West Bengal Major Irrigation and Flood Management Project (WBMIFMP)

(Funded by the World Bank and AIIB)

Environmental and Social Management Framework

SPMU- WBMIFMP
Irrigation & Waterways Directorate
Government of West Bengal
India

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Abbreviation

AIIB	Asian Infrastructure Investment Bank
APMC	Agricultural Produce Market Committees
ASI	Archeological Survey of India
BMP	Best Management Practices
C&D	Construction and Demolition
CCA	Certified Command Area
CEDAW	Convention on Elimination of All Forms of Discrimination against Women
CIB & RC	Central Insecticides Board and Registration Committees
CITES	Convention on International Trade in Endangered Species
CMS	Convention on Migratory Species
CPCB	Central Pollution Control Board
CRZMA	Coastal Regulation Zone Management Authority
CTE	Consent to Establish
DAP	Diammonium Phosphate
DG	Diesel Generator
DLLR	Dept. of Land and Land Reforms
DoA	Department of Agriculture
DPMU	District Project Management Unit
DPSP	Directive Principles of State Policies
DV	Damodar Valley
DVC	Damodar Valley Corporation
DVCA	Damodar Valley Corporation Area
E&W	East and West
EC	Electrical Conductivity
ECoPs	Environmental Code of Practices
EE	Executive Engineer
EIA	Environment Impact Assessment
EKW	East Kolkata Wetlands
ESIA	Environment and Social Impact Assessment
ESMF	Environment and Social Management Framework
ESMP	Environment and Social Management Plan
ESZ	Eco Sensitive Zones
ETL	Economic Threshold Level
FFS	Farmer's Field School
FPO	Farmer Producer Organisation
GAP	Gender Action Plan
GHG	Green House Gas
GoI	Government of India
GoWB	Government of West Bengal
GoWB	Government of West Bengal
GP	Gram Panchayat
GRC	Grievance Redressal Committee
GRM	Grievance Redressal Mechanism
HFL	High Flood Level
HTL	High Tide Line
IBRD	International Bank for Reconstruction and Development
IEC	Information Education and Communication
ILO	International Labour Organisation
IMD	Indian Meteorological Department
INM	Integrated Nutrition Management
IP	Indigenous People
IPM	Integrated Pest Management
IPNM	Integrated Plant Nutrient Management

ITDP / ITDA	Integrated Tribal Development Project / Agency
IUCN	International Union for Conservation of Nature and Natural Resources
IWD	Irrigation and Waterways Department
KoPT	Kolkata Port Trust
LARR	Land Acquisition Rehabilitation and Resettlement
LTL	Low Tide Line
M&E	Monitoring and Evaluation
MADA	Modified Area Development Approach
MGNREGA/S	Mahatma Gandhi National Rural Employment Guarantee Act / Scheme
MIS	Management Information System
MoEFCC	Ministry of Environment, Forests and Climate Change
MOP	Muriate of Potash
MSW	Management of Solid Waste
MTR	Mid-Term Review
NDC	Nationally Determined Contributions
NGO	Non-Government Organisation
NGT	National Green Tribunal
NPK	Nitrogen, Phosphorous and Potash
O&M	Operation and Maintenance
OP	Operational Policy
PAP	Project Affected Person
PCR	Physical Cultural Resource
PCR	Physical Cultural Resources
PESA	Panchayat Extension to Scheduled Area
PIA	Project Implementing Agency
PIM	Project Implementation Manual
PIs	Performance Indicators
PMU	Project Management Unit
R&R	Rehabilitation and Resettlement
RAP	Resettlement Action Plan
ROW	Right of Way
RPF	Resettlement Policy Framework
SAU	State Agriculture University
SC	Scheduled Caste
SEAC	State Level Expert Appraisal Committee
SEIAA	State Environment Impact Assessment Authority
SLF	Scientific Land Filling
SPCB	State Pollution Control Board
ST	Scheduled Tribe
ToR	Terms of Reference
TPP	Tribal People's Plan
TPPF	Tribal People's Plan Framework
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention for Climate Change
WB	World Bank
WBMIFMP	West Bengal Major Irrigation and Flood Management Project
WBPCB	West Bengal Pollution Control Board
WBSLGWRDA	West Bengal State Level Ground Water Resource Development Authority
WHO	World Health Organisation
WRIDD	Water Resource Investigation and Development Directorate
WTP	Water Treatment Plant
WUA	Water User Association

Chapter 1: Introduction

1.1 Overview of Damodar Valley Command (DVC)

River *Damodar* originating from Chota Nagpur Plateau at Latehar District in Jharkhand, flows through the districts of Lakhar, Hazaribagh in Jharkhand and enters Purulia District in West Bengal. It then flows through Dhanbad District in Jharkhand and border of Purulia District, to reach Bardhhaman District. In its lower stretches, the river bifurcates into *Mundeswari* River and Lower Damodar (*Amta*) Channel near the border of Bardhhaman and Hooghly Districts. Mundeswari outfalls into river *Rupnarayan*, after flowing through Hooghly and Howrah Districts, Lower Damodar (*Amta Channel*) debouches into river *Hooghly*, after traversing through Hooghly and Howrah Districts. River *Rupnarayan* also meets river *Hooghly* in its course towards downstream and the combined flow outfalls into Bay of Bengal.

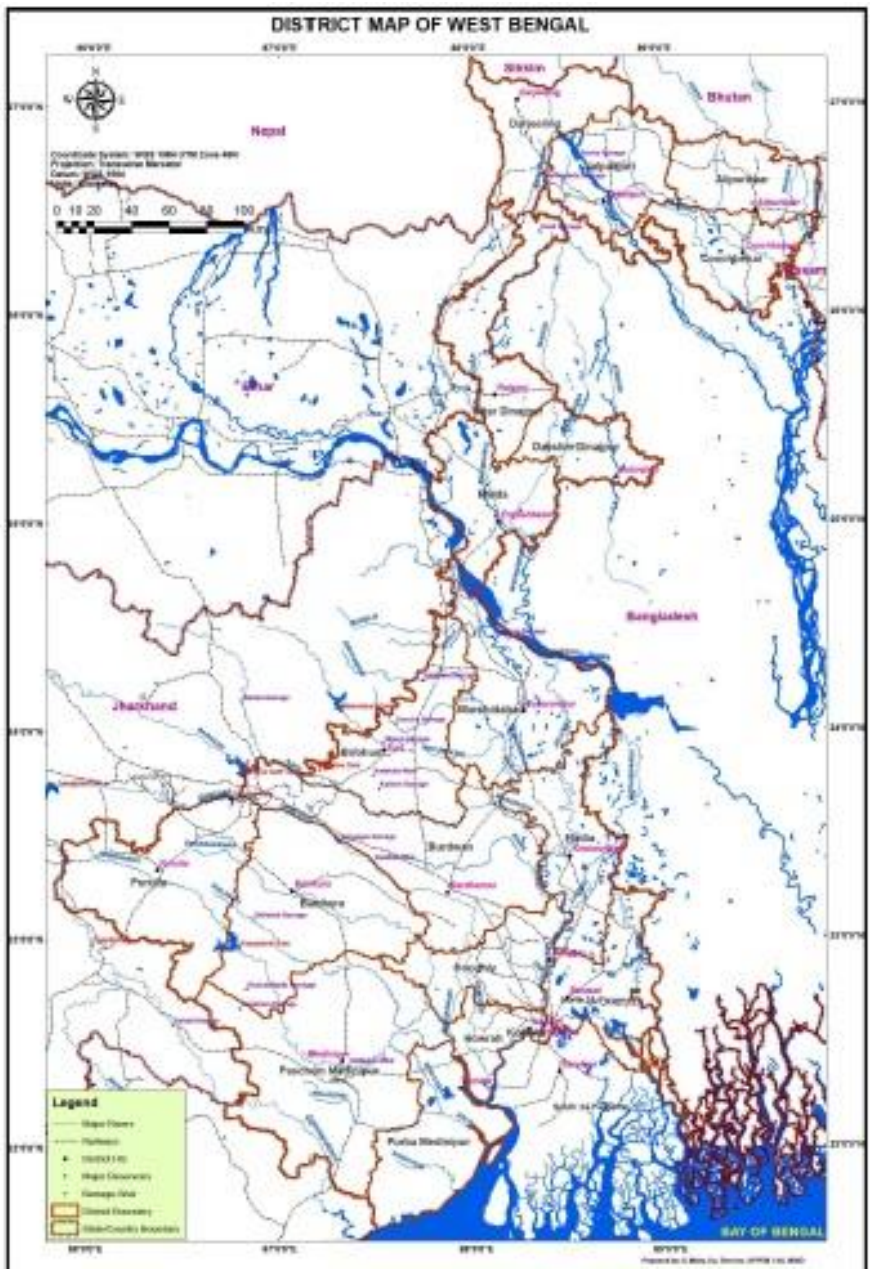

Figure 1: State map demarcating project district

There are 5 reservoirs across river Damodar and its tributaries in Jharkhand, 4 by Damodar Valley Corporation (DVC) under Ministry of Power, Government of India about 6 decades back and 1 by the Government of Jharkhand about 3 decades back. Mandate on DVC was primarily to control floods in West Bengal and to provide water for irrigation, as well as Municipal & Industrial uses in West Bengal and Jharkhand (erstwhile part of Bihar) and to generate hydroelectric power. Barrage at Durgapur across river Damodar is situated at Bardhhaman District. Irrigation canal network off taking from the barrage was constructed by DVC. West Bengal regularly receives its share of allocated and earmarked quantum of water from DVC reservoirs for irrigation (Kharif and Rabi), drinking and other municipal and industrial uses. Apart from the committed allocation, surplus water in the post monsoon season after meeting other committed needs is also released for irrigating Boro (post winter) paddy in West Bengal. Tenughat reservoir constructed by the Government of Jharkhand would also further help in

flood moderation in West Bengal as well as would provide more water for cultivating Boro paddy in the post winter period. So, availability of water at source is not an issue of concern.

1.1.1 Irrigation System

Command area of the DVC served by canal network having total length of around 2734 km in the downstream of Durgapur Barrage and spread over 41 Administrative Development Blocks in the districts of Bankura, East Bardhhaman, West Bardhhaman, Hooghly and Howrah. The DVCA canals currently irrigate around 332,000 ha in the Kharif season (out of a design area of 393,800 hectares), 20,000 ha in the Rabi season on the basis of an earmarked allocation, and an average of 28,000 ha in the summer (Boro) season, depending on the amount of water remaining in upstream reservoirs and after meeting the priority needs. The total area irrigated (including all sources of water) is approximately 100,000 hectares in Rabi and Boro season each. The main sources of water of those parts that are not covered by canal water are ground water, and household and village ponds.

The DVCA was developed more than six decades ago and is now degraded. Numerous regulating structures including cross and tail regulators, outlet gates, distributaries and minors have been severely damaged. Cross drainage structures, including aqueducts are damaged and are leaking, resulting in a loss of irrigation water. Tail end farmers are not getting the required amount of water at the time of need as per the irrigation schedule, and are using groundwater, especially during Rabi and Boro seasons.

Dilapidated regulating structures, silted up canal network, seepage loss of water in some critical zones of unlined canals, led to reduction of efficiency of irrigation management and scanty irrigation, particularly in tail reaches. As a result, gap between irrigation potential created, vis-à-vis utilized by surface water is increasing, in-spite of having adequate water availability at barrage point in normal monsoon years. Revamping of critically affected stretches of canal systems and structures and developing a suitable system for real-time operation and monitoring of irrigation by embracing latest technologies are the needs of the hour. Harnessing of post monsoon flow as well as tidal ingress in channels and rivers for irrigation during the lean season is also a major issue of development.

1.1.2 Flood Management

Flooding of extensive areas of the Lower *Damodar* is a frequent phenomenon within parts of Howrah and Hooghly districts causing significant economic damage and social distress. The situation occurs because these areas are on low-lying alluvial plains of the lower reaches of the river, a naturally accreting zone where tidal backwater restricts outflow of extensive floodwaters from the upland headwaters of the basin. Development of "Boro bunds" to store water in the summer season aggravates the situation.

Lower Damodar sub-basin adjoining the two branches of main Damodar, i.e. Mundeswari River and Lower Damodar (Amta) Channel measuring around 1.887 lakh hectare (1887 sqkm) spread over 2 Municipalities and 20 Administrative Development Blocks, is historically flood prone. Around 4.61 lakh people and 0.335 lakh hectare (335 sq. km.) of cropped area are affected annually due to flood related inundation. The major reasons of floods, water logging and drainage are:

1. Inadequate utilization of flood storage in upstream reservoirs for incomplete land acquisition;
2. Unresolved conflict on the issue of constructing embankments on both banks of river Damodar, vis-à-vis keeping one side unembanked;
3. Progressive rise of bed level of river Mundeswari at head reaches due to siltation, resulting in reduction of its carrying capacity and carrying lesser water particularly during low and medium floods;
4. Tidal effect at the outfall of channels and rivers, causing prolonged drainage congestion;
5. Inadequate capacities of drainage channels and outfall structures.

Although flooding cannot be eliminated altogether, there is scope of reduction of duration as well as extent of inundation, by revitalizing critical channels to facilitate more equitable distribution and quicker passage of flood water. Remodeling of regulating structures and various other structural measures are also required.

To improve the existing irrigation network, optimizing conjunctive and sustainable use of ground and surface water across in the project area and throughout the year, and to reduce flooding The Government of West Bengal (GoWB) has proposed "West Bengal Major Irrigation and Flood Management Project (WBMIFMP)". The Government of West Bengal (GoWB) has applied for USD 290 million financing from the International Bank for Reconstruction and Development (IBRD) and from the Asian Infrastructure Investment Bank (AIIB) towards the cost of the WBMIFMP.

1.2 Objective of the WBMIFM Project

The project aims at modernization of irrigation system, with special emphasis on conjunctive use of ground and surface water in the Damodar Valley Project Command Area of the State, in the districts of Purba& Paschim Bardhhaman/Bardhhaman, Bankura, Hooghly and Howrah and improvement of flood management infrastructure in Lower Damodar Sub-basin, mainly in the districts of Hooghly and Howrah. Prime objective of proposed project is to rejuvenate and rehabilitate existing irrigation network for sustainable development in DVC area and management of floods in Lower Damodar Sub-Basin in West Bengal. Proposed project has mainly three broader objectives namely 1) *Irrigation Management, 2) Flood Management and 3) Modernization of Hydraulic Assets.* Project will also promote conjunctive use of surface and ground water for agriculture. The expected results of the project are to improve irrigation in order to benefit agriculture in the DVCA, and to reduce annual flooding in the Lower Damodar sub-basin area.

1.3 Project Component

Component 1: Irrigation Modernization
This component aims to reduce operational water losses across the system and allow the available water to service a greater combined area across all crop seasons. The investment would include: (i) improving water conveyance and allocation and increasing storage potential; and (ii) strengthening institutions that are responsible for irrigation management.

Table 1: Sub-Components/Activities under Irrigation Modernization

Sl. No.	Sub-component/ Investment activity
I	Restoration of carrying capacity of Main & Branch Canals (Earth Work for Re sectioning Channel Section) throughout the area
II	Slope stabilization of critically affected reaches by PCC Block lining
III	Rehabilitation and upgradation of canal regulating structures wherever required
IV	Construction of gates/shutters at uncontrolled existing outlets
V	Providing controlled structures (Duckbill weir) at tail end of canals and other locations of Level 4 canals.
VI	Construction of rubber dams at identified location across rivers/channels
VII	Construction of water retaining structure over small rivers and drainage channels to create storage for use in Rabi crops
VIII	Adoption of Pressurized Irrigation system
IX	Augmenting induced recharge of ground water

Component 2: Irrigation Management.
This component would complement the irrigation system improvement under Component 1, with the aim of improving water delivery and allocation below the outlet level (effectively at tertiary command level). The investment would include infrastructure development, capacity strengthening and institutional reforms for improving irrigation at tertiary command level.

Table 2: Sub-Components/Activities under Irrigation Management

Sl. No.	Sub-component/ Investment activity
I	Automated gate operation with centralized control only in the main canal and offtake head regulators of branch canals
II	Development of framework of MIS system for monitoring and also development of mobile based apps
III	Capacity strengthening of IWD, operators, farmers & other Convergent Departments

Component 3: Flood Management

This component mainly aims to alleviate annualized flooding in the Lower Damodar sub-basin area. The investment would mitigate flooding hotspots by carrying out channel desilting works, flow regulation structure modification and embankment reconstruction at key locations. In close collaboration with the World Bank-funded Dam Rehabilitation and Improvement Project, the investment would also include measures to strengthen forecasting and analysis capability to improve dam operation and water storage management in upstream reservoirs. Opportunities will also be explored for ways to capture and direct wet season water in order to recharge groundwater.

Table 3: Sub-Components/Activities under Flood Management

Sl. No.	Sub-component/ Investment activity
I	Desiltation of Mundeswari river for a length of 20 km from Beguahana to further down stream
II	De siltation (Re-sectioning) of other smaller rivers and drainage channels
III	Armoring of Damodar Right Dwarf embankment to act as Broad Crested Weir to allow controlled spilling of flood water
IV	Improving Damodar Protected Left Embankment by providing adequate free board to withstand flood through construction of flood walls at identified locations
V	Improving Upper Rampur & Hurhura Channels by providing adequate freeboard through provision of flood wall on Left Embankments
VI	Raising & Strengthening of countryside existing earthen embankments to its design section of Damodar Left, Hurhura Left & Lower Rampur left embankments
VII	Protection / River training works on river Damodar / Mundeswari, Hurhura Khal, Upper Rampur and Lower Rampur Khals
VIII	Remodeling& Reconstruction of sluices at the outfalls of drainage channels

Component 4: Crop Diversification

This component would aim to reduce water demand by diversifying agricultural production towards crops that have a lower water requirement and provide higher income, in particular during Boro season. Indicators would include the proportion of the project area under crops that require less water.

Table 4: Sub-Components/Activities under Crop Diversification

Sl. No.	Sub-component/ Investment activity
I.	**Demonstration for diversification and support in Horticulture, providing infrastructure of cultivation and construction of low cost storage structure - Department of Food Processing Industries and Horticulture**
	Promosion on Cultivation of Hybrid Vegetable
	Infrastructure development for promosion of Vermi compost, protected cultivation and post harvest infrastructure
	Capacity strengthening of DPIUs and training of farmers and DPIUs officials
II.	**Agriculture Marketing Dept.**
	Organization Building (Promotion of small sized FPO) and convert them into farmer producer company (FPC) - 44 nos.
	Construction of aggregation centre/ pack house (1/ FPC)
	Providing equity grant and other financial support to the FPC
	Transport subsidy for procurement of motorized van (transportation support) to each FPC
	Training to the FPCs and departmental staff
III.	**Support for farm mechanisation, diversified cropping demonstration, to promote less water consuming and diversified cropping -Agriculture Dept.**
	Formation of Custom Hiring Centre (CHC) to facilitate farmers in hiring of farm machineries (Zero Tillage) at subsidised rate
	Crop demonstration on Cropping System, Diversification, SARP, SRI, Zero Tillage and Direct Seeding of Rice (Subsidy on Seeds, Pesticides, Fertilizer etc. to promote adoption of new farming practice)
	Capacity Building of farmers on Micro Irrigation, Water management, Farm Mechanisation and Packaging

Sl. No.	Sub-component/ Investment activity
	Training and exposure visit of farmers and departmental staff
IV.	**Promotion of cage based pisciculture along with one time sustainance support- Fisheries Department**
	Promotion of cage culture (prividing cages with appurtenants) in the main and branch canal and one time sustainance support (providing fish seed, fish feed, prophylectics, labour) to FPG/ SHG
	Capacity strengthening and training of departmental staff
	Training and exposure visit of SHG members, facilitators

Component 5: Project Management and Institutional Development
This component would support strengthening of the capacity for project management of both the IWD and the State Project Management Unit (SPMU), including, inter alia, procurement, financial management, and monitoring and evaluation.

1.4 Implementing Agency

Irrigation & Waterways Department, Government of West Bengal is the nodal agency to implement West Bengal Major Irrigation and Flood Management Project (WBMIFMP). To manage and oversee implementation of the project, there will be a State Project Management Unit (SPMU) and two District Project Management Units (DPMUs). The SPMU is headed by a Project Director in the rank of Chief Engineer and the DPMUs are headed by Additional Project Directors in the rank of Superintending Engineers (Civil). In addition to the dedicated SPMU and 2 DPMUs, four Irrigation Divisions (i.e. Howrah Irrigation Division, Hooghly Irrigation Division, Bardhhaman Irrigation Division and Right Bank Irrigation Division) under the Irrigation & Waterways Directorate have been identified for implementing field works of the project exclusively, and these Divisions are designated as District Project Implementation Units (DPIUs). Apart from IWD, Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept. and Fisheries Department of govt. of west Bengal will also be associated in the implementation of the project activities. There will be one Project Management Consultant (PMC) at SPMU level. PMC will assist SPMU in implementing entire project.

1.5 Project Cost

The project is to be co-financed by the World Bank and Asian Infrastructure Investment Bank (AIIB), jointly in equal proportion for USD 145 million each of the total loan amounting to USD 290 million (70% of the total estimated project cost of USD 413 million). Remaining 30% of the project cost, i.e. USD 123 million would be borne by the State Government.

1.6 Project Duration

The project will be executed over a period of five years, starting from 2018-19.

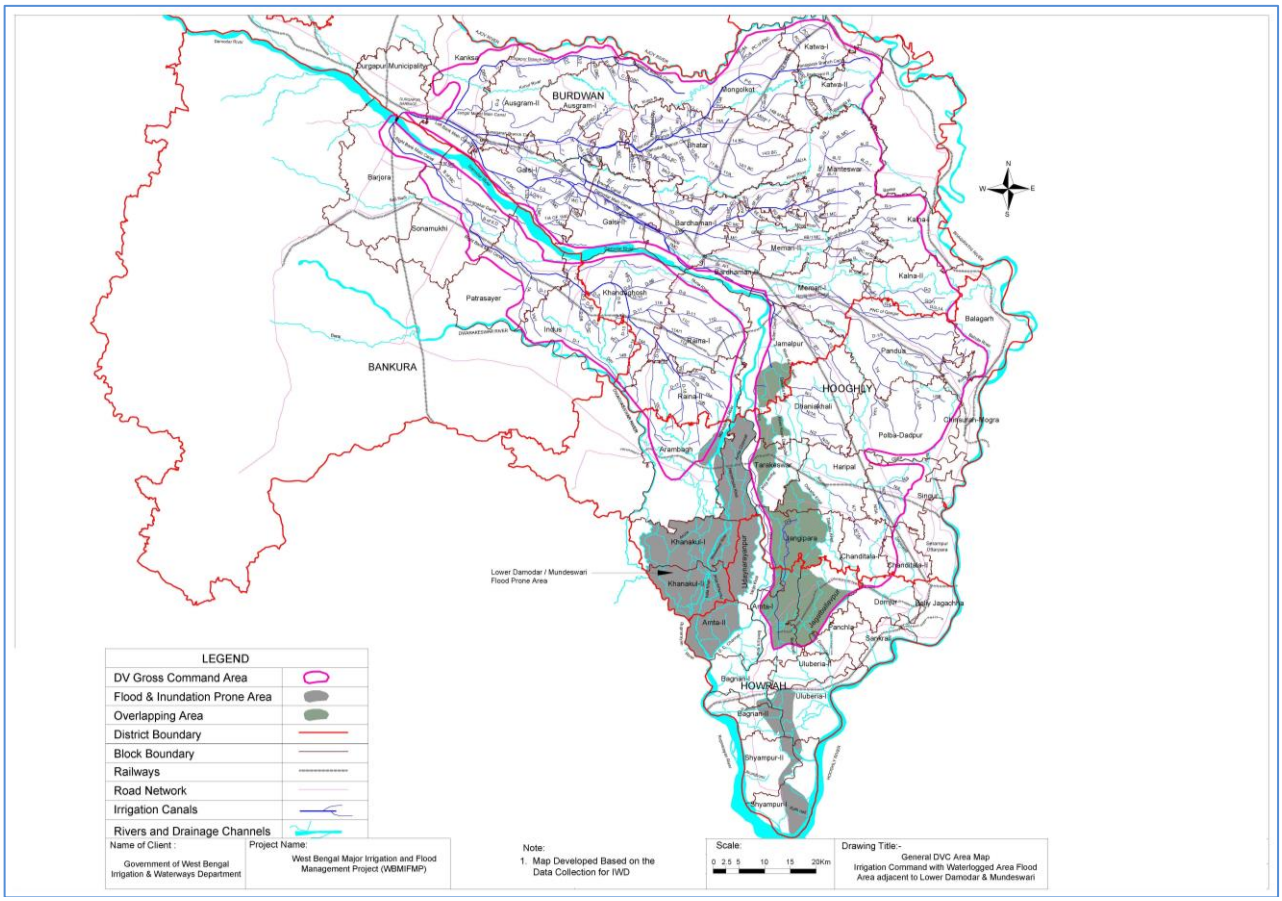

Figure 2: DVC map showing project area

1.7 Environmental & Social Categorization of WBMIFMP

The environmental and social risks and impacts related to the proposed project activities have been identified in a joint AIIB-World Bank mission. The project has been classified into 'category B' as per World Bank's Safeguard Policy OP 4.01 as its potential adverse impacts on human populations or environmentally important areas are limited, site-specific, and mostly reversible in nature. Also, mitigation measures can be designed to remove or reduce the potential negative impacts.

1.8 Purpose and Objectives of the ESMF

The IWD will avoid, minimize, and mitigate potential negative impacts of the project by adhering to India's national safeguard regulatory frameworks, the state's own safeguard regulations, and the principles and processes laid down in the Bank's OPs. The OP 4.01 requires that Environmental Assessment of the project be undertaken to examine the potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. Towards this, the IWD is undertaking the following:

- Environmental and Social Management Framework (ESMF)
- Environmental and Social Impact Assessment (ESIA) and Environmental and Social management Plans (ESMPs)

The exact scope, scale and location of the project activities will be evident after the feasibility study is completed and the preferred options for the project activities are identified and designed. Hence, at the current stage of project preparation, a 'Framework' has been developed to spell out the procedures for undertaking Environmental and Social Impact Assessment (ESIA) and preparing Environmental and Social management Plans (ESMPs) for the identified project activities. The 'Framework' called the 'Environmental and Social Management Framework' (ESMF) also describes the institutional arrangements and the monitoring mechanisms. The ESMF will also guide the environmental and social assessments for future activities to be

taken up by the IWD (that is for activities that are identified through the feasibility study but are not part of the current project).

This ESMF provides guidance to IWD and other associated line departments (e.g., Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept. and Fisheries Department) to ensure the environmental and social assessments and implementation of environmental and social safeguard requirements in compliance with the national guidelines, laws and regulations of the Governments of India and West Bengal, and in accordance with the World Bank Safeguard Policies.

This ESMF and its constituents (procedures for screening, procedures for environmental and social assessment, stakeholder consultation framework, Labour Influx and Construction Workers Camp Management Plan, Waste Management Plan, Integrated Pest and Nutrient Management Plan, Resettlement Policy Framework, Indigenous People Framework, Gender Action Framework) describe the overall environmental and social safeguard procedures to be undertaen during project preparation and implementation.

This ESMF will be an integrated part of the Project Implementation Manual (PIM) and will be applicable to all linked investment activities financed in the project area regardless of their funding source or implementing agency.

The application and implementation of the ESMF will therefore

1. Support the integration of environmental and social aspects into decision-making processes at all stages of the project cycle by identifying, avoiding, and/or minimizing adverse environmental and social impacts at an early stage;
2. Promote sustainable environmental and social outcomes through improved planning, design, and implementation of activities;
3. Minimize environmental degradation resulting from either individual project activities or through their indirect, induced, and cumulative effects; and
4. Ensure compliance with applicable laws and regulations of India, as well as with the requirements of the World Bank's Safeguard Policies.

1.9 Components of the ESMF

The ESMF will assist implementing agency IWD, and other line departments (Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept. and Fisheries Department) in identifying and mitigating potential environmental and social impacts early on and guide them in safeguards planning and implementation. The ESMF

1. Outlines best practices in safeguard policy implementation that will provide a useful guide for IWD;
2. Provides a categorization system to screen out potential environmental and involuntary resettlement issues, and possible impact on indigenous peoples;
3. Establishes the principles and processes for screening out project components with significant adverse environmental or social impacts;
4. Examines whether the mitigation of environmental impacts and risks meet the requirements of environmental laws and regulations of the Government of India, Government of West Bengal, and the World Bank's OPs;
5. Creates awareness among the executing agency, implementing agencies, and supporting departments of the Government of West Bengal, as well as participating agencies about the importance of safeguard requirements;
6. Guides the implementing agencies to conduct meaningful consultations with relevant stakeholders where required;
7. Guides the safeguard personnel of implementing agencies in preparing and monitoring the implementation of ESIAs and ESMPs;

8. Guides IWD on how to disclose information related to environmental and social issues to all stakeholders;
9. Outlines institutional arrangements for implementing safeguard planning instruments, monitoring and reporting, and for undertaking corrective action plans; and
10. Strengthens institutional capacity for safeguard compliance among implementing agencies, affiliated institutions and all associated contractors in the project.

1.10 Methodology of ESMF Development

A participatory and consultative approach has been adopted to prepare the ESMF. Project stakeholders at various levels, including small and marginal farmers (men and women), tribal farmers, line department personnel, technical experts, local CBO / NGO etc., were consulted. Their views and concerns have been incorporated in this document. The key activities undertaken in the preparation and finalization of the ESMF are as follows:

1.10.1 Desk Review of Relevant Documents

A detailed and in-depth review of existing information on the project and the project area was undertaken and covered the following:

- Environmental and social baseline of the project area;
- Central & state level legal and regulatory framework;
- World Bank operational safeguard policies and guidelines;
- Secondary data sources of the Government of India and the Government of West Bengal.

1.10.2 Field Visits

Field visits were conducted in five project districts. The selection of the visit locations within the project districts was based on the project intervention areas. Within each district, sample project blocks were visited, the proposed project interventions were discussed and its potential impacts were assessed. The field visits included visits to project sites and the nearby areas, consultation with different stakeholders at the district and sub-district level, consultation with the farmers (small and marginal, medium and large farmers), etc.

1.10.3 Stakeholder Consultations

Consultations were carried out with farmers, local service providers, state and district level line departments and agencies, extension institutions (for example, ATMA and Krishi Vignan Kendra), etc. The details of consultations held in the four districts are given in the table.

Table 5: Type of Stakeholders Consulted in Project Districts / Blocks

SN	District	Place	Stakeholders
1	Bankura	Vill. - Patrasayer, GP. - Patrasayer, Block- Patrasayer	1. Small farmers 2. Marginal farmers 3. Tribal Community 4. Women farmers / workers 5. Fishing Community 6. FPO 7. Dept. of Agri. 8. Dept. of Horticulture & Food Processing 9. Dept. of Agri. Marketing 10. Dept. of WRIDD 11. Dept. of Fishery 12. Dept. of Irrigation 13. West Bengal State Pollution Control Board
2	West Bardhhaman	Vill. - Malandighi, GP. - Malandighi, Block- Kanksa	
3	East Bardhhaman	Vill. - Tilkoria, GP. - Jarugrame, Block- Jamalpur	
		Vill. - Kaligram, GP. - Belkash, Block- Bardhhaman- 1	
4	Hooghly	Vill. - Nandanpur, GP. - Jagatpur, Block- Khanakul-II	
		Vill. - Fatepur, GP. - Chilidangi, Block- Pursura	
		Vill. - Ratanpur, GP. - Singur-II, Block- Singur	
5	Howrah	Vill. - Sarpai, GP. - Banichak, Block- Amta-I	
		Vill. - Pancharul, GP. - Pancharul, Block- Udayanarayanpur	
		Vill. - Rajapur, GP. - Bonibon, Block- Uluberia-II	

The details of the stakeholder consultation are provided in chapter 12 of this ESMF.

1.10.4 Disclosure

The draft ESMF report will be disclosed on the website of the IWD, the World Bank's website, and will be made available to the project stakeholders through all the Irrigation Division Offices in the project area. The executive summary of the document will be translated into the local language (Bengali) and made public at the divisional level.

1.11 Chapterisation& Report Presentation

Chapter 1: This chapter gives an overview of the project and methodology adopted for ESMF preparation, including stakeholder consultations.

Chapter 2: Safeguards overview, covering National and State acts / policies / regulatory framework are discussed in this chapter, along with World Bank Policies.

Chapter 3: The baseline overview of the project locations is discussed in this chapter covering environmental and social aspects.

Chapter 4: The impact identification process / screening process and methodological aspects are presented in Chapter 4.

Chapter 5: This chapter highlights analysis of alternatives and a comparative assessment of with project and without project scenario.

Chapter 6: The Environmental and Social Management Framework (ESMF) is discussed in this chapter covering key issues and its avoidance, mitigation and management aspects.

Chapter 7: This chapter highlights Resettlement Policy Framework (RPF), covering broad principles and a Resettlement Action Plan (RAP)

Chapter 8: This chapter discuss about nutrition and pest management aspects, covering INM and IPM.

Chapter 9: Gender aspects, including gender inclusion and equity issues are discussed in this section and a Gender Action Plan (GAP) is suggested for the project

Chapter 10: Tribal people and their inclusion in the overall project intervention is discussed in this section along with a framework that suggests greater participation and inclusion of tribals in the project.

Chapter 11: Monitoring and evaluation procedures, in line with the project components and activities, are discussed in this chapter.

Chapter 12: Overall consultation process, information disclosure mechanism and grievance redressal system are presented in this chapter.

Chapter 13: Institutional arrangement for the implementation of safeguards / mitigation measures, in line with the project level institutional arrangement is discussed in this chapter.

