etc.

affecting among others the drinking water source for the local population. The seepage from the irrigation network and the cultivation fields is among the major sources of recharge to this valuable natural water storage. Climate change implies less recharge overall, watercourse rehabilitation points to less upstream and more downstream, and irrigation and agricultural practices can influence recharge in both ways. It also depends on the degree of waterlogging. The impact is moderate adverse in nature.

Mitigation Measures

- One of the design criteria adopted by the Department is to limit the water course lining to 50 percent in the areas with fresh groundwater. This will ensure adequate groundwater recharge from the remaining places;
- In addition, the Department should utilize the results of the groundwater studies being carried out by different organizations in the Country. This would help understand the actual impact of the improvement of watercourse lining on the groundwater table; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to reduced ground water recharge will be insignificant after taking the above-mentioned mitigations.

6.8.3 Air and Noise Quality

Potential Impacts

Major sources of noise, air emissions and dust pollution at all the subproject areas will be periodic vehicular traffic movement especially used for maintenance purpose. Increased use of chemical inputs, since certain volatile substances can become airborne. During operation of the HEIS, if operated on diesel engine, operation of crop harvesting and agro processing equipment and machinery , air quality may be impacted due to air emissions. This impact is of moderate significance. t

Mitigation Measures

- Regular maintenance / tuning of the periodic inspection vehicles will help to keep vehicular emission and noise within limits;
- Judicious use of the chemical inputs and use of alternate techniques (such as integrated pest management and using disease-resistant seeds) will be promoted through awareness raising and capacity building initiatives;
- HEIS should be installed in combination with solar system to avoid the emissions of GHGs from diesel engine;
- Trees planted as per tree plantation plan will also act as a noise barrier;

- Ensure the compliance with PEQS, 2016 or WHO/IFC Guidelines whichever is stringent will be followed, limits (if required or as advised by Environment Specialist); and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to air and noise quality would be insignificant/low after taking the above-mentioned mitigations.

6.8.4 Breaching of Watercourses

Potential Impacts

Breach of watercourses will threat system sustainability and following factors may also fuel the deterioration process of watercourses:

- Improper operation of water control facilities;
- Tampering of outlets and siltation of watercourses;
- Action of borrowing animals such as rats and porcupines will increase; and
- Lack of coverage of hydraulic gradient.

The important aspects that need attention and annual maintenance are mainly watercourse embankments and bed levels which are affected by siltation or scour. The impact is medium adverse in nature.

Mitigation Measures

- Ensure proper monitoring of the system regularly and repair of damages should be on urgent basis;
- Include capacity building of the WUAs and communities in the O&M activities;
- Liaise with the WUAs communities to identify potential weaknesses in the system that could cause breaches; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to breaching of watercourses will be of low significance after taking the above-mentioned mitigations.

6.8.5 Water Borne and Water-related Diseases

Potential Impacts

Operation of irrigation schemes can potentially cause water borne and water-related diseases. In particular, the ponds constructed to store water can provide breeding areas for mosquitoes, potentially causing malaria and dengue. The impact is medium adverse in nature.

Mitigation Measures

- The capacity building component of the project will address the importance of safe drinking water and hygienic practices, thus addressing the water borne diseases;
- The capacity building program will also address the avoidance and cure of water-related diseases. In particular, ways and means to avoid malaria and dengue will be disseminated to the communities; and
- Relevant legislations, conventions, ESSs (ESS-3 & 4) and guidelines must be respected.

Residual Impact: The impact related to water borne and water related diseases during operation / completion phase will be of negligible importance after taking the above-mentioned mitigations.

6.8.6 Disposal of Wastewater

Potential Impacts

Disposal of waste stream into the watercourses from nearby settlements may affect the surface water quality. This impact will lead to serious health issues and will be of moderate significance.

Mitigation Measures

- Proper monitoring of watercourses alignment and disconnect all identified waste streams would step down the significance of impact to low;
- Sign boards should be erected at selected locations to prohibit disposal of waste in watercourses, where required; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to disposal of wastewater in the watercourses will be of low significance after taking the above-mentioned mitigations.

6.8.7 Periodic Cleaning and Maintenance

Potential Impacts

Non-functional WUAs, leakages and improper maintenance may result in unequal utilization of water and potentially cause silting and clogging of these channels. Effectiveness of the subprojects may be decreased if watercourses are not cleaned on periodic basis. This impact would be a moderate significant impact.

Mitigation Measures

By adopting the following measures, the impact would be finally of low significance:

- Sign boards should be erected at selected locations to prohibit disposal of waste in watercourses;
- The WUAs play an important role in maintaining the water courses in good condition. Through social mobilization and capacity building during the project, the sustainability of the WUAs will be promoted;

- Efficiency of the system will be at its best by adopting proper maintenance activities such as silt removal and bed scratching at periodic intervals; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to periodic clearing and maintenance of the system will be of low significance after taking the above-mentioned mitigations.

6.8.8 Intensification of Agricultural Land Use

Potential Impact

The operational activities may potentially cause intensification of cultivation, thus increasing the usage of crop inputs including fertilizers, pesticides, and herbicides.

Pesticides and herbicides are applied to agricultural land during operational phase, to control pests that disrupt crop production. Soil contamination can occur when pesticides persist and accumulate in soils, which can alter microbial processes, increase plant uptake of the chemical, and also cause toxicity to soil organisms. Pesticide leaching occurs when pesticides mix with water and move through the soil, ultimately contaminating groundwater. This in turn can potentially cause negative impacts on people, as well as on natural flora and fauna. This impact will be of moderate significance.

Mitigation Measures

The generic mitigation measures to address the environmental degradation associated with agriculture intensification are listed below.

- Judicious use of the chemical inputs and use of alternate techniques (such as integrated pest management, using disease-resistant seeds, and mulching) will be promoted through awareness raising and capacity building initiatives;
- Adoption of Integrated Pest Management (IPM) techniques will be promoted through capacity building programs. IPMF has been prepared and shall be implemented (refer Annex P);
- Crop rotation practices will be promoted to avoid soil fertility degradation;
- The capacity building program will also include safe handling of hazardous substances such as pesticides; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to environmental degradation associated with agriculture intensification will be of low significance after taking the above-mentioned mitigations.

6.8.9 Soil Erosion and Contamination

Potential Impact

Any excavations required for maintenance would cause impacts similar to those from construction phase, but at a lesser spatial and temporal extent. The accidental spill of product such as accidental fuel and material spills, waste from processing unit would likely cause soil contamination. Soil contamination can occur when pesticides persist and

accumulate in soils, which can alter microbial processes, increase plant uptake of the chemical, and also cause toxicity to soil organisms. The impact would be of moderate in nature.

Mitigation Measures

To minimize the disruption of top soil following remedial measures should be taken:

- The top soil that will be excavated from the area will be preserved and reused for the horticulture purpose;
- Proper solid waste management program is prepared and executed to ensure proper waste containment, collection, transfer and disposal;
- Waste and hazardous material, including fuel, must be handled, stored and treated so as not to cause soil pollution or pose threat to human health;
- The capacity building program will also include safe handling of hazardous substances such as pesticides;
- Monitoring is carried out at specific locations for strict compliance to the developed ESMF in implementing measures to waste management; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to soil erosion and contamination will be of low significance after taking the above-mentioned mitigations.

6.8.10 Climatic Aspects

Potential impacts

The project may affect local climate through rise in evapotranspiration losses from intensified Irrigation, modification in water use on the field, Vehicles and machinery operated with inappropriate fuel, will emit more GHGs.

If improvement in water availability encourages switch to rice from other crops could increase emission of GHGs: methane and nitrous oxide. Increase in agricultural production may entail more burning of agricultural waste in the fields. Use of fossil fuels, synthetic nitrogen fertilizers and pesticides will result in emission of GHGs and exacerbation of climate change.

Resilience to climate change needs to be reinforced; it has already brought floods, droughts, higher temperatures and erratic rainfall as well as new pests and increased the number of familiar pests, prompting the farmers to use more pesticides. Without integrated pest management, which should include cultural practices, the negative impacts of agrichemicals on the environment, human health and livelihoods are likely to intensify. In addition, existing waterlogging must be taken into account, which will be exacerbated by climate change, when considering crop diversification.

The farmers may interpret the improved availability of irrigation water as a new permanent condition and plant crops with high water requirements, it would most likely lead to a direr situation in a few years because of climate change and population increase

that decrease the amount of water available per capita. The impact would be of moderate in nature.

Mitigation Measures

- Under the PRIAT Project, improvement/extension of lining/reconstruction of watercourses, irrigation conveyance system outside canal command and riverine areas, Installation of HEIS, solar systems, provision of certified plants, seeds, moisture meters, pilot development of community-based groundwater recharge schemes development of water storage ponds and advisory services will help to mitigate the climatic aspects;
- Irrigation and agricultural practices that reduce evapotranspiration of crops, including choice of crops, will be promoted;
- A water regime for rice cultivation that produces the least GHGs should be considered;
- All machinery and vehicles in use must be well maintained and in good working condition;
- All machinery and vehicles must be operated with designated fuel;
- Sustainably harvested renewable energy must be used as much as possible;
- Practices that benefit the material cycle of agroecosystems, instead of burning in open air, should be promoted for disposal of agricultural waste;
- Use of substances that contribute to climate change should be avoided as much as possible by adopting integrated pest management;
- Awareness of farmers must be raised on climate change, hydrology, agroecosystems, synthetic agrochemicals, the environment, human health and livelihoods, agricultural problems that already exist, such as salinization and waterlogging; and
- Relevant legislations, conventions, ESSs (ESS 1& 3) and guidelines must be respected.

Residual Impact: The impact related to climatic aspects will be insignificant after taking the above-mentioned mitigations.

6.8.11 Enhanced Use of Pesticides

Potential Impact

Pesticide use is widely practiced in Punjab, intended to assist farmers in getting rid of pests. Extended and indiscriminate use of pesticides has resulted in pest outbreaks as well as negative effects on people working in the agricultural fields and the surrounding environments. Pesticide use also disturbs the agro-ecosystem and kills non-target bio-control agents and environment friendly organisms including birds. Some of other side effects of increased pesticide use have included the contamination of soil, water and

chemical residues in the food chain. Below is brief detail depicting various aspects of pesticides:[67]

- **Sickness Incidence of Pesticide Applicators:** Pesticide related sickness is very common in the cotton zone as about 63% of households report sickness during the spraying season, mortalities are about 1 per 400 households while main reported ailments are vomiting, dizziness, and breathing problems.
- **Sickness in Women Cotton Pickers:** About 87% women pickers complaint of a variety of symptoms like headache, nausea, vomiting, skin irritation, general weakness, fever, dizziness, stomach pain, and blisters while picking the cotton during the season. This might be due to pest residue on the cotton.
- **Industrial Worker Poisoning:** About half of the labor force, working in the pesticide plants report sickness by inhaling pesticide emissions.
- **Pesticide Residue in Food Chain:** Fruits and vegetables are contaminated with pesticide residues to the extent of 40% and 63% to 70% of these are above the Maximum Residue Limit (MRL). Pesticide residues are very injurious to the human health, specially the workers who are engaged in this practice.
- **Irrigation and Drinking Water:** Pesticide residues also found in irrigation and drinking water, cotton seeds, oil, lint and cattle feed, cotton seed cake, animal milk, and soil. Increased pesticide resistance is resulting in additional applications of pesticides to maintain expected crop yields. The consequences are lower yields and higher production costs.
- **Generation of Toxic Solid Waste:** Pest empty container can produce the hazards for the people working in the field, if they are not properly handled.

With additional area under cultivation, and with better water availability for existing area, cropping intensity will increase, resulting in an automatic increase of fertilizers and pesticides use. This would be an impact of high significance.

Mitigation Measures

- Regular medical checkup should be made to assess the sickness incidence of pesticide applicators;
- Awareness program should be conducted to avoid the inhaling pesticide emissions, handling and PPEs, regular medical check-ups are recommended during the season;
- All the fruit and vegetable sample should be checked and verified on regular intervals. They must be brought in the MRL;
- The destruction and removal of the empty packages and pesticide remains shall be achieved without contaminating the water supply;

67 World Bank/Government of Sindh. (2013). Integrated Pest Management Plan (IPMP), Sindh Agricultural Growth Project, August.

- Empty containers should be punctured, crushed or otherwise rendered incapable of holding liquid and then can be disposed of at a sanitary land-fill or returned to the manufacturer or formulator;
- Containers that have held pesticide formulations classified as highly hazardous or extremely hazardous must not be reused;
- Under certain conditions, containers of pesticide formulations classified as slightly hazardous or unlikely to present acute hazard can be reused for purposes other than the storage of food, drink or animal feed;
- Concerted efforts by the Agriculture Department to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level;
- Use of restricted pesticides identified by WHO shall not be allowed. IPMF has been prepared and shall be implemented (refer Annex-P); and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to enhanced use of pesticides will be of moderate to low significance after taking the above-mentioned mitigations.

6.8.12 Liquid and Solid Waste Generation

Potential Impact

Wastewater may generate by the workers during the maintenance related activities, operation of crop harvesting and processing equipment and machinery and from infrastructures (warehouses, collection centers and pack houses). If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels, river etc. apart from soil contamination.

Different types of waste including construction, municipal and hazardous wastes are likely to be generated during the operation phase of the subprojects. The maintenance of watercourses, pilot development of community-based groundwater recharge schemes HEIS and solar system may generate small quantities of wastes, such as plastic tubing, pieces of metal pipes, and pipe fittings, copper, aluminum, rubber, silicon, glass as well as left over materials. Solid wastes can also be generated from the operation of crop harvesting and processing equipment and warehouses, collection centers and pack houses.. These waste can potentially cause soil and water contamination. This impact can be categorized as moderate in nature.

Mitigation Measures

- Proper monitoring to check the compliance of PEQS, 2016 will be carried out (if required or as advised by Environment Specialist);
- Solid waste generated will be safely disposed in demarcated waste disposal sites;
- Ensure training of farmer's regarding waste minimization and reuse to reduce quantity of the waste;

- Ensure immediate collection of solid waste after the competition of maintenance works, no waste or left over construction material is left behind in the cultivation fields;
- Organic waste, the rotten fruits and vegetables generated due to the processing unit, should also be used in the production of animal feed; and
- Relevant legislations, conventions, ESSs (ESS-3) and guidelines must be respected.

Residual Impact: The impact related to solid waste will be insignificant after taking the above-mentioned mitigations.

6.8.13 Flora

Potential Impact

During operational stage the proposed subprojects will not affect Flora (Trees and agricultural crops) or release any significant pressure detrimental to flora.

However, the use of excessive chemical inputs (fertilizers, pesticides, and herbicides) causing soil and water contamination, which in turn can potentially harm natural vegetation. This impact is moderate in nature.

Mitigation Measures

- The implementation of plantation plan recommended in compensation for cutting of trees should start working during operational stage, to ensure the ecological balance and to avoid any impact on local environment;
- Large scale planting with suitable indigenous fruit and timber trees, shrubs and ornamental plants will be carried out in accordance with the Tree Plantation Plan to improve aesthetic value and offset the effect of removal of vegetation;
- The saplings planted in the subproject areas against the trees affected should be properly maintained throughout their initial growth period in terms of water requirement and necessary nutrients by the relevant department;
- Proper check and balance for above activities is highly recommended. Plantations so, raised must be maintained according to the Silvicultural practices which include proper Irrigation, Cleaning, Pruning, thinning at prescribed intensity, Silt clearance and Trench-opening, etc.;
- Maintenance and security of the plantation should be done for at-least five years; and
- Judicious use of the chemical inputs and use of alternate techniques (such as integrated pest management and using disease-resistant seeds) will be promoted through awareness raising and capacity building initiatives; and
- Relevant legislations, conventions, ESSs (ESS-6) and guidelines must be respected.