Chapter 14: A tentative budget for implementation of different safeguard measures, suggested in the ESMF are presented.

Chapter 2: OVERVIEW OF APPLICABLE LAWS AND REGULATORY FRAMEWORKS

This section discusses the policies, legislations and procedures for environmental and social assessment and land acquisition / resettlement, at the national and state levels. It also presents an overview of the environmental laws and regulations relevant for major irrigation works. Further, an outline of the environmental and social safeguards policies of the World Bank has been presented. As is evident from the section below, there are no substantial differences in principle between the two set of policies and operational procedures applicable -

2.1 National Policies

2.1.1 India's Constitutional Provisions

Article 48-A of India's Constitution lays down a directive principle noting that the state shall endeavor to protect and improve the natural environment. Article 51-A of the Constitution declares it a fundamental duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers, and wildlife, and to have compassion for living creatures.

2.1.2 National Conservation Strategy & Policy on Environment & Development, 1992

The National Conservation Strategy and the Policy Statement on Environment and Development respond to the need of environmental considerations and development process. The agenda for action in the policy looks in to the followings;

1. To ensure sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment;
2. To prevent and control future deterioration in land, water and air which constitute our life-support systems;
3. To take steps for restoration of ecologically degraded areas and for environmental improvement in our rural and urban settlements;
4. To prevent further damage to and conserve natural and man-made heritage;
5. To ensure that development projects are correctly sited to minimize their adverse environmental consequences;
6. To ensure that the environment and productivity of coastal areas and marine ecosystems are protected;
7. To conserve and nurture the biological diversity, gene-pool and other resources through environmentally sustainable development and management of ecosystems, with special emphasis on our mountain, marine and coastal, desert, wetlands, riverine and island ecosystems; and,
8. To protect the scenic landscapes, areas of geo-morphological significance, unique and representative biomes and ecosystems and wildlife habitats, heritage sites/structures and areas of cultural heritage importance.

Different instruments of action are suggested in the policy guidelines to achieve the objectives, which area as follows.

1. To carry out environmental impact assessment of all development projects right from the planning stage and integrate it with their cost-benefit considerations. Appropriate costs of environmental safeguards and regeneration would continue to form an integral part of the projects;
2. To ensure that all projects above a certain size and in certain ecologically sensitive areas should require compulsory prior environmental clearance;

3. To incorporate environmental safeguards and protection measures, in policies, planning, site selection, choice of technology and implementation of development projects like agriculture, water resource development, industry, mineral extraction and processing, energy, forestry, transport and human settlements;
4. To encourage research, development and adoption of environmentally compatible technologies; and to promote application of the modern tools of science and technology for conservation, bridging of large gaps in supply and demand as well as control and monitoring of natural resources;
5. To elicit and ensure participation of people in programmes for environmental improvement and for integrating the environmental concerns in planning and implementation of development programmes;
6. To create environmental consciousness through education and mass awareness programmes;
7. To aim at moderation of process of demand unleashed by the developmental process itself by taking measures to recycle waste materials and natural resources, conserve energy, conserve use of natural resources in industrial products by measures like wood substitution and generally try to reach moderation's in life styles consistent with sustainability and human dignity;
8. To develop appropriate organizational structures and a pool of professional manpower to serve as the cadre for environmental management service; and,
9. To effectively implement the various environmental laws and regulations for environmental protection through creation or strengthening of the requisite enforcement machinery.

2.1.3 National Environmental Policy, 2006

India's National Environmental Policy, 2006 seeks to extend the coverage and fill in gaps by building on earlier policies such as the National Forest Policy, 1988; National Conservation Strategy and Policy Statement on Environment and Development, 1992; and Policy Statement on Abatement of Pollution, 1992. This policy intends to mainstream environmental concerns in all developmental activities. The objectives of the National Environment Policy 2006 are:

(i) Conservation of critical environmental resources;
(ii) Intra-generational Equity (Livelihood Security for the Poor);
(iii) Inter-generational Equity;
(iv) Integration of Environmental Concerns in Economic and Social Development;
(v) Efficiency in Environmental Resource Use;
(vi) Environmental Governance; and
(vii) Enhancement of Resources for Environmental Conservation.

2.1.4 National Water Policy, 2012

The nodal ministry for implementation of the policy is the Ministry of Water Resources of the Government of India. It is stated in the policy that water should be treated as an economic good so as to promote its conservation and efficient use. In the preamble, it is stated that water availability for various users including agriculture will be under strain in future due to a range of causatives like increasing needs of growing population, wastage, inefficient use and pollution etc. The policy mentions that, depletion of ground water should be arrested by introducing improved technologies of water use, incentivizing efficient water use and encouraging community-based management of aquifers. The policy emphasizes water basin and sub-basin level. The policy notes that climate change is likely to increase the variability of water resources affecting human health and livelihoods. Therefore, special impetus is to be given towards mitigation at micro level by enhancing the capabilities of community to adopt climate resilient technological options.

2.1.5 National Agricultural Policy, 2002

The policy seeks to promote technically sound, economically viable, environmentally non-degrading and socially acceptable use of natural resources – land, water and genetic endowment to achieve sustainable development of agriculture. The policy while stressing on conjunctive use of surface and ground water intends to promote on-farm management of water resources to optimise use of irrigation potential.

2.1.6 National Policy of Farmers, 2007

The Policy notes non-availability of adequate water for irrigation as a major constraint in achieving higher productivity and stability of farming in many parts of the country. It recognizes water as a public resource and not a private property and there is need to evolve mechanisms for just and equitable sharing of water and to include local communities in managing water resources. It stresses on rainwater harvesting and aquifer recharge for ensuring sustainability of supply and the need for regulation and control of the development and management of ground water resources.

The National Policy for Farmers was formulated in view of the need to focus more on the economic well-being of the farmers, rather than just on production. The policy recognizes the socio-economic well-being of the farmers, besides production and growth. The aim of the Policy is "to stimulate attitudes and actions which should result in assessing agricultural progress in terms of improvement in the income of farm families, not only to meet their consumption requirements but also to enhance their capacity to invest in farm related activities". The major goals of the National Policy for Farmers, among others, are to:

1. Improve economic viability of farming by substantially increasing the net income of farmers and to ensure that agricultural progress is measured by advances made in this income.
2. Protect and improve land, water, bio-diversity and genetic resources essential for sustained increase in the productivity, profitability and stability of major farming systems by creating an economic stake in conservation.
3. Develop support services including provision for seeds, irrigation, power, machinery and implements, fertilizers and credit at affordable prices in adequate quantity for farmers.
4. Strengthen the bio-security of crops, farm animals, fish and forest trees for safeguarding the livelihood and income security of farmer families and the health and trade security of the nation.
5. Provide appropriate price and trade policy mechanisms to enhance farmers' income.
6. Provide for suitable risk management measures for adequate and timely compensation to farmers.
7. Mainstream the human and gender dimension in all farm policies and programmes.
8. Pay explicit attention to sustainable rural livelihoods.
9. Foster community-centered food, water and energy security systems in rural India and to ensure nutrition security at the level of every child, woman and man.
10. Develop and introduce a social security system for farmers.
11. Provide appropriate opportunities in adequate measure for non-farm employment for the farm households.

Overall, the policy looks at improving the socio-economic condition of the farmers through various measures, like, (1) reform in asset, i.e., ensuring that every farmer household in villages possesses and/or has access to productive assets like land, livestock, fishpond, homestead farm and/or income through an enterprise and or market driven skills, so that the household income is increased substantially on a sustainable basis; (2) land reforms, with particular reference to tenancy laws, land leasing, distribution of ceiling surplus land and wasteland, providing adequate access to common property and wasteland resources and the consolidation of holdings; (3) availability of water for irrigation and water use efficiency; (4) livestock development etc.

2.1.7 National Policy for Women

In 2016, Government of India in its Ministry of Women and Child Development formulated a draft women policy. The policy was formulated decade after the formulation of National Policy for the Empowerment of Women (2001). The objectives of the policy look at (1) creating a conducive socio-cultural, economic and political environment for women, (2) mainstreaming gender in all-round development processes / programmes, (3) a holistic and life cycle approach to women's health, (4) improving and incentivizing access of women / girls to universal and quality education, (5) improving participation of women in workforce etc. Different priority areas are identified in the policy that are contextually relevant for women, such as (1) health, food security and nutrition, (2) education, (3) economy (includes agricultural activities; poverty reduction; industry, labour and employment, service sector engagement etc.), (4) governance and decision making, (5) violence against women. In the line of National Policy for Women, the Government of Maharashtra is having a State policy on Women to protect their rights and entitlement.

2.1.8 Tribal Development and Tribal Sub-Plan (TSP) Approach

The tribal situation varies by states where some areas have high tribal concentration while in other areas, the tribal form only a small portion of the total population. The Constitution of India provides a comprehensive framework for the socio-economic development of Scheduled Tribes and for preventing their exploitation by other groups of society. A detailed and comprehensive review of the tribal problem was taken on the eve of the Fifth Five Year Plan and the Tribal Sub-Plan strategy took note of the fact that an integrated approach to the tribal problems was necessary in terms of their geographic and demographic concentration. The tribal areas in the country were classified under three broad categories, i.e., (1) category 1: States and Union Territories having a majority Scheduled Tribes population, (2) Category 2: States and Union Territories having substantial tribal population but majority tribal population in particular administrative units, such as block and tehsils, and (3) Category 3: States and Union Territories having dispersed tribal population.

In the light of the above approach, for the second category of States and Union Territories, tribal sub-Plan approach was adopted after delineating areas of tribal concentration. To look after the tribal population coming within the new tribal sub-Plan strategy, in a coordinated manner, Integrated Tribal Development Projects are conceived during Fifth Five Year Plan. During the Sixth Plan, Modified Area Development Approach (MADA) was adopted to cover smaller areas of tribal concentration and during the Seventh Plan, the TSP strategy was extended further to cover even more smaller areas of tribal concentration and thus cluster of tribal concentration was identified. At the time of delineation of project areas under the Tribal Sub-Plan strategy, it was observed that the ITDPs/ITDAs are not co-terminus. Areas declared under Fifth Schedule of the Constitution. The Scheduled Areas as per the Constitutional orders have been declared in eight States and Maharashtra is one among them. As per the provisions contained in the Fifth Schedule of the Constitution, various enactment in the forms of Acts and Regulations have been promulgated in the states for the welfare of scheduled tribes and their protection from exploitation.

The TSP strategy is having twin objectives, i.e., Socio-economic development of Schedule Tribes and protection of tribal against exploitation, the Govt. of India in Aug., 1976 had decided to make the boundaries of Scheduled Areas co-terminus with TSP areas (ITDP/ITDA only) so that the protective measure available to Scheduled Tribes in Sch. Areas could be uniformly applied to TSP areas for effective implementation of the development programmes in these areas. Accordingly, the TSP areas have been made co-terminus with Scheduled Areas in the State.

2.2 State Policy

2.2.1 State Environment Policy, 1985

It intends to integrate environmental considerations into decision-making process at all levels. This states that rivers, reservoirs, water bodies and watersheds in the State will be protected and developed for ecological balance to provide for agriculture, irrigation, industrial, drinking and other civic purposes. The thrust of the policy is to ensure the tempo of developmental activities considering the conservation of environment and natural resources.

2.3 Environmental Laws and Regulations

The list of relevant Government of India laws and regulations and their applicability to the project is discussed in Table.

Table 6: Applicable Environmental Legislations and Specific Requirements for the Project

Ref.	Legislation	Description	Regulator	Applicability
A	**National Level**			
1.	Water (Prevention and Control of Pollution) Act, 1974, amended 1988 and it's Rules, 1975.	For the prevention and control of water pollution by controlling discharge of pollutants and the maintaining or restoring of wholesomeness of water as per prescribed standards.	West Bengal Pollution Control Board (WBPCB)	- Applicable - There will be generation of wastewater and other water-based pollutants during construction and operations. - Consent to establish (CTE) and consent to operate (CTO) from WBPCB required.
2.	Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and it's Rules, 1982.	For prevention, control and abatement of air pollution activities. Establishes ambient air quality standards.	WBPCB	- Applicable - Applicable for equipment and machinery's potential to emit air pollution (including diesel generators and vehicles); - The project involves digging, spoil dumping, etc., which will generate fugitive dust. - Consent to establish (CTE) and consent to operate (CTO) from WBPCB required
3.	Environmental (Protection) Act, 1986 amended 1991 and associated rules / notifications	To protect and improve overall environment. This act essentially links pollution and natural resource issues. It seeks to supplement existing laws on pollution control and also lays down standards for air quality and noise. For protection and improvement of environment and the prevention of hazards to human beings, other living creatures, plants and property.	MoEFCC, GoI DOE, Govt. of West Bengal, CPCB, SPCB	- Applicable (This is a umbrella legislation for protecting the environment. Many rules/ notification are formed under this act. As per this Act, the responsibility of administering this legislation rests on the MoEFCC, Central Pollution Control Board (CPCB), and SPCB)

Ref.	Legislation	Description	Regulator	Applicability
a.	EIA Notification, 2006 as amended in 2009 and 2013, 2016	To provide environmental clearance to new development activities following an EIA. Sets out the requirement for environmental clearance to new development activities following an EIA for specified activities/projects. Environmental clearance process comprises of a maximum of four stages: Stage (1) Screening (2) Scoping (3) Public Consultation and (4) Appraisal	MoEFCC and SEIAA	- Not Applicable[12]. - This is rehabilitation of existing irrigation network to restore design CCA. The project does not involve any expansion or any capacity addition beyond the designed CCA. - None of the project activities are included in the list of projects requiring Environmental Clearance. .
b.	Environment (Protection) Rules, 1986 including amendments.	These rules include specifications on: -Standards for emissions or discharge of environmental pollutants -Prohibitions and restrictions on the location of industries -Procedure for taking samples and submission of samples for analysis, -Prohibition and restriction on the handling of hazardous substances in different areas -Submission of environmental reports	WBPCB	- Applicable - Compliance with emission and disposal standards during construction required.
c.	Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	WBPCB	- Applicable Solid waste generated during construction stage at construction camp shall be managed and disposed in accordance with the Rules.
d.	Construction and Demolition Waste Management Rules, 2016	Rules to manage construction waste resulting from construction, remodeling, repair and demolition of any civil structure.	WBPCB	- Applicable - Construction and demolition waste generated from the project works shall be managed and disposed as per the rules
e.	Hazardous Waste Management Rules, 2016	- Rules defines and classifies hazardous waste, and procedures for handling and storage - Requires Pollution Control Board's consent for handling hazardous waste	CPCB and WBPCB	- Applicable - Used engine oil, gear oil, hydraulic oil, spent oil, lubricants etc. will be generated during construction and desiltation operation as well as operation of diesel generator at camp site. The desilted sediments will be

[1] The Gazette of India, extraordinary, Part-II, and section (3), sub-section (II), Ministry of Environment and Forest dated 14th September, 2006 notification (S.O. 1533) reads that "... ***the required construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to this notification entailing capacity addition with change in process and or technology shall be undertaken in any part of India only after the prior environmental clearance*** *from the Central Government or as the case may be, by the State Level Environment Impact Assessment Authority,...*".

[2] It has been confirmed with WBPCB.

Ref.	Legislation	Description	Regulator	Applicability
		- Provides procedures for recycling, reprocessing or reuse, import and export of HW - Rules for development of treatment, storage, disposal facility (TSDF) for hazardous wastes		tested for toxicity (presence of heavy metals, pesticide residues, etc.) and disposed as per the provisions of the applicable Rules.
f.	Noise Pollution (Regulation and Control) Act, 1990 and Rules, 2000.	Standards for permitted level of noise during the day and night have been promulgated by the MoEFCC for various uses. The increasing noise level in public places from various sources have delirious effects on humans and thereby it is considered necessary to regulate and control noise generating sources to maintain ambient air quality standards through a set of rules. The ambient air quality standards are achieved through enforcement of noise pollution control measures and restrictions on the use sound producing instruments. In case of any violation in silence zone area, complaints to be made to authority and power to prohibit continuance of music sound or noise also falls under within these rules	WBPCB	- Applicable - Noise will be generated during project implementation stage due to different activities like construction, operation and movement of vehicle, heavy equipment.
g.	Notification of Eco Sensitive Zones (ESZs):	ESZs are of significant ecological importance, and to conserve and protect the natural resources and living beings, several zones are declared in the country as eco sensitive zones by notifications. Besides for specific reasons, buffer areas around protected areas (national park, wildlife sanctuaries etc.,) are also declared as ESZ in this notification. - Notified ESZs in WB are: ESZ around Dalma wildlife sanctuary (in Jharkhand state) established in 2012 falling partly in West Bengal (Purulia); draft notifications issued for 3 ESZs in 2016-17: ESZs around Jaladapara National Park Alipurduar District, Neora Valley National Park and Singalila National Park in Darjeeling. - Restriction of activities (including construction, tree cutting, etc.) in the notified zones -Any project activity located in ESZs will require prior permission from ESZ monitoring committee	Forest Department, GOWB and MoEFCC	- Not applicable - None of the project activity falls within declared ESZ

Ref.	Legislation	Description	Regulator	Applicability
h	Wetland (Conservation and Management) Rules, 2010	-For the protection of wetlands and restriction of certain activities within wetlands, provides a regulatory mechanism -Applies to protected wetlands notified under the rules (which include Ramsar sites; wetlands in ESZs /United Nations Educational, Scientific and Cultural Organization (UNESCO) sites, high altitudes, etc.) - Rules prohibit: reclamation of wetlands, expansion/ setting new industries, hazardous waste storage, disposal., discharge of untreated effluent, permanent construction within 50 m HFL, etc., -Activities such as the following are regulated: water withdrawal/diversion, treated effluent discharge, desiltation, repair of existing infrastructure, buildings and construction	Central Wetlands Regulatory Authority	- Not applicable - None of the project activity area falls within the wetlands listed under the Rules
I	Coastal Regulation Zone (CRZ) Notification, 2011	Protection of fragile coastal belts. This supersedes the CRZ Notification issued in 1991; to ensure livelihood security to the fisher communities and other local communities, living in the coastal areas, to conserve and protect coastal stretches, its unique environment, promote sustainable development considering natural hazards, sea level rise due to global warming Declares coastal stretches as CRZ and restricts new construction, and industrial activities. West Bengal has a coastline of 157.5 km. CRZ (landward side) include the following: (i) land area from High Tide Line (HTL) to 500 m on the landward side on the sea front: (ii) land area between HTL to 100 m or width of creek whichever is less on the landward side along the tidal influenced water bodies connected to sea and; (iii) land area between HTL and LTL. Notification defines CRZ in I. II, III, IV Categories based on the environmental sensitivity and existing development.	West Bengal Coastal Regulation Zone Management Authority (CRZMA)	- Not Applicable - Proposed project is rehabilitation of existing irrigation network to restore design CCA and flood management at Lower Damodar river. Proposed project activities are outside of the CRZ demarcated zone.
j	Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989	-Defines hazardous chemicals - stipulates rules, procedures to manufacture, storage and import of hazardous chemicals -requires permission, authorization from various agencies if	Various agencies	- Not Applicable - (Use and storing of any kind of hazardous chemical beyond permissible limit during construction, or

Ref.	Legislation	Description	Regulator	Applicability
		the total storage exceeds specified quantity; requires emergency management plan		desiltation or any other project activity, will trigger this rules)
4.	Indian Wildlife (Protection) Act, 1972 amended 1993 and Rules 1995; Wildlife (Protection) Amendment Act, 2002	To protect wildlife and preserve national parks and sanctuaries An Act to provide for the comprehensive protection of wild animals, birds and plants. This would cover matters concerning Appointment of forest authorities, hunting of wild animals, protection of specified plants, conservation of national parks and sanctuaries, trade commerce in relation to plants and animals and prevention of any offences. Wildlife protected areas are notified under this act. -There are 6 NPs and 15 WLS s in West Bengal	National Board of Wildlife / State wildlife boards	- Not applicable, - None of the project activities will be taken up in protected areas (Ramnabagan WLS at Bardhhaman-1 block is located minimum 2.5 km away from DVC canal and 3.7 km away from Damodar river. However, only reconstruction of existing regulating structure is proposed in this area. No other project activity is proposed in near around area. Reconstruction work of regulating structure is estimated to take less than ___ days)
5.	Indian Forest Act, 1927	To check deforestation by restricting conversion of forested areas into non-forested areas The Indian Forest Act 1927 was enacted to consolidate the law relating to forests, the transit of forest-produce and the duty leviable. Applies reserved forests, village forests, and protected forests. This act also concerns lands not being the property of government. Provides penalties and procedures with regard to all property, cattle trespasses and powers of Forest officers; declaration of forest areas (reserved, protected and village forests), and regulation of activities within the forests	MoEFCC WB Forest Department	- Not Applicable - Proposed rehabilitation of irrigation network and flood managment will be restricted within design command area. Work will mainly be undertaken on existing canal/ river flowing area and/ or embankment without disturbing or diverting any forest or forest fringe area. Proposed project activities under WBMIFMP in/ along river/ canal stretches does not include any part of forest area.
6.	Forest (Conservation) Act, 1980, amendment 1988	Act provides for conservation of forests Restricts the de-reservation of forests or use of forest lands for non-forest purpose Non-forest purpose means breaking up or clearing of any forest land - Restricts use of forest lands for non-forest purposes - Requires prior permission to take up the works	MoEFCC WB Forest Department	- Not Applicable - Proposed rehabilitation of irrigation network and flood managment will be restricted within design command area. Work will mainly be undertaken on existing canal/ river flowing area and/ or embankment without disturbing or diverting any forest or forest fringe area. Proposed project activities under WBMIFMP in/ along river/ canal stretches does not include any part of forest area.

Ref.	Legislation	Description	Regulator	Applicability
7.	The Major Port Trusts Act, 1963 (Kolkata Port Trust, KoPT)	Prior permission of KoPT Board is required for any construction, mooring, reclamation etc., in port limit and port approaches; the port limit includes River Hooghly and shore and land area within 45.7 m of High Water Mark and extends from Jangipur in the north (in Murshidabad District) to Sandheads in the south (near Bay of Bengal) -Detailed study by designated institutes is a prerequisite of KoPT for any permission -Construction of deep tube wells restricted in said area	KoPT	- Not Applicable Proposed project activities does not fall in port limit.
8.	Ancient Monuments and Archeological Sites and Remains (Amendment and Validation) Act, 2010	Conservation of cultural and historical remains found in India Act for better and effective preservation of the archaeological wealth of the country, on par with constitutional provisions This Act provides for the preservation of ancient and historical monuments and archaeological sites and remains of national importance, for the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects. - Notifies 100m around the monument as prohibited area and 100 to 300m as regulated area for construction works; - No excavation/construction work is allowed within 100m of boundary of the protected monument; - Requires prior permission of Archaeological Survey of India (ASI) for taking works within 100-300m of the boundary of protected monuments	ASI	- Applicable - There are 57 nos.[3] (34 nos. in Bankura, 11 nos. in Bardhhaman, 1 in Howrah and 11 nos. in Hooghly) nationally protected monuments located within 5 nos. project districts. The Environmental Impact Assessment (EIA) of the project will ascertain if any of these monuments are located within 300 m periphery of proposed project activity sites. Environmental Management Plans (EMPs) of the project works will include procedures for dealing with chance finds.
9.	Notification for use of fly ash, 2003 and subsequent amendment, 2016	Reuse large quantity of fly ash discharged from thermal power plant to minimize land use for disposal. - Any construction agency engaged in construction of building with a radious of 300km of coal or lignite based thermal power plant (TPP) shall use only fly ash based product for construction.	MOEF	Applicable Presence of TPPs within 300 km radius of proposed project activities are observed. Project activity involves construction activity like PCC lining, rehabilitation of regulating structure, flood wall construction.

[3] Source: http://www.asikolkata.in/monuments.aspx

Ref.	Legislation	Description	Regulator	Applicability
		- Fly ash shall mandatorily be utilized in asset creation programmes of the Govt. involving construction of building, road, dams and embankment. - Fly ash shll be used in soil conditioner. - Fly ash bvased bricks or product shall be used in construction under all Govt. scheme or programme.		Possibility of using fly ash in diffrent construction related activities will be planned as part of the EMPs of the project works.
10.	Public Liability and Insurance Act, 1991	Protection from hazardous materials and accidents	SPCB	Not applicable, as any of projects activities will not entail the use of hazardous materials. Day to day fuel (Diesel) requirement for operation of heavy machineries will directly be purchased from nearby diesel pump.
11.	Insecticides Act, 1968, Rule 1971	Use of registered and recommended insecticides and non-use of banned insecticides.	Central Insecticides Board and Registration Committees (CIB & RC)	- Insecticides that are banned and restricted in India will not be promoted as part of the project activities.
12.	Central Motor Vehicle Act, 1988 and Central Motor Vehicle Rules,1989	To check vehicular air and noise pollution	Motor Vehicle Department	Applicable, as during project implementation, there will be use of vehicles and these vehicles need to operate within permissible emission levels
13.	Contract Labour (Regulation and Abolition) Act, 1970;	The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.	Chief Labour Commissioner, Government of West Bengal	- Applicable to all construction works under WBMIFMP - IWD/PMU to obtain a Certificate of Registration as the principle employer;
14.	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996.	All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the	Chief Labour Commissioner, Government of West Bengal	- Applicable during construction work - Applicable to any building or other construction work employing 10 or more workers; - provide safety measures at the construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc.

Ref.	Legislation	Description	Regulator	Applicability
		workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government - Cess should be paid at a notified rate; -The employer has to obtain a registration certificate from the Registering Officer		
15.	The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter- state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.	Chief Labour Commissioner, Government of West Bengal	- Applicable - Contractor shall register with Labour Department if Inter- state migrant workmen are engaged - Adequate and appropriate amenities and facilities to be provided to workers - housing, medical aid, traveling expenses
16.	The Child Labour (Prohibition and Regulation) Act, 1986.	The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.	As above	- No person under 18 years of age shall be employed in the project works
17.	Minimum Wages Act, 1948.	The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.	As above	- All construction workers should be paid not less than the prescribed minimum wage.
18.	Workmen Compensation Act, 1923.	The Act provides for compensation in case of injury by accident arising out of and during the course of employment.	As above	- Compensation for workers in case of injury by accident.
19.	Equal Remuneration Act, 1979.	The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.	As above	- Equal wages for work of equal nature to male and female workers.
B	**State Level**			
1.	Notification on Air Pollution, Department of	- Issued under the Air Act, 1981 -Prohibits use of diesel generators not confirming to standards laid down by CPCB	WBPCB	Yes (if generation capacity is more than $\geq$ 15 KVA - for non-Industrial use[5])

[5] Source: http://www.wbpcb.gov.in/pages/view/119/46-download

Ref.	Legislation	Description	Regulator	Applicability
	Environment, GOWB, March 2010[4]			Procure generators that comply with the standards, and obtain CTE and CTO
2	Direction of West Bengal Department of Environment under the Air Act, 1981 Direction No. EN/3170/T-IV-7 /001/2009 dated: 10 December 2009	- lays out norms for control of air pollution from construction activities - failure to comply will lead to legal action, stoppage of work and imposition of `Pollution Cost'.	WBPCB	Compliance to the norms in project implementation by all parties (contractors, including any subcontractors) required
3	West Bengal Ground Water Resources (Management, Control and Regulation) Act, 2005'	-To manage, control and regulate indiscriminate extraction or use - West Bengal State Level Ground Water Resource Development Authority (WBSLGWRDA) was established under this act; State Water Investigation Directorate is its functional organ -Permission of Authority is mandatory to construct ground water extraction structures (operated by engine or motor driven pump)	WBSLGWRDA	- Rehabilititation of irrigation structure and promotion of micro irrigation in semi-critical blocks will reduce stress on ground water abstraction. - Conjuctive water use with a increase availability of surface water will reduce pressure on ground water. - Ground water development status in the project districts is below 50%. However, project will not promote/ support ground water extraction in semi-critical/ over-exploited areas.
4	West Bengal Inland Fisheries Act, 1984	-Act to conserve, develop, propagate, protect, exploitation of inland fish and fisheries -No discharge of wastewater, pollutants into inland water bodies that may affect fish -Prohibits conversion of fishery area (any water area, naturally or artificially depressed land, irrespective of ownership, measuring 0.035 ha or more, which retains water for more than 6 months and capable of being used as fishery) for any other purpose -prohibits filling up fishery areas to convert into solid land, e.g., for any construction -Prohibits dividing water area into parts to make any part less than 0.035 ha -if conversion/ filling up is for development works, prior permission is required	Department of Fisheries	- Contractor shall not be allowed to discharge waste water and other wastes generated during construction activity or campsite activities into water bodies. - Construction workers will be sensitized for not undertaking any kind of fishing activity in any restricted area/manner as notified by fisheries department.

[4] Source: http://www.wbpcb.gov.in/writereaddata/upload/downloads/Download-41.pdf

Ref.	Legislation	Description	Regulator	Applicability
7.	West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006 and Rules, 2007	- A Rule to encourage and promote plantation of trees, and to protect and conserve trees - Rules for felling or otherwise disposing of any tree in non-forest area. - Compensatory plantation to be carried out in the vicinity of the area where trees have been felled. - At least five times the number of tree to be felled shall be replanted. - Cutting of trees in non-forest land, irrespective of land ownership, requires permission from Forest Department. - Permission from the Divisional Forest Officer (Utilization Division), Forest Directorate, will be required if trees are: sacred groves, endangered species, or with heritage status	WB Forest Department	- Yes, Applicable - Tree felling may be required during construction of flood wall, PCC lining and slope stabilization work. The EIA will assess the number of trees to be felled. Permission shall be obtained from competent authority. The EMP will include plan for compensatory plantation and after-care.
9.	WB Preservation of Historical Monuments and Objects and Excavation of Archaeological Sites Act, 1957.	-State government notifies monuments, objects, and excavation sites as state protected under this -Construction activities within the notified areas of each monument are regulated	Directorate of Archaeology and Museums, GOWB	- May applicable, (if any such archaeological wealth found during implementation of project activities specially during desiltation of Mundeswari river) - There are 57 nos.[6] (34 nos. in Bankura, 11 nos. in Bardhhaman, 1 in Howrah and 11 nos. in Hooghly) nationally protected monuments located within 5 nos. project districts. However, any of these archaeological wealths is not located within 300 m periphery of proposed project activity zone or any kind of construction activity under any proposed project activities is not planned within 300 meters of protected monuments.
10	Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and West Bengal Building and Other Construction	- Regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures. - Established West Bengal building and other construction Workers' welfare Board as per the Act - Provide various benefits for the registered workers	Chief Labour Commissioner, Government of West Bengal	- Many of the project activities (like PCC block lining, flood wall construction, renovation of regulating structure) involve construction work where construction labour will be engaged. - Provisions are integrated in the ESMP for Construction and campsite management plan.

[6] Source: http://www.asikolkata.in/monuments.aspx

Ref.	Legislation	Description	Regulator	Applicability
	Workers(Regulation of employment and Conditions of Service) Rules,2004			

2.3.1 National Standards

All project activities during the period of construction and operation have to be guided by the standards set by the Central Pollution Control Board.

2.3.1.1 Ambient Air Quality Standards

Table 7: Ambient Air Quality Standards

Sl. No.	Pollutant	Time-weighted average	Concentration in ambient air		
			Industrial, Residential, Rural and other areas	Ecologically sensitive area	Method of Measurement
1	SO_2, µg/m^3	Annual* 24hrs**	50 80	20 80	Improved West &Gaeke Ultraviolet fluorescence
2	NO_2, µg/m^3	Annual* 24hrs**	40 80	30 80	Modified Jacob &Hocheisser Chemiluminence
3	PM_{10} µg/m^3	Annual 24hrs	60 100	60 100	Gravimetric TOEM Beta attenuation
4	$PM_{2.5}$ µg/m^3	Annual* 24hrs**	40 60	40 60	Gravimetric TOEM Beta attenuation
5	O_3 µg/m^3	8hrs** 1hr**	100 180	100 180	UV Photometry Chemiluminescence Chemical method
6	Pb µg/m^3	Annual* 24hrs**	0.50 1.00	0.50 1.00	AAS/ICP method after sampling on EPM2000 ED-XRF using Teflon Filter
7	CO mg/m^3	8 hrs** 1hr.**	02 04	02 04	Non-dispersive Infra-red spectroscopy
8	Benzene$_{µg/m^3}$	Annual*	05	05	Gas chromatography based continuous analyser
9	BenzoPyrene, (Particulate phase only) ng/m^3	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis
10	Arsenic ng/m^3	Annual*	06	06	AAS/ICP method after sampling on EPM 2000
11	Nickel ng/^{3}	Annual*	20	20	AAS/ICP method after sampling on EPM 2000
12	NH_3 µg/m^3	Annual* 24hrs**	100 400	100 400	Chmilumuminescence Indophenol blue method

**Annual arithmetic means of minimum 104 measurements in a year at a particular site taken twice a week 24 hrs at uniform intervals.*
*** 24hrs/08hrs/02 hourly monitored values as applicable, shall be complied with 98% of the time in a year. 2% of time they may exceed the limits but not on two consecutive days of monitoring.*

2.3.1.2 Ambient Noise Quality Standards

Table 8: Noise Standard by Area

Sl. No.	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	***Night Time***
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence Zone	50	40

Note:

1. *Day time shall mean from 6.00 a.m. to 10.00 p.m.*
2. *Night time shall mean from 10.00 p.m. to 6.00 a.m.*
3. *Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.*
4. *Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.*

* *dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.*

A "decibel" is a unit in which noise is measured.

"A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is an energy mean of the noise level over a specified period.

Table 9: Noise standard for the construction vehicle

Sl. No.	Equipment	Noise Level (in dB)
1	Tractor-scraper	93
2	Rock drill	87
3	Unmuffled concrete breaker	85
4	Hand-held tree saw	82
5	Large rotary diesel compressor	80
6	1 ½ tonne dumper truck diesel	75
7	Concrete mixture	75

Source: The Noise pollution (Regulation & Control) Rules, 2000

2.3.1.3 Emission Standards for Construction Equipment Vehicles:

Bharat Stage Emission Standards (BSES) are emission standards instituted by the Govt. of India to regulate the output of air pollutants from internal combustion engines and spark-ignition engines equipment, including motor vehicles. The standards and the timeline for implementation are set by the Central Pollution Control Board under the Ministry of Environment & Forests and climate change. Since October 2010, Bharat Stage (BS) III norms have been enforced across the country along with Bharat Stage IV emission norms in entire country since April 2017.

Bharat (CEV) Stage II - III emission standards for diesel construction machinery were adopted in 2006. The standards were structured into two tiers, i.e., (1) BS (CEV) II—These standards are based on the EU Stage I requirements, but also cover smaller engines that were not regulated under the EU Stage I; (2) BS (CEV) III standards are based on US Tier 2/3 requirements. Bharat Stage IV-V emission standards for diesel non-road engines used in construction and agricultural equipment was adopted in 2018. The BS IV emission standards are aligned with EU Stage IV standards.

Table 10: Bharat (CEV) Stage II - III emission standards for diesel construction machinery

Engine Power	CO	HC	HC+NOx	NOx	PM
kW	g/kWh				
Bharat (CEV) Stage II					
P < 8	8.0	1.3	-	9.2	1.00
8 ≤ P < 19	6.6	1.3	-	9.2	0.85
19 ≤ P < 37	6.5	1.3	-	9.2	0.85
37 ≤ P < 75	6.5	1.3	-	9.2	0.85
75 ≤ P < 130	5.0	1.3	-	9.2	0.70
130 ≤ P < 560	5.0	1.3	-	9.2	0.54
Bharat (CEV) Stage III					
P < 8	8.0	-	7.5	-	0.80
8 ≤ P < 19	6.6	-	7.5	-	0.80
19 ≤ P < 37	5.5	-	7.5	-	0.60
37 ≤ P < 75	5.0	-	4.7	-	0.40
75 ≤ P < 130	5.0	-	4.0	-	0.30
130 ≤ P < 560	3.5	-	4.0	-	0.20

The Bharat Stage III standards must be met over the useful life periods (refer Table). Alternatively, it was suggested that the manufacturers may use fixed emission deterioration factors of 1.1 for CO, 1.05 for HC, 1.05 for NOx, and 1.1 for PM.

Table 11: Bharat (CEV) Stage III Useful Life Periods

Power Rating		**Useful Life Period (**hours)
< 19 kW		3000
19-37 kW	Constant speed	3000
	Variable speed	5000
> 37 kW		8000

Bharat Stage (CEV/Trem) IV - V emission standards for non-road diesel engines used in construction and agricultural equipment are summarized in Table. The BS IV/V nonroad regulations include BS IV emission standards for diesel engines with rated power below 37 kW (a category that includes some 90% of ag tractors in India) or for engines above 560 kW, but the BS V standards cover all power ratings. The regulation includes a six-month grace period when registrations of equipment complying with the previous set of emission standards is allowed.

Table 12: Bharat (CEV/Trem) Stage IV - V emission standards

Engine Power	CO	HC	NOx	PM	PN	Test Cycle
kW	g/kWh				1/kWh	
Bharat (CEV/Trem) Stage IV						
37 ≤ P < 56	5.0	4.7*		0.025	-	NRSC and NRTC
56 ≤ P < 130	5.0	0.19	0.4	0.025	-	
130 ≤ P < 560	3.5	0.19	0.4	0.025	-	
Bharat (CEV/Trem) Stage V						
P < 8	8.0	7.5*		0.4	-	NRSC
8 ≤ P < 19	6.6	7.5*		0.4	-	
19 ≤ P < 37	5.0	4.7*		0.015	1×10^{12}	NRSC and NRTC
37 ≤ P < 56	5.0	4.7*		0.015	1×10^{12}	
56 ≤ P < 130	5.0	0.19	0.4	0.015	1×10^{12}	
130 ≤ P < 560	3.5	0.19	0.4	0.015	1×10^{12}	
P ≥ 560	3.5	0.19	3.5	0.045	-	NRSC

Engines equipped with SCR must meet an ammonia emission limit of 25 ppm for engines ≤ 56 kW and 10 ppm for engines above 56 kW. The limits are defined as a mean value over the NRTC and NRSC cycles. The

standards must be met over the useful life periods shown Table. Alternatively, manufacturers may use fixed emission deterioration factors of 1.3 for CO, 1.3 for HC, 1.15 for NOx, and 1.05 for PM (NRSC and NRTC).

Table 13: Bharat (CEV/Trem) Stage IV - V Useful Life Periods

Power Rating		**Useful Life Period (**hours)
≤ 37 kW	Constant speed	3000
	Variable speed	5000
> 37 kW		8000

2.3.1.4 Water Quality Criteria

The Central Pollution Control Board has laid down General Standards for discharge of environment Pollutants. Standard is given below:

Table 14: General Standards for discharge of environment Pollutants

General Standards for discharge of environment Pollutants Part-A: Effluents					
SN	**Parameter**	**Standards**			
		Inland Surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Area**
1	Colour and Odour	5 to 25 Agreeable	-	5 to 25 Agreeable	5 to 25 Agreeable
2	Suspended Solids mg/l, Max.	100	600	200	(a) For process waste water-100
	(b) For Cooling water effluent 10 percent above total suspended matter of influent				
3	Particular size of suspended solids	Shall pass 850 microns IS Sieve	-	-	(a) Floatable solids, max. 3 mm
					(b) Settleable solids, max850 microns
4*	---	-	-	---	-
5	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
6	Temperature	Shall not exceed 5oC above the receiving water temperature	-	-	Shall not exceed 5oC above the receiving water temperature
7	Oil and grease (mg/L Max)	10	20	10	20
8	Total residual chlorine mg/1, Max	1	-	-	1
9	Ammonical nitrogen (as N), mg/1 max.	50	50	-	50
10	Total Kjeldhal nitrogen (as NH3) mg/l, Max	100	-	-	100
11	Free Ammonia (as NH3) mg/1, Max	5	-	-	5
12	Biochemical oxygen demand (5 days at 20oC), mg/1 Max)	30	350	100	100
13	Chemical Oxygen demand, mg/1 Max	250	-	-	250
14	Arsenic (as) mg/1 Max	0.2	0.2	0.2	0.2
15	Mercury (As Hg), mg/1 max)	0.01	0.01	-	0.01
16	Lead (as Pb) mg/L, Max	0.1	1	-	2
17	Cadmium (as Cd) mg/1, Max	2	1	-	2
18	Hexavalent chromium, (as Cr + 6) mg/1, Max	0.1	2	-	1
19	Total chromium (as Cr) mg/l, Max	2	2	-	2
20	Copper (as Cu) mg/l, Max	3	3	-	3
21	Zinc (as Zn) mg/l, Max	5	15	-	15

General Standards for discharge of environment Pollutants Part-A: Effluents					
SN	**Parameter**	**Standards**			
		Inland Surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Area**
22	Selenium (as Se) mg/l, Max	0.05	0.05	-	0.05
23	Nickel (as Ni) mg/l, Max	3	3	-	5
24*	-	-	-	-	
25*	-	-	-	-	-
26	-	-	-	-	-
27	Cyanide (as CN), mg/l Max	0.2	2	0.2	0.2
28*	-	-	-	-	-
29	Fluoride (as F) mg/l Max	2	15	-	15
30	Dissolved Phosphates (as p), mg/l Max	5	-	-	-
31*	-	-	-	-	-
32	Sulphide (as S) mg/l Max	2	-	-	5
33	Phenolic Compounds (as C6H5OH) mg/l Max	1	5	-	5
34	Radioactive materials:				
	(a) Alpha emitter micro curie/ml	10-7	10-7	10-8	10-7
	(b) Beta emitter micro curie/ml)	10-6	10-6	10-7	10-6
35	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
36	Manganese (as Mn)	2 mg/l	2 mg/l	-	2 mg/l
37	Iron (as Fe)	3 mg/l	3 mg/l		3 mg/l
38	Vanadium (as V)	0.2 mg/l	0.2 mg/l		0.2 mg/l
39	Nitrate Nitrogen	10 mg/l	-	-	20 mg/l
40	-	-	-	-	-

2.4 Social Policies and Regulations

In this section, some of the policies and legislations of the Government of India and the Government of West Bengal are briefly discussed, that will have bearing on the Project. This is followed by a brief description of the project relevant development programmes and schemes being implemented by the Government of India and the Government of West Bengal. Later, at the end of the section, the World Bank Safeguard Policies are presented.

2.4.1 Memorandum of the Government of West Bengal

Government of West Bengal has issued a memorandum vide Gazette Notification, dated March 1, 2016 to ensure the optimal utilization of public funds and early implementation of projects where direct land purchase from land owners may become necessary. The salient features of the memorandum are;

(i) A 15-day local notice mentioning preference and details of land intended for purchase shall be given in the public offices and local newspaper (s) informing the prospective land owners and requesting them to submit application in plain paper indicating their intention to sell their lands.

(ii) The department concerned will select the appropriate plot (s) of the land to be purchased as per suitability and other considerations from among the applications / offers received on the basis of the notice.

(iii) The relevant administrative department will undertake land searching through the panel advocate (s) at the respective sub-registry office to guard against fraudulent transfer. Besides, the BL & LRO will verify the right and title of the selected lands within 14 days and shall furnish report to the Purchase Committee.

(iv) Land would be purchased through the Zilla Parishad / Municipality / Municipal Corporation / Parastatal as may be decided by the administrative department (s).

(v) Funds will be allotted to the Zilla Parishad / Municipality / Municipal Corporation / Parastatal by the administrative department for payment to land owners and payment will be made to their bank accounts. An appropriate administrative cost will be given to Zilla Parishad / Corporation by the administrative department

(vi) A committee will be constituted to finalize the price of land for the purchasing department, headed by the District Magistrate of the district as Chairperson

Value of buildings/structures would be assessed by the Executive Engineer, PWD / Municipal Engineering Directorate / District Engineer / Executive Engineer, Zilla Parishad or by such agency as the administrative department may decide.

The base price of the land will be determined considering the assessed value of land or set forth value of land whichever is higher. Incentive on the price of land finally determined will be given to the land owner if land registration is done: (a) within 30 days - 50% (b) within 31 to 60 days - 10%, from the date of publication / communication of land price to the landowners. For this purpose, individual land owner will be informed of the price of land in writing by the Member-Secretary of the Land Purchase Committee, for registration of sale deed.

After the purchase of land from the land owners, land will be registered in the name of Zilla Parishad / Municipality / Municipal Corporation / Parastatal. Thereafter, Zilla Parishad / Municipality / Municipal Corporation / Parastatal, as the case may be, could formally transfer the land in favour of administrative department/s).

Care would be taken by the Zilla Parishad / Municipality / Municipal Corporation / Parastatal to ensure that the entire transaction is fair and transparent and it is based on mutual consent. There shall be no element of coercion.

Stamp duty shall be exempted for such purchase of land by Zilla Parishad / Municipality / Municipal Corporation / Parastatal and also for subsequent transfer to administrative department (s).

The Panchayat and Rural Development Department will issue direction upon all the Zilla Parishads concerned to purchase land for other department(s) u/s. 212 of the West Bengal Panchayat Act, 1973.

The Municipal Affairs Department will issue direction upon all the Urban Local Bodies to purchase land for other department(s) u/s. 429B of the West Bengal Municipal Act, 1993.
In case, the aforesaid Purchase Committee fails to perform its functions within a reasonable time, the administrative department would be free to use any Corporation / Parastatal / Authority under its control to purchase the land on the same terms & conditions as prescribed.

2.4.2 Land Acquisition Related Act / Policy

Government of West Bengal has issued a memorandum vide Gazette Notification, dated March 1, 2016 to ensure the optimal utilization of public funds and early implementation of projects where direct land purchase from land owners may become necessary. The salient features of the memorandum are;

The Right to Fair Compensation and Transparency in Land Acquisition, Resettlement and Rehabilitation (RFCTLAR&R) Act, 2013, enacted by the Government of India is the latest legislation. This is in force and supersedes all other old acts for land acquisition and to determining R&R activities. For land acquisition for different development projects, Government of West Bengal has published gazette notification dated March 1, 2016. The act shall apply, when the Government acquires land for its own use, hold and control, including for Public Sector Undertakings and for public purpose;

The Memorandum of Government of West Bengal for purchasing land for project purposes and RFCTLAR&R Act, 2013 will not be applicable to the WBMIFMP as the project does not involve any additional fresh land acquisition for the purpose of implementation of the project. The project will be executed within the river bed and ROW that belongs to Government. However, the Government of West Bengal has decided to compensate the encroachers and squatters for their temporary loss of livelihood due to project activities and impact on residential structures. The financial provisions of GITANJALI scheme of the Government of West Bengal will be adopted and accordingly eviction will be done from the embankment during implementation stage. It is also provisioned that for temporary purposes, farmers land may require to be utilized. In such cases, the concerned farmer / land holder / lease holder / registered share cropper will be compensated for crop loss along with provision of rendering rental value of the land. Refer Resettlement Action Plan (RAP) for details.

GITANJALI Scheme: The scheme is being implemented by the Department of Housing of Government of West Bengal. As per the scheme guidelines, the houses would be constructed by beneficiaries themselves and no contracting agency will be engaged for the purpose. The revised guidelines came into effect from 01/04/2014. As per the revised guidelines, the scheme serves the purpose of three categories of beneficiaries, i.e., (a) Poor People in Rural and Urban areas, (b) Poor People in Erosion/ Flood/ Other calamity affected/ Disaster prone areas, and (c) Poor People affected by Government Projects (As part of rehabilitation measures). The scheme follows the income-based criteria, i.e., the people having family income of Rs 6,000/- per month or less whereas people in the BPL list gets priority. The scheme is applicable to all over the state of West Bengal including Rural and Urban areas.

Provision of Land: The scheme is being implemented in rural areas on the land of the beneficiary. As per the guidelines, required land is to be provided by the beneficiary of his / her own land / patta land and must be free from all encumbrances. In case of urban areas where land of beneficiaries is not available, the Group Housing may be built on the land supplied by District Administration, Municipality or any Development Authority. The dwelling unit is in IAY (currently PMAY-G) pattern. It is mandated that district authority will provide a low-cost toilet in every case.

Cost of the Dwelling Units: The cost of dwelling unit is in line with the PMAY-G scheme, i.e., Rs.1.20 lakhs per unit of housing.

Implementation Modalities: The scheme is being implemented by Housing Department through District Magistrate of the concerned District. He will nominate one of the Additional District Magistrate of the District to look after daily activities of the scheme on his behalf. District Planning Officer of the District acts as the Nodal Officer of the scheme.

2.4.3 Panchayati Raj Act

As per the 73rd constitutional amendment act, 1992, the panchayats as the local self-government are empowered to plan execute and monitor certain activities as per the activity mapping. As per the status of devolution, 11 subjects have been fully devolved in the State of Maharashtra and 18 subjects / schemes are implemented by the PRIs. The act strengthens the decentralized governance system and promotes bottom-up planning. As per the act, the GP level plans are to be prepared in Gram Sabha which is having an important bearing on the planning process of the proposed project. The act is having both mandatory and discretionary provisions and of the mandatory provisions of the Panchayati Raj Act, the most critical are those that strengthen the structure of representative democracy and political representation at the local level. Some of the salient features of the mandatory provisions of the Act are;

1. The establishment in every state (except those with populations below 2 million) of rural local bodies (panchayats) at the village, intermediate and district levels (Article 243B)
2. Direct elections to all seats in the panchayats at all levels (Article 243C)
3. Compulsory elections to panchayats every five years with the elections being held before the end of the term of the incumbent panchayat in the event that a panchayat is dissolved prematurely, elections must be held within six months, with the newly elected members serving out the remainder of the five-year term (Article 243E)
4. Mandatory reservation of seats in all panchayats at all levels for Davits and Advises in proportion to their share of the panchayat population (Article 243D)
5. Mandatory reservation of one-third of all seats in all panchayats at all levels for women, with the reservation for women applying to the seats reserved for Davits and Advises as well (Article 243D)
6. Indirect elections to the position of panchayat chairperson at the intermediate and district levels (Article 243C)
7. Mandatory reservation of the position of panchayat chairperson at all levels for Davits and Advises in proportion to their share in the state population (Article 243D)
8. Mandatory reservation of one-third of the positions of panchayat chairperson at all three levels for women (Article 243D)
9. In addition, the act mandates the constitution of two state-level commissions: an independent election commission to supervise and manage elections to local bodies, much as the Election Commission of India manages state assembly and parliamentary elections (Article 243K); and a state finance commission, established every five years, to review the financial position of local bodies and recommend the principles that should govern the allocation of funds and taxation authority to local bodies (Article 2431).

The Article 243ZD, mandates the constitution of District Planning Committees to consolidate the plans prepared by both rural and urban local bodies. In order to facilitate. This is an essential pre-requisite for each tier of the Panchayati Raj system to prepare plans for its areas, as defined through Activity Mapping, and then for all these plans, along with plans of municipalities, to be "consolidated" by the District Planning Committees (DPC) as mandated by Article 243 ZD of the Constitution.

2.4.4 Panchayats (Extension to the Scheduled Areas) Act, 1996

To mainstream the tribal in the development process, without disturbing or destroying their cultural identity and socio- economic milieu, a committee was constituted in 1994, called Bhuria Committee to examine various dimensions of self-rule for tribals, the constitutional requirements and to make recommendations for extending the provisions of the Constitution 73rd (Amendment) Act, 1992 to the Scheduled Areas. Following the recommendations of the committee, the Parliament extended the provisions of 73rd Amendment Act to the Scheduled Areas by passing Provisions of Panchayats (Extension to the Scheduled Areas) Act, 1996.

The Panchayat (Extension to the Scheduled Areas) Act, 1996, commonly known as PESA, legally recognizes Scheduled Tribe's own systems of self-governance. The Gram Sabha of the village becomes the focal institution, endowed with significant powers. Under section 4(d) of PESA: "every Gram Sabha shall be

competent to safeguard and preserve the traditions and customs of the people, their cultural identity, community resources and the customary mode of dispute resolution." PESA legally recognizes the right of tribal communities to govern themselves through their own systems of self-government and also acknowledges their traditional rights over natural resources.

The salient feature of the Panchayats (Extension to the Scheduled Areas) Act, 1996 (PESA) and the modalities worked out to grant rights to tribals in the country are:

1. Legislation on Panchayats shall be in conformity with the customary law, social and religious practices and traditional management practices of community resources;
2. Habitation or a group of habitations or a hamlet or a group of hamlets comprising a community and managing its affairs in accordance with traditions and customs; and shall have a separate Gram Sabha.
3. Every Gram Sabha to safeguard and preserve the traditions and customs of people, their cultural identity, community resources and the customary mode of dispute resolution.
4. The Gram Sabhas have roles and responsibilities in approving all development works in the village, identify beneficiaries, issue certificates of utilization of funds; powers to control institutions and functionaries in all social sectors and local plans.
5. Gram Sabhas or Panchayats at appropriate level shall also have powers to manage minor water bodies; power of mandatory consultation in matters of land acquisition; resettlement and rehabilitation and prospecting licenses/mining leases for minor minerals; power to prevent alienation of land and restore alienated land; regulate and restrict sale/consumption of liquor; manage village markets, control money lending to STs; and ownership of minor forest produce.
6. The provisions of Panchayats with certain modification and exceptions have been extended to the Schedule V areas.

In line with the PESA Act, the Government of Maharashtra has formulated rules for the Panchayats (Extension to Scheduled Areas) Act, 1996

2.4.5 Forest Rights Act, 2006

This Act, "Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act", 2006 grants legal recognition to the rights of traditional forest dwelling communities and makes a beginning towards giving communities and the public a role in forest and wildlife conservation. The Act gives rights to the forest dwellers which secure individual or community tenure or both. The Act gives forest rights of forest dwelling Scheduled Tribes and other traditional forest dwellers on all forest lands, namely:- (a) right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood by a member or members of a forest dwelling Scheduled Tribe or other traditional forest dwellers; (b) community rights over forest; (c) right of ownership, access to collect, use, and dispose of minor forest produce which has been traditionally collected within or outside village boundaries. The scope of the Act also covers the following rights that are placed on the forest dwelling communities.

1. Community rights of uses or entitlements such as fish and other products of water bodies, grazing (both settled or transhumant) and traditional seasonal resource access of nomadic or pastoralist communities;
2. Community tenures of habitat and habitation for primitive tribal groups and pre- agricultural communities;
3. Rights in or over disputed lands under any nomenclature in any State where claims are disputed;
4. Conversion of leases or grants issued by any local authority or any State Government on forest lands to title;
5. Settlement and conversion of all forest villages, old habitation unsurveyed villages and other villages in forest, whether recorded, notified, or not, into revenue villages;
6. Protect, regenerate, or conserve or manage any community forest resource, which they have been traditionally protecting and conserving for sustainable use;

7. Rights which are recognised under any State law or laws of any Autonomous District Council or Autonomous Regional Council or which are accepted as rights of tribal under any traditional or customary law of concerned tribes of any State;
8. Access to biodiversity and community right to intellectual property and traditional knowledge related to biodiversity and cultural diversity;
9. Any other traditional right customarily enjoyed by the forest dwelling Scheduled Tribes or other traditional forest dwellers, as the case may be, which are not mentioned in clauses (a) to (k) but excluding the traditional right of hunting or trapping or extracting a part of the body of any species of wild animal;
10. In-situ rehabilitation, including alternative land in cases where the Scheduled Tribes and other traditional forest dwellers have been illegally evicted or displaced from forest land of any description without receiving their legal entitlement or rehabilitation prior to the 13th of December 2005.

The project is not expected to take any such measure that may affect the basic interest of the forest dwellers, contrary to the prescription of the Act. Rather, the implementation of the project will create scope for the forest dwellers, who have been allotted rights over the forest land for agriculture. They may take up climate resilient agricultural practices in their fields to cope with the climate variability for improved livelihoods security. The project suggested measures are supportive to the act and can add value to the current initiatives in terms of improving livelihood and food security of the forest dwellers.

2.4.6 Constitutional Safeguard for Scheduled Tribes

"Scheduled Tribes" means such tribes or tribal communities or parts of or groups within such tribes or tribal communities as are deemed under article 342 to be Scheduled Tribes for the purposes of the Constitution. As it is stipulated in the constitution, the President (President of India) may with respect to any State or Union Territory, and where it is a State, after consultation with the Governor thereof, by public notification, specify the tribes, or tribal communities or parts of or groups within tribes or tribal communities which shall for the purposes of this Constitution be deemed to be Scheduled Tribes in relation to that State or Union Territory, as the case may be. With regard to inclusion or exclusion, Parliament may by law include in or exclude from the list of Scheduled Tribes specified in a notification, any tribe or tribal community or part of or group within any tribe or tribal community.

2.4.6.1 Prohibition of Discrimination

As per this provision, the State shall not discriminate against any citizen on grounds only of religion, race, caste, sex, place of birth or any of them. Other provisions are;

1. No citizen shall, on grounds only of religion, race, caste, sex, place of birth or any of them, be subject to any disability, liability, restriction or condition with regard to (a.) access to shops, public restaurants, hotels and places of public entertainment; or (b.) the use of wells, tanks, bathing Ghats, roads and places of public resort maintained wholly or partly out of State funds or dedicated to the use of general public.
2. Nothing (clause (2) of article 29) shall prevent the State from making any special provision for the advancement of any socially and educationally backward classes of citizens or for the Scheduled Castes and the Scheduled Tribes.
3. Nothing (sub-clause (g) of clause (1) of article 19) shall prevent the State from making any special provision, by law, for the advancement of any socially and educationally backward classes of citizens or for the Scheduled Castes or the Scheduled Tribes in so far as such special provisions relate to their admission to educational institutions including private educational institutions, whether aided or unaided by the State, other than the minority educational institutions referred to in clause (1) of article 30.

2.4.6.2 Equality of Opportunity in Matters of Public Employment

There shall be equality of opportunity for all citizens in matters relating to employment or appointment to any office under the State. No citizen shall, on grounds only of religion, race, caste, sex, descent, place of birth, residence or any of them, be ineligible for, or discriminated against in respect of, any employment or office

under the State. The Central and State Government can make provision for the reservation of appointments or posts in favour of any backward class of citizens which, in the opinion of the Centre/State, is not adequately represented in the services under the State.

2.4.6.3 Protection of Rights

All citizens shall have the right (a) to freedom of speech and expression; (b) to assemble peaceably and without arms; (c) to form associations or unions; (d) to move freely throughout the territory of India; (e) to reside and settle in any part of the territory of India; and (g) to practise any profession, or to carry on any occupation, trade or business.

2.4.6.4 Directive Principles of State Policy

Promotion of Educational and Economic interests of Scheduled Castes, Scheduled Tribes and other weaker sections: The State shall promote with special care the educational and economic interests of the weaker sections of the people, and, in particular, of the Scheduled Castes and the Scheduled Tribes, and shall protect them from social injustice and all forms of exploitation.

2.4.6.5 Special Provisions

***Claims of Scheduled Castes and Scheduled Tribes to Services and Posts*:** The claims of the members of the Scheduled Castes and the Scheduled Tribes shall be taken into consideration, consistently with the maintenance of efficiency of administration, in the making of appointments to services and posts in connection with the affairs of the Union or of a State: Provision in favour of the members of the Scheduled Castes and the Scheduled Tribes can be made for relaxation in qualifying marks in any examination or lowering the standards of evaluation, for reservation in matters of promotion to any class or classes of services or posts in connection with the affairs of the Union or of a State.

2.4.6.6 Political Safeguards

Reservation of seats for Scheduled Castes and Scheduled Tribes in the House of the People: Seats shall be reserved in the House of the People for Scheduled Castes and Scheduled Tribes. The number of seats reserved in any State or Union territory for the Scheduled Castes or the Scheduled Tribes at the same proportion to the total number of seats allotted to that State or Union territory in the House of the People as the population of the Scheduled Castes / Tribes in the State or Union territory.

***Reservation of seats for Scheduled Castes and Scheduled Tribes in the Legislative Assemblies of the States*:** Seats shall be reserved for the Scheduled Castes and the Scheduled Tribes in the Legislative Assembly of every State, based on proportion to the total number of seats in the Assembly as the population of the Scheduled Castes and Scheduled Tribes in the State.

***Reservation of seats at GPs*:** Seats shall be reserved for the Scheduled Castes and the Scheduled Tribes in every Panchayat and the number of seats so reserved shall be the same proportion to the total number of seats to be filled by direct election in that Panchayat as the population of the Scheduled Castes or Scheduled Tribes in that Panchayat area to the total population of that area and such seats may be allotted by rotation to different constituencies in a Panchayat. Not less than one-third of the total number of seats reserved shall be reserved for women belonging to the Scheduled Castes or Scheduled Tribes and such seats may be allotted by rotation to different constituencies in a Panchayat.

2.4.7 The SCs and the STs (Prevention of Atrocities) Act, 1989

The act was passed in 1989 to prevent Scheduled Castes and Scheduled Tribes from atrocities. The act suggests Precautionary and Preventive Measures. under which State Government shall identify the area where it has reason to believe that atrocity may take place or there is an apprehension of reoccurrence of an offence under the Act: The state shall order the concerned officer to visit the identified area and review the law and order situation. If deem necessary, in the identified area cancel the arms licenses of the persons, not being member of the Scheduled Castes or Scheduled Tribes, their near relations, servants or employees and family friends and get such arms deposited in the Government Armoury. The act suggests constitution of a high-power State-level committee, district and divisional level committees or such number of other committees as deem proper

and necessary for assisting the Government in implementation of the provisions of the Act; The act has made provision to set-up a vigilance and monitoring committee to suggest effective measures to implement the provisions of the Act. The state can set-up Awareness Centres and organise Workshops in the identified area or at some other place to educate the persons belonging to the Scheduled Castes and the Scheduled Tribes about their rights and the protection available to them under the provisions of various Central and State enactments or rules, regulations and schemes framed there under. Under the act, Non-Government Organisations are encouraged for establishing and maintaining Awareness Centres and organizing Workshops and provide them necessary financial and other sort of assistance;

As per the provision of the act, the State Government shall set up a Scheduled Castes and the Scheduled Tribes Protection Cell at the State head quarter under the charge of Director General of Police/Inspector General of Police. This Cell shall be responsible for (i) conducting survey of the identified area; (ii) maintaining public order and tranquility in the identified area; (iii) recommending to the State Government for deployment of special police force or establishment of special police post in the identified area; (iv) making investigations about the probable causes leading to an offence under the Act; (v) restoring the feeling of security amongst the members of the Scheduled Castes and the Scheduled Tribes; (vi) informing the nodal officer and special officer about the law and order situation in the identified area; (vii) making enquiries about the investigation and spot inspections conducted by various officers; (viii) making enquiries about the action taken by the Superintendent of Police in the cases where an officer in-charge of the police station has refused to enter an information in a book to be maintained by that police station; (ix) making enquiries about the willful negligence by a public servant;

2.4.8 Agricultural Produce Market Committee Act, 2003

The Agricultural Produce Market Committee Act, 1963 (APMC, 1963) operate on two principles, i.e., (1) to ensure that farmers are not exploited by intermediaries (or money lenders) who compel farmers to sell their produce at the farm gate for an extremely low price; (2) all food produce should first be brought to a market yard and then sold through auction.

The specific objective of market regulation is to ensure that farmers are offered fair prices in a transparent manner. The APMC Act empowers state governments to notify the commodities, and designate markets and market areas where the regulated trade takes place. The Act also provides for the formation of agricultural produce market committees (APMC) that are responsible for the operation of the markets. The entire State is divided and declared as a market area wherein the markets are managed by the Market Committees constituted by the State Governments. Once an area is declared a market area and falls under the jurisdiction of a Market Committee, no person or agency is allowed freely to carry on wholesale marketing activities.

The RPF is prepared in accordance with the Right to Fair Compensation and Transparency in Land Acquisition, Resettlement and Rehabilitation (RFCTLAR&R) Act 2013; LARR Rule, 2015; Government of West Bengal Gazette Notification, dated March 1, 2016 for land acquisition and World Bank guidelines as set out in the Operational Policy OP 4.12 on Involuntary Resettlement.

2.5 World Bank Safeguard Policies

.This section is intended to highlight the World Bank safeguard policies and their applicability to the project. The World Bank's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for Bank and borrower in the identification, preparation, and implementation of programs and projects. They also provide a platform for the participation of stakeholders in project design. In essence, the safeguard policies ensure that environmental and social issues are evaluated in decision making, help reduce and manage the risks associated with the project and provide a mechanism for consultation and disclosure of information. The safeguards policies of the World Bank are outlined in the Table and the implications of these policies for the project are discussed in Table below.

Table 15: Operational Policies and its Implications for the Project

Operational Policy	Triggered (Yes/No)	Summary of OP	Implications for the Project and Compliance Mechanism
OP 4.01: Environmental Assessment	Yes	The purpose of this policy is to help ensure the environmental and social soundness and sustainability of investment projects. The policy supports the integration of environmental and social aspects of projects in the decision-making process. The OP/BP 4.01 requires that the environmental consequences of the project are taken into consideration during the project cycle and are considered in selection, siting, planning and designing of projects. It emphasizes upon the mitigative measures so as to reduce the adverse environmental impact, if any.	The project aims at rehabilitation and restoration of irrigation infrastructure, flood control and management, and agricultural improvement through various measures. These activities could result in adverse environmental impacts, if not properly designed, implemented and managed. The project is categorized as Category B as per the policy. Environmental Assessment is necessary to understand the current environmental setting and possible impact and thereafter propose alternatives or mitigation measures for the identified impacts. The exact scope, scale and location of the project activities will be evident after the feasibility study is completed and the preferred options for the project activities are identified and designed. Hence, at the current stage of project preparation, a 'Framework' has been developed to spell out the procedures for undertaking ESIA and preparing ESMPs for the identified project activities. The 'Framework' called the 'Environmental and Social Management Framework' (ESMF) also describes the institutional arrangements and the monitoring mechanisms. The ESMF will also guide the environmental assessments for future activities to be taken up by the IWD (that is for activities that are identified through the feasibility study but are not part of the current project).
OP 4.04: Natural Habitats	Yes	The OP promotes environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions.	The project essentially involves works/management of existing irrigation infrastructure. The project will not involve activities that can lead to significant conversion or degradation of critical natural habiatats (protected areas). The nearest protected area, the Ramnabagan Wild Life Sanctuary (WLS) at Bardhhaman-1 block is 3.7 km away (NNE) from Damodar river and 2.5 km away (NE) from the DVC canal. The project impacts on natural habitats such as the rivers and wetlands will be assessed as part of the ESIA, and ESMPs for the various project activities will be prepared to mitigate any identified impacts.