Residual Impact: The impact will be of low significance after taking the above-mentioned mitigations.

6.8.14 Fauna

Potential Impact

The proposed interventions will not be located in any protected area, Game reserve, Game sanctuary or national park, so no major impacts on wildlife and livestock is expected.

However, the use of excessive chemical inputs (fertilizers, pesticides, and herbicides) causing soil and water contamination, which in turn can potentially harm beneficial insects, birds, and other faunal species. This impact is moderate in nature.

Mitigation Measures

- The pathways of locally available wildlife and livestock for food, shelter and other normal activities must be compensated with proper alternative routes/pathways & water points must be provided (where applicable) to minimize the impact and movement of available wild and domesticated animals;
- Judicious use of the chemical inputs and use of alternate techniques (such as integrated pest management and using disease-resistant seeds) will be promoted through awareness raising and capacity building initiatives; and
- Relevant legislations, conventions, ESSs (ESS-6) and guidelines must be respected.

Residual Impact: The impact will be of low significance after taking the above-mentioned mitigations.

6.9 Potential Social Impacts and Mitigation on Operation / Completion

6.9.1 Improper Distribution of Water

Potential Impacts

Unavailability or improper distribution of irrigation water in the subproject areas will result social unrest in the area. Increased water consumption at upstream may potentially affect other water users. The impact is medium adverse in nature. The relevant guidelines are in ESS3: Resource Efficiency and Pollution Prevention and Management.

Mitigation Measures

- It is obvious that more consistent and regulated availability of water will be a beneficial outcome. Proper water distribution through “Warabandi System” engaging WUAs should be ensured. Conflict avoidance and resolution are some of the key functions of the WUAs. The social mobilization and capacity building

components of the subprojects will address formulation and sustainability of the WUAs;

- The water saved through the project interventions should be used to address the water stress and/or to bring the fallow land under cultivation.
- Compensate downstream Farmers in case of any water rights losses;
- Discourage spate agriculture; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Residual Impact: The impact related to unavailability or improper distribution of irrigation water will be of low significance after taking the above-mentioned mitigations.

6.9.2 Non Functionality of Water User Associations

Potential Impact

Currently the WUAs are not functioning as they should, which has led to inefficient use of water resources and related facilities. Unsatisfactory functioning of the associations is indeed the insufficient human capital and social cohesion among the farmers, the impacts of proposed interventions of watercourses, HEIS, installation of solar system, and storage of water ponds on would depend on how the Directorate and the communities seize the project as an opportunity to galvanize the sentiment among the farmers that effective WUAs are necessary for making the best use of the improvement brought about by the project.

Farmers' interest in collective action and long-term solutions would be increased by making them aware of climate change implications as well as the effects of larger water demand on the environment and further on agricultural productivity.

WUAs can serve as a platform for peer-to-peer knowledge sharing on various practices and technologies: judicious use of groundwater, cultivation of crops with lower water requirements, agricultural techniques to reduce evapotranspiration, design and management of diversified agricultural lands or agroforests; market information on high-value crops; and techniques and opportunities for value addition. The impact would be of moderate in nature.

Mitigation Measures

- The roles of WUAs for each village should be redefined and their rules revised using a participatory approach;
- Social capacity of and cohesion among farmers must be strengthened so that they will be able to act collectively for tasks, such as maintain the watercourses, development of community-based groundwater recharge schemes and storage ponds, solar system, HEIS, mediate disputes, reduce incidences of conflicts and other tasks that are best done collectively;
- Farmers' awareness must be raised on climate change and groundwater recharge through participatory training so that they can effectively plan water use in the long run;

- WUAs should be encouraged to take an integrated management of water resources; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Residual Impact: The impact related to WUAs will be insignificant after taking the above-mentioned mitigations.

6.9.3 Sustainability of Interventions

Potential Impacts

Without appropriate backup support, interventions such as HEIS and solar may not likely to be accepted by the growers. Any disruption in these high efficiency systems may cause water stress and associated damage to the crops. Locals are preferring flood irrigation to fulfill their crops and orchards water requirements as they believe that it increases their yield. They are using this method from decades. Now, they may assume if the HEIS will be installed for their crops and orchards then their yield might be affected. The impact will be of medium significance.

Mitigation Measures

- The subprojects will ensure strong and effective backup support to be provided by the suppliers through appropriate contractual clauses. This arrangement has been quite successful in providing after-sales support to the farmers during the on-going project;
- Proper trainings of farmers regarding the importance of HEIS and solar system will be carried out; and
- Relevant legislations, conventions, ESSs and guidelines must be respected.

Residual Impact: The impact related to sustainability of interventions will be of low significance after taking the above-mentioned mitigations.

6.10 Environmental Overview of Overall Landscape Along the Indus River

Though almost all of the proposed project activities are at farm level representing the tertiary /third tier in the canal irrigation network; yet these interventions are very closely linked with the overall irrigation system that wholly depends upon the flows in the Indus river and its tributaries. Therefore, an environmental overview of the overall landscape along the Indus Basin and the river is briefly given below.

In the context of climate change, the projected retreat of glaciers that supply the Indus River is a threat to water security and the sustainability of the water services in the Indus Basin. Floods and droughts risk the life and livelihood of millions of people, and migration driven by water stress is also increasing. Further, the extent and rate of melting of glaciers and snowpack in the Himalayas have a large influence on the flow of the Indus and hence on its quality (that is, capacity to dilute salts), but predictions for this also remain uncertain under future climate change scenarios are clearer.

The Indus Delta is an important landmark of Pakistan's coastline extending up to 150 km along the Arabian Sea, and is the most prominent ecological feature of the Sindh Coast. The

delta receives freshwater from the Indus River that flows through the delta before reaching the Arabian Sea. About 97 percent of the total mangroves found in Pakistan lie in the Indus delta. Geophysical factors/ changes affecting the mangrove ecosystems are mainly coastal erosion and deposition of sediments transported by the Indus. Due to reduced river flows and silt deposition in deltaic areas, the potential for new mudflat development is decreasing.

The landscape is amongst the most heavily irrigated across the globe, and canals can be found throughout the province. Weather extremes are notable from the hot and barren south to the cool hills of the north. Due to rich surface irrigation in the central Punjab, the fertile soils of the floodplains give a good per unit yield.

Groundwater use in the Indus Basin in Pakistan has steadily grown since the 1960s; and now groundwater has become a major supplement to canal supplies, especially in the Upper Indus Plain, where ground water quality is good. About 79 percent area of the province has fresh groundwater. Major part of the groundwater abstraction for irrigation is within the canal commands or in the flood plains of the rivers. However, the amount of abstraction varies throughout the area, reflecting inadequacy/unreliability of surface water supplies and groundwater quality distribution. Salinity is a major quality issue affecting groundwater in the Indus basin and is worsened by waterlogging and evaporative concentration of salts in irrigation water. The impact of monsoonal recharge of groundwater is significant. In the post-monsoon period, water tables in Punjab can rise by 0.5 meters, increasing the risk of waterlogging and salinization, particularly in areas with shallow groundwater. Further, the groundwater in Pakistan lacks regulation and monitoring, apart from likely depletion of groundwater reservoir, this situation has an effect on all water resources in the Indus Basin because of their interconnected nature in this alluvial environment.

The E&S risks and impacts mentioned above currently affecting the Indus River basin (desertification, cumulative impacts, including salinization and mangrove forest degradation of the estuary and all implication for coastal climate resilience and livelihoods) are at the broader landscape; **and cannot be directly attributed to project activities**. As no coastal belt falls in the project area; and as such there will be no impact on mangrove forest degradation or any implication on coastal climate and livelihood of the people; rather most of the project interventions are anticipated to contribute towards the effective use of ecosystem services.

7 ESMF Implementation

7.1 General

This chapter summarizes the mitigation, monitoring, and institutional measures to be taken during construction / implementation and operation / completion phases to eliminate adverse environmental and social impacts.

7.2 Key Steps for Environmental and Social Management

Environmental and Social (E&S) management will follow the below mentioned procedures closely linking with activity planning, design and implementation phases:

1. Preliminary environmental information including physical, biological and socioeconomic baseline data collection and analysis;
2. E&S screening and categorization of each subproject using E&S Screening Checklist (Attached as Annex-A);
3. Information disclosure & consultations;
4. Preparation of Environmental and Social Management Plan (ESMP)/screening checklists with mitigation measures / other instruments; and inclusion of social and environmental mitigation costs in the subproject document/cost;
5. Environmental and social clearances of ESMPs from WB;
6. Inclusion of ESMP/ other E&S instruments in bidding documents and Contractor's Agreement / MoUs signed with farmers/water user associations;
7. Implementation of ESMPs/ other instruments by the Contractors/WUAs and/or Farmers as the ESMP cost will be the part of Bill of Quantities (BOQ). Compliance of E&S instruments will be carried out by the Contractors/WUAs and/or Farmers; and
8. Monitoring the compliance of E&S instruments in field by Environmental and Social Management Unit (ESMU) of Project Management Unit (PMU).

Based on type of construction required, all preliminary information analysis, Environmental Assessments, ESMPs/ relevant E&S instruments must be completed prior to awarding of contracts for construction.

7.3 Capacity Assessment of Implementing Entity

The project will be implemented by the provincial Department of Agriculture (DoA), while Directorate General On Farm Water Management (DGOFWM) will be the implementing agency (IA). The DGOFWM has gained good experience of addressing Environmental and Social (E&S) issues/requirements by successfully implementing a World Bank funded "Punjab Irrigated Agriculture Productivity Improvement Program project (PIPIP)".

For PRIAT Project, the IA had adequate E&S implementation set up at Head Quarter level. Currently the IA has no Environmental and Gender Experts of relevant qualification and implementation experience, therefore, hiring of above-mentioned experts is needed to

ensure the compliance with WB, national and provincial level requirements. However, good support is available at headquarter level through newly established Climate Change Cell and from the designated district level staff i.e. Water Management Officers (WMOs) for physical E&S compliance at field level with the assistance from WUAs and/or Farmer. Apart from hiring and maintaining dedicated E&S Specialists proposed in this ESMF; all of these staff belong to regular/ permanent cadre of the Agriculture Department (Water Management) and would continue for PRIAT with necessary adjustments/ transfers/ re-designations, as and if required.

PIPIP is/was being implemented under WB SG policies, while this project, PRIAT will follow WB ESF. Similarly, PIPIP was implemented under the Punjab Environmental Protection Act, 1997 and National Environmental Quality standards (NEQS), while PRIAT will follow Punjab Environmental Protection (Amendment) Act, 2017 and Punjab Environmental Quality Standards (PEQS), 2016. Therefore, the IA may need further strengthening and capacity building of E&S staff for effectively meeting the additional requirements of ESF and updated/latest environment related legislation for implementing PRIAT subprojects/ activities.

Apart from this regular E&S set-up, Project Implementation Supervision Consultants (PISC) will be hired to support the PMU for overall PRIAT implementation and also ensure supervision and compliance with ESF, national and provincial level requirements in the field. Additionally, the effectiveness of these implementation and compliance is regularly validated and assessed by the Monitoring and Evaluation Consultants (MEC), as an independent/third party monitor.

For IPM implementation, the Agriculture Department has a specialized wing for Plant Protection i.e. Directorate General of Pest Warning & Quality Control of Pesticides with adequate set up at headquarter level for the implementation of the IPM throughout the Punjab province. Moreover, good support is available from the designated district/tehsil level staff for physical IPM compliance at field level.

7.4 Integration of Recommendations in Project Design / ESMF / Instruments

7.4.1 The Key Lessons Learnt and Integration in PRIAT Design/ESMF

The key lessons learnt during the ESMP implementation of the PIPIP are listed below.

- The institutional arrangements made by the IA to ensure ESMP compliance during installation of HEIS and improvement/rehabilitation/lining of watercourses by the field engineers were satisfactory and would continue to be followed in PRIAT;
- The adopted reporting mechanism of the department is also adequate and is serving the purpose however, the format was not comprehensive. It was also noted that the information pertaining to impacts identified and mitigation measures adopted was also not reported in detail especially community and occupational health and safety related issues. The current ESMF caters such gaps accordingly
- There were some gaps in the training of supervisors and other lower staff regarding ESMP compliance, who spend most of their time with farmers and working force

during construction. This ESMF has provided a detailed training framework to overcome this gap

- The laborers working on site especially during watercourses improvement are not familiar with using Personal Protective Equipment (PPEs), noise reduction techniques and solid waste management. Guidelines to prepare the OHS plan and training framework has been provided in this ESMF to address this gap; and
- The training component for farmers especially regarding safe usage of fertilizers and pesticides needs further strengthening. IPMF has been prepared as a part of this ESMF to eradicate this gap.

7.4.2 Good Practices

The PIPIP staff took some good initiatives while implementing ESMP and conditions mentioned in the No Objection Certificate (NOC) / environmental approval which are produced hereunder for record; and project will continue such practices under PRIAT

- Efforts were made for the capacity building of PIPIP staff and farmers through trainings;
- Efforts were made to ensure the compliance with ESMP and the conditions of NOC / environmental approval issued by EPA-Punjab;
- Third party was hired for monitoring and validation of ESMP implementation;
- The plantation was carried out by the WUAs under the supervision of WMO/Supervisor;
- The extra soil was disposed of properly at all sites and the leftover materials lifted up upon completion of works;
- All the conflicts have been resolved by the WUAs amicably under the supervision of OFWM staff; and
- Alternate routes were provided on all such sites to facilitate the people passing through the area.

7.4.3 Suggestions for Improvement

There is always room for improvement and opportunities for further enhancements; therefore, following are the recommendations, on the basis of lessons learnt from PIPIP. Efforts have been made to integrate these in Project Design /ESMF/ E&S Instruments:

- Sufficient budget should be allocated for the effective implementation of mitigation measures;
- Strengthening and capacity building through trainings/awareness sessions/workshops of the E&S staff;
- Induction of qualified Environment Specialist having additional experience in Occupational Health and Safety at construction sites in the existing staff of the Department at provincial level/ PMU;

- Additional vigorous efforts to be made by the proponent to arrange necessary trainings to departmental lower staff in field offices and farmers especially related to use of PPEs, operation of HEIS and to keep WUAs active for repair and maintenance after construction is required;
- Third party monitoring regarding the ambient air, noise and water quality as per PEQS, 2016 according to the monitoring plan and as per advice of Environment Specialist and ESMF/instruments should be carried out;
- More stringent monitoring and supervision of the compensatory tree plantation;
- The progress reports should be prepared using a comprehensive format;
- Information pertaining to impacts identified and mitigation measures adopted should be reported in detail in the progress reports;
- Roles and responsibilities of key players involved in the implementation of ESMF should be defined;
- Ensure the incorporation of ESMP/ E&S instrument in the contract Documents/ MoUs with WUAs to bound the Contractor/WUAs and or Farmers for compliance; and
- Engagement of relevant stakeholders, also with women in general and female farmers should be ensured for effective implementation of ESMF.

7.5 Subprojects Environmental and Social Screening

The Bank classifies all projects into four classifications: High Risk, Substantial Risk, Moderate Risk and Low Risk. In determining the appropriate risk classification, the Bank takes into account relevant issues, such as the type, location, sensitivity, and scale of the project; the nature and magnitude of the potential environmental and social risks and impacts; and the capacity and commitment of the borrower to manage the environmental and social risks and impacts in a manner consistent with the ESSs. The Bank has classified PRIAT as Moderate Risk on the basis of potential environmental and social risks and impacts.

All identified subprojects will be screened for E&S impacts using the E&S screening checklist given at Annex Q. Since exact extent and precise location/footprints of individual interventions (subprojects) to be implemented under the PRIAT are not known at this stage, therefore, a framework approach has been adopted for the present E&S assessment for this ESMF. This ESMF provides a screening procedure following the ESF for the type of instrument (Checklist with mitigation measures or ESMP) to be used before implementing a subproject. The components of the PRIAT project which may have adverse E&S impacts are listed below:

A. Community-driven Improvement of On-farm Water Conveyance Efficiency

- Improvement of unimproved watercourses.
- Extension of lining on watercourses.
- Reconstruction of outlived watercourses.

- Development of irrigation schemes outside canal commands.
- Development of pilot community based groundwater recharge schemes.

B. Promotion of Climate Smart Production, Diversification, Value Addition & Inclusive Access to Markets

- Installation of HEIS.
- Installation of solar systems for operating HEIS.
- Development of on-farm water storage ponds.
- Application of pesticide/fertilizer harvesting/processing equipment and other infrastructures (warehouses, collection centers and pack houses).

The screening criterion is based on the nature of activities and potential E&S impacts as described below:

High (H) -All those subprojects having negative environmental impacts and risks (sensitive, diverse, or unprecedented) will be categorized as High (H) Risk subprojects, though it is expected that no subprojects of PRIAT will fall under this category. In case such projects are identified, preparation and submission of Environmental and Social Impact Assessment (ESIA) will be necessary. However, such subprojects will be avoided under PRIAT.

Substantial (S) -All those subprojects having negative/adverse environmental impacts and risks, but which are less adverse than those classified as High Risk subprojects, will be categorized as Substantial (S) Risk Subprojects and for such projects, preparation and submission of Environmental and Social Management Plan (ESMP) will be necessary (Generic ToR for the preparation of ESMP is attached as Annex-S).

Moderate (M) -All those subprojects having low to moderate level adverse impacts and risks on environment will be categorized as Moderate (M) Risk subprojects. Most of these environmental risks and impacts are however temporary, site specific and largely reversible in nature and can be managed and mitigated through appropriate mitigation measures to acceptable levels. For such subprojects, preparation and submission of a checklist with mitigation measures/ ESMP will be required.

Low (L) -All those subprojects having negligible to no negative/adverse impacts and risks on environment, will be categorized as Low (L) Risk subprojects and for such subprojects, no further environmental assessment will be required following the initial screening.

Table 7.1 shows the PRIAT subprojects environmental screening anticipated classification and guides on preparation of relevant E&S management instrument/tool. The exact instrument will however be decided as per screening outcome of individual subproject.

Table 7.1: PRIAT Subprojects Environmental Screening and Categorization

Project Categories	*Type of Subprojects*	*Nature of Environmental and Social Impact*	*Env Category*	E&S Management Instrument / *Tools*
Community-driven Improvement of On-farm Water Conveyance Efficiency	Improvement of unimproved watercourses	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
	Extension of lining on watercourses	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
	Reconstruction of outlived watercourses	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
	Development of irrigation schemes outside canal commands	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
	Development of pilot community based groundwater recharge schemes.	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
Promotion of Climate Smart Production, Diversification, Value Addition & Inclusive Access to Markets	Installation of HEIS	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
	Installation of solar systems for operating HEIS	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
	Provision of certified orchard plants and vegetable seeds/ seedlings	NA	NA	NA

Project Categories	*Type of Subprojects*	*Nature of Environmental and Social Impact*	*Env Category*	E&S Management Instrument / *Tools*
	Development of on-farm water storage ponds	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
	Provision of soil moisture meters for irrigation scheduling	Likely to have negligible to no adverse environmental and/or social impacts.	L	No further E&S assessment is required after initial screening
	Development of on-farm irrigation advisory services (water budgeting & accounting) on watercourses	NA	NA	NA
	Development of infrastructures (warehouses, collection centers and pack houses)	Likely to have low to moderate adverse environmental and/or social impacts	M	Checklist with mitigation measures/ ESMP
	Promotion of harvesting, processing & value addition machinery, market development, etc.	Likely to have negligible to no adverse environmental and/or social impacts.	L	No further E&S assessment is required after initial screening
Project Supervision, Monitoring, Management, Awareness Creation and Capacity Building	Project implementation supervision consultants	NA	NA	NA
	Project monitoring & evaluation	NA	NA	NA
	Awareness creation, capacity development, strategic studies, buildings, technical assistance, etc.	NA	NA	NA
	Project management and supervision	NA	NA	NA
Contingent Emergency Response Component	---	NA	NA	NA

7.6 Provincial Regulatory Requirements to Conduct Environmental Assessment

The proposed PRIAT Project (including all subprojects) is located in Punjab Province, therefore the Punjab Environmental Protection (Amended) Act, 2017 is the core environmental law for the proposed Project. Under Section 12 (1) of the Act, it is mandatory for the proponents of the project[68] to execute the Initial Environmental Examination (IEE) and/ or EIA, where warranted, and get the approval from EPA, Punjab. Hence for the proposed Project, the EPA, Punjab is the concerned authority with respect to environmental approvals.

Review of IEE and EIA Regulations, 2000 provides screening categories of projects for which IEE or EIA need to be conducted. The proposed PRIAT Project falls under the Category 'E' of "Water Management, Dams, Irrigation and Flood Protection" of the Schedule II. This category requires an EIA study to be conducted to initiate the process of environmental approval. Therefore, a separate EIA will be prepared by the Client/ implementing agency to fulfill the provincial legal requirement.

7.6.1 Integration of E&S Management in Project Life Cycle

The E&S management steps described in above section (Key Steps for Environmental and Social Management) will be seamlessly integrated within the subprojects identification, preparation, appraisal, approval, and implementation cycle. E&S screening (described in above section i.e. Subprojects Environmental and Social Screening) will be carried out at the subproject identification stage. The subproject specific ESMPs/relevant instruments will be prepared, based on this ESMF, during the preparation/appraisal stage and same will be implemented during the implementation stage.

7.7 Key Institutions / Persons Involved in the Implementation of the PRIAT ESMF

7.7.1 DG-OFWM /PMU

The DG-OFWM / PMU, will be headed by PD who will monitor and coordinate all project implementation activities. PMU would serve as the lead implementing entity to monitor all project related functions with the support of line departments and field offices. Accordingly, PMU will also take lead in monitoring of ESMF compliance with the technical support of ESMU and respective E&S DESCs at district level.

7.7.2 Environment and Social Management Unit – PMU / DG-OFWM

ESMU will be established under PMU / DG-OFWM consisting of the following dedicated staff at provincial level:

- Environment Specialist;

[68] "No proponent of a project of public and private sector shall commence construction or operation unless he has filed with the Punjab Environmental Protection Agency an Initial Environmental Examination / Environmental Impact Assessment or where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment, and has obtained from the Punjab Environmental Protection Agency approval in respect thereof".

- Social Specialist; and
- Gender Specialist.

The ToRs for these specialists are provided in Annex-X

Overall responsibility of ESMU- PMU /DG-OFWM include:

- Supervising, facilitating and coordinating implementation of ESMF including E&S mitigation and monitoring plan;
- Closely follow up the integration of E&S assessment information and inclusion at the project development and design stage;
- Ensuring that Contractors/WUAs and/or Farmers follow WB ESSs, national, provincial and other requirements mentioned in the ESMF;
- Identifying any issues of non-compliance and report these;
- Preparing bi-annual monitoring and progress reports for submission to the WB;
- Suggesting mechanisms to link Contractors/WUAs and/or Farmers performance in relation to the ESMF to the timing of financial payments, incentives or penalties;
- Interacting with stakeholders for their concerns about the construction activities;
- Assisting PD in addressing and resolving environment-related complaints and grievances;
- Identifying and preparing environmental training materials and conducting environmental trainings;
- Monitoring and evaluation of social related matters of the project and maintain a social complaint register to document social issues;
- Ensure implementation of and remain the focal point for managing the project Grievance Redressal Mechanism (GRM) and maintain analysis and reports on types of complaints received, resolved, time taken to action, etc.
- Provide technical lead to the field teams regarding gender mainstreaming activities of the proposed subprojects;
- Linkages development with Non-Governmental Organizations (NGOs) and public-sector entities working on empowerment of women and marginalized segments of society;
- Ensure implementation of the Gender Mainstreaming and GBV, SH and SEA Action Framework and gender sensitive GRM;
- Ensure implementation of the Stakeholder Engagement Plan (SEP)
- Provide assistance and advice to field staff for resolving grievances related to gender arising on account of project implementation;
- Prepare Grievance Reports as and when required basis;

- At PMU level, maintain the record of all information, documents evidence and reports including progress reports, ESMF, third party monitoring reports, training reports, ESMPs and Screening Checklists etc.; and
- Reviewing ESMF and revising/updating it, if required.

7.7.3 Project Policy Committee (PPC)

The PSC will provide planning and strategic guidance for project implementation as well as facilitate interagency coordination at the highest level, make policy decisions for smooth project execution and constitute committee/s to resolve any policy-related issues.

7.7.4 Project Steering Committee (PSC)

The PSC will ensure coordination among all stakeholders, arrange bridge financing for local resources during any financial constraints from donors, modify implementation mechanisms for project interventions, if needed, annual work plans, amend eligibility criteria of different project activities and project implementation mechanisms, make necessary modifications/improvements in project implementation and modalities and resolve issues constraining the smooth implementation of the envisaged activities.

7.7.5 Project Implementation Committee (PIC)

The major functions of the PIC will be as follows: prepare an annual work plan, review physical and financial progress, coordinate and supervise project activities, ensure the implementation of decisions of the PSC, formulate mechanisms for transparent external monitoring of project activities and review monitoring reports and rectify shortfalls.

7.7.6 PISC

Roles and responsibilities of PISC will be:

- To oversee the performance of the Contractors/WUAs and/or Farmers to make sure that the Contractors/WUAs and/or Farmers is complying with ESMF including E&S mitigation and monitoring plan;
- Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner;
- Strong coordination with the Contractors/WUAs and/or Farmers and ESMU-PMU / DG-OFWM;
- Preparing training materials and implementing programs;
- To supervise and monitor environmental activities being performed at site;
- To organize periodic environmental training programs and workshops for the proponent and Contractors/WUAs and/or Farmers staff;
- Periodic reporting of ESMF including E&S mitigation and monitoring plan to ESMU / DG-OFWM; and
- Suggest any additional mitigation measures (if required).

7.7.7 Contractors/WUAs and/or Farmers

Contractors/WUAs and/or Farmers are also required to appoint/designate Environmental and Social Experts for onsite implementation of ESMF including environmental and social mitigation and monitoring plan.

The Contractors/WUAs and/or Farmers will develop Site Specific Environmental and Social Management Plan (SSESMP) and Site Specific Health and Safety Plans (SSHSP) (only for those sites which may require preparation of an ESMP according to the screening criteria as per advise of Environment Specialist) with the support of ESMU-PMU / DG-OFWM based on the guidelines and impact assessment provided in ESMF. The Contractors/WUAs and/or Farmers will also be responsible for communicating with and training of its staff in the environmental/social aspects with the support of ESMU- PMU / DG-OFWM before the commencement of the construction works. The Contract Agreement will have appropriate clauses to bind the Contractors/WUAs and/or Farmers for the above obligations.

7.7.8 MEC / Third Party

MEC/Third Party will be recruited by PMU to carry out independent monitoring regarding implementation of ESMF. The MEC will have Environment and Social Experts and shall carryout intermittent third party monitoring of the project. This will be done on bi-annual basis to evaluate the overall effectiveness of ESMF implementation for the subprojects financed under PRIAT.

PMU will ensure the timely hiring and engaging a suitable consultant/firm. For this purpose ESMU will be responsible for coordination; arranging site visits and providing necessary support to the MEC /firm. The objective of this MEC will be to review the entire ESMF and/or ESMPs (if required as per screening criteria) implementation process and its effectiveness, to identify any environmental and/or social issues caused by the project that may exist on ground, and to frame recommendations for course correction and to improve ESMF and its various components.

7.8 Institutional Arrangements

7.8.1 Implementation of ESMF during Construction / Implementation Phase

The DG-OFWM / PD-PMU, through ESMU, will be responsible for the overall implementation of ESMF as well as E&S performance of the project in accordance with the national, provincial and WB requirements.

The ESMF implementation arrangements have been suggested to keep it well aligned and synergetic with the overall project implementation and institutional setup as described below:

1) **Provincial Level**: The Environment and Social Management Unit (ESMU) will be established within the PMU. The ESMU will support the PD in all technical matters related to E&S management. The ESMU will be responsible for implementing all E&S related requirements including compliance monitoring, documentation and reporting. The ESMU will maintain liaison and coordination with the Deputy Director Agriculture (OFWM) at district level and Assistant Director Agriculture (OFWM) at tehsil level for the implementation of ESMF;

2) **Division Level**: At each of nine divisions of the Punjab, Director Agriculture (OFWM) offices will act as the Divisional Project Coordination Units (DPCUs) in Lahore, Gujranwala, Faisalabad, Sargodha, Sahiwal, D.G. Khan, Bahawalpur, Multan and Rawalpindi to help coordinate and supervise the project activities at the district and Tehsil level. The ESMU may maintain liaison and coordination Director Agriculture (OFWM) for the implementation of ESMF at the district and Tehsil level, if required;
3) **District Level:** Deputy Director Agriculture (OFWM), will be designated as the District Environment and Social Coordinators (DESCs) in their respective districts; and
4) **Tehsil Level:** The Tehsil is the lowest tier of the administration where the office of Assistant Director Agriculture (OFWM) carries out the execution of works through field staff. Assistant Director Agriculture (OFWM), will be designated as the Tehsil Environment and Social Coordinators (TESCs) in their respective districts. The TESCs will in turn supervise and coordinate through field staff with the Contractors/WUAs/Farmers for the actual implementation of the E&S related requirements including compliance during the project implementation.

The PISC will be responsible for the implementation of ESMF while MEC will be responsible for the third party monitoring.

The proposed institutional arrangement for the implementation of the ESMF is presented in Figure 7.1.

7.8.2 Implementation of ESMF During Operation / Completion Phase

The proposed project will be administrated by the DG-OFWM / PD-PMU, through ESMU, during the operation / completion phase. The PD and his staff (ESMU) will be responsible for the following:

- Coordinating with the operational staff to monitor environmental compliance during operation;
- Advising on, and monitoring tree plantations;
- Reporting on the progress of environmental compliance to the EPA-Punjab (if required);
- Sustaining a working partnership among the relevant stakeholders; and
- Reporting to PD-PMU about progress of the work.