Operational Policy	Triggered (Yes/No)	Summary of OP	Implications for the Project and Compliance Mechanism
OP 4.36: Forests	No	This policy emphasizes upon the management, conservation, and sustainable development of forest ecosystems.	The project activities will not be executed in any notified forest area or forest land. The ESIA will confirm any involvement of any forest area for the project activities.
OP 4.09: Pest Management	Yes	This policy seeks to minimize and manage the environmental and health risks associated with pesticide use and promote and support safe, effective, and environmentally sound pest management.	With improved availability of surface water, it is likely that use of pesticides may increase with agricultural intensification and diversification. However, the project does not intend to finance any activity that involves procurement of chemical pesticides which may have adverse human and environmental implications. Further, the project will discourage use of banned pesticides and pesticides listed in the WHO categories 1a, 1b and II. The project will promote Integrated Pest Management (IPM). An Integrated Pest and Nutrient Management Strategy has been included as part of the ESMF.
OP 4.11 Physical Cultural Resources (PCR)	Yes	The policy aims assist in preserving PCR and in avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance.	The project activities (construction works) are limited to canal bed, embankment and water regulatory structures. As the structural / construction works are limited to existing structures / canal systems, PCR are not likely to be adversely affected. The EIA will confirm any involvement of any PCR in the project activity sites. The EMPs will include provisions for dealing with any 'Chance Finds' of archaeological, paleontological, historical significance.
OP 4.37 Dam Safety	Yes	This policy is concerned with ensuring quality and safety in the design and construction of new dams and the rehabilitation of existing dams, and in carrying out activities that may be affected by an existing dam.	The project area is fed by waters from 5 large dams located in the State of Jharkhand (Tehyghat, Tilayia, Konar, Panchet and Maithon). The IWD has commissioned an independent safety assessment of the dams.
OP 7.50 International Water Ways	Yes, only in regard to the fact that the rivers considered under the project lie in Lower Damodar Sub basin, that is within Ganga basin and Ganga is an international river. It is also to be mentioned that the project area is more than 60 km away from the international border and	This policy applies any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states.	The river Damodar drains into the Hooghly. The river Damodar is entirely within the national boundary of India, and, India is the lowest downstream riparian state of the Hooghly before it drains into the Bay of Bengal. Therefore, an exception of the policy has been approved by the World Bank.

Operational Policy	Triggered (Yes/No)	Summary of OP	Implications for the Project and Compliance Mechanism
	there is absolutely no drawal/impact from/ on the said international river due to implementation of this project.		
OP 4.10 Indigenous People	Yes	This policy asserts that the adverse impacts of the development projects on the indigenous people should be mitigated or avoided and the benefits of the project should be accrued to them.	The assessment finds scheduled tribe population living in command area of the DV. Though, the project is not likely to impact adversely to the tribal population, the project will take care of ensuring their participation in the implementation process and ensure equity and inclusion in accessing project benefits. The project will have a TPPF focusing on inclusion of tribal in the project benefits. Based on the TPPF, if so found required, specific TPP will be prepared once sites are identified.
OP 4.12 Involuntary Resettlement	Yes	This policy aims at avoiding, if not minimizing adverse impacts on the local population due to project and where unavoidable it ensures that those affected improve or at least restore their livelihood.	Preliminary assessment reveals that there are some encroachments in the river bed and near embankment those may be temporary relocated. However, the project is unlikely in the need of any additional land for which displacement will take place.
Projects in Disputed Areas (OP 7.60, BP 7.60)	No	This policy is concerned with any project in the disputed area/s concerning two countries	The project is not in any disputed area and hence OP7.60 is not applicable to the project.

Chapter 3: Baseline Assessment

3.1 Introduction

The state of West Bengal, the fourth largest state of India having an area of about 88,752 sq. km, is the home of about 91.28 million population[7]. About 31.87 percent of total population of the State lives in urban areas and remaining 68.13 percent live in rural areas. West Bengal offers wide topographic diversity and intricate drainage network of the Ganga, the Brahmaputra and the Subarnarekha river basins. The State can distinctly be divided into three geographical units. The Ganga divides the State into two unequal hubs, i.e., the North and South Bengal. The State has 20 administrative districts. The North Bengal with seven districts covers 21,855 sq. km and renders home to 17,211,010 persons. The remaining thirteen districts of South Bengal can further be subdivided into two geographical units taking Bhagirathi-Hooghly river as the demarcating line. The western Rarh region covers an area of about 46,418 sq. km and supports a population of about 42,677,166 while the eastern deltaic plain covers 20,484 sq. km and population living thereon is 31,387,939.

The proposed project is located in the Damodar Valley Command Area (DVCA) and the Lower Damodar Sub-basin, and includes areas located in East (*Purba*) & West (*Paschim*) Bardhhaman, Bankura, Hooghly and Howrah Districts of the state of West Bengal in India. Water to the DVCA is provided by five dams that are located in the upstream parts of the Damodar River in the state of Jharkhand. The DVCA canals currently irrigate around 332,000 ha in the Kharif season (out of a design area of 393,800 hectares), 20,000 ha in the Rabi season on the basis of an earmarked allocation, and an average of 28,000 ha in the summer (Boro) season, depending on the amount of water remaining in upstream reservoirs and after meeting the priority needs. The total area irrigated (including canals, groundwater and ponds) is approximately 100,000 hectares in Rabi and Boro season each.

The DVCA was developed more than six decades ago and is now degraded. Numerous regulating structures including cross and tail regulators, outlet gates, distributaries and minors have been severely damaged. Cross drainage structures, including aqueducts are damaged and are leaking, resulting in a loss of irrigation water. As a result, tail end farmers are not getting the required amount of water at the time of need as per the irrigation schedule, and are using groundwater, especially during Rabi and Boro seasons.

Further, Flooding of extensive areas of the Lower Damodar is a frequent phenomenon within parts of Howrah and Hooghly districts causing significant economic damage and social distress. The situation occurs because these areas are on low-lying alluvial plains of the lower reaches of the river, a naturally accreting zone where tidal backwater restricts outflow of extensive floodwaters from the upland headwaters of the basin. Along with this, development of Boro bunds to store water in the summer season aggravates the situation. So, WBMIFMP aims to improve the existing irrigation network, to optimize conjunctive and sustainable use of ground and surface water across in the project area throughout the year, and to reduce flooding.

[7] Census of India, 2011

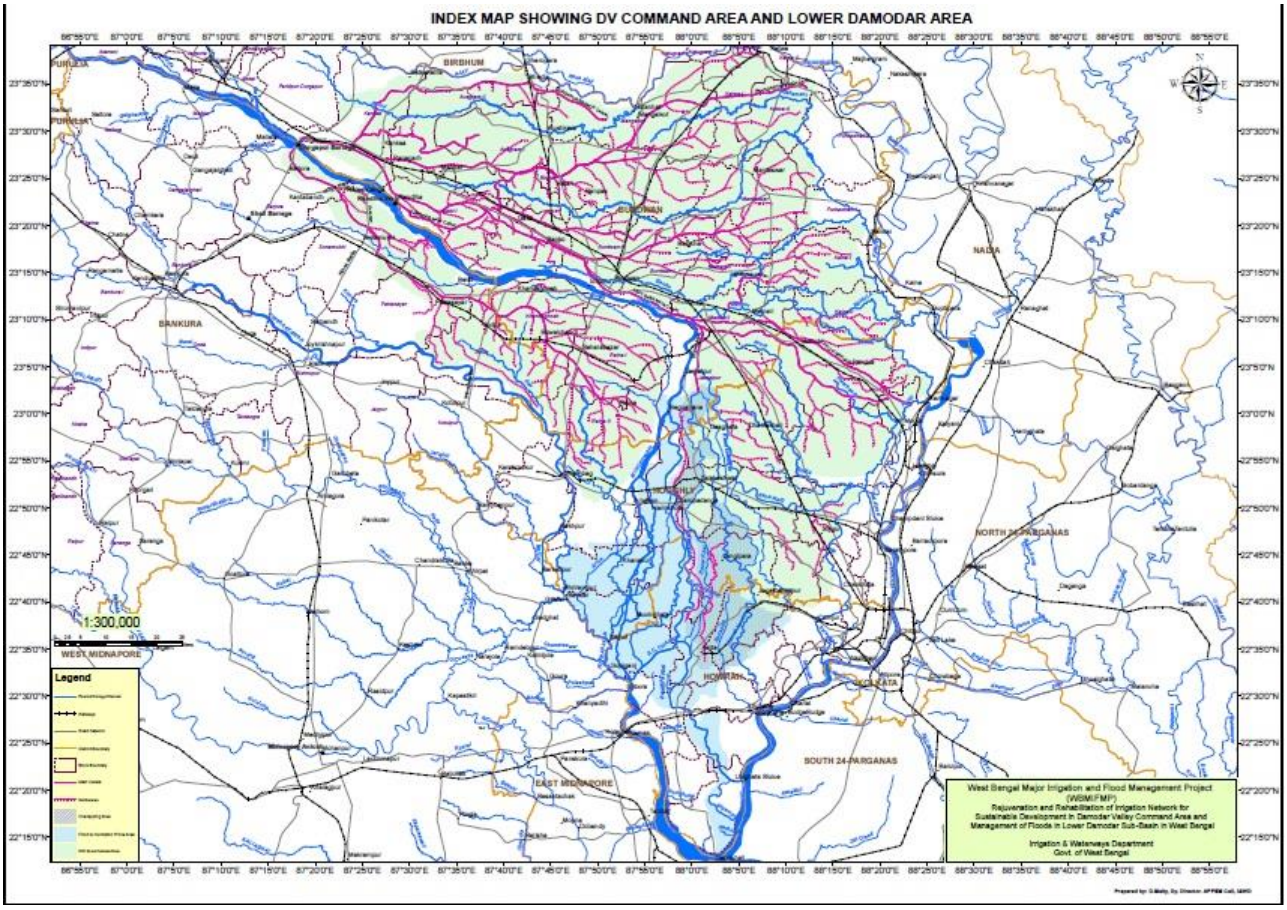

Figure 3: Damodar River Basin

Table 16: Constituents of Damodar River Basin in West Bengal

SN	District	Total Area (Sq. Km.)	Area in the Basin (Sq. Km.)	% Area of the District in the Basin	% Share in the Basin
1	Purulia	6259	1383.28	22.1	5.92
2	Bankura	6881	1564.67	22.74	6.69
3	Bardhhaman	7028	2113.61	30.07	9.04
4	Hooghly	3145	359.87	11.44	1.54
5	Howrah	1474	726.16	49.29	3.11
	Total		**6147.59**		**26.30**

Note: 73.70 percent share of the basin is in Jharkhand sub-region of the Damodar River Basin; Purulia district is not a part of the proposed WBMIFM project.

3.2 District Profile

3.2.1 Bankura

Bankura, the fourth largest district of West Bengal is located in the western part of the state, which is popularly known as "Rarh" from time immemorial. It has an area of 6,882 sq.km and according to the census of 2011, it has a population of 35.98 lakh. The district is surrounded by the districts of Paschim Medinipur and Hooghly district in the east, Purulia district in the west, Bardhhaman district in the north and again Purulia and Medinipur in the South. It is somewhat triangular in shape and lies within 22° to 23° North latitude and 86° to 87° East longitude. Bankura is drained by Damodar, Darkeswar and Kangsabati along with their tributaries of which Gandeswari, Silai and Kumari deserve separate mention. The river Damodar separates the district from Bardhhaman in the North. This district has a moderate deposit of coal and a number of good deposits of china clay, base material for ceramic industry. The district lies in sub-humid zone having total annual rainfall of 1423 mm. The major part of the district is characterized by undulating topography. The average slope of

land varies from 0.4% to 10%. The soil is mostly lateritic, light in texture and acidic in nature. The fertility status is also very low. The soil is light and porous in nature with low organic matter and low water holding capacity. However, eastern and southern part of the district is more productive than western part. Rice is the main crop of the district. Besides rice, the other major crops are Potato, wheat, vegetables, Mustard, Summer Til, etc. This district is self-sufficient in rice, potato and vegetable production. The district is having 8 blocks and 75 GPs with 1,378 inhabitant village. The land utilization statistics of the district is presented in the table.

Table 17: Land utilization Pattern of Bankura District

Sl. No.	Particulars	Value (Area in Ha.)
1.	Geographical Area	6,88,100.00
2.	Forest	1,48,350.00
3.	Area under Non-Agricultural use	1,09,621.00
4.	Barren and Unculturable Land	3,302.00
5.	Permanent Pasture	633.00
6.	Area under Fruit Crops, Misc. Tree crops and others	5,284.49
7.	Culturable Waste Land	2,337.00
8.	Fallow other than Current Fallow	1,386.00
9.	Current Fallow	2,55,679.40
10.	Net Area Cultivated	1,61,507.11
11.	Area Cultivated More than Once	1,49,985.00
12.	Gross Cropped Area	3,11,492.11
13.	Cropping intensity	192.86 %

Source: Dy. Director, Agriculture (Admn), Bankura (http://www.bankura.nic.in/agriculture.htm), Note: Figures are of 2010-11

3.2.2 Bardhhaman

Bardhhaman district having a total area of 7,024 square Kilometers, constitutes of 31 Blocks containing 277 Gram Panchayats and 2438 inhabited villages. The district extends from22°56/ to 23°53/ North latitude and from 86°48/ to 88°25/ east longitude. Lying within Bardhhaman division, the district is bounded on the north by the districts of Dumka, Birbhumand Murshidabad, on the East by Nadia, on the South by Hooghly, Bankura, Purulia and the West by Dhanbad district of Jharkhand. The average rainfall of the district is 1,446 mm and the maximum and minimum temperature lies between 38to 39 degrees Celsius.

There are **two distinct agro-climatic regions** in Bardhhaman district namely alluvial region (eastern part) and lateritic region (western part). The Eastern Part consists of alluvial soil and is pioneering in agriculture which is mainly a food grain producing zone. The conditions of soil, climate and irrigation infrastructure are favorable for agriculture. As such agriculture and its allied activities i.e. fishery, animal husbandry, horticulture and allied industries like husking mill, cold storage have been flourished in this zone. The Western Part is full of mines, both abandoned and working.

The soil of the eastern part of Bardhhaman district is of rich alluvial variety and is suitable for intensive cultivation of paddy, wheat, potatoes and other crops and vegetables. The soil of the western part of the district is reddish and is not that fertile. The district of Bardhhaman is girdled by three major rivers – the Hooghly on the east, the Ajay on the north and the Damodar on the south. Apart from these three, there are myriads of minor rivers and streams which crisscross the district.

Table 18: Land Utilization Pattern of Bardhhaman District

SN	Particulars	Values (in '000 Ha.)
1	Reporting Area	698.74
2	Forest Area	22.27
3	Area under Non-agri. use	182.62
4	Barren and unculturable Land	2.38
5	Permanent pastures and other grazing land	0.62
6	Land under Misc. tree groves not included in Net Area shown	3.01
7	Culturable Waste Land	9.84
8	Current fallow	8.04
9	Fallow land other than current fallow	3.33
10	Net cropped area	466.63

Source: District Statistical Officer, Bardhhaman (http://Bardhhaman.nic.in/agri/agriculture.htm, Accessed during August 2018).

3.2.3 Howrah

Howrah district situated in the southern part of West Bengal district is surrounded by South 24 Parganas on the east, Purba and Paschim Medinipur on the west, Hooghly and North 24 Parganas on the North. It lies within 22 º 35'44.77" N latitude and 88º 15'49.10" E longitude. With an area of 1467 sq. km, the district comprises 02 Sub- Divisions, 14 Blocks and 734 inhabited villages. More than 98% of land belongs to small and marginal farmers and average size of land holdings is about 0.42 ha. Agriculture is one of the predominant activities in the district. The district lies in humid zone having total annual rainfall of 1515 mm. The soil is highly fertile alluvial in nature. Rice is the main crop of the district. Besides rice, the other major crops are Potato, Mustard, Summer Til, Jute, wheat, pulses, etc. This district is self-sufficient in rice, potato and vegetable production. The Land utilization pattern of the district is presented in the table.

Table 19: Land Utilisation Pattern of Howrah District

Sl. No.	Particulars	Value (in '000 Ha.)
1	Geographical area	138.67
2	Cultivable area	85.57
3	Forest area	-
4	Land under non- agricultural use	51.24
5	Permanent pastures	-
6	Cultivable Wasteland	0.21
7	Land under Misc. tree crops and groves	1.2
8	Barren and Uncultivable land	1
9	Current fallows	4.6
10	Other fallows	0.24

Source: Dept. of Agriculture, Agriculture Contingency Plan of Howrah, 2011

3.2.4 Hooghly

The total geographical area of this District is 314900 ha of which 223390 ha (71%) is under cultivation. Out of the total area under cultivation 66% area is covered by irrigation. More than 95% of land belongs to small and marginal farmers and average size of land holdings is about 0.66 ha. Hooghly despite being a major industrial district of West Bengal retains its basic rural characteristics with over 70% of its total population depending on Agriculture and its position as one of the major producers of cereals in the State. With highly fertile alluvial soil, well developed irrigation infrastructure, the district can be called as an agriculturally advanced district. The cropping intensity in the district is 244%. Aman &Boro Rice is the main crop of the district. Besides rice, the other major crops are Potato, oilseed, Jute, wheat, etc. This district is self-sufficient in rice, potato and vegetable production. Land utilization pattern of the district is presented in the table.

Table 20: Land Utilisation Pattern of Hooghly District

Sl. No	Particulars	Area (in Ha.)
1	Total Area Reported	314900
2	Forest Land	649
3	Area Not Available for Cultivation	96615
4	Permanent Pasture and Crazing Land	8
5	Land under Miscellaneous Tree Crops	1588
6	Cultivable Wasteland	1518
7	Current Fallow	594
8	Other Fallow	119
9	Net Sown Area	223390
10	Total or Gross Cropped Area	513797
11	Area Cultivated More than Once	193425
12	Cropping Intensity [GCA/NSA]	230

Source: Dept. of Agriculture, Agriculture Contingency Plan of Hooghly, 2011

3.3 Demography

The population density among the project districts is highest at Howrah and lowest at Bankura. The sex ratio is highest at Hooghly district, which is marginally higher than the state value. Decadal growth rate in project district varies from 9.5% at Hooghly to maximum 13.5% at Howrah, whereas the state decadal rate recorded at 13.84 which is slightly more than average of project districts.

Literacy rate is found to be highest in Hooghly (81.8%) followed by Howrah (80.0%), which are more than state average of 76.3%. ST concentration is maximum (10.25%) in Bankura district and minimum (0.31%) in Howrah district. Average ST concentration at project blocks is only 5.26%, which is slightly lower than state average of 5.80%. However, district specific project blocks analysis reveals that, ST concentration is maximum at Bardhhaman and minimum at Howrah- which is described in following sections.

Table 21: Demographic profile of whole project district

Indicators	Bankura	Bardhhaman (Purba & Paschim)	Howrah	Hooghly	West Bengal
Population	714599	7717563	4850029	5519145	*91276115*
Decadal growth rate	12.65%	11.9%	13.5%	9.5%	13.84%
Density	523	1099	3306	1753	1,028
Sex ratio	957	932	939	961	950
Child sex ratio		951	962	954	956
Work Participation Rate	40.77%	37.7%	37.5%	39.0%	38.1%
Main workers	25.48%	28.1%	30.9%	31.1%	28.1%
Literacy Rate	70.26%	76.2 %	80.0 %	81.8 %	76.3 %
Scheduled caste	32.65%	27.41%	14.82%	24.35%	23.51 %
Scheduled Tribe	10.25%	6.34%	0.31 %	4.15 %	5.80 %
Urban Population	8.33%	39.89%	63.4 %	38.6%	31.87 %

Note: This table represents total figure of project districts.

3.3.1 SC & ST Population in Project District

SC population is predominant in all project district. Average SC population (31.2%) in project districts is marginally below state average (32.65%). Secondary study reveals that ST population is present in all project blocks. In Bankura district, ST concentration is lowest (1.64%) at Barjora block and highest (3.5%) at Sonamukhi block. In West Bardhhaman ST concentration is highest (10.2%) at Kanksa and lowest (6.9%) at Faridpur Durgapur. In East Bardhhaman, ST concentration is more than 10% in 8 project blocks and less than 5% in 7 project blocks. ST concentration is highest at Memari – II (18.4%), followed by Kalna – II (17.28%), Memari – I (15.7%), Jamalpur (15.1%) and Ausgram - II (14.4%) in East Bardhhaman district. In Howrah district, ST population is lowest (0.04%) at Uluberia-II block, followed by Shyampur – II block (0.05%) and

highest (1.03%) at Jagatballavpur block. In 4 blocks of Hooghly district, ST population concentration is more than 9% and remaining 11 blocks has less than 7% ST concentration. Block wise ST population is given in ANNEXURE- 10.

Table 22: Project district wise SC & ST population concentration

Items	Bankura	Purba Bardhhaman	Paschim Bardhhaman	Howrah	Hooghly	Total (in 51 Blocks)
Household	151,989	806,809	42,590	372,070	706,281	2,079,739
Population	688,813	3,459,154	188,964	1,688,303	3,053,642	9,078,876
Scheduled Caste Population	291,761	1,161,884	70,652	376,505	929,574	2,830,376
Scheduled Tribe Population	17,508	299,879	19,927	3,820	195,422	536,556
% of SC Population	42.4	33.6	37.4	22.3	30.4	31.2
% of ST Population	2.5	8.7	10.5	0.2	6.4	5.9

Note: This table represents only rural population of 51 project blocks (41- Irrigated and 10 – Flood affected) of these five districts

3.4 Literacy

According to the 2011 census, the average literacy rate (78.7) in project districts is much more than state (76.3%) as well as country (73%) average. Average urban literacy rate is above 80% in all the project districts and rural literacy rate is below 80 percent in all the project districts. Bankura has rural literacy rate (71%) below state as well as national average. There is a gap between male and female literacy, which is most pronounced in Bankura. Elsewhere the gender gap is less than the national average (16.2%).

Table 23: Literacy Rate in Project District

District	Literacy Rate (%)	Male literacy rate			Female literacy rate			Gender gap in literacy		
		Total (%)	Rural (%)	Urban (%)	Total (%)	Rural (%)	Urban (%)	Total (%)	Rural (%)	Urban (%)
Bankura	71	80	79.1	90.1	60.1	58.3	78.5	20	20.8	11.6
Bardhhaman (Purba & Paschim)	77.2	82.4	79.1	87.3	69.6	65.9	75.3	12.8	13.3	12
Howrah	83.9	87	84.7	88.2	79.4	75	82	7.5	9.8	6.2
Hooghly	82.6	87	84.8	90.5	76.4	72.1	83.1	10.7	12.7	7.4
Project Average	78.7	84.1	81.9	89.0	71.4	67.8	79.7	12.8	14.2	9.3
West Bengal	*76.3*	*81.7*	*78.4*	*88.4*	*70.5*	*65.5*	*81*	*11.2*	*12.9*	*7.4*
India	*73*	*80.9*	*77.1*	*88.8*	*64.6*	*57.9*	*79.1*	*16.2*	*19.2*	*9.7*

Note: This table represents total figure of project districts.

3.5 Working Population

West Bengal has a fewer percentage of female main workers (4.39% of the population) than the national average (7.38%) and a larger percentage of female non-workers (39.91%) than the national average (36.14%). Both main and marginal type female worker percentage in entire project coverage area (51= 41 – Irrigated and 10- Flood affected) is very low (9.6%). In Bardhhaman west, the percentage of male main workers is lowest (19.7%) and the percentage of male marginal workers (10.3%) and non-worker (21.7%) is highest among project blocks. The largest percentage of female main workers is in Bankura and the largest number of female marginal workers is in Bardhhaman (West).

Table 24: Worker and Non-Worker Population

District	Male Population				Female Population			
	Main Worker	Marginal Worker	Non-Worker	Total	Main Worker	Marginal Worker	Non-Worker	Total
Bankura	24.2	6.6	20.5	51.2	5.2	6.3	37.3	48.8
Bardhhaman (East)	24.6	6.8	19.7	51.0	5.0	5.0	39.0	49.0
Bardhhaman (West)	19.7	10.3	21.7	51.6	3.6	7.2	37.5	48.4
Howrah	25.1	6.0	20.1	51.2	3.2	3.3	42.2	48.8
Hooghly	25.8	6.0	19.0	50.8	4.5	4.4	40.3	49.2
Average (Project District)	23.8	7.1	20.2	51.2	4.3	5.3	39.3	48.8

Note: This table represents only rural population of 51 project blocks (41- Irrigated and 10 – Flood affected) of these five districts

3.6 Livelihood

The livelihood profile of the state varies widely across the districts. The proportion of cultivators is the largest in Bardhhaman (Purba & Paschim) and Bankura district, and the smallest in Howrah. In the latter district, there is a large percentage of household industrial workers. In Howrah, there are a large percentage of female household industrial workers followed by Bardhhaman and Hooghly district. Other workers have a large presence in Bardhhaman, Howrah and Hooghly. As in many districts of the State, cultivators constitute a far smaller part of the West Bengal workforce than in India as a whole.

There is a notable growth in the number of marginal workers from 1991 to 2001, largely due to the implementation of the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA). The growth has taken place across all the districts. There has been a decline in the number of main workers in Bankura.

Table 25: Male Work Force (Main and Marginal)

District	Male Worker (Both Main and Marginal) (% Distribution)								
	Cultivator		Agricultural Labourer		Household Industrial Worker		Other Worker		Total
	% of West Bengal	*% of District*	*% of West Bengal*	*% of District*	*% of West Bengal*	*% of District*	*% of West Bengal*	*% of District*	*% of West Bengal*
Bankura	6.16	57.75	5.17	80.29	2.69	6.26	2.63	74.81	3.93
Bardhhaman (Purba & Paschim)	7.09	66.54	9.40	146.07	5.81	13.51	8.86	252.02	8.58
Howrah	1.58	14.84	2.15	33.47	17.85	41.49	7.82	222.58	5.61
Hooghly	5.32	49.95	5.58	86.73	5.98	13.89	7.26	206.74	6.41
West Bengal	*100.00*	*938.32*	*100.00*	*1554.01*	*100.00*	*232.43*	*100.00*	*2845.89*	*100.00*

Note: This table represents total figure of project districts.

Table 26: Female Work Force (Main and Marginal)

District	Female Worker (Both Main and Marginal) (% Distribution)								
	Cultivator		Agricultural Labourer		Household Industrial Worker		Other Worker		Total
	% of West Bengal	*% of District*	*% of West Bengal*	*% of District*	*% of West Bengal*	*% of District*	*% of West Bengal*	*% of District*	*% of West Bengal*
Bankura	5.31	16.04	9.59	128.50	2.33	15.38	2.66	43.57	5.17
Bardhhaman (Purba & Paschim)	3.74	11.29	9.97	133.57	4.43	29.27	7.87	128.68	7.69
Howrah	1.53	4.61	0.77	10.35	7.32	48.39	5.76	94.23	4.00
Hooghly	3.27	9.87	6.12	82.02	3.35	22.14	6.19	101.15	5.46

Note: This table represents total figure of project districts.

It may be observed that the percentage of cultivators has reduced in all the districts. Even when the cultivators are considered together with the agricultural labourers (both main and marginal workers), their percentage among all workers has gone down drastically. The decline happened during the decade 1991-2001, when there was implementation of NREGS in West Bengal. Going by this percentage for2001 and 2011, it can be concluded that agriculture no longer provides the only means of livelihood to the majority of the workforce in all project districts. Another change observed is that the combined percentage of agricultural labourers and other workers has steadily increased at the expense of cultivators and household industrial workers. Thus, there has been a clear shift toward wage-earning jobs.

3.7 Migration

The sharp rise in the decadal growth rate of the urban population of West Bengal from 2001 to 2011, together with the continued decline in the growth rate of the rural population, is indicative of urban migration. Except for two cities that had growth rates of 40 percent (English bazar urban agglomeration) and 25 percent (Habra urban agglomeration), all the other cities had growth rates below 20 percent. On the other hand, the urban population of West Bengal grew by 30 percent during the same decade. Therefore, it is the smaller towns and cities that must account for this phenomenal growth rate. The growth has happened all over the State. Except for Kolkata, Paschim Medinipur and North 24 Parganas, the urban growth rate in all the districts during this decade has been more than 20 percent. This would have happened because of rural to urban mobility.

3.8 Health and Gender

The proportion of institutional births in rural areas of the project district is 84.5%, close to the overall district average of 85.6%. Percentage of children who received full vaccination is high at 96.2% and 95.9% in the overall district and in its rural areas, respectively. Prevalence of diarrhoea among under-five age group children is reportedly 5.1% in the overall project district and 5.2% in its rural areas.

There are 2 medical college, 2 District Hospital, 10 Sub-divisional Hospital and 1 State- general & other Hospital, 48 Rural Hospitals. There are also 67 Block Primary Health Centers, 279 Primary Health Centers. However, medical hospital is not present in Howrah and Hooghly district. There is no district hospital as well as state general hospital in Bankura and Bardhhaman district.

Table 27: District wise healthcare facilities

Category			Bankura	Bardhhaman	Hooghly	Howrah	Project Total		*State Total*
Department of Health & Family Welfare Government of West Bengal	**Medical College Hospital**	No	1	1	0	0	2		*13*
		Total no of beds	947	1181	0	0	2128		*15071*
	District Hospital	No	0	0	1	1	2		*22*
		Total no of beds	0	0	650	642	1292		*10100*
	Sub-divisional Hospital	No	2	4	3	1	10		*45*
		Total no of beds	350	1000	814	589	2753		*8926*
	State General Hospital	No	0	0	1	7	8		*35*
		Total no of beds	0	0	204	538	742		*4019*
	Other Hospital	No	1	0	1	1	3		*34*
		Total no of beds	550	0	55	52	657		*8898*
	Rural Hospital	No	5	13	17	13	48		*273*
		Total no of beds	180	460	630	546	1816		*9361*
	Block Primary Health Centre	No	17	29	10	11	67		*252*
		Total no of beds	340	500	180	190	1210		*4774*
	Primary Health Centre	No	70	104	62	43	279		*921*
		Total no of beds	394	567	452	387	1800		*5593*
State Government Other Departments*		No	2	5	6	6	19		*67*
		Total no of beds	18	352	817	966	2153		*6044*
Local Body		No	0	0	3	1	4		*31*
		Total no of beds	0	0	83	35	118		*960*
Government of India*		No	1	24	2	2	29		*58*
		Total no of beds	50	3102	34	272	3458		*6235*
NGO/Private		No	36	149	173	107	465		*1789*

Category		Bankura	Bardhhaman	Hooghly	Howrah	Project Total		*State Total*
	Total no of beds	657	1944	2215	1169	5985		*29891*
Total	*No*	*135*	*329*	*279*	*193*	*936*		*3540*
	Total no of beds	*3486*	*9106*	*6134*	*5386*	*24112*		*109872*

Source: Data compiled from https://www.wbhealth.gov.in and baseline report of WBMIFMP.

3.9 Physical Features

Physio-graphically, the State is broadly divided into three regions, viz (i) Eastern Himalayas (in the north), (ii) Eastern or Chhotonagpur Plateau, and (iii) Alluvial and Deltaic Plains. This section covers the following features of the project area, i.e., climate, temperature and rainfall.

3.9.1 Climate

The topography and latitudinal extent (200 30'16"N to 270 16'17"N) exert influence on temperature and rainfall pattern in different parts of West Bengal. The climate of the area is characterized by moderate winters to hot and humid summers. The general climate of all the five project districts is tropical. The Tropic of Cancer passes across the northern part of the district of Bankura. The Damodar Valley experiences three principal seasons; summer (April to June), rainy Season (July to October) and winter (December to March). In the winter season, from December to March the general flow of surface air is north easterly and less humid. In summer months, April to June, the general flow of winds is from sea to land and the season is of much humidity, cloud and rain. The direction of winds mostly south westerly, the season is named as South west Monsoon season. Between these two principal seasons are the transition seasons of hot weather April and May and retreating Monsoon months for October and November.

Since the agriculture is the largest consumer of water, agricultural activities are linked with three principal cropping seasons with corresponding meteorological seasons, i.e., (a) Summer corresponding with pre-Kharif or Boro cultivation; (b) Monsoon with Kharif (dominated by Aman cultivation); and (c) Retreating Monsoon with Rabi.

3.9.2 Temperature

Bankura is generally arid in nature compared to other parts of Bengal. The climate in the western portion of the district is drier than the eastern regions. From March to May, the hot westerly winds prevail and the day time temperatures are oppressive. The North-westers are frequent during the early part of March (locally called as “Kal Baisakhi”) and help to mitigate the excessive heat.

Bardhhaman district experiences a climate which is transitional between CWg and AW types, where 'C' stands for 'warm temperate rainy climates with mild winter', 'W' for 'dry winter not compensated for by total rain in the rest of the year', 'g ' for 'eastern Ganges type of temperature trend' and 'AW ' for 'tropical savanna climates'. Maximum temperature in summer season reaches upto 36 ^{0C} while at the cold season minimum temperature touches 16 ^{0}C. The cold season starts from about the end of October and continues till the beginning of March. March to May is dry summer intervened by tropical cyclones and storms. June to September is wet summer while October and November are autumn.

Table 28: Project district wise temperature profile

Season	Bankura	Bardhhaman	Howrah	Hooghly
Summer (April – May)	17 ^{0C} to 42 ^{0C}	24 ^{0C} to 36 ^{0C}	23 ^{0C} to 35 ^{0C}	25 ^{0C} to 33 ^{0C}
Winter (October to March)	10 ^{0C} to 32 ^{0C}	16 ^{0C} to 30 ^{0C}	14 ^{0C} to 27 ^{0C}	17 ^{0C} to 28 ^{0C}
Rainy season (June to September)	23 ^{0C} to 35 ^{0C}	24 ^{0C} to 33 ^{0C}	21 ^{0C} to 34 ^{0C}	25 ^{0C} to 30 ^{0C}

Source: District Irrigation Plan prepared under PMKSY (Prepared in the year of 2016)

Temperature of Hooghly during hot summer (April – May) is varies between minimum 23 ^{0C} to maximum 33 ^{0C}. During winter (October to March) it varies between minimum of 17 ^{0C} to maximum 28 ^{0C} . During rainy season (June to September) it ranges between 25 ^{0C} to 30 ^{0C} .

3.9.3 Rainfall

The normal annual rainfall in the project area varies from 1422 to 1625 mm. The season wise and annual rainfall in the project districts is presented in the table below.