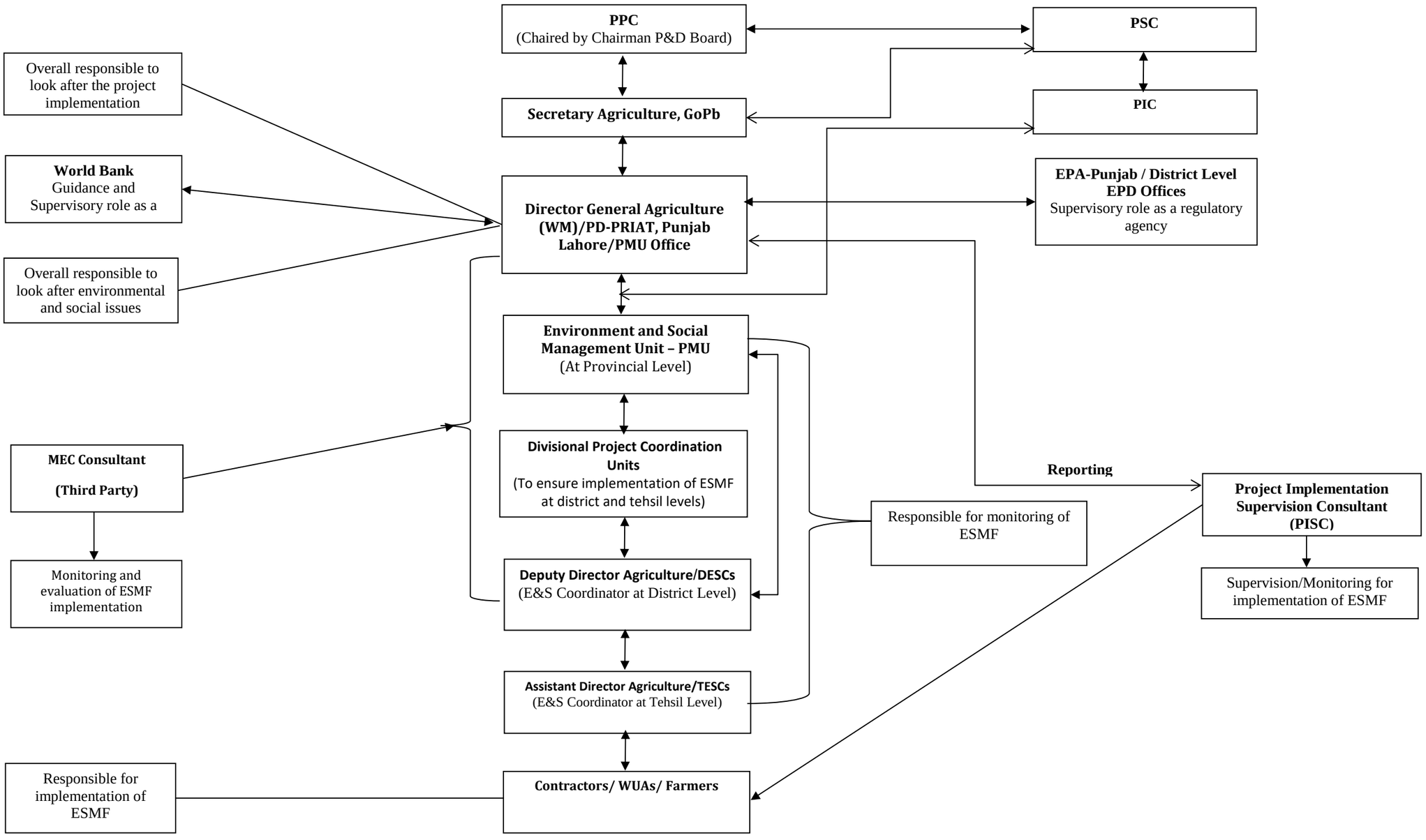


Figure 7.1: Institutional Arrangement for Implementation of ESMF

7.9 Environment and Social Management Plan

ESMP is a tool for the implementation of all the suggested mitigation measures to make the project environmentally sustainable. It provides an overall approach for managing and monitoring the environmental, ecological and socio-economic impacts arising out of the implementation of the proposed subprojects and describes the institutional framework and reporting mechanism to implement ESMP for the subprojects.

7.9.1 Scope and Objectives of ESMP

The scope of the ESMP includes the following phases of the proposed subprojects:

- Design / Planning Phase;
- Construction / Implementation Phase; and
- Operation / Completion Phase.

All the activities performed during these phases will be controlled and monitored according to this ESMP. The main objectives of the ESMP are:

- Provide project impacts along with the proposed mitigation measures, and a corresponding implementation phase;
- To ensure that all necessary corrective actions are carried out in time to counter any adverse environmental impact;
- To ensure the regular monitoring of those factors which may affect the safety of the environment under a systematic monitoring approach;
- Define the roles and responsibilities of the project Proponent and Contractor in order to effectively communicate environmental issues among them;
- Provide a procedure for timely action in the face of unanticipated environmental situation;
- Identify training requirements at various levels including project Proponent, Contractor /WUAs/Farmers and PISC;
- Provide a monitoring mechanism in the form of an environmental monitoring program, which includes monitoring parameters, monitoring frequency to ensure that all the mitigation measures are completely and effectively implemented;
- Provides estimation of environmental cost for the implementation of ESMP;
- Define the requirements necessary for documenting compliance with ESMP and communicating it to all the concerned regulatory agencies; and
- Provide other plans considering the project specific requirements.

7.9.2 Inclusion of Relevant Components of ESMP in Contract Documents

The ESMP will be included in the bidding/ contract documents and their implementation will be a contractual binding for the Contractors/WUAs and/or Farmers. To ensure the implementation of ESMPs by the Contractors/WUAs and/or Farmers, the ESMP cost will be

the part of BOQ. Compliance of E&S instruments will be carried out by the Contractors/WUAs and/or Farmers.

7.9.3 Environmental and Social Mitigation and Monitoring Plan (ESMMP)

ESMMP is considered as one of the main elements of ESMF. It will be used as the management tool for the implementation of mitigation measures. The plan includes following:

- The envisaged impacts as identified in EMSF and their recommended mitigation measures; and
- The person/organization directly responsible for adhering to or executing the required mitigation measures.

It is highlighted that although the responsibilities for executing and monitoring the mitigation measures have been delegated to different organizations, however, DG-OFWM will hold the primary responsibility for ensuring the full implementation of ESMF including ESMP. Table 7.2 provides information about all impacts to be raised due to subprojects activities during different phases of the project i.e. Design/ Planning/Pre-construction, Construction / Implementation and Operation / Completion. For detailed E&S impacts please refer to Chapter 6: Potential Environmental and Social Impacts and Mitigation Measures.

Table 7.2: Environmental and Social Mitigation and Monitoring Plan

Sr. No.	*Parameter*	*Project Impacts*	*Mitigation Measure*	*Implemented by*	*Monitoring Location*	*Monitoring Frequency*	*Performance Monitoring Indicators*	*Monitored by*			
								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
POTENTIAL ENVIRONMENTAL IMPACTS DURING PLANNING/DESIGN PHASE											
	Technical Design and Layout Planning	Incompatible layout plan and engineering design of the project's structures may cause seepage issues, damages of structures, interruption of water supply etc. Construction/improvement of watercourses, pilot community based groundwater recharge schemes and irrigation schemes, construction of infrastructure, installation of HEIS, and development of water storage ponds may create seepage if construction, design, siting and material are inadequate.	Technical design of the proposed project must consider all the above-mentioned factors for the final design and should meet all the local and international standards; Proponent must review and validate all the design considering the possible impacts (as mentioned) before the start of construction of proposed Project; Maximum wind speed will be considered for detailed design. Water storage tanks should be designed and located so as to avoid soil erosion and subsidence; Shortlisted/pre-qualified service providers should be hired; Ensure appropriate measures to facilitate the locals so that they can access their land and avoid from interrupting the water supply; Ensure hiring of skilled labor otherwise one representative of service providers should be hired to avoid economic losses to service providers; and Contractually after sale services should be ensured to WUAs/Farmers by service providers.	Design Consultant and DG-OFWM	Subproject Area	Monthly	Confirmation of design incorporation. Audits and Checks.	√	NA	NA	NA
	Hydrology and Water Resources	Improved water availability may prompt less efficient water use, increase in cultivation of crops, in particular, high water consumption crops, such as sugarcane and rice, causing reduced water availability downstream. Farmers may also turn to use groundwater, which may cause depletion water resources.	Hydrology, including both surface water and groundwater, should be studied before project design and monitored. Ensure avoiding groundwater depletion through surface water availability; Agricultural practices should be promoted, including selection of crops; and Awareness must be raised among the stakeholders on hydrological cycle, including climate change, especially in the south Punjab.	Design Consultant and DG-OFWM	Subproject Area	Monthly	Confirmation of design incorporation. Audits and Checks.	√	NA	NA	NA
	Seismology	A high intensity earthquake impacting the project site can adversely impact the proposed development (PGA: 0.08 to 0.16 g).	Adopt Seismic Building Code of Pakistan, 2007 (SBC-07) to comply with minimum requirements for seismic safety of structures.	Design Consultant and DG-OFWM	Subproject Area	Monthly	Confirmation of design incorporation. Audits and Checks.	√	NA	NA	NA
	Flora	Activities such as installation of construction camps[69] and mobility of construction staff may damage the local agriculture land/vegetation/trees.	Ensure minimize the cutting of trees, shrubs and herbs; Ensure the camp sites where minimum or no vegetation exists; Tree planation must be formulated; No subproject should be located within environmental sensitive area; and Critical areas of animal breeding and nests should be avoided.	Design Consultant and DG-OFWM	Subproject Area	Monthly	Confirmation of design incorporation. Audits and Checks.	√	NA	NA	NA

69 *Mostly the local labor would be hired due to small works, the establishing regular construction camps by the contractor(s) is unlikely. However, given measures would be taken, if needed*

Sr. No.	*Parameter*	*Project Impacts*	*Mitigation Measure*	*Implemented by*	*Monitoring Location*	*Monitoring Frequency*	*Performance Monitoring Indicators*	*Monitored by*			
								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
	Fauna	Movement of construction machinery and installations of construction camps (if required) may cause habitat loss especially birds' nests and affect the routes of the available wildlife.	Ensure to minimize the noise due to machinery movements and installations of camps; Wildlife movements and routes (if any) must be considered; and Extreme care should be taken to avoid mature trees and specially those providing nesting habitat to avifauna.	Design Consultant and DG-OFWM	Subproject Area	Monthly	Confirmation of design incorporation. Audits and Checks.	√	NA	NA	NA
POTENTIAL SOCIAL IMPACTS DURING PLANNING/DESIGN PHASE											
	Conflicts in Water Supply Rights	Increased irrigation water availability can potentially cause conflicts among the local communities due to unavailability of water to downstream users.	Ensure proper water distribution through "Warabandi System" through engaging WUAs and avoid conflicts; and Traditional water rights and concerns of locals must be considered while designing.	DG-OFWM	Subproject Area	Monthly	Minutes of meetings with WUAs	√	NA	NA	NA
	Public utilities	Due to the proposed subprojects, telephone lines, electric poles, wires, water lines etc. within the project area of proposed subprojects locations may require to be shifted	Maximum effort will be made to avoid the abovementioned public utilities, and if these are unavoidable than these will be relocated timely through the concerned department to avoid any public inconvenience	DG-OFWM	Subproject Area	Monthly	Complaints received and relocation completed	√	NA	NA	NA
	Risk of social exclusion	Marginalized groups may be marginalized from project activities	Ensure that project consultations reach all groups and the whole community is aware of venues and times of farmer's meetings. Communications campaigns to be launched for general public	DG-OFWM	Subproject Area	As needed	Communications outreach methods	√	NA	NA	NA
	Gender impacts	Men tend to overshadow females employed in agriculture, and the concerns of the latter may not be recorded	Female social outreach teams to be active throughout sub-project areas. Extension departments to hire trained women workers particularly for vegetable and fruit growing	DG-OFWM	Subproject areas	Monthly	Visits by female social organizers and extension workers	√	NA	NA	NA
POTENTIAL ENVIRONMENTAL IMPACTS DURING CONSTRUCTION / IMPLMENTATION PHASE											
	Soil Erosion and Contamination	Soil Erosion and Contamination may occur due to clearing of vegetation, unauthorized use of borrow areas, solid waste generated and by oil and chemical spills. Improper location/construction of pond can potentially cause soil erosion/subsidence. Surplus soil if inappropriately disposed can potentially cause blocked drainage and loss of cultivable land.	Ensure training of workforce in the storage handling and management of materials and chemicals; Material Safety Data Sheets (MSDS) will be strictly followed; Excavated soil will be disposed appropriately, site shall be restored back to its original conditions; Ensure proper location and design of structures; and Soils removed during construction would be stockpiled for reuse where possible.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks and photographic record Site restoration and rehabilitation.	√	√	√	√
	Excavation of Earth	There is a chance of finding archaeological remains. Mismanagement of the archaeological remains may result loss of a valuable asset.	Ensure immediate reporting to PISC for onward reporting to Director General, Archaeology Department, Punjab through Proponent to take further suitable action to preserve those antiques or sensitive remains. Chance finds procedure is given in Annex E Antiquities (Amendment) Act, 2012 must be followed. Ensure approval for excavation and submit the plan of rehabilitation of the site after excavation, if required; and Time scheduling to avoid excavation during rain.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks and photographic record Check and audits	√	√	√	√
	Surface and Groundwater Contamination	Surface water and groundwater may get contaminated due to the surface runoff,	Ensure that construction debris do not find their way into the drainage or nullah, canals and nearby river (where applicable) which may get contaminated;	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks Environmental monitoring,	√	√	√	√

Sr. No.	*Parameter*	*Project Impacts*	*Mitigation Measure*	*Implemented by*	*Monitoring Location*	*Monitoring Frequency*	*Performance Monitoring Indicators*	*Monitored by*			
								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
		liquid and solid waste during construction phase.	Prohibit washing of machinery and vehicles in surface waters; Wastes will be collected, stored and taken to approve disposal site; and Ensure compliance with PEQS, 2016 or international standards/guidelines, whichever is stringent will be followed).				sampling and testing reports as per monitoring Framework (as advised by Environment Specialist) Waste Management plan implementation				
	Landscape Changes	Landscape changes may occur due to visual intrusion from large piles of excavated and construction material. The proposed interventions under subprojects may cause damage to the agricultural land.	Ensure removal of material stockpiles and the area re-landscaped; Avoid damages to agriculture land and ensure compensation in case of damages; and Avoid use of heavy machinery within or near the agricultural land.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks Waste Management plan implementation	√	√	√	√
	Traffic Issues	Movement of project vehicles for construction material supply, traffic problems may arise for the commuters and transporters including traffic jams, soil erosion, debris flow, dust emissions, vibrational impacts, etc.	Ensure movement of project vehicles during the nighttime; Ensure controlled speed of the vehicles; Avoid damages to existing roads; and Ensure provision of proper sign boards.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Vehicle maintenance record Training record Implementation of TMP Regular visual checks	√	√	√	√
	Air Quality	Decline in the ambient air quality is expected construction machinery (excavator, tractor trolley etc.) and exhausts from generators (if used).	Vehicles, machinery, equipment and generators (if required) used should be kept in good working condition and be properly tuned and maintained; Construction materials and spoil materials will be transported through trucks covered with tarpaulins and all vehicles; Ensure compliance with the PEQS, 2016 and IFC/WHO guidelines whichever is stringent (if required or as advised by Environment Specialist); Ensure regular water sprinkling of the site; and Ensure regular visual monitoring of air quality.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks Environmental monitoring, sampling and testing reports, as per Monitoring Framework (as advised by Environment Specialist) Vehicle maintenance records Water sprinkling records.	√	√	√	√
	Noise/ Vibration	Noise and vibration will be produced due to the operation of construction machinery such as excavators, tractor trolley, water tanks and other equipment's, unloading of PCPS. The cumulative effects from several machines may be significant and may cause significant nuisances.	Ensure provision of PPEs to workers and train them in their use; Preferably, restricting construction vehicles movement during night time; Vehicles and equipment used shall be fitted, as applicable, with silencers and properly maintained; First aid kit shall be available at easily accessible location. Complaints will be recorded and responded to in a timely and professional manner; and Ensure the compliance with PEQS, 2016 and IFC/WHO guidelines whichever is stringent (if required or as advised by Environment Specialist)	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Physical observation Environmental monitoring, sampling and testing reports, as per Monitoring Framework (as advised by Environmenta Specialist) Vehicle maintenance records	√	√	√	√

Sr. No.	*Parameter*	*Project Impacts*	*Mitigation Measure*	*Implemented by*	*Monitoring Location*	*Monitoring Frequency*	*Performance Monitoring Indicators*	*Monitored by*			
								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
	Borrow Areas	Borrow areas, if additional soil required, may result in potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife.	Avoid soil erosion along the borrow pits and shall be regularly checked; Obtain written consent of the landowner/concerned for material (soil) borrowing; Keep photographic record (before, during, after) for borrow and disposal areas; Ensure borrow pits should not be filled with rainwater; Ensure training or workers; Ensure selected borrow areas are clearly demarcated, including the allowable depth of the excavation, before starting any soil removing; and Barren or unfertile land will be preferred to use as borrowing area.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks and photographic record Check and audits	√	√	√	√
	Construction Camps / Camp Sites[70]	Improper construction camp location and mismanagement of construction camp activities can lead to various social and environmental impacts which include health and safety, traffic problems, soil degradation, loss of vegetation and assets on the selected land, solid waste and water pollution. Furthermore, cultural differences, behavior of construction workers, potential disregard for local cultural norms can lead to increased tension between local communities and workers residing in the construction camps.	Avoid setting camps where their presence might contribute to any conflicts with locals; prefer locals for employment; Ensure preparation o comprehensive safety and security plan (If required / as per advise of Environment Specialist) for the camps; Site for construction camp will be selected at least 500 m away from the settlements and there should not be any ecological sensitive areas; Ensure compensatory plantation to be done when construction work near ends; Ensure proper waste management practices including safe handling, storage, collection and disposal of construction/municipal/hazardous wastes (liquid and solid) and the training of employees who handle waste (as advised by Environment Specialist); Ensure rehabilitation of site upon completion.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks and photographic record. Waste Management plan implementation	√	√	√	√
	Wastewater Generation at Construction Camps	Generated wastewater, If not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels, river etc. apart from soil contamination.	Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks (if required); Proper monitoring to check the compliance of PEQS, 2016 will be carried out (as per advise of Environment Specialist); and Ensure proper and safe waste management practices including wastewater collection, transportation and its disposal and the training of employees who handle waste (if required or as per advice of Environment Specialist).	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual observation Environmental monitoring, sampling and testing reports, as per Monitoring Framework (as advised by Environment Specialist) Waste Management plan implementation	√	√	√	√
	Solid Waste Generation	Different types of waste including construction, municipal and hazardous wastes are likely to be generated during the construction phase of the project. All these, if left unattended, can become a source of nuisance and environmental pollution in the subprojects area.	Endure safely disposed in demarcated waste disposal sites; Ensure training of work force in the storage and handling of hazardous materials and chemicals, waste minimization and reuse to reduce quantity of the waste; Address the accidental spillage of fuels and hazardous goods immediately;	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks and photographic record. Waste Management plan implementation	√	√	√	√

70 *It is expected that for all proposed subprojects, local labor / workers may be hired and returned to their residences on daily basis. However, this impact may be applicable where the contractor (s) needs to established the construction camp.*

Sr. No.	*Parameter*	*Project Impacts*	*Mitigation Measure*	*Implemented by*	*Monitoring Location*	*Monitoring Frequency*	*Performance Monitoring Indicators*	*Monitored by*			
								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
			Ensure immediate collection of spilled oils/fuels/lubricants; Construction waste should be crushed and reused in other sites, where possible; and Ensure that no waste or left over construction material is left behind in the cultivation fields.								
	Flora	Approximately 32,000[71] of trees / saplings including fruit trees (if any) may be affected during the clearance of RoW.	Ensure to minimize removal of trees/ saplings including fruit trees (if any); No Objection Certificate (NOC) must be obtained from concerned Forest / Agriculture Department (where required); Ensure the compensation of tree cutting to concerned parties i.e. local community, forest and other relevant departments (where applicable); A tree plantation program shall be formulated; and Ensure compensatory planting for three (03) trees against each fallen tree of similar floral function.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks Regular monitoring, audit and checks Departmental consultations record	√	√	√	√
	Fauna	Existing population of mammals and reptiles of the subproject areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery, movement of labor, camping, etc. The existing animals may leave the directly affected areas due to construction activities and human intervention. Birds as well will tend to move away from the construction area.	Care shall be taken during construction activities for avoiding purposely or chance killing of animals; Avoid o minimize mature trees and specially those providing nesting habitat to avifauna; The speed of construction vehicles should be limited to in certain limits to avoid killings of reptiles and other fauna. Hunting, poaching and harassing of wild animals shall be strictly prohibited, Provision of culvert for the movement of different faunal species may be provided (where required); Minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding; and Ensure compliance with PEQS, 2016.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Visual checks Regular monitoring, audit and checks Departmental consultation record	√	√	√	√
POTENTIAL SOCIAL IMPACTS DURING CONSTRUCTION / IMPLMENTATION PHASE											
	Community Health and Safety	Local communities may be affected due to roadside accidents, impact on quality of water resources, air (dust pollution), noise and vibrational impacts, diseases like HIV/AIDs and COVID-19, conflicts due to workers etc. due construction related activities.	To comply with WBG EHS Guidelines, 2007, prepare the site specific community health and safety plan in compliance with relevant sections of the WBG EHS Guidelines, 2007; Barricade work areas to prevent access by the public; Ensure medical training to specified work staff; Proper control on construction activities and oil spillage leakage of vehicles; Ensure labourers with different transmittable diseases will be restricted within the construction site; Efforts will be made to create awareness about road safety among the drivers operating construction vehicles; Timely public notification on planned construction works;	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Implementation of HSE Management Plan Use of PPEs Community concerns record Medical reports of worker (if required) Implementation of GRM Inspect fencing around the working area	√	√	√	√

71 Based on PIPIP experience, it is estimated that on average four (04) trees per watercourse may be affected. The PRIAT project involves improvement/extension of lining/reconstruction rehabilitation of eight thousand (8,000) watercourses. Therefore, 32,000 trees (4*8,000) are estimated to be affected.

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								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
			Close consultation with local communities to identify optimal solutions; Provision of proper safety and diversion signage; Setting up speed limits in close consultation with the local stakeholders; Ensure effective implementation of GRM; Ensure the compliance with PEQS, 2016 and IFC/WHO guidelines whichever is stringent (if required or as advised by Environment Specialist); Ensure training related to and health awareness to staff; Updated / latest guidelines by WHO / GoP may be observed to combat with COVID-19 (Annex-I); Ensure water sprinkling to suppress dust; and Ensure due care of the local community and observe sanctity of local customs and traditions by his staff.							
	Occupational Health and Safety	Occupational Health and Safety related impacts may arise during construction phase due to activities including earthworks, installation of PCPS, development of pilot community-based groundwater recharge schemes, construction of infrastructures (warehouses, collection centers and pack houses), installation of HEIS and solar system, construction of Contractor camps (if required), movement of machinery and manual handling during loading unloading operation, as result of these works there will be a direct impact on the health and safety of all staffs working in subprojects.	Ensure compliance with Punjab Occupational Safety and Health Act, 2019 and WBG EHS Guidelines, 2007 (refer Annex H-). The Farmers / WUAs / Contractor will prepare the site specific occupational health and safety plan in compliance with relevant sections of the WBG General EHS Guidelines, 2007 and chosen methodology; Provision of basic medical training to specified work staff and basic medical service to workers; Complying with the safety precautions for the construction workers as per applicable International Labor Organization (ILO) Conventions; Ensure training of workers in construction safety procedures, environmental awareness, equipping all construction workers with PPEs and monitoring their proper and sustained usage; Work areas will be cordoned off where necessary; Ensure the provision of fire prevention and firefighting equipment; and Ensure the provision of training related to emergency prevention, preparedness and response arrangements.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Implementation of HSE Plan Use of PPEs Training Records Work permits Implementation of Emergency response plan Accident/Incident reported. Implementation of GRM Inspect fencing around the working area	✓	✓	✓	✓
	Accessibility Issues	Local routes can potentially be blocked and may cause inconvenience to the nearby residents, visitors and will affect their daily life activities.	Ensure the provision of culverts at appropriate locations, if required; Ensure provision of alternate routes in case of temporary blocking, where required; and Ensure public awareness through media, appropriate sign boards and timely completion of the subprojects activities.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Regular observation and photographic record of transportation route, Road/track repair records, Compensation records for damages of trees and other infrastructure (if happens)	✓	✓	✓	✓
	Cultural / Religious Sites	Social issues arise if sites of cultural, or religious significance sites affected	Ensure that these sites are not affected by the construction related activities. Ensure trainings to workers; and	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Regular observation Implementation of GRM	✓	✓	✓	✓

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								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
			Ensure no disturbance to Graveyards during the construction activities.								
	Coronavirus Disease (COVID-19)	Coronavirus disease (COVID-19) may be introduced due to the immigration of workers associated with the proposed subprojects.	Ensure complete sanitization of workers at the sites as per updated / latest SOPs/guidelines issued by WHO and the national guidelines issued by the GoP[72] (refer Annex I); Ensure wearing of mask and gloves; Ensure social distancing measures; Ensure COVID awareness sign boards must be installed at the work site(s); Ensure prohibition of entry for local community/any unauthorized persons at work sites; Ensure proper hygiene practices in the toilets and washrooms will be implemented with proper and adequate use of soaps and disinfectant spray, where applicable; Observe sneezing and coughing etiquettes; Ensure the lunch breaks of the workers must be staggered to avoid the clustering of workers; Sick worker should immediately inform the focal person and get medical advice from nearby health center; and Ensure the vaccination of all working staff.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Implementation of HSE Plan Use of PPEs Training Records	✓	✓	✓	✓
	Labor Influx	Workforce from other regions which may result in conflicts between locals and non-locals concerning employment opportunities, wages and natural resources. Mobile workers can also contribute significantly to gender-based social impacts and risks. Other Issues related to labor influx includes Risk of social conflict, Increased risk of illicit behavior and crime, Increased burden on and competition for public service provision, communicable diseases and burden on local health services, etc.	Local population will be given preference in construction related jobs; Ensure the compliance with grievance redress mechanism should be established to resolve disputes or conflicts; Ensure due care of the local community and observe sanctity of local customs and traditions by his staff. Workers and service providers must be trained on cultural sensitivity; Ensure the compliance with updated / latest SOPs related to COVID-19; and Ensure that solid waste and wastewater is disposed of properly.	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Record register of all the issues and rational expectations desired by the local public; Implementation of GRM	✓	✓	✓	✓
	Risk of use of child labor or forced labor	Child labor is ubiquitous in agriculture, and forced labor may also occur in the form of exploitative tenancy agreements and contracts	Contracts with implementors and with partner farmers will clearly specify that no person below the age of 16 will be allowed to work on any project in any capacity. Similarly, contractors will be required to provide written agreements on wages and benefits to sub-contractors. All such agreements will be reviewed by ESMU	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Site visits	✓	✓	✓	✓
	Gender Issues	The induction of outside labor may create social and gender issues due to the labor force being unaware of local customs and norms.	Nominate person to address the specific risks; Bidding documents will include specific requirements that minimize the use of expatriate workers and encourage hiring of local workers, thereby minimizing labor influx; Ensure establishment of anti-sexual harassment policies that governs conduct in the workplace; and Provision of mandatory and repeated training to workers on sexual exploitation and abuse and	Contractor/WUAs/ Farmers	Subproject Area	Monthly /Weekly	Grievance redress record Minutes of meetings of community/ gender consultation	✓	✓	✓	✓

72 https://covid.gov.pk/guideline

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								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
			HIV/AIDS prevention and on the content and obligations derived from the code of conduct.								
POTENTIAL ENVIRONMENTAL IMPACTS DURING OPERATIONAL / COMPLETION PHASE											
	Loss of Soil Productivity	Soil fertility may be lost, depending on the agricultural practices, excessive use of agrochemicals, tilling, and inadequate crop rotation would result in decrease in soil organic matter, reduction in aggregate stability, damage to soil structure, and reduction in mineralization. Excess use of agrochemicals will also lead to soil pollution and destruction of soil fertility.	Agricultural practices to be promoted should enhance soil fertility; Use of hazardous chemical substances should be avoided; Soil analyses should be carried out in the fields to detect any salt build up, to avoid exacerbation of waterlogging, salinity and other undesirable characteristics; Occasional (say, once a year) flood irrigation may be considered to avoid salt build up in the soil, particularly where groundwater is used for irrigation; Ensure concrete lining to minimize potential for water logging; and HEISs help in minimizing water loss and potential water logging and result in efficient water use.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Soil testing Visual observation and checks.	√	√	NA	NA
	Reduced Groundwater Recharge	Improvement of watercourse while conserving water by reducing the water seepage from the water courses can also potentially reduce the groundwater[73] recharge thus affecting among others the drinking water source for the local population.	Ensure the watercourse lining to 50 percent in the areas with fresh groundwater. This will ensure adequate groundwater recharge from the remaining places.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Visual observation and checks.	√	√	NA	NA
	Air and Noise Quality	Major sources of noise and air emissions are vehicular traffic movement especially used for maintenance purpose, increased use of chemical inputs, operation of the HEIS on diesel engine, operation of crop harvesting and processing equipment and machinery.	Judicious use of the chemical inputs and use of alternate techniques (such as integrated pest management and using disease-resistant seeds) will be promoted through awareness raising and capacity building initiatives; HEIS should be installed in combination with solar system to avoid the emissions of GHGs from diesel engine; Trees planted as per tree plantation plan will also act as a noise barrier; and Ensure compliance with PEQS, 2016 or WHO/IFC Guidelines whichever is stringent will be followed, limits (if required or as advised by Environment Specialist).	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Visual observation and checks. Environmental monitoring, sampling and testing reports, as per Monitoring Framework (as advised by Environment Specialist)	√	√	NA	NA
	Breaching of Watercourses	Breach of watercourses will threat system sustainability and following factors may also fuel the deterioration process of watercourses: improper operation of water control facilities; tampering of outlets and siltation of watercourses, action of borrowing animals such as rats and porcupines will increase; and lack of coverage of hydraulic gradient.	Ensure proper monitoring of the system regularly and repair of damages should be on urgent basis; Ensure capacity building of the WUAs and communities; and Liaise with the WUAs communities to identify potential weaknesses in the system that could cause breaches.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Training records	√	√	NA	NA
	Water Borne and Water-related Diseases	Ponds constructed to store water can provide breeding areas for mosquitoes, potentially causing malaria and dengue.	Capacity building component of the project will address the importance of safe drinking water and hygienic practices, in particular, ways and means to	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Training records	√	√	NA	NA

73 The sources of groundwater recharge are: seepage from the irrigation systems, including ponds; application of irrigation water, rainfall etc.