Table 29: Season wise average annual rainfall

Sl. No.	District	Normal Rainfall in mm		
		Monsoon	Non-monsoon	Total
1	Bankura	1109	313	1422
2	Bardhhaman	1140	356	1496
3	Howrah	1208	417	1625
4	Hooghly	1137	386	1523
	Average	**1148.5**	**368**	**1516.5**

Source: Ground Water Year Book of West Bengal & Andaman & Nicobar Islands (2014-15)

There are three rain gauge station namely Durgapur, Champadanga and Amta situated within entire project district. Month wise cumulative rainfall data as recorded in these three rain gauge stations during monsoon season are presented in the above below. Average rainfall in project area during monsoon season is 1148 mm and ranges between 1109 mm to 1208 mm.

BANKURA

Rainfall in the project district of Bankura during the period 2013 to 2017 is presented in the table. It is evident that during 2014 and 2015, quantum of rainfall was less in comparison to other three years, i.e., 1075.5 mm and 1127.2 mm. respectively. However, in 2013, the district received 60.21 percent of total annual precipitation during JJAS (June, July August and Sept.) which increased gradually till 2016 and marginally reduced during 2017 (82.46 percent during 2014, 84.0 percent during 2015, 86.41 percent during 2016 and 77.49 percent during 2017). So, monsoon months are gradually experiencing high rainfall and rainfall during post-monsoon months have decreased.

Table 30: Month wise rainfall from 2013-17 in Bankura

YEAR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEPT		OCT		NOV		DEC	
	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP
2013	0.9	-93	15.0	-17	22.9	4	72.6	100	342.4	412	369.7	72	289.8	-4	368.4	27	260.8	8	398.0	278	0.0	-100	0.0	-100
2014	0.8	-93	38.3	113	8.0	-64	3.3	-91	84.7	27	85.7	-60	313.7	3	323.4	11	164.1	-32	53.2	-49	0.0	-100	0.3	-97
2015	17.4	45	1.5	-91	7.1	-68	85.6	136	55.9	-16	152.2	-29	467.5	54	230.6	-21	96.5	-60	12.7	-88	0.0	-100	0.2	-98
2016	6.1	-49	10.2	-43	15.6	-29	0.8	-98	101.3	51	175.1	-19	264.8	-13	445.5	53	268.9	11	46.9	-55	0.7	-93	0.0	-100
2017	0.0	-100	0.0	-100	16.9	-23	27.9	-23	76.3	14	228.8	6	634.2	109	330.4	14	186.1	-23	249.1	137	25.3	159	5.2	-45

BARDHHAMAN

The district Bardhhaman also reflect more or less similar trend like that of Bankura. In 2013, the district received 61.71 percent of the total annual rainfall in the monsoon months (JJAS) and rest rainfalls were in the pre-monsoon and post-monsoon period. In the year 2014, 2015 and 2016, the district received maximum rainfall during monsoon (85.18 percent in 2014, 85.55 percent in 2015 and 84.10 percent in 2016) and rainfall in other months was relatively less. In 2017, the district received 69 percent of the total annual rainfall during monsoon of the total rainfall of 1668 mm.

Table 31: Month wise rainfall from 2013-17 in Bardhhaman

YEAR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEPT		OCT		NOV		DEC	
	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP
2013	6.8	-36	17.5	-21	4.6	-77	41.5	10	175.1	122	210.2	6	145.5	-51	341.1	20	250.7	0	342.5	243	0.0	-100	0.0	-100
2014	1.1	-90	35.1	58	32.0	62	0.7	-98	74.6	-5	233.9	18	280.6	-5	256.5	-10	195.3	-22	23.9	-76	0.0	-100	0.7	-88
2015	8.5	-20	10.1	-54	29.4	48	76.3	102	64.2	-19	338.1	71	587.3	100	285.8	0	111.8	-55	34.1	-66	0.0	-100	0.9	-85
2016	13.5	26	29.3	32	15.0	-24	0.0	-100	120.0	52	182.5	-8	263.9	-10	463.5	62	274.5	9	44.3	-56	1.9	-84	0.0	-100
2017	1.2	-88	0.0	-100	32.6	65	28.3	-25	171.2	117	255.8	29	464.1	58	252.9	-11	178.2	-29	260.1	161	14.5	27	9.1	51

HOOGHLY

Between 2013 to 2017, the district received average annual rainfall of 1336.96 mm with variance in receipt of rainfall during pre-monsoon, monsoon and post monsoon. The rainfall received during monsoon was 67.30 percent of the total annual rainfall which increased during 2014-2017. In the year 2013, percentage of

departure from actual rainfall during June was (-)8.0 which increased to (-)23.0 during 2017. Similarly, highest percentage of departure in the month of July was in the year 2015, i.e., 112 percent and highest negative departure in 2015 in the same year (2015). In post-monsoon months, i.e., in November and December, percentage of departure was (-)100.0 percent during 2013 and 2014 and 188 percent during 2017.

Table 32: Month wise rainfall from 2013-17 in Hooghly

YEAR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEPT		OCT		NOV		DEC	
	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP
2013	2.1	-82	8.9	-67	2.4	-91	56.5	12	93.7	-14	223.9	-8	221.4	-30	287.0	8	186.6	-23	282.8	177	0.0	-100	0.0	-100
2014	0.0	-100	44.0	65	19.5	-31	0.1	-99	78.6	-28	218.3	-10	239.9	-24	289.1	9	190.5	-22	34.4	-66	0.0	-100	0.0	-100
2015	9.1	-24	4.1	-85	16.0	-43	62.4	23	54.0	-50	299.5	23	671.6	112	188.0	-29	215.3	-11	27.2	-73	0.1	-99	1.8	-74
2016	1.3	-89	14.0	-47	20.3	-28	0.0	-100	85.3	-21	166.2	-32	253.0	-20	347.1	31	242.8	0	75.9	-26	12.7	-21	0.0	-100
2017	0.0	-100	0.0	-100	23.9	-15	11.8	-77	115.2	6	186.6	-23	434.6	37	227.0	-14	180.8	-26	212.4	108	25.2	58	19.9	188

HOWRAH

The district received major part of its annual rainfall during monsoon months (JJAS), ranging between 72.10 percent during 2013 to 86.68 percent during 2015 and 74.83 percent during 2017.Trend of percent of departure from the actual rainfall is more or less same to other project districts. However, there is a negative departure in the month of June and September in all the five years whereas negative departure from actual rainfall observed in three years during July and August.

Table 33: Month wise rainfall from 2013-17 in Howrah

YEAR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEPT		OCT		NOV		DEC	
	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP
2013	5.8	-52	9.6	-61	9.9	-69	40.2	-24	99.4	-21	228.1	-2	310.2	-10	550.0	67	249.1	-18	352.6	256	0.0	-100	0.0	-100
2014	0.1	-99	54.2	118	19.5	-39	0.0	-100	103.6	-18	161.8	-31	224.9	-34	362.6	10	280.4	-8	24.0	-76	0.0	-100	1.2	-88
2015	9.8	-20	4.2	-83	10.0	-69	101.1	92	68.3	-46	227.9	-2	854.4	149	180.8	-45	202.2	-34	25.7	-74	0.0	-100	6.0	-41
2016	0.4	-97	104.1	318	8.8	-73	0.0	-100	52.0	-59	119.0	-49	334.6	-3	309.5	-6	214.1	-30	74.4	-25	59.0	88	0.0	-100
2017	0.1	-99	0.0	-100	71.5	123	11.3	-79	65.4	-48	174.7	-25	629.6	83	281.8	-14	155.5	-49	223.1	125	32.3	3	14.0	38

Source: Customized Rainfall Information System (CRIS), Hydromet Division, India Meteorological Department, Ministry of Earth Sciences<http://hydro.imd.gov.in/hydrometweb/(S(vuluke45w5upcxmigpsnmt55))/DistrictRaifall.aspx>

Note: (1) The District Rainfall in millimetres (R/F) shown below are the arithmetic averages of Rainfall of Stations under the District.
(2) % Dep. are the Departures of rainfall from the long period averages of rainfall for the District.
(3) Blank Spaces show non-availability of Data

3.10 Irrigation Status

Canal irrigation is the prime source of irrigation among all irrigation sources in project districts, excluding Hooghly where borewell is the prime source of irrigation. Project district wise irrigation sources, net irrigated area and gross irrigated area is presented in the table.

Table 34: Irrigation by Source in Project Districts

Irrigation	Bankura		Bardhhaman		Hooghly		Howrah	
	Area ('000 Ha.)	%	Area ('000 Ha.)	%	Area ('000 Ha.)	%	Area ('000 Ha.)	%
Net irrigated area	276.9		331.6		157.52		44.03	
Gross irrigated area	453.3		693.3		213.53		126.17	
Rainfed area	112.4		138.8		371.05		36.69	
Sources of Irrigation								
Canals	180.3	65.1	296.0	89.2	52.4	23.43	29.34	66.63
Tanks	33.5	12.1			21.0	9.39	8.39	19.05
Open Wells	2.5	0.9						
Bore Wells					113.0	47.75		
Lift Irrigation	54.5	19.6	35.6	10.7	19	8.49	6.3	14.3
Other Sources	6.28	2.3			8.13	3.63		
Total Irrigated Area	276.9	100	331.6	99.9	213.53	92.69	44.03	99.98

Source: Agriculture Contingency Plan of Project Districts, http://agricoop.nic.in/agriculturecontingency/west-bengal

Lift irrigation has significant contribution in providing irrigation in Bankura and Howrah district. RBMC and LBMC canals (Lvl- 1) have Branch canals (Lvl- 2), Distributaries (Lvl- 3) & Minors/Sub - Minors (Lvl- 4) catering for irrigation in Kharf, Rabi and Boro seasons. Total length of canals is 2646 Km. and total number of irrigation structures in RBMC and LBMC canal systems is 1702. Season wise water availability from different source is tabulated below.

Table 35: Source wise water avalability in diffrent season

Sources of water availability		Water availability (in ham)		
		Kharif	**Rabi**	**Boro**
1.	Average Canal water supply	111070	7960	33347
2.	Water from other surface sources (surface lift, surface flow, ponds, etc.) and Groundwater	67756	31386	107454
3.	Total water availability (1+2)	178826	39346	140801

Source: Feasibility report of WBMIFMP

No instance of drip or sprinkler irrigation system is observed within study blocks. Eventually majority of respondent (morethan 90%) are neither aware of sprinkler nor drip irrigation system. Very few respondents are aware of sprinkler irrigation system but none of them has ever heard of drip irrigation system. Watershed dept. (under Pradhan Mantri Krishi Sinchai Yagona -PMKSY) and agriculture department has recently introduced sprinkler based irrigation in other districts. Success rate of such intitiative can only be measured after few years. Financial funding is a major concern for all these Govt. agencies in continually promoting this activity.

3.10.1 Water Quality of Damodar River

The use-based water quality of Damodar falls to category A and C (location specific) as per water classification, i.e., Drinking water source without conventional treatment but after disinfection (Class A) and Drinking water source with conventional treatment followed by disinfection (Class C). The water quality is better than the prescribed standards for Class E (Irrigation, industrial cooling or controlled waste disposal).

Table 36: Water quality of damodar river

District:	Unit	Bardhhaman	Bardhhaman	Hooghly	Hooghly	Hooghly	Hooghly	Hooghly	Hooghly	Tolerance Limits For Inland Surface Waters, Class C
Block		Katwa- I	Bardhhaman -I	Pursurah	Pursurah	Pursurah	Khanakul-II	Singur	Dhaniyakhali	
Village		Narainpur	Majhermana	Sahapur	Katalpara	Soaluk	Markhana	Dhopaghata	Harirampur	
Site		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 4	
Sample Month		May	April	April	April	April	April	April	April	
River		Damodar	Damodar	Damodar	Damodar	Mundeswari	Mundeswari	Kana River	Kana River	
Chloride	mg/l	28.07	29.64	24	21	23	21	23	21	600
Conductivity	µs/cm	410.6	335.7	340	340	372	342	384	372	--
Fluoride	mg/l	0.298	0.247	0.39	0.49	0.3	0.12	0.14	0.68	1.5
pH	Unit	8.21	7.41	7.7	7.65	7.44	7.84	7.17	7.2	6- 8.5
Sodium	mg/l	37	26	21.7	21.1	23.7	24.4	31.4	25.6	--
Total Dissolved Solids(TDS)	mg/l	244	164	218	218	238	220	246	238	1500
Total Hardness as CaCo3	mg/l	152	140	150	140	170	160	180	190	--
Total Iron as Fe	mg/l	NT	NT	0.28	0.15	0.49	0.33	0.39	1.24	0.5
Arsenic as As	mg/l	NT	NT	BDL	BDL	BDL	BDL	BDL	BDL	0.2

Source: West Bengal State Pollution Control Board (Year 2018) and State Water Investigate Directorate (2018)
NT – Not Tested, BDL – Below Detectable Limit
Class – E: Irrigation, Industrial Cooling, Controlled Waste disposal

3.11 Land

Total geographical area of entire project blocks is 940273.3 (Excluding Howrah district). Gross cropped area is 138% of total geographical area. Net sown area is only 50% to gross cropped area. Project district as well as block wise information on different land use pattenr is tabulated below.

Table 37: Land Utilisation Pattern in Project Districts and Blocks

Name of the Block	Area in Ha.							
	Total Geographical	Gross cropped	Net sown	Sown more than once	Cropping Intensity (%)	Under Forest	Under Wasteland	Under other uses
Bankura								
Barjora	38445.5	24057	19787	4270	122	8816.3	2457.5	8894.7
Sonamukhi	37884.8	47508	23160	24348	205	9068.5	523	5623.1
Patrasayer	32261.5	39111	20810	18301	188	5129	1433	6591.2
Indus	25498.5	29659	18823	10836	158	65.9	315	4142.4
Total	**134090.3**	**140335**	**82580**	**57755**	**168**	**23079.7**	**4728.5**	**25251.4**
Bardhhaman (East)								
Ausgram-I	24066	30087	19702	10385	153	3321	250	793
Ausgram-II	35922	29110	24480	4630	119	7625	2138	1679
Bhatar	42232	56097	31150	24947	180	250	100	10732
Bardhhaman Sadar (I & II)	43998	56565	32400	24165	175	16	0	11582
Galsi-I	25406	31406	17015	14391	185	108	0	8283
Galsi-II	21802	40559	18780	21779	216	36	47	2940
Jamalpur	26290	50063	21200	28863	236	25	0	5065
Kalna-I	16890	24081	11362	12719	212	130	0	5398
Kalna-II	17540	26997	12835	14162	210	0	0	4705
Katwa-I	16990	21454	11508	9946	186	0	0	5482
Katwa-II	29618	21059	12318	8741	171	0	0	17300
Khandaghosh	26000	37338	23521	13817	159	167	25	2287
Mongalkote	36162	45133	27120	18013	166	0	0	9042
Monteswar	30540	45519	20527	24992	222	60	0	9953
Memari-I	20710	49884	17000	32884	293	0	220	3490
Memari-II	18695	32549	16529	16020	197	9	21	2136
Raina-I	25363	47151	21500	25651	219	0	2	3861
Raina-II	22240	30325	18002	12323	168	46	50	4142
Total	**480464**	**675377**	**356949**	**318428**	**193**	**11793**	**2853**	**108870**
Bardhhaman (West)								
Faridpur - Durgapur	31597	12409	10500	1909	118	2080	4490	14527
Kanksa	25100	17187	14350	2837	120	8150	0	2600
Total	**56697**	**29596**	**24850**	**4746**	**119**	**10230**	**4490**	**17127**
Hooghly								
Arambag	30390	51200	20455	30745	250	528	0	0
Balagarh	20215	37680	14972	22708	252	0	201	0
Chanditala-I	9345	15650	7194	8456	218	0	0	0
Chanditala-II	7042	6000	2421	3579	248	0	45	0
ChinsurahMagra (Chuchura)	10820	7071	2863	4208	247	0	0	0
Dhaniakhali	27568	50325	20089	30236	251	0	160	0
Haripal	18442	34946	13799	21147	253	0	105	0
Jangipara	16423	25250	11496	13754	220	0	94	0
Khanakul-I	17240	33134	13184	19950	251	0	0	0
Khanakul-II	12183	20800	8631	12169	241	0	0	0
Pandua	28642	55696	22368	33328	249	0	131	0
PolbaDadpur	28569	54132	21740	32392	249	0	309	0
Pursura	10042	18364	7405	10959	248	0	15	0

Name of the Block	Area in Ha.							
	Total Geographical	Gross cropped	Net sown	Sown more than once	Cropping Intensity (%)	Under Forest	Under Wasteland	Under other uses
Singur	19983	23250	9285	13965	250	0	26	0
Tarakeswar	12118	19840	8232	11608	241	0	47	0
Total	**269022**	**453338**	**184134**	**269204**	**244**	**528**	**1133**	**0**

Source: District Irrigation Plan (DIP) prepared under PMKSY in the year 2016
Note: Howrah is not included

3.12 Soil

Soil texture and covered area are the main two components for analysis of soil profile. Entire project area is mainly dominated by loamy soil (almost 80 %). Only 15.16 % area is covered by clay and 2.34 % by sandy soil. Soil distribution map for the command area under this project is depicted in below figure:

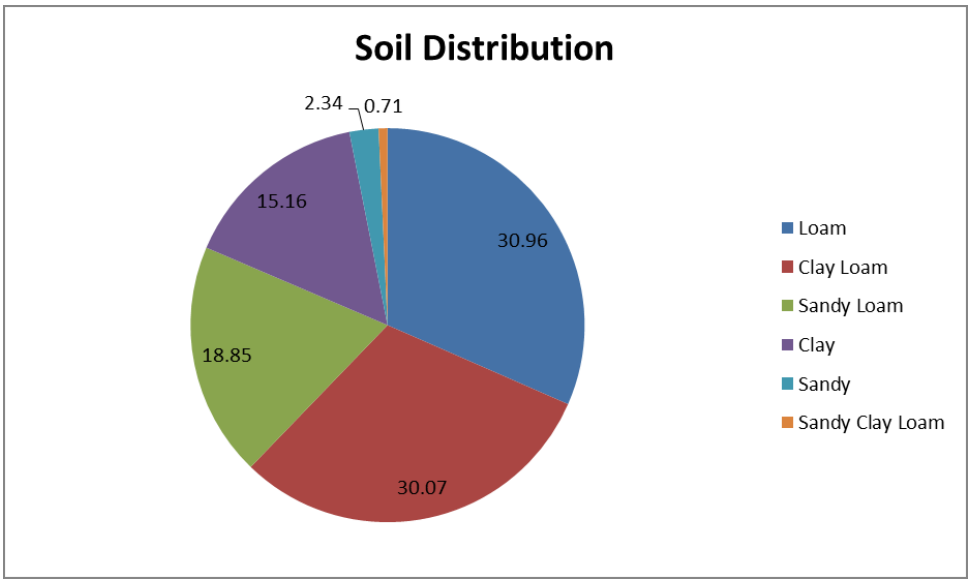

Figure 4: Soil distribution map of project district under WBMIFMP

3.12.1 Soil Type

Physiographically, the soil of the project area can be classified into several groups depending on their texture, structure, colour, porosity and nutrient content. Broadly, the soils of Rarh tract lying to the west of Bhagirathi-Hooghly are mostly lateritic or red soil. The soils along the eastern deltaic tract and along the western flood plain are younger alluvium. The water infiltrates quickly in this soil. Further south, soil is again classed as younger alluvium but grains are coarser than southern deltaic. The texture and structure of the soil are two important factors controlling runoff infiltration ratio. It has been observed that in lateritic area, the hard crust does not allow easy infiltration and generate more runoff. In the Rarh uplands, the presence of a rock layer in the subsurface does not allow the infiltration of water into the deeper aquifer.

Effective soil depth governs root development and is a source of moisture and nutrient supply to the plants. The extent of depth classes which affect crop growth presents that the project district Bankura is having two depth classes of soil, i.e., shallow depth (25-50 cm.) and moderately shallow soil depth (50-75 cm). Bardhhaman district is having moderately shallow soil (50-75 cm.) in some parts of the district.

Table 38: Project district wise major soil class and area coverage

Sl. No.	District	Major Soil Classes	Area (Ha.)	Sl. No.	District	Major Soil Classes	Area (Ha.)
1	Bankura Total	Inceptisol	104114	3	Bardhhaman West	Sandy	3200
		Alfisol	7750			Sandy Loam	25724
		Entisol	22224			Red &Lataritic	7410
2	Bardhhaman East	Sandy	21537	4	Howrah	Recent alluvial plain	12659

Sl. No.	District	Major Soil Classes	Area (Ha.)	Sl. No.	District	Major Soil Classes	Area (Ha.)
		Sandy Loam	147714			Coastal Plain	11392
		Clay, Clay loam	246286			Older alluvial plain	38387
		Red &Lataritic	14777	5	Hooghly	Recent Alluvial	77812
		Clay Loam	611			Older Alluvial	191210

Note: This table represents 51 project blocks (41- Irrigated and 10 – Flood affected) of these five districts

Bankura District: Major soil types found in Bankura are (1) Loamy (307.6 thousand Ha.; 44.7 percent of the total geographical area), (2) Gravelly Clay Loamy (46.7 thousand Ha., 6.8 percent of the total geographical area), (3) Loamy Sandy (27.3 thousand Ha.; 4.0 percent of the total geographical area) and (4) Clayey Loamy (7.8 thousand Ha.; 1.1 percent of the total geographical area).Soil taxonomy of Bankura district reveals major soil classes are Inceptisol, followed by Alfisol and Entisol.

Bardhhaman District: Major soil types found in Bardhhaman are (1) Loamy (357.6 thousand Ha.; 51.2 percent of the total geographical area), (2) Gravelly Loamy (42.3 thousand Ha., 6.1 percent of the total geographical area), (3) Clayey (37.6 thousand Ha.; 5.4 percent of the total geographical area), (4) Clayey Loamy (28.2 thousand Ha.; 4.0 percent of the total geographical area) and (5) Loamy Sandy (4.7 thousand Ha.;0.7 percent of the total geographical area). Soil types by east and west Bardhhaman district is presented in the table.

Howrah District: The district is having three major soil types, i.e., (1) Clayey (13.82 thousand Ha.; 16.0 percent of the total geographical area), (2) Clayey Loamy (42.35 thousand Ha.; 49.0 percent of the total geographical area) and (3) Loamy (30.25 thousand Ha.; 35.0 percent of the total geographical area).

Hooghly District: Three major soil types are found in the district, i.e., (1) Clayey (64.84 thousand Ha.; 29.0 percent of the total geographical area), (2) Clayey Loamy (80.50 thousand Ha.; 36.0 percent of the total geographical area) and (3) Loamy (76.26 thousand Ha.; 35.0 percent of the total geographical area).

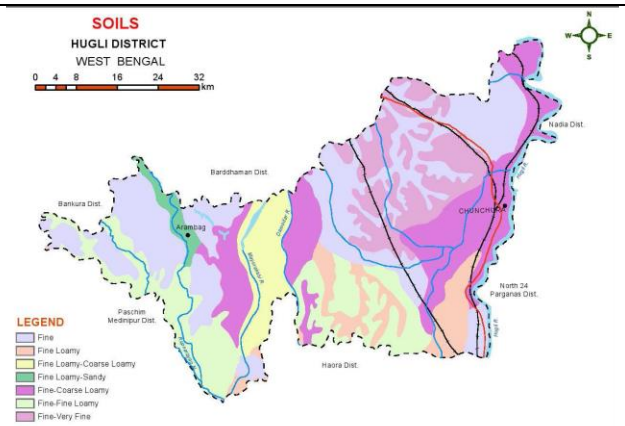

Figure 5: Soil map of Hooghly district

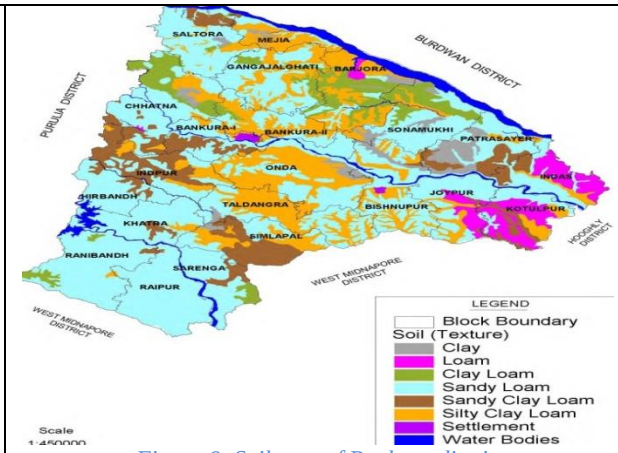

Figure 6: Soil map of Bankura district

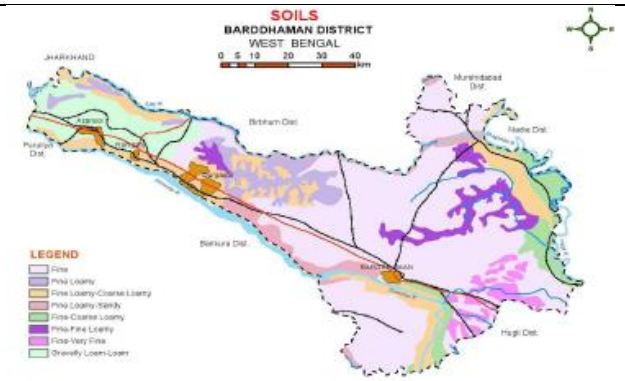

Figure 7: Soil map of Bardhhaman district

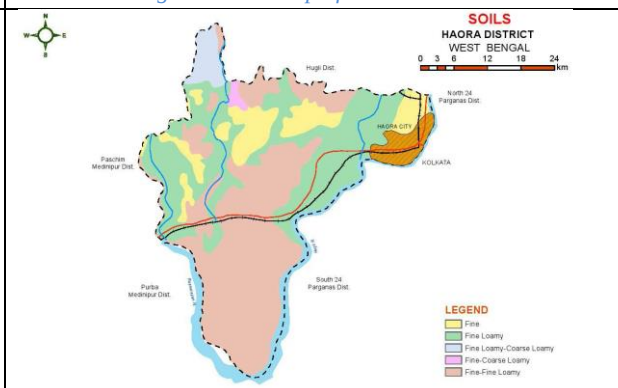

Figure 8: Soil map of Howrah district

3.12.2 Soil Degradation

The major problems of the soil degradation in project districts are due to water/wind erosion and deterioration of soil properties including physical deterioration in the form of waterlogging, flooding and chemical deterioration as salinization. About 19.7 percent area in the districts of Bankura is affected due to loss of top soil by water erosion; while 6.9 percent of area in Hooghly is degraded due to waterlogging for a significant period.

3.12.3 Soil Drainage and Water Logging

Soils of West Bengal have been grouped into six drainage classes, of which four classes have been found to adversely affect soil and crop management. These are (1) very poorly drained, (2) poorly drained, (3) imperfectly drained and (4) excessively drained, soils. The project district of Hooghly is falling under "very poorly drained" class and "poorly drained" class whereas Howrah falls under "poorly drained" and "imperfectly drained" category. The project district Bankura falls under "excessively" drained category.

Water-logging refers to the soil condition whereby the soil becomes saturated with water within the depth of root zone for a significant period. Water-logging may occur due to high water table or submergence by rainwater or both. It is one of major physical deterioration which adversely affects the yield and quality of crops. Crop yield and selection of crop of about 14 per cent area of the State are influenced by water-logging and remaining 86 percent area is free from such problem.

Table 39: Soils under Limiting Water Logging Classes

Soils under limiting water-logging classes		
Class	**AERS (No.)**	**Project District**
Moderate	Hot Per-humid (15.3)	
	Hot Moist Sub-humid (15.1)	Bardhhaman
Slight	Warm Perhumid (16.2) Hot Perhumid (15.3)	-
	Hot Moist Sub-humid (15.1)	Bardhhaman, Hooghly

Source: SOE Report, West Bengal; Note: TGA: Total Geographical Area

Water logging is common phenomenon in Howrah and Hooghly district almost in each alternate year. Water logging becomes worst during flood occurance. The main rivers which take flood discharge coming from water release through Durgapur barrage and responsible for flooding in Lower Damodar areas are river Damodar (Amta Channel) and Mundeswari, bifurcating from main Damodar river at Beguahana. The drainage channels which carry flood water and local run off are located in the flood affected blocks as well as in some blocks in the lower part of Lower Damodar system. A good number of drainage channels exist in the area out of which 30 drainage channels in the upper and middle reaches of Damodar and Mundeswari are mostly carrier channels of flood spill water and 40 channels are also prominent in the lower reaches which also debouch flood water in their outfall channels. Besides this, many small drainage channels are existing in the middle and lower part of Lower Damodar area.The bank full discharges of Damodar and Mundeswari are 1400 m3/s and 2600 m3/s respectively, i.e. the rivers spill practically every year, Damodar over its dwarf right embankment and Mundeswari over both banks. Some of the drainage channels have been highly silted up, the present reduction in their capacities ranging from 25% to 35%.

Water Erosion: Erosion by water is a major soil degradation factor. Some parts of project districts are affected by severe and moderate erosion hazards. Bankura falls under "severe" class whereas a part of Howrah and Hooghly falls under "moderate" water erosion class.

3.12.4 Soil Contamination

In West Bengal groundwater in 12 districts (out of 20 districts) and 111 blocks (out of 341 blocks) is under the risk of arsenic contamination. Continuous withdrawal and deposition of arsenic contaminated groundwater (<0.01 mg/l as is the permissible limit for irrigation water set by WHO and FAO, the USA and European Union) for irrigation purpose may lead to increase soil arsenic level beyond the maximum acceptable limit for agricultural soil (20 mg/kg) recommended by the European Union and can affect the food chain cultivated in those areas. As per the available information, soil arsenic concentration in agricultural land soils (10.7 mg/kg) is higher compared to the fallow land (5.32 mg/kg). Sarkar et al. (2012) reported that application of 1,200-

1,400 mm water contaminated with arsenic ranging from of 0.1-0.35 mg/l adds 120-420 mg arsenic per sq. m with each cropping of summer rice making the soil as a secondary source of arsenic pollution.

3.12.5 Sediment Contamination

Peninsular rivers like Damodar and Rupnarayan carry fluoride charged alluvium in West Bengal. Use of fluoride loaded groundwater for irrigation purpose can build up fluoride concentration in soils as well as in crops grown in those areas beyond the threshold limit.

3.13 Floods

Chronically flood affected parts of project area are in Howrah, and Hooghly Districts. These two districts among 5 project districts under WBMIFPM is typically flood prone due to over discharges of Durgapur barrage during monsoon and not sufficiently drained during peak moment by the Lower Damodar and Mundeswari rivers. It has many reasons like heavy siltation, encroachments, no embankment along the river in most of the areas, etc.

Frequent inundation of low lying areas result in stagnation of water turns certain times of the year. Besides flood hazards this also affect the normal dry land crop yields.

Flooding is considered as a serious limitation for crop production in Indo-Gangetic plains of West Bengal. Therefore, crop planning as well as crop yield of nearly 22 percent of total geographical area are impacted by surface flooding, while rest is safe from flooding.

489 ha of the Lower Damodar area is subject to frequent flooding to varying intensity (Average depth of inundation varies between 1.0 M to 2.0 M and duration varies between 7 days to more than a month) due to intense rainfall and river spills. Even after construction of the upstream reservoirs for flood moderation, there have been significant floods in many years, with events in 1978 and 2009 the most extensive and damaging. The Lower Damodar (Amta Channel) has an established flood protection left bank that has saved the area to the east, which includes railways, highways, townships and industries established and operating over many decades, although the embankment failed in 1978 (flood discharge of 10,741 cumecs) with breaches at several locations. The Lower Damodar right bank is constructed lower than the left bank, and therefore starts spilling flood flow earlier, once the flow exceeds the channel conveyance capacity of 1,400 cumecs, and thereby causes more extensive flooding and damage to the farmers and rural communities living to the west, with substantial economic loss through disrupted livelihood, loss of livestock, loss of infrastructure, and even some loss of human life.

3.14 Ground Water Availability

Nearly two third area of the state is occupied by unconsolidated sediments; the western part of the state is partly occupied by the hard rocks. The phreatic aquifer is generally developed through dug well, dug cum bore well and shallow tube well. The yield of these wells varies from 1-5 lps.

Table 40: Project district wise Ground Water Resources Availability, Utilization and Stage of Development (As on 31st March 2013)

Description/ Particular			**District** (water in ham)				**Total (ham)**	**Total (bcm)**
			Bankura	**Bardhhaman**	**Howrah**	**Hooghly**		
Annual Replenishable Ground Water	Monsoon Season	Recharge from rainfall	98905.53	170643.19	18922.39	87499.21	375970.32	3.76
		Recharge from other sources	24886.50	42504.98	5987.95	24032.23	97411.66	0.97
	Non-Monsoon Season	Recharge from rainfall	21562.59	13283.39	1114.80	6344.07	42304.85	0.42
		Recharge from other sources	32647.44	35214.86	6932.33	21148.49	95943.12	0.96
	Total Annual Ground Water Recharge		178002.06	261646.42	32957.47	139024.00	611629.95	6.12
Natural Discharge during non-monsoon season			16232.96	24768.66	3295.74	13902.41	58199.77	0.58
Net Annual Ground Water Availability			161769.10	236877.76	29661.73	125121.59	553430.18	5.53

Description/ Particular		District (water in ham)				Total (ham)	Total (bcm)
		Bankura	Bardhhaman	Howrah	Hooghly		
Annual Ground Water Draft	Irrigation	69980.27	94059.60	4970.00	54601.80	223611.67	2.24
	Domestic and Industrial uses	4702.22	9608.01	2356.32	7171.42	23837.97	0.24
	Total	74682.48	103667.61	7326.32	61773.22	247449.63	2.47
Projected Demand for Domestic and Industrial uses up to 2025		7362.46	15762.29	6038.57	10669.27	39832.59	0.40
Ground Water Availability for future irrigation		84426.38	127055.87	18653.16	59850.52	289985.93	2.90
Stage of Ground Water Development (%)		46.17	43.76	24.70	49.37	44.71	44.71

Source: Dynamic Ground Water Resources of India (June 2017)

Apart from surface irrigation, farmers are using Ground Water during Rabi and Boro Crops. Due to extraction of Ground Water, 19 (Nineteen) blocks in the DVC command have reached to semi critical stage.

Table 41: Source wise irrigated area from ground water sources

Sl. No.	Name	Dugwell		Sallow Tubewell		Medium Tubewell		Deep Tubewell		Surface Flow		Sarface Lift	
		No.	Actuat Area Irrigated (ha.)	No.	Actuat Area Irrigated (ha.)	No.	Actuat Area Irrigated (ha.)	No.	Actuat Area Irrigated (ha.)	No.	Actuat Area Irrigated (ha.)	No.	Actuat Area Irrigated (ha.)
	Bankura												
1	Borjora	2	6	501	1800	47	462	3	68	214	1023	344	1649
2	Indus	5	25	1239	5419	58	507	21	190	31	191	331	1628
3	Patrasayer	2	8	1155	4507	97	1092	62	766	19	252	78	765
4	Sonamukhi	2	8	871	3138	161	1109	163	942	119	592	417	1667
	Total	11	47	3766	14864	363	3170	249	1965	383	2058	1170	5710
	East Bardhhaman												
1	Ausgram-I	4	32	583	4379	78	708	4	83	40	207	172	551
2	Ausgram- II	5	16	991	2494	32	196	57	976	46	150	160	1685
3	Bhatar	1	2	2104	8326	115	635	11	285	3	5	21	910
4	Bardhhaman-I	2	10	993	3317	18	164	62	1314	9	31	10	324
5	Bardhhaman-II	0	0	1235	5730	10	37	30	724	8	392	16	258
6	Galsi-I	1	2	1098	3473	13	68	11	806	1	2	23	201
7	Galsi-II	0	0	1373	4433	6	15	65	1246	1	5	60	209
8	Jamalpur	1	5	1612	5096	4	62	73	2852	17	243	52	1631
9	Kalna-I	2	7	915	3663	115	873	75	3073	2	10	45	2399
10	Kalna-II	1	2	1612	5583	83	798	37	1491	6	16	13	689
11	Katwa-I	0	0	830	4132	1	40	44	2069	0	0	12	266
12	Katwa- II	6	23	645	2875	11	157	62	3012	5	13	37	2169
13	Khandaghosh	0	0	1449	4559	15	367	61	1978	1	5	130	750
14	Mangalkote	2	27	573	3305	1378	8335	51	1257	15	143	299	1542
15	Memari- I	7	123	1006	3708	13	179	53	1496	14	453	101	2102
16	Memari- II	1	0	1066	4538	241	2729	35	1716	4	63	25	794
17	Monteswar	2	4	1023	5094	750	11102	62	3851	8	587	39	2348
18	Raina-I	0	0	1293	4316	51	590	61	3111	3	15	14	368
19	Raina-II	0	0	1470	5238	8	22	88	3063	22	110	23	449
	Total	35	253	####	84258	2942	27079	942	34403	205	2450	1252	19645
	Wast Bardhhaman												
1	Durgapur Faridpur	0	0	13	37	0	0	0	0	3	17	94	705
2	Kanksha	1	4	687	3007	9	260	41	716	21	128	90	2852
	Total	1	4	700	3044	9	260	41	716	24	145	184	3557
	Hooghly												
1	Arambagh	18	256	1802	15111	24	365	57	3654	0	0	57	3577
2	Balagarh	1	0	664	2553	120	1286	59	4260	0	0	74	2862
3	Chanditala- I	0	0	381	2372	65	453	17	1218	2	7	140	523
4	Haripal	59	282	533	3388	5	166	15	1119	7	92	266	2090
5	Jangipara	1	4	591	4521	12	157	18	1133	2	19	58	566
6	Khanakul-I	0	0	476	3819	7	107	30	2425	0	0	112	3304
7	Khanakul-II	0	0	54	570	3	126	19	1660	4	398	126	3922
8	Pandua	1	10	1467	12536	38	860	48	4442	1	3	48	2045
9	Polba Dadpur	3	10	476	974	77	471	46	4414	0	0	93	2767
10	Singur	4	23	410	2536	40	337	21	1321	2	7	20	325
11	Tarakeswar	3	25	148	799	6	166	12	1011	8	289	64	444
	Total	90	610	7002	49179	397	4493	342	26658	26	814	1058	22425

	Howrah													
1	Amta-II	8	58	27	109	19	495	14	582	37	194	220	3513
2	Jagotballavpur	2	68	26	138	20	627	17	535	3	16	233	2325
3	Udaynarayanpur	2	13	78	636	45	1048	32	1339	4	48	144	4175
	Total	12	139	131	883	84	2170	63	2455	44	258	597	10014

3.15 Ground Water Quality

Ground water data was collected from 101 locations of Bankura, 69 locations of Bardhhaman, 18 locations from both Howrah and Hooghly district. EC ranges between 64 to 4540 *µS/cm,* whereas average is 1061 *µS/cm*. Maximum EC found in all project districts is above 4200 except in Hooghly block (1300)[8].

Table 42: Ground Water Quality in Project Districts

District	Bankura			Bardhhaman			Howrah			Hooghly			Entire Project District			Acceptable Limit	Permissible Limit
	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average		
EC	64	4240	970.2	115	4540	1018.8	554	4450	1631.4	285	1300	623.8	64.0	4540	1061.1		
PH	7.4	8.2	7.8	7.1	8.2	7.8	6.88	7.62	7.3				6.9	8.2	7.6	6.5 - 8.5	6.5 - 8.5
HCO3	12	976	213.0	37	1720	298.7	250	457	324.4	152	372	217.8	12.0	1720	263.5	200	600
Cl	18	1013	158.9	14	1013	145.5	32	1195	250.2	21	237	88.1	14.0	1195	160.7	250.0	1000
TH	10	1300	243.1	40	600	252.6	100	600	270.8	105	400	234.7	10.0	1300	250.3	250 (max)	1000 (max)
Ca	4	445	80.2	8	140	64.2	8	104	27.7	24	80	39.4	4.0	445	52.9	75.0	200
Mg	1.2	108	28.0	2.4	80	23.4	14.59	93.63	49.0	6	74	32.8	1.2	108	33.3	30.0	100
Na	4	550	86.9	4.6	759	115.6	30	400	129.6	12	50	32.1	4.0	759	91.0	200	No limit
K	bdl	253	14.71	bdl	34	5.070	2	51	13	0.2	19.8	5.2	bdl	253	9.5	No limit	No limit
F	bdl	2.4	0.47	bdl	1.6	0.481	N.D	0.74	0.28	N.D	0.12	0.087	bdl	2.4	0.3	1.0 (max)	1.5 (max)
SO4	bdl	502	88.96	bdl	528	141.44	1	83	43.66	N.D	69	22.47	bdl	528	74.1	200 (max)	400 (max)
PO4	bdl	3.2	0.87				0.069	3.079	0.29	0.1	2	0.272	bdl	3.2	0.5	No limit (BIS, WHO)	No limit (BIS, WHO)
SiO2	bdl	25	8.53				11.41	37.66	24.52	9	47	27.83	bdl	47	20.3		
Fe				bdl	10	1.213	ND	2.51	1.15	0	7.33	1.11	bdl	10	1.2	0.3	No Relaxsaion

Source: Ground Water Year Book of West Bengal & Andaman & Nicobar Islands (2014-15)

Iron (Fe) and SiO2 was found in very low concentration in all project district. Fluoride concentration of 1.60 mg/ ltr. has been found at Rampurdanga village of Barjora block of Bankura district. Three blocks of Bardhhaman, 1 block from both Howrah and Hooghly is affected by Arsenic. Almost all project blocks are Iron affected.

Table 43: Ground water contamination status in Project Districts

	District	Block	Location	Concentration (mg/lt.)
Fluoride affected area	Bankura	Borjora	Rampurdanga	1.6
Arsenic affected area	Bardhhaman	Kalna-II		0.602
	Bardhhaman	Katwa-I		0.101
	Bardhhaman	Katwa-II		0.835
	Hooghly	Balagarh		0.51
	Howrah	Uluberia- II		1.155
Iron affected area	Bardhhaman	Kalna-II	Kalna	3.91
	Bardhhaman	Kandaghosh	Khejurhati	2.53
	Bardhhaman	Kandaghosh	Metedanga	1.95
	Bardhhaman	Mangalkot	Natunhat	1.54
	Bardhhaman	Memari-I	Pallaroad	1.87
	Bardhhaman	Memari-II	Palarhati	7.26
	Howrah	Amta-II	Joypur	8.45
	Howrah	Amta-II	Sehagori	4.3
	Howrah	Domjur	Howarhtown	3.05
	Howrah	Jagatballavpur	Jagatballavpur	5.05
	Howrah	Udayanarayan	Goalpota	1.14
	Howrah	Uluberiya -I	Baganda	1.23
	Bankura	Borjora	Sahabdi	2.85
	Bankura	Borjora	Tarasinghbrid	2.69
	Bankura	Sonamukhi	Ganganidanga	2.49
	Hooghly	Arambag	Gourhati	17.89
	Hooghly	Arambag	Pachimpura	1.4

[8] Water quality of surface water will be a part of the ESIA report

	District	Block	Location	Concentration (mg/lt.)
	Hooghly	Arambag	Pursura	1.14
	Hooghly	Balagarh	Inchura	2.05
	Hooghly	Chanditala -I	Aniya	1.56
	Hooghly	Chunchura	Khyanyan	6.5
	Hooghly	Dhaniakhali	Ichhapur	2.13
	Hooghly	Haripal	Nalikul	3.15
	Hooghly	Khanakul - I	Digruighat	7.15
	Hooghly	Khanakul - I	Ramnagar	13.37
	Hooghly	Khanakul - II	Kaknan	2.5
	Hooghly	Khanakul - II	Senhat	2.32
	Hooghly	Pursura	Srirampur	1.26
	Hooghly	Singur	Beraberi	1.78
	Hooghly	Singur	Singur	1.06

Source: Ground water Quality in shallow aquifers of India – CGWB- 2010

3.16 Ecological Profile of Project area

While there are a number of ponds available in project area, there are no wetlands of significant conservation importance such as protected wetlands. Mostly the existing ponds are used for fish farming. Presently DVC Area has 725 water bodies with area having > 2 Ha and farmers use abundantly abstracted ground water through shallow and deep tubeless in the non- monsoon period to meet the requirement of the crops. Due to non-availability of sufficient irrigation water from the canals, farmers of blocks: Raina-I, Raina-II, Bhatar, Kalna-II, Katwa-II, Mangolkote, Manteswar, Memari-II, in Bardhhaman District and Arambag, Chinsurah-Mogra, Pandua, Polba-Dadpur and Singur in Hooghly District use Ground Water for the field crops in the Kharif, Rabi and Boro season.

The Ramnabagan Wildlife Sanctuary having a total area 0.14 Km^2 is located at Bardhhaman-1 block within DVC command area. This is located within the Bardhhaman City - and there is no likelihood of any project works being taken up in the sanctuary area – as the DVC canal passes outside the BardhhamanCity. The Ramnabagan Wild Life Sanctuary (WLS) at Bardhhaman-1 block is 3.7 km away (NNE) from Damodar river and 2.5 km away (NE) from the DVC canal.

Figure 9: Location map showing Ramnabagan WLS at Bardhhaman- 1 block of East Bardhhaman district

Table 44: Ecological profile of project area

Ecologically significant feature		**Availability within project area**
Elephant corridors		No
Wildlife corridors		No
Meandering rivers		Yes. Mainly in Howrah district (Mundeswari)
Flood-prone areas		Yes. Howrah and Hooghly district
Areas of severe landslides		No
River erosion		Yes. Embankment of Damodar river
Flood embankment		Yes. Embankment of Damodar river
Eco-sensitive areas/stretches in rivers (including habitats of endangered or vulnerable species)		No (Though no ecosensitive area is identified, there is presence of some endangered and vulnerable species - details mentioned below under section – 'District-wise biodiversity profile')
Physical cultural properties		To be determined during EIA
Protected Areas	National Parks	No
	Wildlife Sanctuaries	No Ramnabagan WLS is located at Bardhhaman-1 (it is located at a distance of 2.5 km (NE) from the nearest stretch of the DVC canal)
	Reserved Forest	No
	RAMSAR sites	No
	Biosphere reserves	No
Unprotected and community forests		No (Not located within project work area)
Forest patches		No (Not located within project work area)
Protected Wetlands		No
Surface water bodies		Yes Small ponds mostly used for fishery.

3.16.1 District-wise biodiversity[9] profile

This section gives an overview of the biodiversity in the project districts. As the project area is a sub-set of the area covered by the 5 districts, its biodiversity profile will be examined during the EIA.

Bardhhaman

The eastern part of the district is typical flood plains of Bhagirathi with abundance of wetlands. Purbasthali wetland complex, located about 45 km from the Damodar River, harbours a rich diversity of residential and migratory birds. It is quite rich in native species of hydrophytes and supports a diverse fauna of freshwater fishes, mollusks, crustaceans and odonates. Most importantly, a small breeding population of Gharial (*Gavialis gangeticus*), a Critically Endangered species, which was thought to be extinct in the State for at least half a century was recently identified close to this wetland complex.

Previously, large water bodies of both Durgapur and Mython barrage have been winter home of a good number of many migratory water birds. Unfortunately, Durgapur barrage stays abandoned by them in recent years. There is also a small protected patch of Sal forests in the district - the Rambagan Wild Life Sanctuary, which provides shelter to smaller wildlife and birds. The district is also known for the high productivity and traditional diversity of rice crop.

Hooghly

Agricultural diversity especially, that of rice is traditionally the most important biodiversity component of the district. It occupies the western bank of the river Bhagirathi, now called Hooghly and possesses the originally beautiful riverscape with the richness of riverine biodiversity including fishes. The district has no more any significant patch of forests, wild scrubs and bushes in and around villages. The dried beds and banks of the rivers Mundeshwari and Damodar provide shelter to many smaller mammals like jackal, hare, jungle cat,

[9] Source: State of Environment Report-West Bengal (2016)

civets and variety of snakes. There are few swampy wetlands within the district which are home of many wetland birds and animals. Previously, the vast swamp in Dankuni area was a rich haven for water birds and other wetland animals. Unfortunately, much of it has been reclaimed already.

Howrah

This district shares the western bank of the river Hooghly. But, the most prominent biodiversity feature of the district is the abundance of swampy wetlands, much of which form extensive reed beds. The latter is a very good wildlife habitat for many species of birds to roost and nest. It's also a preferred habitat for the State animal - the Fishing cat. Big predatory fishes like Gojal (Channa maurilius) which are killed selectively by pisciculturists from their culture ponds along with many other species unwanted by commercial pisciculture, find asylum in these wetlands.

Bankura

Most of the original patches of mixed forests are gone. Highly degraded relics of original forests exist in patches. Patches of Butea scrubs with lonely canopy of Mahua or Karanja are now dotting over the eroded, undulating meadows with plantations of coppicing Sal, Acacia and Eucalyptus taking over original forest patches all over the district. Considerable forest covers still survive in the Jaipur forests near Bishnupur. Apart from the dominating Sal, few other tree species like Mahua, Piasal, Kusum, are found with dense growth at the shrubs and herb layers. District is of course still rich with the traditional knowledge of tribals and many medicinal products are collected by them along with other forest produce. Many indigenous rice varieties have been documented from the district quite a few of which remain in practice yet.

3.16.2 Forest Profile

Some part of DVC command area in Bankura and Bardhhaman district intersect small patches of forest land. However, none of project activities under WBMIFMP is propoed in forest area or any part of forest is located adjacent to proposed work zone. Bankura district has maximum forest cover followed by Bardhhaman among all 5 project districts. Project district wise forest cover is tabulated below and shown in following pictures:

Table 45: Area under Forest in project district

			Area Under Forest (in Sq. Km.)	
District	**Reserved Forests**	**Protected Forests**	**Unclassed State Forests**	**Total Area**
Bankura	80	1311	91	1482
Bardhhaman	3	192	82	277
Howrah	-	-	-	-
Hooghly	3	-	-	3
West Bengal	*7054 (59.38%)*	*3772 (31.75%)*	*1053 (8.87%)*	*11879 (100%)*
All India	*423311*	*217245*	*127881*	*768437*

Source: Annual Report 2014-15 of the Directorate of Forests, Government of West Bengal

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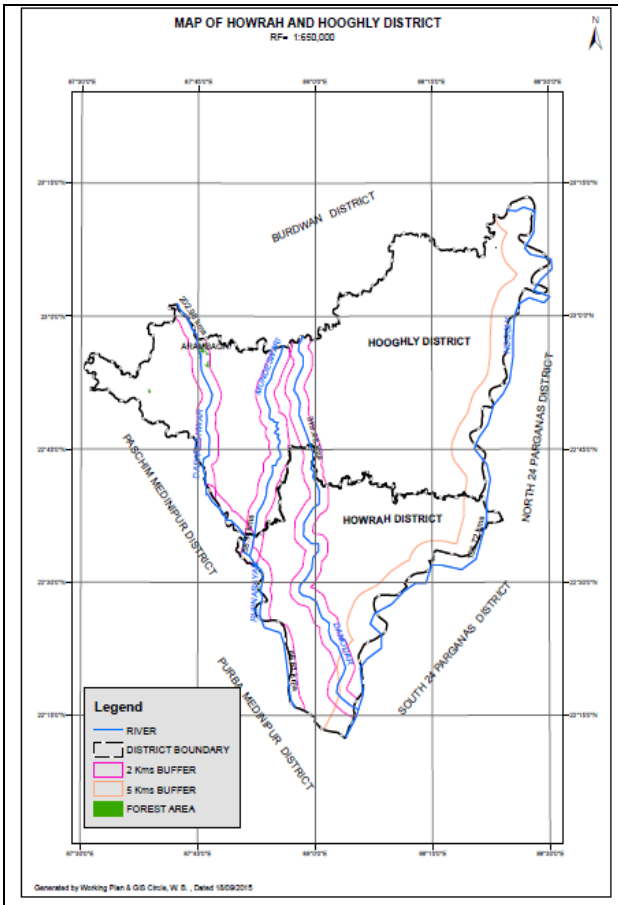

Figure 10: Forest Map of Howrah & Hooghly District

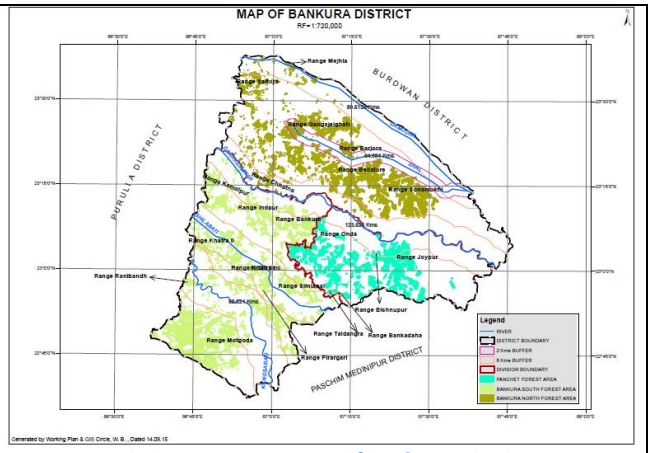

Figure 11: Forest Map of Bankura District

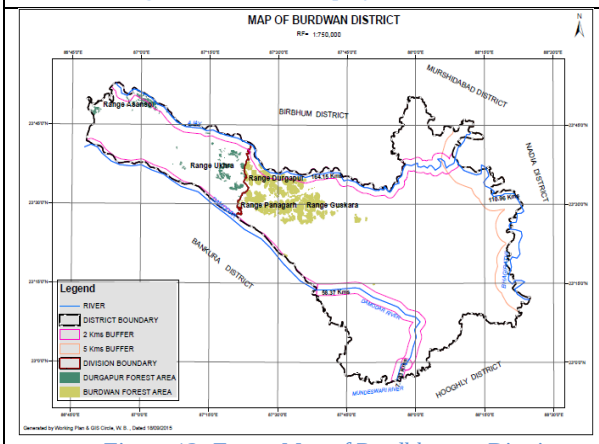

Figure 12: Forest Map of Bardhhaman District

3.16.3 Fisheries

The water body of river Damodar has a rich biodiversity of fresh water fishes. Fish diversity recorded a total of 68 species belonging to 22 families and 46 genus. Species of the family *Cyprinidaeis* dominant followed by *Bagridae* and *Channidae*. The abundance distribution showed 23 dominant species across different sites. Maximum species richness has been recorded in Ashishnagar site, followed by Panchet and Namomejia indicating less disturb areas in respect of pollution level as well as suitable habitat characteristics. The dominant species observed are *Gudusiachapra* with significant relative abundance followed by *Securilagora* and *Labeobata*. Exotic species *Oreochromis niloticus* and *Ctenophora godonidella* recorded their presence with relative abundance. A sharp dominance of minor and medium carp was evident in the entire stretch. Some fish species that comes under the threatened category in other areas was found to be stable in the river. The trophic structure of fish indicated dominance of carnivore fish species across the river followed by omnivore and herbivores. Three endangered fish species, i.e., *Ailiacoila* (Gangetic Ailia), *Bagariusbagarius* (Gangetic goonch; Bag Mach / Bhagar in Bengali) and *Wallago attu* (Boal; Barali / Bayali in Bengali) has low relative abundance in the river.

Table 46: Near Threatened Fish Species in Damodar

Sl. No.	Near Threatened (NT) Species (IUCN Status)
1	*Ailia coila* (Hamilton-Buchanan) *, Common Name: Gangetic ailia (English) Local Name: Kajoli, Kajulivacha (West Bengal)
2	*Bagarius bagarius* (Hamilton-Buchanan) *, Common Name: Gangetic Goonch (English) local Name: Baghari, Baghaar (West Bengal)
3	*Bagarius yarrelli*, Common Name: Goonch (English), Local Name: Baghaar (West Bengal)
4	*Gagata cenia* (Hamilton-Buchanan), Common Name: Indian gagata (English) Local Name: Jungla (West Bengal)
5	*Wallago attu* (Schneider) *, Common Name: Boal (English),, Local Name: Boal (West Bengal)

*Note: *: Fish Species are also recorded as Endangered Species*

Inland capture fisheries are an important sector of many local economies especially in West Bengal. It provides more job opportunities to rural mass in fishing marketing. The fishing in rivers and other water bodies is one of the main occupations next to farming. The water level and locations of the fish catching area determine the quantity and quality of fish. In most of the villages along the river, the economy depends upon fishing activities. The infrastructural facility, preservation and marketing are main concern of fishing community.

Table 47: Inland fish production Year 2014-15 (in Tons)

District	Fish	Fish Varieties	Prawn	Total
Bardhhaman	140518	Rui, Mrigal, Kalbose, Bata, Khaira, Chital, Pholui, Kakia, Kanpona, Mourola, Techokha, Punti, Chela, Lata, Sal, Sol, Aard, Tangra, Magur, Ban, Boal	111	140629
Howrah	38127		293	38420
Hooghly	96080		100	96180
Total	**274725**		**504**	**275229**

Source: Department of Fisheries

The river Damodar and Mundeswari site is rich in aquatic fauna (fish species). The aquatic ecology of these rivers may be affected by desiltation operation which is temporary in nature and specific to identified sites. During desiltation, the water of the river will not be stored and the natural flow of the river will tried be maintained throughout the stretch. However, the area near the desiltation site will be affected. Desiltation of gravel and sand may affect fish stocks and other aquatic life by destabilizing the sub-stratum, increasing the turbidity of water. These alterations are likely to upset the composition and balance of aquatic organisms. The material at the river substratum like stones and pebbles provide anchorage and home to aquatic life. Amongst the aquatic fauna, the fish life would likely to be affected.

During fish spawning season, the fertilized eggs are laid amidst the gravel so that the eggs are not washed away. The eggs of almost all the species are sticky in nature, which provide additional safety. The turbidity in excess of 100 ppm brought by suspended solids chokes the gills of young fish. Fine solids in concentration greater than 25 mg/l, adversely affects the development of fish eggs and fish.

3.17 Agro-Climatic Zone

The physiographic setting of the State come under three Agro climatic Regions. Agriculturally, the three broad regions are Eastern Himalayan Region (Zone II), Lower Gangetic Plain Region (Zone III) and Eastern Plateau & Hilly Region (Zone VIII). Three broad regions are further stratified into six agro-climatic sub regions. Salient features of these sub regions are as follows:

Table 48: Districts by Agro-Climatic Zone and Main Crops Grown

Sl. No.	Agroclimatic Zone	Area (ha)	Project Districts	Main Crops
3	Old Alluvial Zone	17,53,757 (20.20%)	Bankura, Howrah, Hooghly, Bardhhaman,	Rice, wheat, maize, jute, mustard, Niger, groundnut, sesame, linseed, lentil, black gram, green gram, pigeon pea, vegetables etc.
4	New Alluvial Zone	15,30,415 (17.62%)	Bardhhaman, Hooghly, and Howrah	Rice, wheat, maize, jute, green gram, black gram, pigeon pea, lentil, rapeseed, mustard, groundnut, sesame, linseed, Niger, vegetables etc.
5.	Red Lateritic Zone	24,84,244 (28.61%)	Part of Bardhhamanand Bankura	Rice, maize, millets, vegetables, Niger, toria, safflower, mustard, sesame, pulses, potato, vetiver, sabai etc.
6	Coastal Saline Zone	14,56,879 (16.77%)	Howrah	Rice, chilli, vegetables, sunflower, sesame watermelon, Lathyrus etc.

Source: SOE Report; Data in parenthesis indicate the percentage of land under the concerned agroclimatic zones.
Note: Districts in Bold are the project districts

3.18 Agriculture

3.18.1 Operational Holding

Land holding pattern reflects that all the project districts are having significant percentage of marginal and small farmers. In Bankura, 68.0 percent farmers are having less than 1.0 Ha. of land and percentage of holding to total holding is 36.0 percent. Of the total farmers, 21.0 percent are having 1.0 to 2.0 Ha. of land with 31.0 percent of the total land whereas only 11.0 percent farmers are in the holding category of greater than 2.0 Ha. of land with 33.0 percent of the total area of holding.

Table 49: Project district wise land holding status

District	Item	Classification of Holding	<= 1 Ha	> 1 to <= 2 Ha	>2 Ha	Total
Bankura	Holding	Nos.	278414	85292	44325	408031
		% to Total	68	21	11	100
	Area	Ha.	148494	125064	133850	407408
		% to Total	36	31	33	100
Bardharnan	Holding	Nos.	325565	88410	38892	452867
		% to Total	72	20	8	100
	Area	Ha.	191610	149896	130612	472118
		% to Total	41	32	27	100
Howrah	Holding	Nos.	256387	22339	5369	284095
		% to Total	90.24	7.86	1.9	100
	Area	Ha.	81880	26669	13242	121791
		% to Total	67.23	21.9	10.87	100
Hooghly	Holding	Nos.	293535	40363	8633	342531
		% to Total	86	12	3	100
	Area	ha.	128989	61311	25855	216155
		% to Total	60	28	12	100
Total	Holding	Nos.	1153901	236404	97219	1487524
		% to Total	77.57	15.89	6.54	100.00
	Area	Ha.	550973	362940	303559	1217472
		% to Total	45.26	29.81	24.93	100.00

Source: NABARD
Note: This table represents total figure of project districts.

In Bardhhaman, less than 1.0 Ha. of land holding is more prominent as 72.0 percent farmers are in this category with holding of 41.0 percent of the total land. About 20.0 percent farmers who have holding size of 1.0 to 2.0 Ha. having 32.0 percent of the total land and remaining 27.0 percent land belongs to 8.0 percent farmers who have average holding of more than 2.0 Ha. of land. Similar trend is observed in other two project districts, i.e., Howrah and Hooghly.

3.18.2 Land Utilisation Pattern

The land utilisation pattern of the project districts reflects that 61.59 percent of the total geographical area is the net sown area in Bankura whereas 74.29 percent of district geographical area is the net sown area in Bardhhaman (east), 43.83 percent in Bardhhaman (west) which is lowest among all the project districts, 64.17 percent in Howrah and 68.45 percent in Hooghly. Among all the project districts, highest cropping intensity observed in Hooghly (244 percent) followed by Bardhhaman (east) with 193 percent. Lowest cropping intensity is in Bardhhaman (west) among all the project districts with 119 percent.

Table 50: Project district wise land use pattern

	Area under Agriculture (ha)							
District	**Total Geographical Area**	**Gross cropped Area**	**Net sown Area**	**Area sown more than once**	**Cropping Intensity (%)**	**Area under Forest**	**Area under Wasteland**	**Area under other uses**
Bankura	134090.3	140335	82580	57755	168	23079.7	4728.5	25251.4
Bardhhaman (East)	480464	675377	356949	318428	193	11793	2853	108870
Bardhhaman (West)	56697	29596	24850	4746	119	10230	4490	17127
Howrah	115593	138738	74180	54706	188	0	0	41413
Hooghly	269022	453338	184134	269204	244	528	1133	0

Source: District Irrigation Plan (DIP), 2016

3.18.3 Agricultural Crops

Different crops are grown in the project districts during different seasons and paddy is the prominent among them. Farmers in the district also grow course cereals, pulses, oil seeds, fibres and horticultural crops. Project district wise area covered under different crops are presented in the below table.

Table 51: Crops Grown in Project District and Area under Different Crops

Project District	**Crop Type**	**Kharif (Area in Ha)**	**Rabi (Area in Ha)**	**Summer (Area in Ha)**
		Total	**Total**	**Total**
Bankura	Cereals	79997	754	28290
	Coarse Cereals	135	67	0
	Pulses	116	669	70
	Oil seeds	34	5795	7759
	Fibre	222	0	0
	Hort. & Other crops	2037	12996	1355
	Total	***82541***	***20281***	***37474***
Bardhhaman (East)	Cereals	350919	21415	117260
	Coarse Cereals	8	0	10
	Pulses	731	23145	2112
	Oil Seeds	30	29634	17560
	Fibre	2551	0	0
	Potato including Horticulture	2710	78217	4440
	Total	***356949***	***153611***	***141382***
Bardhhaman (West)	Cereals	23900	100	1100
	Coarse Cereals	500	20	15
	Pulses	0	155	5
	Oil Seeds	0	460	100
	Fibre	0	0	0
	Potato including Horticulture	450	1715	250
	Total	***24850***	***2450***	***1470***
Hooghly	Cereals	159753	0	61095
	Coarse Cereals	40	0	0
	Pulses	0	4374	861
	Oil seed	0	11601	48934
	Fibre	16117	0	0
	Other crops (potato)	0	78856	0

	Total	***175910***	***94831***	***110890***

3.19 Agro-Chemical Use

3.19.1 Pesticides

In the process of preparation of ESMF, Focus Group Discussion (FGD) were conducted with the farmers of the project locations, in project districts to understand about the type of pesticides they mostly use. The discussions reveal that in most cases, pesticides are used by the farmers as prescribed by the local agrochemical shops. In many cases, farmers are also use a particular type of pesticide that is used and recommended by the fellow farmer of the locality for the specific crop. So, farmer to farmer sharing of pesticide use and advised by the local agrochemical shop play a vital role. Most of the farmers purchase pesticides from agrochemical shops by telling the type of infections or disease the plants are suffering from. Consumption of pesticides in project districts (figure of 2012) are presented in the table.

Table 52: Pesticide consumption in the year of 2012

Pesticides Use	Bankura	Bardhhaman	Howrah	Hooghly	Total
Pesticides Consumed [MT]	351.28	N.A.	4447	N.A.	4798.28

Source: District Agriculture Profile (NABARD)

Key Pests and Vulnerable Crops:
The project districts are having agricultural base with major emphasis on cereal, pulses and vegetables. Attack of pests is a common phenomenon in the project districts during agricultural season. Pests observed in the project districts by crop types are presented in the table.

Table 53: Key Pests by Crop Categories in Project Districts

District	Paddy	Pulses	Vegetable
Bardhhaman	Rice leaf Folder, Yellow stem borer, striped stem borer, Army worm	Cutworms, stem fly, root knot nematode, soil beetle	Fruit borer (Tomato), Fruit and shoot borer (Brinjal), Thrips (Chillies) Fruit borer (Okra) Fruit fly (Cabbage and Cauliflower)
Howrah	Rice leaf Folder, Yellow stem borer, striped stem borer, Army worm	Cutworms, stem fly, root knot nematode, soil beetle	Fruit borer (Tomato), Fruit and shoot borer (Brinjal), Thrips (Chillies)Fruit borer (Okra) Fruit fly (Cabbage and Cauliflower)
Hooghly	Rice leaf Folder, Yellow stem borer, striped stem borer, Army worm	Cutworms, stem fly, root knot nematode, soil beetle	Fruit borer (Tomato), Fruit and shoot borer (Brinjal), Thrips (Chillies)Fruit borer (Okra) Fruit fly (Cabbage and Cauliflower)
Bankura	Rice leaf Folder, Yellow stem borer, striped stem borer, Army worm	Cutworms, stem fly, root knot nematode, soil beetle	Fruit borer (Tomato), Fruit and shoot borer (Brinjal), Thrips (Chillies)Fruit borer (Okra) Fruit fly (Cabbage and Cauliflower)

Commonly Used Pesticides and its WHO Classification:
Farmers use different pesticides for different crops which are normally procured from the local market by elaborating the disease type to the pesticide outlets. As agriculture extension services remain deficient due to various reasons, the pesticide outlets play a critical role in prescribing different pesticides for different insects / pests / plant diseases. The most commonly used pesticides are *alpha-cypermethrin, methyl parathion, imidacloprid, dichlorvos and phorate*. Farmers mostly store these chemicals and Pesticides in cowsheds, store rooms and bathrooms.Pesticides that are commonly used by the farmers and its WHO category is presented in the table.