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								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
			avoid malaria and dengue will be disseminated to the communities.								
	Disposal of Wastewater	Disposal of waste stream into the watercourses from nearby settlements may affect the surface water quality.	Proper monitoring of watercourses alignment and disconnect all identified waste streams would step down the significance of impact to low; and Sign boards should be erected at selected locations to prohibit disposal of waste in watercourses, where required	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Training records	√	√	NA	NA
	Periodic Cleaning and Maintenance	Non-functional WUAs, leakages and improper maintenance may result in unequal utilization of water and potentially cause silting and clogging of these channels.	Sign boards should be erected at selected locations to prohibit disposal of waste in watercourses; Through social mobilization and capacity building during the project, the sustainability of the WUAs will be promoted; and Efficiency of the system will be at its best by adopting proper maintenance activities such as silt removal and bed scratching at periodic intervals.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Training records	√	√	NA	NA
	HSE Considerations	Health and safety issues may arise due to improper handling of pesticides and herbicides, water storage ponds, injuries due to slipping and falling, electric hazard, exposure to chemicals, hazardous or flammable materials, spread of COVID-19 and poor handling of the solid waste.	Judicious use of the chemical inputs and use of alternate techniques (such as integrated pest management, using disease-resistant seeds, and mulching) will be promoted through awareness raising and capacity building initiatives; Ensure compliance with label requirement and/or FAO code of conduct and /or national legislation (whichever is stringent); Protective fencing would be erected around the water ponds; Ensure provision of PPEs and training to maintenance staff regarding health and safety issues; and COVID-19 SOPs must be fully adopted in accordance with the updated / latest WHO and GoP guidelines.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Training records Use of PPEs	√	√	NA	NA
	Intensification of Agricultural Land Use	Intensification of cultivation causing increase usage of crop inputs including fertilizers, pesticides, and herbicides. This may cause soil and groundwater contamination.	Judicious use of the chemical inputs and use of alternate techniques (such as integrated pest management, using disease-resistant seeds, and mulching) will be promoted through awareness raising and capacity building initiatives; Crop rotation practices will be promoted to avoid soil fertility degradation; and The capacity building program will also include safe handling of hazardous substances such as pesticides.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Training records Use of PPEs	√	√	NA	NA
	Soil Erosion and Contamination	Soil Erosion and Contamination may cause due to excavations, accidental spill of fuel and material spills, waste from processing unit, application of pesticides etc.	Ensure reuse of excavated soil; Waste and hazardous material, including fuel, must be handled, stored and treated so as not to cause soil pollution or pose threat to human health; The capacity building program will also include safe handling of hazardous substances such as pesticides; and Monitoring is carried out at specific locations for strict compliance to the developed ESMF in implementing measures to waste management.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Training records Implementation of Waste Management Plan	√	√	NA	NA
	Climatic Aspects	The project may affect local climate through rise in evapotranspiration losses from intensified Irrigation, modification in water use on the field, Vehicles and machinery operated with inappropriate fuel, will emit more GHGs, application of pesticides.	Ensure promotion of Irrigation and agricultural practices that reduce evapotranspiration of crops, including choice of crops; A water regime for rice cultivation that produces the least GHGs should be considered;	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Relevant Training records	√	√	NA	NA

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								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
			Ensure all machinery and vehicles in use must be well maintained and in good working condition and operated with designated fuel; Practices that benefit the material cycle of agroecosystems, instead of burning in open air, should be promoted for disposal of agricultural waste; and Awareness of farmers must be raised on climate change, water, synthetic agrochemicals, the environment, human health and livelihoods, agricultural problems that already exist, such as salinization and waterlogging.								
	Enhanced Use of Pesticides	Extended and indiscriminate use of pesticides has resulted in pest outbreaks as well as negative effects on people working in the agricultural fields and the surrounding environments (agro-ecosystem and kills non-target bio-control agents and environment friendly organisms including birds, the contamination of soil, water and chemical residues in the food chain).	Ensure regular medical checkup should be made to assess the sickness incidence of pesticide applicators; Awareness program should be conducted to avoid the inhaling pesticide emissions and handling; All the fruit and vegetable sample should be checked and verified on regular intervals and must be brought in the MRL; Ensure destruction and removal of the empty packages and pesticide remains without contaminating the water supply; Containers that have held pesticide formulations classified as highly hazardous or extremely hazardous must not be reused, however, slightly hazardous or unlikely to present acute hazard can be reused for purposes other than the storage of food, drink or animal feed; Concerted efforts by the Agriculture Department to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level; and Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as Annex J of this report.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Relevant Training records Use of PPEs Medical check-ups of Farmers	√	√	NA	NA
	Liquid and Solid Waste Generation	Wastewater and solid waste may generate by the workers during the maintenance related activities, operation of crop harvesting and processing equipment and machinery and from infrastructures (warehouses, collection centers and pack houses). These wastes can potentially cause soil and water contamination If not properly treated or disposed of.	Proper monitoring to check the compliance of PEQS, 2016 will be carried out (if required or as advised by Environment Specialist); Solid waste generated will be safely disposed in demarcated waste disposal sites; Ensure training of workers regarding waste minimization and reuse to reduce quantity of the waste; Ensure immediate collection of solid waste, no waste or left over construction material is left behind in the cultivation fields; and Organic waste, the rotten fruits and vegetables generated due to the processing unit, should also be used in the production of animal feed.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Relevant Training records Use of PPEs Implementation of Waste Management Plan Environmental monitoring, sampling and testing reports, as per Monitoring Framework (as advised by Environment Specialist)	√	√	NA	NA
	Flora and Fauna	No major impacts are anticipated on flora and fauna during operation / completion phase. However, excessive chemical inputs (fertilizers, pesticides, and herbicides) causing soil and water contamination, which in turn can	Tree planation must be implemented; The maintenance of the saplings/new plants must be monitored efficiently; and Judicious use of the chemical inputs and use of alternate techniques (such as integrated pest	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Monitoring of Plantation Relevant Training records	√	√	NA	NA

Sr. No.	*Parameter*	*Project Impacts*	*Mitigation Measure*	*Implemented by*	*Monitoring Location*	*Monitoring Frequency*	*Performance Monitoring Indicators*	*Monitored by*			
								ESMU-PMU-DG-OFWM	DESCs and or TESCs	PISC	MEC (Third Party)
		potentially harm natural vegetation, beneficial insects, birds, and other faunal species.	management and using disease-resistant seeds) will be promoted through awareness raising and capacity building initiatives.								
POTENTIAL SOCIAL IMPACTS DURING OPERATIONAL / COMPLETION PHASE											
	Improper Distribution of Water	Unavailability or improper distribution of irrigation water in the subproject areas will result social unrest in the area.	Proper water distribution through "Warabandi System" engaging WUAs should be ensured. Conflict avoidance and resolution are some of the key functions of the WUAs; Compensate downstream Farmers in case of any water rights losses; and Discourage spate agriculture.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Implementation of Warabandi System.	√	√	NA	NA
	Non Functionality of Water User Associations	Currently the WUAs are not functioning as they should, which has led to inefficient use of water resources and related facilities.	Roles of WUAs for each village should be redefined and their rules revised using a participatory approach; Farmers' awareness must be raised on climate change and groundwater recharge through participatory training; and WUAs should be encouraged to take an integrated management of water resources.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Relevant Training records	√	√	NA	NA
	Sustainability of Interventions	Proposed interventions such as HEIS and solar may not likely to be accepted by the growers. Any disruption in these high efficiency systems may cause water stress and associated damage to the crops.	Ensure strong and effective backup support to be provided by the suppliers through appropriate contractual clauses. This arrangement has been quite successful in providing after-sales support to the farmers during the on-going project; and Proper trainings of farmers regarding the importance of HEIS will be carried out.	WUAs / DG-OFWM	Subproject Area	Biannually / As and when required basis	Regular monitoring. Relevant Training records After sale service records.	√	√	NA	NA

7.10 Guidelines for the Preparation of Site Specific Management Plans

Prior to mobilization, within 30 days of commencement, the Contractors/WUAs and/or Farmers will develop SSESMP and SSHSP with the support / consent of ESMU- PMU / DG-OFWM based on the WB EHS guidelines (refer Annex A), which will be relevant to his chosen methodology and meet the requirement of this ESMF[74]. The Contract Agreement will have appropriate clauses to bind the Contractors/WUAs and/or Farmers for the above obligations.

Guidelines for various management plans have been prepared as a part of ESMF for the better management and implementation of ESMF during all phases of the proposed subprojects. However, these plans will be updated by Contractor (s)/WUAs and/or Farmers and approval from ESMU / DG-OFWM should be sought before start of construction activities. These plans are listed below:

- Tree Plantation / Reforestation Plan;
- Community Health and Safety Plan;
- Occupational Health and Safety Plan;
- Emergency Response Plan;
- Restoration and Rehabilitation Plan;
- Waste Management Plan; and
- Traffic Management Plan.

7.10.1 Tree Plantation / Reforestation Plan

The basic purpose of reforestation/afforestation/plantation of suitable species in the subproject areas is to reduce the risk been made due to cutting of trees for the proposed subprojects and to enhance green cover and improve the overall environment of the area. Reforestation will not only reduce the risk been made but will also increase the carrying capacity of the area regarding many positive aspects.

Afforestation will be done in those areas in which there is low forest cover or in areas which have been clearly felled and leave barren. Afforestation is highly important to maintain the biodiversity and ecological balances. It is also important to prevent global warming, soil erosion and pollution. Afforestation purifies the environment and helps in reducing the carbon dioxide level. Along with the importance of proposed subprojects to the local communities, the afforestation activity will further help in enhancing the socio-economic condition of the local communities. The spacing of the plantings should be wide enough to prevent competition for soil moisture, or when part of management, to accommodate machinery used for irrigation/ agriculture practices.

Based on the estimation, total cost of approximately 96,000 numbers of trees/plants will be 115.2 million PKR. The details are attached as Annex T.

7.10.2 Community Health and Safety Plan

[74] only for those sites which may require preparation of an ESMP according to the screening criteria as per advise of Environment Specialist

The community health and safety plan recognizes that project activities in general, and certain sub-projects that can potentially create health and safety risks for communities. The purpose of this plan is to inform community members of whom to call with questions or concerns, worksite hazards and monitoring protocol and strategies being used to protect the community from possible hazards. The construction activities and conflicts due to labour influx affect the nearby communities. The Contractor/WUAs/Farmers will take due care of the local community and observe sanctity of local customs and traditions by his staff. Local population will be given preference in construction related jobs. During construction phase, Contractors/WUAs and/or Farmers will be responsible for all to comply with WBG EHS Guidelines, 2007. Guideline for the Community Health and Safety Plan is attached as Annex V.

7.10.3 Occupational Health and Safety Plan

Health risks and work safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment due to storage, handling and transport of construction material. Workers should be provided with safe and healthy working environment taking into account risks inherent to the particular sector and specific classes of hazards in subproject areas. During construction phase, Contractors/WUAs and/or Farmers will be responsible for all to comply with WBG EHS Guidelines, 2007. Guideline for the Health and Safety Plan is attached as Annex U. The ultimate goal of the plan is to eliminate any injury to human and damage to facilities, materials and the environment.

The following measures are identified for health, safety, and environment protection during all activities of the proposed project to minimize risk of accidents, which could endanger the life of personnel, cause damage to properties and environment:

- All Contractor/WUAs and / or Farmer staff shall be well informed and trained on the HSE policies and guidelines;
- Contractor/WUAs and / or Farmer shall provide adequate health services as well as site first aid services for its workforce;
- Work safety measures and good workmanship practices shall be followed by the Contractor/WUAs and / or Farmer to ensure no health risks for workers;
- Provision of adequate sanitation, washing, cooking and dormitory facilities, if required;
- Proper maintenance of facilities for workers shall be monitored, if applicable;
- Provision of protective clothing for laborers handling hazardous materials, e.g. helmet, adequate footwear, protective goggles, etc. and Contractor/WUAs and / or Farmer will ensure strict use of wearing these protective clothing during work activities;
- A comprehensive Emergency Response Plan (ERP) should be developed and implemented at site;
- Accidents shall be reported to and investigated by the Contractor/WUAs and / or Farmer. All personnel shall be encouraged to report all accidents/incidents and to cooperate in the investigation of such occurrence. A comprehensive accident/incident report should be produced to ESMU / DG-OFWM for its review and necessary action;

- Adequate signage, lightning devices, barriers, and persons with flags during construction to manage traffic at haulage and access roads shall be conducted, as per advise of Environment Specialist;
- The communicable diseases of most concern during construction phase, like sexually-transmitted diseases such as HIV/AIDS, COVID-19 should be prevented by successful initiative typically involving health awareness, education initiatives, training heath workers in disease treatment, immunization program and providing health service;
- Reducing the impacts of vector borne diseases on long-term health effect of workers should be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease;
- All construction activities shall be properly managed through careful planning and the applicable and relevant HSE policies / guidelines; and
- Prior approval from ESMU's team should be sought before starting any construction related activity.

7.10.4 Emergency Response Plan

Emergency Response Plan (ERP) provides an overview of the procedures to mitigate and control the impacts on community, on occupational health and safety, on the environment and on the project in the event of emergency situations and to respond in life threatening situations usually occurring suddenly and unexpectedly during the construction and operational phases of the proposed subprojects under PRIAT. The Contractors/WUAs and/or Farmers will be responsible for the preparation of plan and implemented at site after prior review and approval from the supervisory consultant and proponent. Guidelines for ERP is attached as Annex M.

7.10.5 Restoration and Rehabilitation Plan

The implementation of the proposed subprojects may result in accumulation of large amount of unused or spoil material at various sites which will change the existing land cover in the subprojects areas. After completion of the construction work, it is required to restore the disturbed area to its original conditions wherever it is possible that is the sole responsibility of the Contractors/ WUAs/Farmers. Following are the measures have been suggested for the restoration of these areas:

- Material stockpiles shall be removed as soon as the construction work will be completed;
- All the construction, toxic and hazardous chemicals/materials shall be completely removed from the site;
- The area should be planted with indigenous vegetation that would require the initial establishment of fast growing grasses along with annuals and perennials, nitrogen fixing herbaceous legumes and non-legume shrubs to increase the soil conditioning and to stabilize the subproject sites;
- All fencing, if required, shall be removed and pits shall be backfilled;
- The reconstruction of interrupted drainage channels and pipes, where applicable, shall be carried out;

- Rehabilitation of affected roads should be carried out to avoid any inconvenience to the road commuters; and
- A clearance certificate from the ESMU has to be taken by the Contractor/WUAs/Farmers in this regard.

7.10.6 Waste Management Plan

Management of solid and hazardous waste is one of the most important issues during construction phase of the subprojects. The construction waste will include wastewater, oil spillage from machinery and solid waste (damaged or spoiled materials, temporary and expendable construction materials, etc.). Insecure and unhygienic disposal of the wastes may cause degradation of soil, land and water resources. However, a criterion has been developed for the solid and hazardous waste management at site. The criterion for plan is as follows:

- All the anticipated solid wastes should be collected through a properly designed solid waste management system, as per advise of Environment Specialist;
- Classification will be made based on organic waste, recyclable waste, reusable waste (for resource and recovery) and waste for disposal site. Based on the conditions of the region, organic waste should be frequently collected to avoid odour problems;
- Recyclable, reusable and waste for disposal site should be collected twice a week and on alternate days and should be transferred to a properly designed disposal site;
- The special strategy for safe handling, storage and use of hazardous substances/material should be developed and ensured at site;
- The sewage system for camps, if established, shall be properly designed to receive all sanitary wastewaters;
- Construction waste i.e. waste concrete, damaged PCPS, etc. should be disposed of at the designated areas; and
- Construction related staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of the waste for disposal.

Based on the above guidelines, Contractor(s)/WUAS/Farmers will be responsible for the preparation of site specific Waste Management Plan before the commencement of construction activities and its implementation at site after the prior review and approval from PISC and ESMU.

7.10.7 Traffic Management Plan

A comprehensive Traffic Management Plan (TMP) will be developed by Contractor / WUAs and/or Farmers mentioning routes to be followed for transportation of construction machinery and materials e.g. cement, gravels, sand, PCPS, HEIS, solar system etc. TMP will comprise following contents necessarily:

- Goals and objectives of plan;
- Purpose & Scope;
- Project specific traffic;

- Roles & responsibilities of Contractors'/WUAs/Farmers environmental personnel;
- Routes to be followed along with necessary maps;
- Transportation timing; and
- Mechanism to address road accidents (if occurs).

Guideline for TMP is attached as Annex L**.**

7.11 Chance Find Procedure

The purpose of these guidelines is to address the possibility of archaeological deposits, finds and features becoming exposed during earth removing and ground altering activities associated with the construction and to provide procedures to follow in the event of a chance archaeological find. The chance find procedure of archaeological deposits is attached as Annex K.

7.12 Monitoring Framework

Monitoring framework is also associated with mitigation plan during the different phases of the subprojects. It ensures that mitigation measures are being effectively implemented. The monitoring of the subprojects is very imperative for implementation of the ESMF. The ESMU / DG-OFWM will carry out the monitoring at the field level on a continuous basis while MEC will also carry out intermittent third-party monitoring of ESMF implementation.

7.12.1 Monitoring Mechanism

Monitoring of E&S management is an essential tool for assessing whether the adopted environmental and social management measures are meeting their stated objectives. Two complementary methodology approaches are being applied to monitor the proposed actions under the ESMF:

- Compliance monitoring; which checks whether the actions proposed by the ESMF have been carried out by visual observation, photographic documentation and the use of checklists prepared for the ESMF; and
- Effects monitoring; which records the consequences of program activities on the biophysical and social environment; as applicable, these effects are repeatedly measured by applying selected indicators.