Table 54: Pesticides in use by the Farmers in Project Districts

Sl. No.	Chemical Pesticides in Use by the Farmers in Project Districts	WHO Class
1	Alpha-cypermethrin	II
2	Methyl parathion	1a
3	Imidacloprid	II
4	Dichlorvos	1b
5	Phorate	1a
6	Athidathion	O
7	Indofil	II
8	Aldicarb	1a
9	Allethrin	II
10	Molinate	II
11	Oxamyl	1b

Note: 1a: Extremely hazardous; 1b: Highly Hazardous; II: Moderately hazardous; O: Obsolete

Key Issues in Pesticide Use:

1. WHO classified 1a, 1b and II pesticides, i.e., extremely hazardous, highly hazardous and moderately hazardous pesticides are in use in the project districts;
2. Knowledge on pesticide application / doses of application is rudimentary and depends mostly on prescription of the agro-chemical shops;
3. Use of organic pesticides is limited in different stages of crop development;
4. Doses of pesticide use is comparatively higher than prescribed norms;
5. Physical and cultural method of pest / insect control is very less adopted;
6. Integrated pest management practices by crop types is less;
7. Unscientific way of pesticide storage at household level which may have adverse impact on family members;
8. Personal protective measures / Physical safety equipment is limited to covering mouth and nose with cloths;
9. Agri-extension services on pesticide application and promotion of IPM principles are limited.

Source of Technical Support:
The local agriculture extension service provides of dept. of agriculture / horticulture are officially the major source of providing technical support for pest management. However, their outreach remains limited for which local agrochemical shops play an important role in advising farmers on pesticide use.

3.19.2 Fertilizers

Soil Fertility relates to the presence of minerals like nitrogen, potassium and phosphorous. This helps in procuring the right fertilizers and choosing a suitable variety of seed in order to get the highest possible crop productivity. Organic carbon plays an important role in maintaining soil fertility. The soil fertility map of the project districts (excluding Howrah) reveals that high soil organic carbon (0.75) is observed in 79 percent area of Bardhhaman followed by 52 percent area in Hooghly and 19 percent area of Bankura. It reveals that major part of Bankura district is low to medium in soil organic carbon. Further, pH value indicates that soil of these districts are mostly acidic and deficient in Boron and Zinc. Nitrogen content of soil in these districts are low in majority parts and for which Nitrogenous fertiliser application is high in these districts. Use of Phosphorous and Potassium in these districts are low as substantial part of these districts are having moderate to high Phosphorous and Potassium content.

Soil Depth: Soil depth helps in development of roots and is a source of moisture and nutrient supply to the plants. The soil depth classes reflect that part of Bankura is in shallow soil depth class (25-50 cm) whereas Bardhhaman and part of Bankura are in the depth class of moderate shallow (50-75 cm).

Soil Drainage: Soils of the State can be grouped into six drainage classes, of which four classes adversely affect soil and crop management, i.e., (1) very poorly drained, (2) poorly drained, (3) imperfectly drained and (4) excessively drained soils. The project district Hooghly falls in to very poorly drained class whereas some part of Hooghly and Howrah district falls in to poorly drained category. Part of Bardhhaman and part of Howrah district falls in to imperfectly drained class whereas Bankura falls in to excessively drained class.

Water Erosion: Erosion by water is a major soil degradation factor and project district Bankura falls in to severe water erosion class whereas Howrah and Hooghly falls in to moderate water erosion category.

Water Logging: Waterlogging is considered a serious limitation which adversely affects the yield and quality of crops. The project district Bardhhaman falls in to moderate water logging class whereas Hooghly, Howrah and part of Bardhhaman falls in to marginal (slight) class of water logging.

Commonly Used Fertility Management System:

Farmers of the project area mostly use Urea, NPK, DAP and MOP fertilizers. Consumption of urea is more than other fertilizers. Approximately 150 kg/ha of NPK fertilizer is used in paddy fields (Irrigated) and 75-80 Kg/ha of NPK fertilizer is used in rainfed paddy fields. Use of organic manure (farmyard manure, compost, green manure) is the oldest practiced means of nutrient replenishment. But due to increasing trend of using cow dung as fuel and using crop residue as animal feed, use of organic manure is reduced. People in command area of the project also used animal waste as organic manure for their crops, However the use of organic manure is less than that of Mineral fertilizers.

Table 55: Consumption of Fertilizers in West Bengal by District (in MT)

District	2010-11			2011-12			2012-13			2013-14			2014-15			Growth (in %)		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
Bardhhaman	68631	57644	38294	77511	42157	35037	80848	54189	27030	71384	30474	30932	81802	48398	38121	19.19	-16.04	-0.45
Bankura	29263	26586	17194	31827	21853	16175	38485	29326	13134	30652	13599	13937	35448	22312	17887	21.14	-16.08	4.03
Howrah	10128	8339	5937	12627	10213	6000	13941	7348	7339	10533	3469	3728	11449	7287	5660	13.04	-12.62	-4.67
Hooghly	54485	56969	42844	57998	36736	40695	61917	52617	39118	47367	28532	31926	54853	41744	38296	0.68	-26.73	-10.62
West Bengal	**712374**	**495581**	**363869**	**782650**	**476150**	**319031**	**824001**	**453675**	**282730**	**692964**	**262930**	**270955**	**756844**	**390817**	**319240**	**6.24**	**-21.14**	**-12.27**

Source: Statistical Abstract of West Bengal, 2015

Fertilizer consumption, comparing 2010-11 with 2014-15 reveals that there is an increment in the consumption of Nitrogen whereas Phosphorous (P) and Potash (K) consumption has reduced at district level. During the period of reference, consumption of Nitrogen has increased by 19.2 percent in Bardhhaman whereas consumption of P and K has reduced by 16 percent and 0.5 percent respectively. In project district Bankura, both N and K consumption has increased by 21.1 percent and 4.03 percent respectively whereas P consumption reduced by 16 percent. In Howrah and Hooghly, fertilizer consumption trend is more or less same to that of Bardhhaman.

The Compound Annual Growth Rate (CAGR) in N consumption is positive in all the project districts (0.045 in Bardhhaman, 0.049 in Bankura, 0.031 in Howrah and 0.002 in Hooghly) whereas consumption of P is negative in all project districts (-0.043 in Bardhhaman, -0.043 in Bankura, -0.033 in Howrah and -0.075 in Hooghly) along with consumption of K (-0.001 in Bardhhaman, -0.012 in Howrah and -0.028 in Hooghly), excluding Bankura (0.010).

Table 56: Consumption of Fertilizer per unit of Gross Cropped Area (Kg. /Ha.)

District	**1990-91**	**2000-01**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**
Bardhhaman	115.15	149.73	226.83	219.95	221.4	180	160	200
Bankura	63.72	109.28	161.3	227	226.5	160	110	150
Howrah	241.96	350.2	155.97	152.17	171.9	180	110	160
Hooghly	170.13	258.12	286.16	284.51	280.6	280	180	250
West Bengal	86.93	119.02	172.56	177.96	179.1	160	130	150

Source: Statistical Abstract of West Bengal, 2015

Consumption of fertilizer per unit of Gross Cropped Area (GCA) observed increased between 1990-91 to 2014-15 in three project districts. Comparing the rate of consumption (Kg/Ha.) of fertilizer in 1990-91 and

2014-15, it can be observed that there is 73.69 percent growth in fertilizer consumption in Bardhhaman, 135.4 percent in Bankura, 46.95 percent in Hooghly whereas there is reduction of 33.87 percent in Howrah. The Compound Annual Growth Rate (CAGR) from 2009-10 to 2014-15 reveals that there is reduction in fertilizer consumption by 0.018 in Bardhhaman, 0.010 in Bankura and 0.019 in Hooghly. The CAGR of the State also shows negative (-0.020) in fertilizer consumption. There is a marginal increase of 0.004 in fertilizer consumption per unit of gross cropped area in Howrah district.

Use of Bio-fertilizers is of relatively recent origin and its use is restricted to some parts only. Bio fertilizers include N fixers (Rhizobium, Azotobacter, Azolla, Blue green algae) and Phosphate solubilizing bacteria and Fungi (Imycorrhizae). People of the project command area do not possess required knowledge on use of bio-fertilizers.

Technical Support on Fertility Management:

In order to provide technical support for fertility management, there are seventeen (ten static and seven mobile) soil testing laboratories, three fertilizer quality control laboratories, one pesticide quality control laboratory, one seed testing laboratory and one bio-pesticide quality control laboratory are operating in the State to provide agricultural extension services to the farmers. Apart from current institutional support systems, technical inputs on use of fertilizer and pesticides are also rendered by the input suppliers as extension services remains inadequate in majority cases.

Key Issues in Fertilizer Use:

Key issues related to fertilizer application in the project districts are;

1. Unscientific application of fertilizer (higher doses);
2. Many farmers use fertilizer without soil test;
3. Inadequate technical inputs on fertilizer application;
4. Poor adoption of Integrated Plant Nutrient Management;
5. Input supplier to farmer extension which is more commercial and less technical;
6. Less use of organic manure in comparison to synthetic fertilsiers
7. Less fertilizer efficiency and less adoption of fertigation method of application

3.20 Presence of Industry

Bankura: The district is not having major or minor minerals. There is one industrial area (Bishnupur) having 9 production units. The district is having 226 registered industrial units. The district is having 5 large scale industrie / public sector undertaking. Apart from large scale industries, the district is having a number of medium scale enterprises.

Bardhhaman: The district is having minerals like coal, building stone, ordinary sand, murrum and brick earth. The district is having about 11 industrial area with a number of production units. The district is having a number of large scale industries / public sector undertaking. Type of existing industries in the district includes Modern Rice Mill, Rice Bran Oil, Cold Storage, Oil Mill, Chira Mill, Bakery, L.P.G. Gas Filling Plant, Transformer manufacturing/repairing automobile spare parts etc. This district is rich in handicrafts also. Since Bardhhaman is an agro-based area, many Rice Mills are located in Bardhhaman

Hooghly: The economy of Hooghly district is admixture of predominant agriculture and industry. Numbers of large and medium scale industries have been set up along the bank of the Hooghly river. Besides, a large number of MSEs have also been set up along the bank of Hooghly river as well as other parts of the district. The district has a number of large scale industries / public sector undertakings along with small scale industries. No. of industrial units registered in the districts are about 6383. The large-scale industries / public sector undertakings include chemical industries, jute mills, ferroalloys, floor mills, agro-industries etc.

Howrah: The district is not having a rich mineral base but having about 11 industrial areas with 3049 registered industrial units. More than 50 large scale industries / public sector undertakings are operating in the district which includes docking and engineering, agro-based industries, iron and steel, chemical industries,

jute industry etc. Engineering and chemical based articles are the major exported items from the district. The ancillary industries in the district are mainly engaged in the manufacture of ships, rail locomotive, industrial furnace, structural etc. Apart from major industries / public sector undertakings, the district is having a number of medium scale enterprises.

Chapter 4: Environmental and Social Screening

WBMIFMP will include activities that have several positive environmental and social impacts including irrigation efficiency, flood mitigation, capacity building and job creation. However, many activities under the project include construction works that are likely to have negative environmental and social impacts. The project does not include large dam or barrage rehabilitation. Large land taking is not anticipated due to rehabilitation work of existing canal system and flood management components. However, all encroachment on canal embankment will be removed as per approved RAP. Considering these aspects, the project has beenclassified as category B as per the World Bank's OP 4.01.

Proposed project has mainly 5 broad components namely 1. Irrigation Modernization, 2. Irrigation Management, 3) Flood Management, 4) Crop Diversification and 5) Project Management and Institutional Development. Project will include a number of activities that will be designed and executed during the project's implementation phase. The types of activities that are planned at this preliminary stage are:

Table 57: Component wise investment activity

Component	Sub-component/ Investment activity
A. Irrigation modernization	I. Restoration of carrying capacity of Main & Branch Canals (Earth Work for Re sectioning Channel Section) throughout the area
	II. Slope stabilization of critically affected reaches by PCC Block lining
	III. Rehabilitation and upgradation of canal regulating structures wherever required
	IV. Construction of gates/shutters at uncontrolled existing outlets
	V. Providing controlled structures (Duckbill weir) at tail end of canals and other locations of Level 4 canals.
	VI. Construction of rubber dams at identified location across rivers/channels
	VII. Construction of water rataining structure over small rivers and drainage channels to create storage for use in rabi crops
	VIII. Adoption of Pressurized Irrigation system
	IX. Augmenting induced recharge of ground water
B. Irrigation Management	I. Automated gate operation with centralized control only in the main canal and offtake head regulators of branch canals
	II. Development of framework of MIS system for monitoring and also development of mobile based apps
	III. Capacity strengthening of IWD, operators, farmers & other Convergent Departments
C. Flood Management	I. Desiltation of Mundeswari river for a length of 20 km from Beguahana to further down stream
	II. De siltation (Re-sectioning) of other smaller rivers and drainage channels
	III. Armouring of Damodar Right Dwarf embankment to act as Broad Crested Weir to allow controlled spilling of flood water
	IV. Improving Damodar Protected Left Embankment by providing adequate free board to withstand flood through construction of flood walls at identified locations
	V. Improving Upper Rampur & Hurhura Channels by providing adequate freeboard through provision of flood wall on Left Embankments
	VI. Raising & Strengthening of countryside existing earthen embankments to its design section of Damodar Left, Hurhura Left & Lower Rampur left embankments
	VII. Protection / River training works on river Damodar / Mundeswari, Hurhura Khal, Upper Rampur and Lower Rampur Khals
	VIII. Remodelling & Reconstruction of sluices at the outfalls of drainage channels
D. Crop diversification and Intensification	**I. Demonstration for diversification and support in Horticulture, providing infrastructure of cultivation and construction of lowcost storage structure - Department of Food Processing Industries and Horticulture**
	Promosion on Cultivation of Hybrid Vegetable
	Infrastructure development for promosion of Vermi compost, protected cultivation and post harvest infrastructure
	Capacity strengthening of DPIUs and training of farmers and DPIUs officials

Component	Sub-component/ Investment activity
	II. Agriculture Marketing Dept.
	Organization Building (Promotion of small sized FPO) and convert them into farmer producer company (FPC) - 44 nos.
	Construction of aggregation centre/ pack house (1/ FPC)
	Providing equity grant and other financial support to the FPC
	Transport subsidy for procurement of motorized van (transportation support) to each FPC
	Training to the FPCs and departmental staff
	III. Support for farm mechanisation, diversified cropping demonstration, to promote less water consuming and diversified cropping -Agriculture Dept.
	Formation of Custom Hiring Centre (CHC) to facilitate farmers in hiring of farm machineries (Zero Tillage) at subsidised rate
	Crop demonstration on Cropping System, Diversification, SARP, SRI, Zero Tillage and Direct Seeding of Rice (Subsidy on Seeds, Pesticides, Fertilizer etc. to promote adoption of new farming practice)
	Capacity Building of farmers on Micro Irrigation, Water management, Farm Mechanisation and Packaging
	Training and exposure visit of farmers and departmental staff
	IV. Promotion of cage based pisciculture along with one-time sustainance support-Fisheries Department
	Promotion of cage culture (prividing cages with appurtenants) in the main and branch canal and one-time sustainance support (providing fish seed, fish feed, prophylectics, labour) to FPG/ SHG
	Capacity strengthening and training of departmental staff
	Training and exposure visit of SHG members, facilitators

As seen above, the proposed activities are diverse, ranging from civil works to crop diversification. Therefore, the potential environmental and social impacts of the activities are also varied. The screening process helps to make a preliminary assessment of the environmental and social issues associated with the proposed activities. The screening is followed by detailed, focused assessments.

This chapter presents the following:

1. Preliminary screening of the project activities for E & S impacts, based on the information available at this stage of the project preparation process (section 4.1).
2. Categorization of the project activities based on potential E & S impacts (section 4.2).
3. Description of the procedure for undertaking screening of each specific project activity, during the activity design stage, when the exact details on location and scale of the activities are known (section 4.3).

4.1 Preliminary E&S Impact Screening for the WBMIFMP

A preliminary screening exercise was carried out to delineate the potential environmental and social impacts due to the activities identified in the project preparationstage. The screening has been carried out based on three major parameters, i.e., (1) potential impact covering positive and adverse impact which includes land, air quality, water quality and biological factors; (2) nature of the expected impact which may be reversible or irreversible; and (3) nature of the impact which may be long term or short term.

Table 58: Environmental and Social Impacts of Project Activities (organized by Project components)

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
A. Irrigation modernization				
I. Restoration of carrying capacity of Main & Branch Canals (Earth Work for Re sectioning Channel Section) throughout the area	Minimize losses of irrigation water	+ ve	Long-term	
	Improvement of irrigation water supply	+ ve	Long-term	
	Less pressure on groundwater resource	+ ve	Long-term	
	Help in recharging ground water	+ ve	Long-term	
	Removal of weed from river/ canal system	+ ve	Short-term	
	Help in maintaining soil moisture of surrounding agricultural field	+ ve	Long-term	
	Loss of vegetation and impacts on flora and fauna	- ve	Short-term	Indirect impact; reversible in nature; severity is low; negligible impact on livelihood.
	Soil and water pollution due to improper weed disposal	- ve	Short-term	Low severity; Impact minimization /neutralization with suitable mitigation measures.
	Generation and disposal of solid waste	- ve	Short-term	Low severity; no / low impact on livelihood.
	Removal of excess excavated materials from the canals and its inappropriate dumping which may affect nearby agriculture field and waterbody.	- ve	Short-term	Direct impact; reversible in nature; severity is low; insignificant impact on local livelihood.
	Stripping, stocking of excavated earth on agricultural field may damage top soil of agricultural field	- ve	Short-term	Direct impact; reversible in nature; severity is low; insignificant impact on local livelihood.
	Dust and air pollution from flying of dried up excavated earth	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Soil and water pollution due to improper weed disposal	- ve	Short-term	Low severity. Impact minimization /neutralization with suitable mitigation measures.
II. Slope stabilization of critically affected reaches by PCC Block lining	Minimize losses of irrigation water	+ ve	Long-term	
	Reduce Seepage Loss from embankment	+ ve	Long-term	
	Protection against soil erosion	+ ve	Long-term	
	Loss of vegetation and impacts on flora and fauna	- ve	Short-term	Indirect impact; reversible in nature; severity is low; negligible impact on livelihood.
	Soil and water pollution due to improper weed disposal	- ve	Short-term	Low severity. Impact minimization /neutralization with suitable mitigation measures.
	Felling of tree	- ve	Long-term	Reversible in nature; severity is low.

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
	Soil impacts and sediment transport in streams, canal, water bodies	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Generation and disposal of solid waste	- ve	Short-term	Low severity; no / low impact on livelihood.
	Removal of top soil	- ve	Short-term	Reversible in nature; low severity; low impact on local livelihood.
	Selection of Borrow areas	- ve	Long-term	Ireversible in nature; severity is high; mederae impact.
	Extraction of borrow earth can disrupt natural drainage, vegetation and resulting in accelerated erosion and leading to water stagnation, ponding and pollution	- ve	Long-term	Reversible in nature; low severity; low impact on local livelihood.
III. Rehabilitation and upgradation of canal regulating structures wherever required	Minimize losses of irrigation water	+ ve	Long-term	
	Improvement of irrigation water supply	+ ve	Long-term	
	Less pressure on groundwater resource	+ ve	Long-term	
	Optimum use of water resource	+ ve	Long-term	
	Better or equitable distribution of water	+ ve	Long-term	
	Help in recharging ground water	+ ve	Long-term	
	Reduce Seepage Loss from regulating structure	+ ve	Long-term	
	Reduce water loss	+ ve	Long-Term	
IV. Construction of gates/shutters at uncontrolled existing outlets	Loss of vegetation and impacts on flora and fauna	- ve	Short-term	Indirect impact; reversible in nature; severity is low; negligible impact on livelihood.
	Soil impacts and sediment transport in streams, canal, water bodies	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Generation and disposal of solid waste	- ve	Short-term	Low severity; reversible in nature, no / low impact on livelihood.
V. Providing controlled structures (Duckbill weir) at tail end of canals and other locations of Level 4 canals.	Disposal of debris from dismantling structures and spoil	- ve	Short-term	Indirect impact; reversible in nature; severity is low; negligible impact on livelihood.
	Fish migration in water courses may be restricted	- ve	Long-term	Indirect impact; reversible in nature; severity is low; mederate impact on livelihood.
	Natural flow of rivers/channels may alter and take diversion	- ve	Short-term	Indirect impact; reversible in nature; severity is low; negligible impact on livelihood.
VI. Construction of rubber dams at identified location across rivers/channels	Improvement of irrigation water supply	+ ve	Long-term	
	Less pressure on groundwater resource	+ ve	Long-term	
	Optimum use of water resource	+ ve	Long-term	
	Better or equitable distribution of water	+ ve	Long-term	
	Reduce water loss	+ ve	Long-Term	

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
	When the Rubber dam is inflated/deflated, water levels change suddenly and may create a hazard to adjacent people or their properties	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Flood borne debris, especially sharp objects	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
	Fish migration in water courses may be restricted	- ve	Long-term	Indirect impact; reversible in nature; severity is low; mederate impact on livelihood.
VII. Construction of water rataining structure over small rivers and drainage channels to create storage for use in rabi crops	Minimize losses of irrigation water	+ ve	Long-term	
	Improvement of irrigation water supply	+ ve	Long-term	
	Less pressure on groundwater resource	+ ve	Long-term	
	Optimum use of water resource	+ ve	Long-term	
	Better or equitable distribution of water	+ ve	Long-term	
	Help in recharging ground water	+ ve	Long-term	
	Generation and disposal of solid waste	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
VIII. Adoption of Pressurized Irrigation system	Minimize losses of irrigation water	+ ve	Long-term	
	Improvement of irrigation water supply	+ ve	Long-term	
	Less pressure on groundwater resource	+ ve	Long-term	
	Optimum use of water resource	+ ve	Long-term	
	Better or equitable distribution of water	+ ve	Long-term	
	Attract community participation irrigation management	+ ve	Long-term	
	Sump development (for pressurised irrigation)	+ ve	Long-Term	It will used for storing water, stored water can be utilized during lean period. It will reduce irrigation water loss.
	Help in maintaining soil moisture of surrounding agricultural field	+ ve	Long-Term	
	Natural flow of rivers/channels may alter and take diversion due to construction of water storage sump	- ve	Short-term	Indirect impact; reversible in nature; severity is low; negligible impact on livelihood.
IX. Augmenting induced recharge of ground water	Help in recharging ground water	+ ve	Long-term	
	Rise of water table leading to water logging	- ve	Short-term	Indirect impact; reversible in nature; severity is high.
B. Irrigation Management				
I. Automated gate operation with centralized control only	Minimize human effort and error	+ ve	Long-term	

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
in the main canal and offtake head regulators of branch canals				
II. Development of framework of MIS system for monitoring and also development of mobile based apps III. Capacity strengthening of IWD, operators, farmers & other Convergent Departments	Better management of irrigation water distribution system	+ ve	Long-term	
	Strengthening forecasting and analysis capacities	+ ve	Long-term	
C. Flood Management				
I. Desiltation of Mundeswari river for a length of 20 km from Beguahana to further down stream	Reduction in flood intensity and occurrence	+ ve	Long-term	
	Increase in storage capacity	+ ve	Long-term	
	Minimizing overflow from embankment	+ ve	Long-term	
	Minimizing chances of breaching	+ ve	Long-term	
	Reuse of desilted material for road construction and embankment strengthening	+ ve	Long-term	
	Removal of weed from river/ canal system before commencement of desiltation	+ ve	Short-term	
	Soil and water pollution due to improper weed disposal	- ve	Short-term	Low severity. Impact minimization /neutralization with suitable mitigation measures.
	Impact on Soil quality & River Bed sediments	- ve	Long-term	Direct impact; reversible in nature; severity is low.
II. De siltation (Re-sectioning) of other smaller rivers and drainage channels	Detoriation of Water Quality	- ve	Short-term	Low severity. Impact minimization /neutralization with suitable mitigation measures.
	Aquatic Ecology- Removal of benthic communities , increasing underwater noise levels, increasing sediments/ turbidity, release of locked pollutants in sediment, disposal of desilted material, increasing depth	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Location of Socioeconomic importance and socioeconomic environment	- ve	Short-term	Indirect impact; reversible in nature; severity is low.

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
	Inappropriate dumping of excavated material which may affect nearby agricultural areas	- ve	Long-term	Direct impact; irreversible in nature; severity is high.
	Stripping, stocking of desilted material on agricultural field may cause damage to top soil.	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
	Dust and air pollution from flying of dried up excavated earth	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
	Loss of vegetation and impacts on flora and fauna	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
	Soil impacts and sediment transport	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Desiltation will increase chances of sedimentation at downstream	- ve	Long-term	Reversible in nature with further desiltation activity; severity is high; significant impact on river morphology
	Desiltation will increase chances of water pollution at downstream	- ve	Short-term	Water Quality may deteriorate in the immediate downstream due to surface runoff; severity is low
	Disruption of agricultural land due to temporary staking of desilted material	- ve	Short-term	Reversible in nature; severity is medium, significant impact on on livelihood. (Desilted material will temporarily be stored at nearby agricultural field – setback zone of embankment)
	Temporary storing of desilted/ desilted / excavated materials at nearby areas (fallow, unutilized land, degreded land, agricultural fields- located within both side of the bank – buffer area in between river and embankment)	- ve	Short-term	Reversible in nature; severity is medium; insignificant impact on livelihood
	Disposal of desilted material	- ve	Long-term	Irreversible in nature; severity is high (if it contains heavy metals and proper mitigation measures are not in place); significant impact on soil and water
III. Armouring of Damodar Right Dwarf embankment to act as Broad Crested Weir to allow controlled spilling of flood water	Reduction in flood intensity and occurrence	+ ve	Long-term	
	Increase in storage capacity	+ ve	Long-term	
	Minimizing overflow from embankment	+ ve	Long-term	
	Minimizing chances of breaching	+ ve	Long-term	
	Protection against soil erosion	+ ve	Long-term	
	Reduce Seepage Loss from degreded embankment and control structure	+ ve	Long-term	

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
IV. Improving Damodar Protected Left Embankment by providing adequate free board to withstand flood through construction of flood walls at identified locations	Loss of vegetation and impacts on flora and fauna	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
	Soil and water pollution due to improper weed disposal	- ve	Short-term	Low severity. Impact minimization /neutralization with suitable mitigation measures.
	Felling of tree	- ve	Long-term	Reversible in nature; severity is low.
	Loss of land / properties and livelihood; shelter due to land taking	- ve	Long-term	Reversible in nature; severity is high, significant impact on on livelihood. (Encroached people will be allowed to shift to their previous land after completion of construction work)
	Soil impacts and sediment transport in streams, canal, water bodies	- ve	Short-term	Direct impact; reversible in nature; severity is low.
V. Improving Upper Rampur & Hurhura Channels by providing adequate freeboard through provision of flood wall on Left Embankments	Generation and disposal of solid waste	- ve	Short-term	Low severity; reversible in nature, no / low impact on livelihood.
	Removal of top soil	- ve	Short-term	Reversible in nature; low severity; low impact on local livelihood.
	Borrow areas- extraction of materials like earth etc., can disrupt natural drainage, vegetation and resulting in accelerated erosion and leading to water stagnation, ponding and pollution	- ve	Long-term	Reversible in nature; low severity; low impact.
	Transportation of earth from borrow areas for construction	- ve	Short-term	Reversible in nature; low severity; low impact.
	Higher within channel or river velocity will cause more bank erosion and river bed scouring	- ve	Long-term	Reversible with proper mitigation, high severity; moderate impact
VI. Raising & Strengthening of countryside existing earthen embankments to its design section of Damodar Left, Hurhura Left & Lower Rampur left embankments	More sediment trapping at downstream river channels	- ve	Long-term	Reversible with regular desiltation work; moderate severity, moderate impact
	Less silt deposited on land affecting fertility	- ve	Long-term	Less occurance of flood will carry and deposit reduced amount of fertile soil, which in turn will reduce yield.
	Reduced soil fertility due to reduced aquatic vegetation and micro-biota	- ve	Long-term	Less occurance of flood will carry and deposit reduced amount of fertile soil, soil moisture of nearby field will be reduced.
	Decline in quality of sub-surface and surface waters due to loss of flushing effect of floods	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	More pollution from agrochemicals due to promotion and intensification of agriculture	- ve	Long-term	Irreversible in nature; severity is high; significant impact on soil and water

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
VII. Protection / River training works on river Damodar / Mundeswari, Hurhura Khal, Upper Rampur and Lower Rampur Khals	Decline in capture fisheries	- ve	Long-term	Irreversible in nature; severity is low; no / low impact on livelihood.
VIII. Remodelling & Reconstruction of sluices at the outfalls of drainage channels	Better management of water	+ ve	Long Term	
	Reduction in flood intensity and occurrence	+ ve	Long Term	
	Minimizing overflow from embankment	+ ve	Long Term	
	Minimizing chances of breaching	+ ve	Long Term	
	Reduce Seepage Loss from control structure	+ ve	Long Term	
	Loss of vegetation and impacts on flora and fauna	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
	Soil impacts and sediment transport in streams, canal, water bodies	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Generation and disposal of solid waste	- ve	Short-term	Low severity; reversible in nature, no / low impact on livelihood.
	Disposal of debris from dismantling structures and spoil	- ve	Long Term	Irreversible in nature; severity is moderate; significant impact on soil and water
	Fish migration in water courses may be restricted	- ve	Long Term	Reversible in nature; low severity; low impact.
	Natural flow of rivers/channels may alter and take diversion	- ve	Short-term	Indirect impact; reversible in nature; severity is low; negligible impact on livelihood.
D. Crop diversification and Intensification				
I. Demonstration for diversification and support in Horticulture, providing infrastructure of cultivation and construction of lowcost storage structure - Department of Food Processing Industries and Horticulture				
Promosion on Cultivation of Hybrid Vegetable	Increased Rabi & Boro cultivation area	+ ve	Long Term	
	Increased production	+ ve	Long Term	
	Increase in use of fertilizer and pesticide	- ve	Long Term	
	Agriculture run off may be containing excess fertilizer promotes the excessive growth of aquatic plants (ssuch as algae, weed and water hyacinth).	- ve	Long Term	
	Deterioration of groundwater quality	- ve	Long Term	
	Soil quality degradation due to excess use of Fertilizer and pesticide.	- ve	Long Term	
Infrastructure development for	Reduction in water demand due to adoption of protected cultivation	+ ve	Long Term	

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
promosion of Vermi compost, protected cultivation and post harvest infrastructure	Adoption and application of vermi compost	+ ve	Long Term	
	Increase in avalability of agriculture-based infrastructure	+ ve	Long Term	
	Protection against diseases, pests and other vermin	+ ve	Long Term	
	Ability to grow all the year	+ ve	Long Term	
	Throughing of non-degredable plastic material in agriculture field	- ve	Long Term	Reversible in nature; severity is moderate; significant impact on soil and water
	Storing of construction material on agriculture field	- ve	Short Term	Reversible in nature; severity is low; low impact on soil and water
	Use of metal structure on agriculture field	- ve	Short Term	Reversible in nature; severity is low; low impact on soil and water
	Drainage and water logging	- ve	Short Term	Reversible in nature; severity is low; low impact on soil and water
	Crop damage during construction	- ve	Short Term	Reversible in nature; severity is low; low impact on soil and water
Capacity strengthening of DPIUs and training of farmers and DPIUs officials	Awareness creation	+ ve	Long Term	
II. Agriculture Marketing Dept.				
Organization Building (Promotion of small sized FPO) and convert them into farmer producer company (FPC) - 44 nos.	Increase in agri- value chain actors	+ ve	Long Term	
	Increase in income from agri based product and facilities	+ ve	Long Term	
Construction of aggregation centre/ pack house (1/ FPC)	Storing of construction material	- ve	Short Term	Reversible in nature; severity is low; low impact on soil and water
	Drainage and water logging	- ve	Short Term	Reversible in nature; severity is low; low impact on soil and water
Providing equity grant and other financial support to the FPC	Increase in agri- value chain actors	+ ve	Long Term	
	Increase in income from agri based product and facilities	+ ve	Long Term	
Transport subsidy for procurement of motorized van	Increase in income from agri based product and facilities	+ ve	Long Term	
	Air, water, soil and noise pollution	- ve	Long Term	Reversible in nature; severity is low; low impact on soil and water
	Awareness creation	+ ve	Long Term	

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
(transportation support) to each FPC Training to the FPCs and departmental staff				
III. Support for farm mechanisation, diversified cropping demonstration, to promote less water consuming and diversified cropping -Agriculture Dept.				
Formation of Custom Hiring Centre (CHC) to facilitate farmers in hiring of farm machineries (Zero Tillage) at subsidised rate	Increase in agri- value chain actors	+ ve	Long Term	
	Increase in income from agri based product and facilities	+ ve	Long Term	
Crop demonstration on Cropping System, Diversification, SARP, SRI, Zero Tillage and Direct Seeding of Rice (Subsidy on Seeds, Pesticides, Fertilizer etc. to promote adoption of new farming practice)	Awareness creation	+ ve	Long Term	
	Reduction in water demand due to adoption of less water demanding crops	+ ve	Long Term	
	Increased Rabi & Boro cultivation area	+ ve	Long Term	
	Increase in use of fertilizer and pesticide	- ve	Long Term	
Capacity Building of farmers on Micro Irrigation, Water management, Farm Mechanisation and Packaging	Awareness creation	+ ve	Long Term	
	Reduction in water demand due to adoption of less water demanding crops	+ ve	Long Term	
	Increased Rabi & Boro cultivation area	+ ve	Long Term	
Training and exposure visit of farmers and departmental staff	Awareness creation	+ ve	Long Term	
IV. Promotion of cage based pisciculture along with one time sustainance support- Fisheries Department				
Promotion of cage culture (prividing cages with appurtenants) in the main and branch canal	Creation of livelihood for fishermen by introducing cage culture (During Operation)	+ ve	Long Term	
	Pollution from overstocking and overfeeding	- ve	Long Term	Reversible in nature; severity is low; low impact on soil and water

Sub-component/ Investment activity	Expected Impact	Impact (+ ve / -ve)	Impact Duration	Remark
and one time sustainance support (providing fish seed, fish feed, prophylectics, labour) to FPG/ SHG	Risk of cultivation of exotic species that may impact native populations	- ve	Long Term	Reversible in nature; severity is low; low impact on soil and water
Capacity strengthening and training of departmental staff	Awareness creation	+ ve	Long Term	
Training and exposure visit of SHG members, facilitators	Awareness creation	+ ve	Long Term	

Table 59: Environmental and social impacts of construction related activities

Issues	Expected Impact	Overall Impact (+ ve / -ve)	Impact Duration	Remark
Camp Site				
Establishment of camp and machinery/equipment/ stone stacking yard/workshop etc.	Creation of job opportunity for local communities	+ ve	Short-term	
	Conflict due to use of agriculture land for camp construction	- ve	Short-term	Severity is low; low impact on livelihood.
	Social conflicts due to influx of external workforce and migrants	- ve	Short-term	Indirect impact; severity is low; low impact on livelihood.
	Conflicts arising due to mixing of local & migratory job seekers	- ve	Short-term	Indirect impact; severity is low; low impact on livelihood.
Workers safety and hygienic conditions	Health risks due to unsafe and unhygienic living environment	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
Camp site security	Security related conflicts with local community	- ve	Short-term	Indirect impact; severity is low; low impact on livelihood.
Parking/ repair of machinery and equipment	Soil and water contamination due to spillage of liquid wastes (lubricants, fuel, chemicals from the machinery yard)	- ve	Short-term	Direct impact; reversible in nature; severity is low.
Operation of diesel operated generators	Deterioration of air quality; Noise exceeding 55 dB is harmful for receptors	- ve	Short-term	Direct impact; reversible in nature; severity is low.
Use of water for construction and consumption	Conflict with local water demand	- ve	Short-term	Indirect impact; severity is low; low impact on livelihood.
Water supply to labour camp	Water related health risks (Gastroenteritis, Diarrhoea etc.)	- ve	Short-term	Indirect impact; reversible in nature; severity is low.