The plan also defines the monitoring mechanism and identifies a set of verifiable monitoring parameters to ensure that all proposed mitigation measures laid down in the ESMF are completely and effectively implemented.

Monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be performed at three levels i.e. ESMU level, District level by DESC and Contractor/WUAs/Farmers. At Contractor's/WUAs/Farmers level, the environmental monitoring checklist will be filled on daily basis, or a*s per frequency and responsibilities defined in the ESMPs and concurred by concerned specialists,* by their environmental manager and countersigned by the representative of ESMU / DG-OFWM.

Table 7.3 provides environmental monitoring schedule for different stages of the proposed subprojects. A template form for environment and social monitoring is provided as Annex-Q.

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Table 7.3: Environmental Monitoring Framework

Sr. No.	*Receptor*	*Monitoring Parameters / Performance Indicator*	*Locations*	*Monitoring Mechanism*	*Monitoring and Reporting Frequency*	*Responsibility*	*Monitored by during Construction*
1	Water Resources/ Water Quality (as advised by Environment Specialist[75])	Compliance with all parameters as per PEQS 2016, WHO and FAO standards (whichever is stringent)	Within Subprojects Areas Sampling from nearby water bodies. One (01) Surface / Wastewater sample for each district. One (01) Drinking / Groundwater sample for each district.	Visual checks Discrete grab sampling and laboratory testing of water samples by EPA approved Laboratory for monitoring.	Once before the start of construction activities; On bi-annually basis during the construction; At least once a year during Operation phase.	Contractor/WUAs/Farmers Contractor/WUAs/Farmers Proponent	ESMU along with designated staff at district & tehsil level/PISC/MEC
2	Air Quality (as advised by EnvironmentSpecialist)	Monitoring of CO, CO_2, SOx, NO_x, HC and $PM_{2.5}$ PM_{10} and compliance with PEQS, 2016 and IFC/WHO guidelines (whichever is stringent) Condition of construction machinery, generators, and vehicles in terms of exhaust emissions. Covering and spraying of soil and temporary spoil piles.	Within Subprojects Areas One (01) point for each district.	Visual checks Onsite Ambient Air Monitoring EPA approved Laboratory for monitoring.	Once before the start of construction activities; On bi-annually basis during the construction; At least once a year during Operation phase.	Contractor/WUAs/Farmers Contractor/WUAs/Farmers Proponent	ESMU along with designated staff at district & tehsil level/PISC/MEC
3	Noise Pollution (as advised by EnvironmentSpecialist)	Compliance with dBA Leq. as per PEQS, 2016 and IFC/WHO (whichever is stringent)	Within Subprojects Areas One (01) point for each district	Visual checks Monitoring of noise level at site.	Once before the start of construction activities; On bi-annually basis during the construction; At least once a year during Operation phase.	Contractor/WUAs/Farmers Contractor/WUAs/Farmers Proponent	ESMU along with designated staff at district & tehsil level/PISC/MEC
4	Soil Contamination (as advised by EnvironmentSpecialist)	Soil contamination, uncontrolled solid waste disposal activities at sites.	Within Subprojects Areas One (01) point for each district Sites with severe contamination.	Visual observations and checks Sampling and laboratory testing for soil samples.	Once before the start of construction activities; On bi-annually basis during the construction; At least once a year during Operation phase.	Contractor/WUAs/Farmers Contractor/WUAs/Farmers Proponent	ESMU along with designated staff at district & tehsil level/PISC/MEC
5	Ecological Resources	Disturbance to natural habitat, wildlife, trees cutting.	Within Subprojects Areas	Visual checks to ensure that only marked trees are cut. Monitoring of Wildlife / birds hunting.	Monitoring and reporting on monthly basis during the construction stage.	Contractor/WUAs/Farmers	ESMU along with designated staff at district & tehsil level/PISC/MEC
6	Public Infrastructure / utilities	Disturbance or damage to public infrastructure/ utilities	Public infrastructures within the subprojects area. These structures will be verified prior to the start of construction.	Random visits and consultations with AP's.	Prior to the start of construction. Reporting will be done on the basis of recommendation.	Contractor/WUAs/Farmers	ESMU along with designated staff at district level/PISC/MEC
7	Waste Management	Collection, disposal, and management of solid and liquid waste.	Within subprojects areas	Random visits and consultations with AP's. Monitoring Checklists and Reports etc.	Daily	Contractor/WUAs/Farmers	ESMU along with designated staff at district & tehsil level/PISC/MEC

75 Since the project footprints are not finalized at this stage, therefore the no. of environmental monitoring sample can be decreased or increased, as per advice of Environment Specialist. However, keeping in view the extent of subproject activities, one sample for water, soil, ambient air and noise level has been considered for reference from each district.

Sr. No.	*Receptor*	*Monitoring Parameters / Performance Indicator*	*Locations*	*Monitoring Mechanism*	*Monitoring and Reporting Frequency*	*Responsibility*	*Monitored by during Construction*
8	Community around the subproject corridor	Use of common resources. Hindrance to mobility. Community health and safety	Communities within the area of influence.	Community consultations.	Prior to the start of construction and during the construction phase. Reporting will be done on the basis of recommendations of ESMU.	Contractor/WUAs/Farmers	ESMU along with designated staff at district & tehsil level/PISC/MEC
9	Labour Management	Child labour, employment conditions, workers' accommodation, Housekeeping, HIV/STDs, COVID 19 etc.	Within subprojects areas At construction camps (if established)	Consultations and medical check ups	Daily / *as per frequency and responsibilities defined in the ESMPs and concurred by concerned specialists*	Contractor/WUAs/Farmers	ESMU along with designated staff at district & tehsil level/PISC/MEC
10	Grievances Redress	Type and number of grievances / Social and Environmental Conflicts	Within subprojects areas At construction camps (if established)	Complaint register	Daily / *as per frequency and responsibilities defined in the ESMPs and concurred by concerned specialists*	Contractor/WUAs/Farmers	ESMU along with designated staff at district & tehsil level/PISC/MEC
11	Community/occupational health & safety	Compliance with WBG EHS Guidelines, 2007 Type and number of accidents	Within subprojects areas At construction camps (if established)	Consultations and complaint register	Daily / *as per frequency and responsibilities defined in the ESMPs and concurred by concerned specialists*	Contractor/WUAs/Farmers	ESMU along with designated staff at district & tehsil level/PISC/MEC
12	Gender Based Violence	Impacts on Women, Children, and Vulnerable Groups and related issues.	Within subprojects areas At construction camps (if established)	Community consultations	Daily / *as per frequency and responsibilities defined in the ESMPs and concurred by concerned specialists*	Contractor/WUAs/Farmers	ESMU along with designated staff at district & tehsil level/PISC/MEC

7.13 Capacity Building

To ensure the successful implementation of ESMF and compliance of the E&S mitigation measures, strengthening capacity of relevant PMU/ District Office technical staff and Contractors/WUAs/Farmers is essential. This will achieve through series of customized trainings and awareness sessions.

The objectives of the E&S trainings include providing basic knowledge and information on the key environmental and social issues associated with the proposed interventions under PRIAT subprojects.

Training/capacity building will cover three key areas and include: (i) E&S Orientation/ Awareness, (ii) ESMF Implementation; and (iii) E&S Management.

Table 7.4 below provides capacity building / training framework for the proposed subprojects.

Table 7.4: Capacity Building and Training Framework

Sr. No.	*Key Areas*	*Key Aspects to Cover*	*Potential Participants*	*Frequency of Training*
	E&S Orientation / Awareness	E&S awareness; Lessons learnt from PIPIP; WB Environmental and Social Standards (ESSs); WBG EHS Guidelines; Use of PPEs; GoPb Safety SOPs in Pandemic EPA-Punjab's requirements / regulations/guidelines / standards; Key E&S issues associated with the proposed subprojects; ESMF findings; Checklist /ESMP and its components; and GBV and GRM.	ESMU, Designated staff at District & Tehsil level, Contractors/ WUAs/Farmers, PISC staff.	At the start of the project; and Refresher afterwards as and when required.
	Gender Mainstreaming and GBV, SH and SEA Action Framework	Introduction to and Implementation of Gender Mainstreaming and GBV, SH and SEA Action Framework	ESMU, Designated staff at District & Tehsil level, Contractors/ WUAs/Farmers, PISC staff.	At the start of the project; and Refresher afterwards as and when required.
	ESMF Implementation	ESMF components; Key steps for the implementation of ESMF; Subprojects specific E&S issues and their mitigation measures; Subprojects mitigation measures compliance and monitoring requirements and monitoring Checklists used in the field; GRM & GBV; Checklist /ESMP implementation; and Documentation and reporting.	ESMU, Designated staff at District & Tehsil level, Contractors/ WUAs/Farmers, PISC staff.	At the start of the project; and Refresher afterwards as and when required

Sr. No.	*Key Areas*	*Key Aspects to Cover*	*Potential Participants*	*Frequency of Training*
	E&S Management	E&S mitigation plans; Community consultation and disclosure of information; Waste disposal; Health and safety issues during construction; Mitigation measures and their implementation; Importance of safe drinking water; Personal hygiene; Water conservation; and Prevention and cure of diseases such as malaria and dengue, COVID-19, HIVs and STDs.	ESMU, Designated staff at District & Tehsil level, Contractors/ WUAs/Farmers, PISC staff, Subproject Beneficiaries	On-going/informal

7.14 Reporting and Documentation

A robust reporting mechanism can enable project progress to be followed up, any prevalent hindrances to program implementation to be identified and rectification measures to be setup if so required. Such a system will allow project staff and WB to track the advancement of the program and reconcile these with the overall objectives and targets of the Project.

Regular and comprehensive reporting will be conducted during the subprojects execution. ESMU and respective DESC at district level shall ensure a constant surveillance of the subprojects progress and deliverables through preparation and submission of these reports. The reporting requirements are provided in Table 7.5.

Table 7.5: Reporting Requirements

S. No.	*Type of Reporting*	*Frequency*	*Responsibility*	*Submitted to*
1	Visit Reports and Consultation with Communities including Women (with date, time, venue and photographs)	Monthly/ Weekly	DESCs & TESCs	ESMU-PMU / PD
2	E&S Screening Checklists and Screening Reports	As and when required basis	DESCs & TESCs	ESMU-PMU / PD
3	E&S Monitoring Checklists	Monthly/ Weekly	DESCs & TESCs	ESMU-PMU / PD
4	ESMF Progress Reports	Quarterly, Biannual and Annual	ESMU-PMU/PISC[76]	PD-PMU and World Bank
5	Training Reports	Quarterly	ESMU-PMU, DESCs & TESCs	PD-PMU
6	MEC/ Third Party Reports	Bi-annually	PD / ESMU-PMU	PSC

The system for monitoring compliance with environmental mitigation measures provides periodic inspection, data compilation, and reporting of results. The PISC will utilize a

[76] Prepare the quarterly reports.

checklist to evaluate compliance with mitigation measures. Checklists serve primarily as guides for reviewing performance to determine general compliance with broad indicators, tentatively as follows:

- General conduct of work;
- Labor provisions and occupational / community health and safety;
- Air quality, dust control, noise control and site cleanliness;
- Traffic management;
- Drainage and wastewater;
- Solid waste and spoil handling and disposal;
- Protection of community values; and
- Environmental monitoring and other indicators selected for the work at hand.

The PISC will prepare quarterly/biannual reports that reflect performance of each contract over the period. Reports will be submitted to ESMU and respective environmental department, if required, as per the conditions mentioned in the NOC / environmental approval as part of the periodic project performance reporting requirement. Monitoring reports will also summarize the status of complaints under the GRM, as well as results of air, water and noise monitoring conducted by the MEC/third party.

7.14.1 Data Recording and Maintenance

All forms to be used for recording information during the environmental monitoring will follow a standard format which will correspond to the database in to which all the gathered information will be placed. Check boxes will be used as much as possible to facilitate data entry. Tracking system will be developed for each form.

7.14.2 Database

The database may include the following information:

- Training programs;
- Staff deployment;
- Non-compliances;
- Corrective actions;
- List of environmental data; and
- List of environmental data to be maintained:
    - Soil and land pollution;
    - Disposal of waste;
    - Water resources;
    - Fuel oil and chemical spills;

- Vegetation record;
- Noise and air pollution;
- Socio-economic data; and
- Ecological sensitivities.

7.14.3 Photographic Records

The Contractor/WUAs/Farmers will maintain photographic records, with the support and consent of DESCs and TESCs, during the implementation of the proposed subprojects. As a minimum, the photographic records will include the site photographs, camp sites and monitoring activities, etc.

7.14.4 Non-Compliance of the ESMF

The implementation of the proposed ESMF involves inputs from various functionaries. The Contractor/WUAs/Farmers will be primarily responsible for ensuring implementation of the mitigation measures proposed in the ESMF including ESMP, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of subprojects, for which the Contractor/WUAs/Farmers will be paid on the basis of monthly compliance reports. However, if the Contractor/WUAs/Farmers fails to comply with the implementation of ESMF including ESMP, deductions will be made from the payments to the ESMF including ESMP claimed under the heads of environmental components.

7.14.5 Review of Recorded Data

All the data and communication recorded and maintained by the Contractor/WUAs/Farmers will be periodically reviewed and checked by PISC and DESCs/TESCs and necessary actions will be recommended for Contractor/WUAs/Farmers to improve the recording and documentation. All the complaints in social complaint register shall be recorded in accordance with the project GRM. Resident complaints will be responded to in a timely manner and action taken recorded in accordance with the GRM.

7.15 ESMF Disclosure Requirements

Once finalized, the ESMF with Urdu translation of Executive Summary, will be disclosed on the official websites of GoPb and DG-OFWM. The executive summary in Urdu language will be shared with affected communities and locals. This will ensure the locals to be aware of the Project impacts, its mitigation, responsible staff and mode of implementation. Hard copies of these documents will also be maintained at all district offices. In addition, these documents will be disclosed on WB image bank. The subproject specific ESMPs will also be cleared by the WB and disclosed on relevant official websites.

7.16 ESMF Implementation Budget

The tentative cost estimates to implement ESMF is estimated as Rs. 335,894,988/- Details are provided in below Table 7.6. This tentative cost will be included in the overall project cost. This cost will be reviewed and firmed up periodically when the project footprints will be finalized at subproject level to ensure realism. Additional costs could be included in the

subproject specific ESMPs that would become part of each bidding/BOQ documents. The Contractor(s)/WUAs/Farmers however shall be paid against the actual execution with evidential proof of respective ESMF/ESMP/ relevant instruments activity.

Table 7.6: ESMF Implementation Cost Estimate

Sr. No.	*Parameter*	*Frequency*	*Unit Rate (PKR)*	*Quantity*	*Cost (PKRs)*	*Remarks*
A	PLANNING AND DESIGN / PRE- CONSTRUCTION PHASE					
Environmental Monitoring Cost						
1.	Water Resources/ Water Quality (as per advice of Environment Specialist) Drinking/Groundwater Sample=1 Surface Water / Wastewater Sample=1	Once	20,000	2*36[77]	1,440,000	This is one-time cost required prior to start of construction activities. Since the proposed subprojects footprints are not finalized at this stage, therefore the no. of environmental monitoring sample can be decreased or increased, as per advice of Environment Specialist. However, keeping in view the extent of subproject activities, one sample for water, soil, ambient air and noise level has been considered for reference from each district.
2.	Noise Levels (as per advice of Environment Specialist)	Once	2,000	1*36	72,000	
3.	Ambient Air Monitoring (as per advice of Environment Specialist)	Once	25,000	1*36	900,000	
4.	Soil Testing (as per advice of Environment Specialist)	Once	15,000	1*36	540,000	
Sub-Total A					2,952,000	
B	CONSTRUCTION / IMPLEMENTATION PHASE (Five-Years Cost)					
Environmental Monitoring Cost						
1.	Water Resources/ Water Quality (as per advice of Environment Specialist) Drinking/Groundwater Sample=1 Surface Water / Wastewater Sample=1	Bi-annual	20,000	2*36*2	14,400,000	This is the tentative cost for five-year period. Since the project footprints are not finalized at this stage, therefore the no. of environmental monitoring sample can be decreased or increased, as per advice of Environment Specialist. However, keeping in view the extent of subproject activities, one sample for water, soil, ambient air and
2.	Noise Levels (as per advice of Environment Specialist)	Bi-annual	2,000	36*2	720,000	
3.	Ambient Air Monitoring (as per advice of Environment Specialist)	Bi-annual	25,000	36*2	9,000,000	

77 Total no. of districts in Punjab.

Sr. No.	*Parameter*	*Frequency*	*Unit Rate (PKR)*	*Quantity*	*Cost (PKRs)*	*Remarks*
4.	Soil Testing (as per advice of Environment Specialist)	Bi-annual	15,000	36*2	5,400,000	noise level has been considered for reference from each district.
Sub-Total (B-1)					29,520,000	
B-2	Environmental and Social Management Cost					
1.	Environment Specialist	Monthly	300,000	01	21,978,360	This is the tentative monthly cost for five-year period. 10% increment/year has been considered while calculating the salary cost.
2.	Social Specialist	Monthly	300,000	01	21,978,360	This is the tentative monthly cost for five-year period. 10% increment/year has been considered while calculating the salary cost.
3.	Gender Specialist	Monthly	300,000	01	21,978,360	This is the tentative monthly cost for five-year period. 10% increment/year has been considered while calculating the salary cost.
4.	Training and Capacity Building Cost	Quarterly	300,000	4	6,000,000	4 events per year. This is the tentative cost for five-year period.
5.	Monitoring & Evaluation Consultant / Third Party Validation	Bi-annual	1,000,000	2	10,000,000	This is the tentative annual cost for five-year period.
6.	ESMPs Preparation	As required	NA	NA	10,000,000	Lump sum cost for five-year
7.	GRM Implementation Cost	Daily	NA	NA	3,000,000	Lump sum cost for five-year
8.	Implementation Cost of Gender Mainstreaming and GBV, SH and SEA Action Framework	Daily	NA	NA	7,000,000	Lump sum cost for five-year
9.	PPEs Cost	NA	NA	NA	5,000,000	Lump sum cost for five-year
10.	Tree Plantation Cost	NA	1,200[78]	96,000[79]	115,200,000	This is the tentative cost for tree plantation. The maintenance of trees will be ensured by WUAs/Farmers.

78 Estimated cost of single tree, as per discussion with Forest Department.
79 No. of trees to be planted in lieu of cutting of estimated 32,000 trees due to proposed interventions.

Sr. No.	*Parameter*	*Frequency*	*Unit Rate (PKR)*	*Quantity*	*Cost (PKRs)*	*Remarks*
11.	Cost of Mitigation Measures	NA	NA	NA	NA	Cost will be included in respective subproject bidding/ estimated costs.
12.	Other ESMU Cost (equipment, vehicles, laptop etc.)	NA	NA	NA	15,000,000	Lump sum cost for five-year
Sub-Total (B-2)					237,135,080	
Sub-Total B ((B-1)+(B-2))					266,655,080	Tentative for five (05) year project construction period. The cost shall be updated based on the current market prices during construction phase.
C	OPERATION & MAINTENANCE / COMPLETION PHASE (One Year Cost)- Optional					
C-1	Environmental Monitoring Cost					
1.	Water Resources/ Water Quality (as per advice of Environment Specialist) Drinking/Groundwater Sample=1 Surface Water / Wastewater Sample=1	Once	20,000	2*36	1,440,000	Monitoring cost for the one year.
2.	Noise Levels (as per advice of Environment Specialist)	Once	2,000	36	72,000	
3.	Ambient Air Monitoring (as per advice of Environment Specialist)	Once	25,000	36	900,000	
4.	Soil Testing (as per advice of Environment Specialist)	Once	15,000	36	540,000	
Sub-Total (C-1)					2,952,000	
C-2	Environmental and Social Management Cost (Optional)					
1.	Environment Specialist	Monthly	300,000	01	3,600,000	This is the tentative monthly cost for one-year period. This rate will be applicable in case of new hiring otherwise above adopted practice will be followed.
2.	Social Specialist	Monthly	300,000	01	3,600,000	This is the tentative monthly cost for one-year period. This rate will be applicable in case of new hiring otherwise above adopted practice will be followed.

Sr. No.	*Parameter*	*Frequency*	*Unit Rate (PKR)*	*Quantity*	*Cost (PKRs)*	*Remarks*
3.	Gender Specialist	Monthly	300,000	01	3,600,000	This is the tentative monthly cost for one-year period. This rate will be applicable in case of new hiring otherwise above adopted practice will be followed.
4.	Implementation of Integrated Pest Management Framework (IPMF)	NA	NA	NA	22,000,000	This is the tentative annual cost for five-year period. The breakup of this cost is provided in IPMF (attached as Annex J)
	Sub-Total (C-2)				32,800,000	
	Sub-Total C ((C-1)+(C-2))				35,752,000	Tentative for one (01) year project Operation phase, if required.
	Grand Total (A+B+C)				305,359,080	
	Contingency Charges			10% of Grand Total	30,535,908	
	Grand Total with Contingencies				335,894,988	

8 Grievance Redress Mechanism

The purpose of a GRM is to provide a forum for project stakeholders to be able receive and facilitate resolution of concerns and grievances of project-affected parties arising in connection with the project, in particular about the project's environmental and social performance. Such a mechanism allows for trust building amongst the stakeholders and prevent the aggravation of neglected issues into major community unrest. The GRM should be accessible, culturally appropriate and understandable for all stakeholders in the project and must be communicated to all relevant stakeholders.

8.1 Objectives and Scope of GRM

GRM is a tool for early identification, assessment and resolution on any complaints or disputes on the project activities. The overall objective of the grievance procedure is to ensure that complaints and grievances from local stakeholders are handled in a systematic and transparent manner in order to promote mutual confidence and trust during all stages of project development and operation. The specific objectives of the GRM are as follows:

- To allow stakeholders the opportunity to lodge complaints and raise concerns;
- To ensure that comments, responses, and grievances are handled in a fair and transparent manner;
- To mitigate or prevent adverse impacts on communities caused by the Project operations;
- To serve as an early alert system to project management of significant or recurring issues that might signal a systemic problem, and facilitate a resolution

8.2 Existing Systems

A review of existing GRM systems for the Agriculture Department shows that the Department installed a helpline in 2002-03 which remains active 12 hours a day (from 8:00 a.m. to 8:00 p.m.).80 Since February 2017, the helpline has been operated by Punjab Information Technology Board (PITB), and is dedicated to answering queries about the various initiatives for promotion of agriculture that the government has taken over the last few years.

Citizen engagement is dealt with by the Directorate of Information. The Directorate has a number of functions including monitoring of news on agriculture on the media, and clarifications of wrong information; managing the website of the Department and its social media accounts; preparation of press releases and video packages for the media; and planning and implementation of publicity campaigns. The Directorate has developed a Communications Strategy which is mainly concerned with information dissemination on government policy and promotions in the sector.

Process: Call agents sitting in PITB are trained to respond to a set of basic queries related to Agriculture. However, more specific or technical queries are referred to the department

80 http://www.agripunjab.gov.pk/helpline

through a software package known as the Citizen's Response Mechanism (CRM) which is designed to escalate the query to the relevant officer in the Department. There are 15 sub-sectors within the department to which queries are directed, including marketing, extension, agribusiness etc. Once calls are directed to concerned officers, they have 72 hours to answer the queries – normally done by making a recorded telephone call to the initiator of the query. The answer the expert gives is also recorded in the CRM in writing. The Department estimates that PITB gets about 20,000 calls per month related to agriculture, the vast majority of which are answered by PITB call agents. About 15 to 20 queries are forwarded to the Department through the CRM daily, and these are normally answered within the stipulated timeframe according to the Department.

In addition to the helpline, the Department is active on media, particularly social media. The Department runs a Facebook page (which, as of January 2022, had over one million followers) which is mainly used to relay information about agricultural subsidies and marketing campaigns. In recent years, there have been attempts to use social media to support extension services, and short advisory videos have been uploaded on YouTube. The Department has also initiated a few WhatsApp groups, with farmers who interact regularly with the Department. These are mainly used to convey messages on commodity prices in different markets.

The Department of Irrigation also runs a helpline where complaints can be registered.81 In addition, complaints can be filed through email, or through a plain paper application. The helpline operators at the Irrigation Department respond to basic questions on the Department's functioning. Some complaints are escalated to relevant personnel. Most queries are referred to monitoring staff, including field monitoring assistants and/or Senior Assistant Director Monitoring. When field staff receives a complaint, they enter details in a database known as the Complaints Management System (CMS) and generate a computer ID for it. From then on, the complaint is part of a database, and can be tracked online. Most of the complaints are related to water theft, lack of supply at the tail end, head or tail gauges missing, water course tampering. Field operators are expected to respond to complaints within four days of receipt. The resolution of complaints is recorded in the CMS.

The helpline number is advertised through posters in the Department's offices, and through boards placed at strategic locations near canal works. The Department is not active on print and social media.

While the above summarizes a brief review of existing systems, a more detailed review will be carried out within one month after inception to enable lessons learnt from existing systems to be incorporated into PRIAT's proposed GRM.

8.3 GRM Framework

The GRM Framework for PRIAT will provide mechanisms for project beneficiaries, citizens, and project and contractor staff to lodge their concerns and complaints. Given that the nature of complaints and resolution mechanisms for different stakeholders may vary, the overall PRIAT GRM will house the following sub-GRMs:

81 https://irrigation.punjab.gov.pk/complaints

- GRM for Communities – as per the requirements of the Stakeholder Engagement Plan (SEP)
- GRM for Project Staff/Workers/Labor – as per the requirements of the Labor Management Procedures (LMP)
- GRM provisions for Gender Based Violence, Sexual Exploitation and Harassment and Sexual Abuse (GBV/SEAH) – as per the requirements of the Gender Mainstreaming and GBV, SH and SEA Action Framework

Use of audio-visuals including photos, video materials with captions and edutainment materials will be encouraged for outreach and dissemination of information on the project and the GRM, and the step-by-step GRM submissions for the illiterate or undereducated people or people with disabilities. Toll-free call centers and automated voice systems will be provided as uptake channels for digitally illiterate people and people who do not own or have access to internet or smart phones. For grievances related to Gender-Based Violence, all levels of GRM should have a female officer who will communicate with the female complainant for follow-up and guidance with the GRM processes and referrals to GBV service providers.

The GRM will be disclosed to the stakeholders through written and verbal communication. The mediums to be used for this purpose are staff and community trainings and all inclusion in all project communications materials (brochures, flyers, social media, websites, advertisements, information boards at offices etc.)

8.4 Structure of the GRM

The GRM will function as a multi-tier grievance redress mechanism with designated staff at each level (ESMU, district level, and field offices). The project will setup a formal Grievance Redressal Committees (GRCs) at each level and suitable staff will be nominated to take the responsibility of GRM management throughout the processes. Electronic databases will be maintained at the ESMU, along with manual registers at district and tehsil level. It should be ensured that the database reflects all the manually registered cases in order to allow tracking of the complaints and their resolutions and evaluations.

GRCs will be established at the ESMU and any field offices that may be established for sub-project implementation to ensure accessibility for the aggrieved parties. The members of the GRC will include designated/notified PRIAT staff. Grievances will be received at multiple levels, which are most accessible for the complainants. Any unresolved grievances will be escalated to the next tier.

To address GBV-related complaints, the project will make certain the availability of a GBV-sensitive GRM with multiple channels to address a complaint. The gender specialist in the ESMU will be the focal person for properly handling GBV allegations including assessment of the nature of the complaint and seeking support from various GBV support channels. The PMU should have specific procedures for GBV including confidential reporting with safe and ethical documenting of GBV cases.

8.5 Process of Complaints

Steps involved in the resolution of the complaints are as follows.

A set of procedures for receiving, recording, and handling complaints should be available in the GRM. They should include procedures for recording, registering, and sorting grievances; conducting an initial assessment of grievances; referring grievances to appropriate levels or persons; determining the resolution process; making decisions, including parameters and standards for accurate and consistent decision making; directing relevant agencies responsible for implementing decisions; notifying complainants and other affected parties of eligibility, the resolution process, and outcomes; and tracking, monitoring, documentation, and evaluation.

Step 1: Receive, log and acknowledge the Complaint/Grievance

As part of the GRM, the grievances from the stakeholders or their representatives may be communicated verbally (in person or over a telephonic conversation) or in written form. All grievances communicated in any of these mediums shall be recognized and recorded. Once the grievance is recorded, a grievance number shall be allocated and communicated to the aggrieved. In case the grievance is assessed to be out of the scope of the GRM, a communication towards the same shall be made to the complainant, and an alternative mode of redress shall be suggested. As part of this acknowledgement a tentative timeline for the redress of the grievances shall be identified, in keeping with the process below. This acknowledgement shall be provided on the same day as the grievance is received.

A grievance log (or register) can be used to analyze information about grievance and conflict trends, community issues, and project operations to anticipate the kinds of conflicts they might expect in the future, both to ensure that the grievance mechanism is set up to handle such issues and to propose organizational or operational changes. Sometimes, enacting policies or other types of structural change can resolve grievances around a common issue, rather than continuing to settle individual complaints on a case-by-case basis

Step 2: Initial Review, Examine and Investigate the Complaint/ Grievance

Once the grievance is received and recorded on the subject and issue, the Grievance Officer shall identify the contractor or personnel responsible for resolving the grievance. The Grievance Officer and concerned department shall then undertake an enquiry into the specifics of the grievance. The aim will be to determine and analyze the cause of the grievance and subsequently identify suitable resolution measures. Depending on the sensitivity of the issue, a site inspection can be undertaken to check the validity and severity of the grievance. For this purpose, the Grievance Officer will also undertake discussions with the aggrieved concerned and external stakeholders. The inspection will be undertaken within three days of receiving the grievance.

Step 3: Resolve or Escalate Complaint/Grievance

Based on the case investigation, the grievance officer, in consultation with the concerned personnel, shall identify a suitable resolution to the issue. In case the issue is beyond the purview of the grievance officer at the GRC where it is received, it should be escalated to the higher tier GRC. All complaints shall be resolved within a maximum of 14 days. For assisting the communication of grievances, records of complaints (sex-disaggregated) will be maintained in the database at the PMU.

Step 4: Close and Prepare Outcome Reports

The records of the grievance register shall be updated every working week with the present status of the grievance. Once the grievance is resolved, and the same has been communicated to the complainant, the grievance shall be closed in the grievance register. The grievance register should also provide an understanding of the manner in which the grievance was resolved. These instances shall then serve as references for any future grievances of similar nature.

Step 5: Monitoring and Follow up

The Grievance Officers at the district and tehsil offices will update the Complaint/Grievance Register on a weekly basis to indicate resolved (closed-out) and unresolved cases, those pending with the GRC or with courts. The Grievance Officer will ensure that the status of all complaints/grievances is kept current and will brief the Project Director on a weekly basis on the status of all current complaints/grievances. On a monthly basis, the district and tehsil Grievance Officers will produce a summary status report and share with the ESMU. An annual sex-disaggregated qualitative review of a sample of complaints processed (ensuring variation such as along type of complaint, resolution status etc.) will also be undertaken to analyze the efficacy of the system. Regular monitoring of the grievance mechanism and its outcomes, particularly of trends and patterns, will be critical to ensuring to identify systemic problems and adapt practices accordingly.