Issues	Expected Impact	Overall Impact (+ ve / -ve)	Impact Duration	Remark
Sanitation and waste water disposal	Soil and water contamination	- ve	Short-term	Direct impact; reversible in nature; severity is low.
Solid waste generation	Land pollution	- ve	Short-term	Direct impact; reversible in nature; severity is low.
Storage, handling and transport of hazardous materials	Work safety and human health risks	- ve	Long-term	Indirect impact; severity is low; low impact on livelihood.
Restoration of camp area	Low esthetic value if camp site is not restored to its original landscape	- ve	Short-term	Indirect impact; severity is low; low impact on livelihood.
Work Places				
Operation and movement of machinery and equipment	Deterioration of air quality due to exhaust gases and dust emissions	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Noise from vehicles, compaction rollers, concrete mixers and construction equipment exceeding 55 dB is harmful for receptors	- ve	Short-term	Reversible in nature; severity is low.
Transportation of construction material	Smoke and dust generation; fall of transported material; chance of accidents; damage to access roads	- ve	Short-term	Direct impact; reversible in nature; severity is low.
	Soil erosion and contamination	- ve	Short-term	Reversible in nature; severity is low; mederate impact.
	Air pollution	- ve	Short-term	Reversible in nature; severity is low.
	Water pollution	- ve	Short-term	Reversible in nature; severity is low; low impact due to contamination of surface water by surface runoff from the construction site.
	Noise pollution	- ve	Short-term	Reversible in nature; severity is low.
	Occupational, Health and Safety issues	- ve	Short-term	Reversible in nature; severity is low.
	Damage to infrastructure	- ve	Short-term	Reversible in nature; severity is low; mederate impact.
Construction works				
	Creation of job opportunity for local tribal communities as well as local people	+ ve	Short-term	
	Soil erosion and contamination	- ve	Short-term	Reversible in nature; severity is low (if desilted material contains heavy metals-severity is high); insignificant impact on local livelihood.
	Accident risks	- ve	Short-term	Severity is low; moderate impact on livelihood.

Issues	Expected Impact	Overall Impact (+ ve / -ve)	Impact Duration	Remark
	Dumping of waste material to crops and cultivated area	- ve	Short-term	Indirect impact; reversible in nature; severity is low.
	Loss of natural vegetation and associated fauna	- ve	Long-term	Reversible in nature; Low severity; low to moderate impact on aquatic life due to reduction or irregular water supply in the downstream during construction phase.
	Damage to infrastructure	- ve	Short-term	Reversible in nature; severity is low; mederate impact.
	Noise pollution	- ve	Short-term	Reversible in nature; severity is low.
	Air pollution	- ve	Short-term	Reversible in nature; severity is low.
	Water pollution	- ve	Short-term	Reversible in nature; severity is low; low impact due to contamination of surface water by surface runoff from the construction site.
	Land degradation; soil erosion; drainage and water logging problem	- ve	Short-term	Reversible in nature; severity is low; mederate impact.
	Residual wastes; construction material waste	- ve	Short-term	Reversible in nature; severity is low; mederate impact.
	Procurement of construction material from unauthorised source	- ve	Short-term	Reversible in nature; severity is low; low impact.
	Stripping, stocking of construction material on agricultural field may cause damage to top soil of agricultural field	- ve	Short-term	Direct impact; reversible in nature; severity is low; insignificant impact on local livelihood.
	Soil Erosion due to temporary diversion of natural drain during construction	- ve	Short-term	Water Quality may deteriorate in the immediate downstream due to surface runoff; severity is low; insignificant impact on livelihood.
	Irrigation water delivery reduction /interruption	- ve	Short-term	Reversible and low severity in nature; low to moderate impact on local livelihood on short-term due to reduction or irregular water supply in the downstream during construction phase.
Safety/health measures for local population	Accident risks, particularly for local population living within/near the project intervention area especially women, children and elderly people	- ve	Short-term	Severity is low; moderate impact on livelihood.
	Impact on human health, especially workers working at construction sites.	- ve	Short-term	Severity is low; moderate impact on livelihood.
Excavation and restoration of Borrow Area	Change in land use pattern; Soil erosion;	- ve	Long-term	Reversible in nature; severity is low; mederate impact.

Issues	Expected Impact	Overall Impact (+ ve / -ve)	Impact Duration	Remark
	Visual sores in landscape; Public health risks due to mosquito-breeding places; Land disputes; Loss of potential crop land; Loss of vegetation			
Generation and disposal of solid waste	Soil, water pollution	- ve	Short-term	Reversible in nature; severity is low (if desilted material contains heavy metals-severity is high); insignificant impact on local livelihood.
Environmental damage during flood	Environmental damage from accidental release of toxic, infectious, or otherwise harmful material from construction site during flooding.	- ve	Long-term	Irreversible in nature; severity is moderate; significant impact on soil and water
Road impacts and traffic issues	Communities along haulage road, project communities, public	- ve	Short-term	Reversible in nature; low severity and low impact on local livelihoods
Obstruction of access ways to communities	Community members	- ve	Short-term	Reversible in nature; low severity and low impact on local livelihoods
Disruption of livelihoods	Community members, farmers	- ve	Short-term	Reversible in nature; low severity and moderate impact on local livelihoods
Sanitation issues and public health impacts	Land, water bodies, workers, public	- ve	Short-term	Reversible in nature; severity is low; mederate impact.
Disturbance of culturally sensitive sites	Local communities	- ve	Short-term	Indirect Impact; reversible in nature; severity is low.
	Chance of finding Archaeological property	+ ve	Long-term	

Table 60: Environmental and Social Impacts of Project Activities (organized by Environmental and Social resources)

Resource	Expected Environmental and Social Impacts
Surface Water Availability	Improvement to delivery system and hydro-mechanical works will result in conservation of water and improving water use efficiency. Investment in micro-irrigation will improve water use efficiency.
Surface Water Quality	Surface water contamination due to project activities is not foreseen except during construction stage due to improper handling of construction materials, equipment and wastes. However, during the course of water conveyance through canals, water quality may be impacted byexternalities. Intensified agricultural practices will cause increased use of synthetic fertilizer and pesticides which could pollute surface water.
Ground Water	Induced recharge of ground water is one of the activities proposed under the project. In addition to this, theactivitiesproposed under rehabilitation of irrigation system and flood management will also help in recharging ground water. Proper treatment mechanism shall be adopted before augmenting induced ground water recharge to eliminate any possibility of ground water contamination, which may affect entire aquifer system. Intensified agricultural practices will cause increased use of synthetic fertilizer and pesticides which could pollute ground water.
Waterlogged areas	The flood mitigation component of the project will mitigate water logging and improve conditions in affected farm land and habitations.
Geology and Soils	There will be no impacts to geology and soils, all work will take place within the existing canal and its embankment. However, desilted material shall be disposed in scientific manner to minimize any kind of impact on environment and health. Quality of desilted material shall be tested before developing disposal plan and disposal plan shall be in accordance with chemical specification of desilted material.
Vegetation	Trees, large shrubs, etc., in the canal RoW will be cleared. Therefore there is a loss in vegetation cover. Aquatic weeds will be cleared from the canals and have to be suitably disposed.
Fisheries	There will be impacts due to construction activity leading to deterioration in water quality impacting fish populations. Also, closure of canals during the civil works will affect water flows and impact downstream fisheries. Fish breeding during monsoon may be affected due to construction related activities.
	Promotion of cage based fishery may lead to water pollution due to overstocking and overfeeding. Cultivation of exotic species may impact native populations.
Wildlife Resources	The canal will remain an open water conveyance; there will be no impact to wildlife. No wild life habitation is there where the existing canal system operates.
Threatened, Endangered and Sensitive Species	No species of conservation importance or critical habitats have been identified in the project area. There would be no impact to such species.
Health and Public Safety	No severe health issues are expected due to construction or implementation of proposed activities at this stage. However, health and public safety measures are required during construction phase of the project. Agricultural activity will be increased due to rehabilitation of irrigation network and promotion of crop diversification, which in turn may lead to increase in using synthetic fertilizer/ pesticide. Improper selection and handling of these agro-chemicals could impact on soil, water and health.
Air Quality	Air quality impacts include generation of dust, gaseous emissions as well as noise during construction activity.
Access and Transportation	Transportation to the project location would take place on specified roadways (state, national and/or municipal / rural / GP). No new roadways will be constructed under the project. The proposed project will not impact access and transportation for a longer duration. Temporary disruptions are likely during construction.
Socio-economic	The project will benefit the community in general and farmers and fishers in particular. More area will have surface irrigation facility hence dependency on ground water will reduce. There will be improvement in crop production and income of the farmers. However, inclusion and equity issues may remain a concern in benefit accessing in certain activities like agriculture, accessing canal irrigation, etc.

4.2 Categorization of project activities

The project activities have been classified under three categories based on the type and extent of potential environmental and social impacts.

Category 1: Project activities that are likely to have major environmental impacts will go through Environmental Impact Assessment (EIA). The EIA will identify the impacts and mitigation measures, based on which, an activity specific Environmental Management Plan (EMP) will be prepared. The EMP will list the impacts, mitigation measures, responsible parties, timeframe for implementation, monitoring systems, and budget. The EMP will be incorporated into the bid documents and the contractor is bound to implement it.

Category 2: Project activities that are likely to have moderate environmental impacts will not go through EIA. A Rapid Environmental Checklist will be used to determine possible impacts. Based on the generic EMP provided in this ESMF (see bullet point 6.5.4 under section 6), an activity specific EMP will be prepared that will list the impacts, mitigation measures, responsible parties, timeframe for implementation, monitoring systems, and budget. The EMP will be incorporated into the bid documents and the contractor is bound to implement it.

Category 3: Project activities that are likely to have negligible or no environmental impacts will not go through EIA. EMP will not be required.

Table 61: Sub-component/ activity wise project categorization based on potential environmental and social impacts

Sl. No.	Component	Sub-component/ Investment activity	Category (1- High)	Category (2- Medium)	Category (3 – Low)
A	**Irrigation modernization**	I. Restoration of carrying capacity of Main & Branch Canals (Earth Work for Re-sectioning Channel Section) throughout the area		✓	
		II. Slope stabilization of critically affected reaches by PCC Block lining		✓	
		III. Rehabilitation and upgradation of canal regulating structures wherever required		✓	
		IV. Construction of gates/shutters at uncontrolled existing outlets		✓	
		V. Providing controlled structures (Duckbill weir) at tail end of canals and other locations of Level 4 canals.		✓	
		VI. Construction of rubber dams at identified location across rivers/channels		✓	
		VII. Construction of water retaining structure over small rivers and drainage channels to create storage for use in Rabi crops		✓	
		VIII. Adoption of Pressurized Irrigation system		✓	
		IX. Augmenting induced recharge of ground water		✓	
B	**Irrigation Management**	I. Automated gate operation with centralized control only in the main canal and offtake head regulators of branch canals			✓
		II. Development of framework of MIS system for monitoring and also development of mobile based apps			✓
		III. Capacity strengthening of IWD, operators, farmers & other Convergent Departments			✓
C	**Flood Management**	I. Desiltation of Mundeswari river for a length of 20 km from Beguahana to further down stream	✓		
		II. De siltation (Re-sectioning) of other smaller rivers and drainage channels	✓		

Sl. No.	Component	Sub-component/ Investment activity	Category (1- High)	Category (2- Medium)	Category (3 – Low)
		III. Armoring of Damodar Right Dwarf embankment to act as Broad Crested Weir to allow controlled spilling of flood water		✓	
		IV. Improving Damodar Protected Left Embankment by providing adequate free board to withstand flood through construction of flood walls at identified locations		✓	
		V. Improving Upper Rampur & Hurhura Channels by providing adequate freeboard through provision of flood wall on Left Embankments		✓	
		VI. Raising & Strengthening of countryside existing earthen embankments to its design section of Damodar Left, Hurhura Left & Lower Rampur left embankments		✓	
		VII. Protection / River training works on river Damodar / Mundeswari, Hurhura Khal, Upper Rampur and Lower Rampur Khals		✓	
		VIII. Remodeling& Reconstruction of sluices at the outfalls of drainage channels		✓	
D	**Crop diversification**	**I. Demonstration for diversification and support in Horticulture, providing infrastructure of cultivation and construction of low cost storage structure - Department of Food Processing Industries and Horticulture**			
		Promosion on Cultivation of Hybrid Vegetable		✓	
		Infrastructure development for promosion of Vermi compost, protected cultivation and post harvest infrastructure			✓
		Capacity strengthening of DPIUs and training of farmers and DPIUs officials			✓
		II. Agriculture Marketing Dept.			
		Organization Building (Promotion of small sized FPO) and convert them into farmer producer company (FPC) - 44 nos.			✓
		Construction of aggregation centre/ pack house (1/ FPC)		✓	
		Providing equity grant and other financial support to the FPC			✓
		Transport subsidy for procurement of motorized van (transportation support) to each FPC		✓	
		Training to the FPCs and departmental staff			✓
		III. Support for farm mechanisation, diversified cropping demonstration, to promote less water consuming and diversified cropping -Agriculture Dept.			
		Formation of Custom Hiring Centre (CHC) to facilitate farmers in hiring of farm machineries (Zero Tillage) at subsidised rate			✓
		Crop demonstration on Cropping System, Diversification, SARP, SRI, Zero Tillage and Direct Seeding of Rice (Subsidy on Seeds, Pesticides, Fertilizer etc. to promote adoption of new farming practice)			✓
		Capacity Building of farmers on Micro Irrigation, Water management, Farm Mechanisation and Packaging			✓
		Training and exposure visit of farmers and departmental staff			✓
		IV. Promotion of cage based pisciculture along with one time sustainance support- Fisheries Department			
		Promotion of cage culture (prividing cages with appurtenants) in the main and branch canal and one time sustainance support (providing fish seed, fish feed, prophylectics, labour) to FPG/ SHG		✓	
		Capacity strengthening and training of departmental staff			✓
		Training and exposure visit of SHG members, facilitators			✓

4.3 Procedure for screening of project activities

The project will use a structured approach to environmental and social management following the hierarchy of avoidance, minimization, compensation/mitigation for negative impacts and enhancement of positive impacts where practically feasible and advantageous.

The overall step-by step process begining with the screening stage is depicted in a flow chart (see Figure 16). The screening stage is elaborated in this section. The remaining stages are described in chapter 6.

4.3.1 Overview of the Process – From Screening to E&S Management Plans

For project activities in Categories 1 and 2 (listed in Table 67 belo), a screening process is undertaken in order to identify the need and scope for further social and environmental assessments.

The screening checklist will help identify any likelihood of substantial social and environmental impacts of the activities arising due to the nature, scale and location of the activities. Such activities require detailed assessment through an EIA and identification of appropriate mitigation measures spelt out in an ESMP (described in detail in chapter 6). The screening checklist will also help identify activities having limited or insignificant environmental and social consequences for which further assessment could be limited in scope or may not be required.

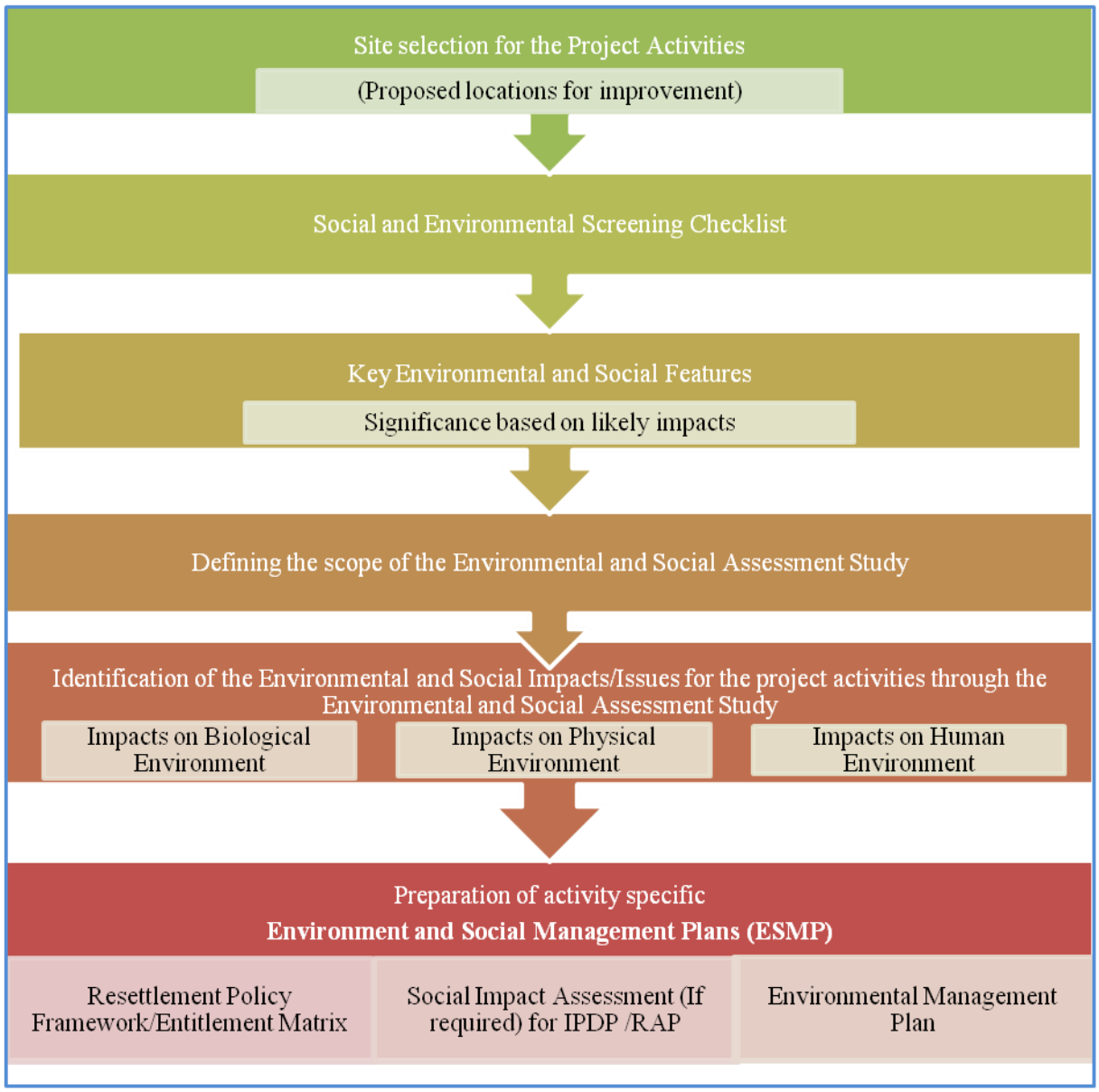

Figure 13: ESMF Process

4.3.2. Details of the Screening Process

This step will involve review of the available environmental and social information about the project activities and their location. It would help identify issues to be verified during reconnaissance site visits and also provide preliminary information regarding the nature, extent, and timing of environmental and social issues that would need to be handled during the subsequent stages. It will also help identify opportunities for avoidance and/or minimization early in the project cycle so that the design process can be informed appropriately. The steps to be followed include the following:

I. Confirm the presence of environmentally and socially sensitive areas from secondary sources or preliminary site observations.
II. Verify the extent of applicability of GoI, state and World Bank policies in project activities.
III. Identify potential negative and positive impacts; provide clarity on which issues need to be investigated more comprehensively during preparation of Environmental & Social Impact Assessment that will be done during the design stage.

This should help with sequencing of project locations and factoring in timelines like those associated with regulatory clearance processes into project implementation.

The process of preparing the environmental and social screening checklist and scoping will typically cover:

i. Describing the need for the project activity, i.e. the issues or problems to be addressed.
ii. Describing the proposed options.
iii. Identifying the potential environmental and social impacts of the options.
iv. Undertaking a preliminary evaluation of the potential environmental and social impacts of the options.
v. Consulting local officials on the options, and the potential impacts.
vi. Describing the preliminary consultation with relevant agencies and local community. The focus of these consultations would be informing the local community, reviewing the likely issues and problems.
vii. Selecting a preferred option or short list of options. The appraisal of the available DPR / Feasibility study reports should be included from an environmental and social perspective.
viii. Identifying the planning approvals which are likely to be required from MoEFCC, SPCB and other regulatory agencies.
ix. Determining the type and scope of EIA study. Terms of Reference (ToR) for an Environmental and Social Assessment Study of the preferred option or the short list of options.

While more extensive data is likely to be required for ESIA, some data on baseline conditions will generally be required for screening to compare the environmental and social impacts of project options and to assess the extent of any environmental and social impacts.

The robustness of screening will often be dependent on the quality of data on baseline conditions and the assessment of induced environmental and social impacts. The assessment of baseline conditions should consider the followings:

i. Past trends in environmental and social quality
ii. Community preferences and competing demands for resources
iii. Other current or proposed development programs in the project area.

Maps will be required to indicate the spatial relationship between the sources and recipients of the environmental and social impacts. Google Earth and other open source satellite imagery data can also be very useful in indicating changes in land use and other environmental features.

The following checklist will help identify the components that need to be investigated during the screening process.

Table 62: E&S Screening Checklist

S. No.	Environmental & Social Features	Status / Availability within 3 km radius from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High, Medium, Low)	Likelihood of Impact (Likely, Unlikely)	Description of Impact
Physical Environment						
	Natural Drain					
	Standing water bodies (ponds, lakes, etc.)					
	Flowing water bodies (rivers, rivulets, streams, canals, etc.)					
	Ground water sources (open wells, bore wells, etc.)					
	Meandering River					
	Erosion prone stretches					

S. No.	Environmental & Social Features	Status / Availability within 3 km radius from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High, Medium, Low)	Likelihood of Impact (Likely, Unlikely)	Description of Impact
	Areas with high slope (higher than 15 percent)					
	Landforms (hills, valleys)					
	Coal Mine					
Biological Environment						
	National Park / Wildlife Sanctuary					
	Reserved Forests					
	Community Forest					
	Large Trees / Woodland					
	Sacred Groves					
	Presence of endangered species / habitat areas					
	Migratory routes					
	Ecologically sensitive areas					
Human Environment						
	Settlements/Habitations					
	Sensitive Receptors (schools, hospitals, etc.)					
	Drinking water sources					
	Underground utility lines like electricity lines, pipelines for gas, etc					
	Physical cultural resources – Protected monuments, historical sites, etc.					
	Physical cultural resources – Religious structures, other sites significant to community					
	Agricultural land					
	Defence Installations / Airports					
	National highway					
	State highway					
	Heavy polluting Industry					
	Water or Waste water Treatment Plant					
Social Safeguard Issues						
	Any loss / reduction of access to traditional dependent communities (to areas where they earn for their primary or substantial livelihood).					
	Adverse impacts to women, gender issues including economic and safety concerns					
	Presence of Indigenous / vulnerable communities					
	Land acquisition of private land leading to loss of shelter and livelihood					
	Involuntary land taking resulting in loss of income; livelihood; sources of livelihood; loss of access to common property resources and / or private residential and/or					

S. No.	Environmental & Social Features	Status / Availability within 3 km radius from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High, Medium, Low)	Likelihood of Impact (Likely, Unlikely)	Description of Impact
	property resources.					
	Possible conflicts with and/or disruption to local community					
	Significant issues raised by the stakeholders during consultation					

The results of the above checklist will help identify the scope of the ESA study and timeframe required for obtaining the regulatory clearances (if any). The environmental and social safeguard screening shall occur during the project preparation stage as a soon as the fairly accurateintervention location is known for the project activities. The formulation of the project specific ToR shall be done based on the screening outputs highlighting environmental and social components that require detailed assessment during the ESA stage. A generic ToR for ESA study is attached in Annexure-I.

EIAs may take the form of Comprehensive EIAs or Rapid EIAs depending on whether the environmental and social impacts can be readily mitigated. Comprehensive EIAs generally need to rely on data collected over a 12-month period whereas Rapid EIAs can rely on data collected in one season (other than the monsoon season) to facilitate a speedier assessment process.

Rapid EIAs are generally acceptable if the analysis of environmental and social impacts is sufficient for the purposes of selecting a preferred project option and determining appropriate measures for mitigating environmental and social impacts. The outcome of a Rapid EIA process will sometimes determine if a Comprehensive EIA is required and, if this is likely, then it will often be more efficient to prepare a Comprehensive EIA from the outset.

Having identified the probable adverse impacts, the next step shall involve quantification of the impacts and developing action plans to mitigate such adverse impacts.

Chapter 5: Analysis of Alternative

In order to assess alternatives scenarios and to identify the preferred alternative, an analysis of the proposed project activities was carried out with regard to their environmental and social implications. The analysis was carried out for two scenarios, namely, "no-project" scenario, and "with-project" scenario. The findings of the analysis are given in the following sections / sub-sections.

5.1 Analysis of Alternatives

On alternatives to the proposed project and its activities, the assessment procedure stipulates that environmental and social investigations need to identify main project alternatives during the course of implementation. It is required that available alternatives for accomplishing the same objectives are to be considered at the DV command area, irrigation structures / systems, flood control mechanism, etc. while implementing different activities. In principle, these should include an analysis of the technology, location, timing, input and design alternatives as well as the "not to do" option. Different irrigation and agricultural technologies which the project is expected to promote will be more localized, based on its suitability to the agro-climatic condition, soil characteristics, water availability, condition of irrigation structures, flooding intensity and damage etc. Same technology and measures may not be applicable across all the project locations as they will vary significantly depending upon the local characteristics. For example, measures to be taken in critical / semi-critical ground water area may not be the same as measure inareas that are in the safe ground water zone. Similarly, technological options for the restoration / improvement of irrigation structures and its modernization may not be same across all the project locations. So, alternatives will be more activity driven and location specific which will be assessed before implementation and after careful selection of alternatives.

In view of the above requirement, it should be noted that during subsequent stages of environmental assessment by activity categories and implementation planning, particularly the activity scoping exercise and later during detailed environmental and social impact assessment of the particular activity, the investigation on site location alternatives is to be undertaken. However, some alternatives will emerge through feasibility assessment which is now being carried out by the executing department.

5.2 Analysis of 'No Project' Scenario

In case, the project WBMIFMP is not taken-up, the situation with regard to irrigation systems, water availability at the tail end, loss of water, flooding situation etc. may not change positively in the desired direction in the coming years. The current "as-is" situation may prevail and irrigation coverage and loss of properties due to flood may continue the way it has been for years. A minimal change in positive direction is expected to happen in due course as a part of investment that are to be made in a routine Government budget. However, the urgent requirement for improvement of the situation for long-term benefit to the local community will remain unaddressed. At this juncture, it is important to promote measures in irrigation, agriculture and flood control mechanisms so that long-lasting results can boost the local socio-economic condition of the people without hampering the social and natural capital base. With project and without project scenario is presented in the Table 64.

Table 63: Analysis of "No Project" and "With Project" Scenario

Sl. No.	"No Project" Scenario	"With Project" Scenario
1	Existing irrigation structures and systems which are in dilapidated condition may continue to adversely impact upon irrigation coverage.	Improvement in irrigation coverage through renovation / restoration of existing irrigation structures and service channels
2	The environmental and social concerns arising due to regular flooding, inefficient use of water, loss of water due to seepage, less coverage of land at the tail end of the command area will continue for a longer period.	Reduced occurrence of flood and related damage due to flood protection measures like desiltation, flood protection embankments, strengthening existing embankments, etc.
3	Ground water exploitation may further increase in the absence of surface water for irrigation during Rabi and Boro resulting with increased area under critical or semi-critical zone.	Reduction in ground water exploitation due to increased availability of surface water for irrigation in Rabi and Boro seasons.
4	Current agricultural production status may continue further with lower production at the tail end of the existing irrigation command.	Increased water availability at the tail end will help to put more area under crops and hence increment in production of different crops.
5	Water use efficiency and water productivity status, specifically in Rabi and summer (Boro) may not change significantly.	Water regulatory structures and canal automation will help to improve water efficiency and minimise loss of water.
6	Community ownership of irrigation structure / system, its maintenance and participatory irrigation management and participatory ground water management (PGM) may not emerge in the coming years.	Water user associations will be formed in the canal command areas for management and O&M of the irrigation structures. PGM groups will be further helpful to reduce ground water exploitation, its recharge and management.
7	Possibility of irrigation automation and improvement of water use efficiency may not take place in coming days.	Automation of irrigation structures will maintain water flow as per the requirement minimising losses. It will also be helpful to monitor release / supply of water to the fields.
8	Current nutrient and pest management practices may continue with low awareness and management capacity.	Awareness, INM and IPM will boost the understanding of the farmers and greater adoption of environment friendly practices. It will also reduce the cost of production of different crops.

Overall, the impact of "no project" is considered to be significant in hampering development in terms of local and regional irrigation status and agriculture in general. If it were decided that the project is not taken up, then the situation may further deteriorate in the coming years where flood and lack of water availability for irrigation may pose further challenges. The dilapidated irrigation structures, silted canal systems, flood proneness of the rives will further have adverse impact on social and environment front. The problems arising due to climate variability may get intensified further in irrigation and agriculture sector and may induce movement of farmers from agriculture to other sectors which is persistent at present. Poor water availability and its management may reduce area under different crops and hence returns from farm field will be affected drastically.Based on the analysis, "with-project" scenario is suggested as the preferred alternative

Table 64: Activity wise scenario mapping at no project and with project situation

Sl. No.	Component	Sub-component/ Investment activity	No Project Scenario	With Project Scenario
A	**Irrigation modernization**	Restoration of carrying capacity of Main & Branch Canals (Earth Work for Resectioning Channel Section) throughout the area	Decreased carrying capacity Frequent occurrence of embankment breaching and flood	Increased water bearing capacity Increased irrigation potential Help in ground water recharge Availability of irrigation water during Rabi &Boro season
		Slope stabilization of critically affected reaches by PCC Block lining	Soil erosion Embankment breaching	Protection from embankment breaching Restriction of soil erosion

Sl. No.	Component	Sub-component/ Investment activity	No Project Scenario	With Project Scenario
		Rehabilitation and upgradation of canal regulating structures wherever required	Irrigation water loss	Increase irrigation efficiency Better management of irrigation supply system
		Construction of gates/shutters at uncontrolled existing outlets	Defunct sluice gates Un-controlled movement of water towards lower reaches of canal	Better control of available canal water Ease in managing and distribution of available irrigation water
		Providing controlled structures (Duckbill weir) at tail end of canals and other locations of Level 4 canals.	Non-reaching of irrigation water to tail end farmers	Equal distribution of water among all users
		Construction of rubber dams at identified location across rivers/channels	Construction of Boro Bandh for irrigation purpose; alleviate flood damage during flood	Water availability during lean period; help in recharging ground water.
		Construction of water retaining structure over small rivers and drainage channels to create storage for use in Rabi crops	Construction of Boro Bandh	Water availability during lean period; help in recharging ground water.
		Adoption of Pressurized Irrigation system	Non-presence within project area Flood based irrigation practice require much more water than requirement	Water conservation Optimum utilization of water Increase in Boro and Rabi area coverage Cultivation of high value horticulture product
		Augmenting induced recharge of ground water	Fall in ground water table causes irrigation pump failure; Increase in water stress blocks Depletion of ground water table Run-off loss	Development of GW table specially at semi-critical blocks Increased availability of ground water for irrigation purpose
B	**Irrigation Management**	Automated gate operation with centralized control only in the main canal and offtake head regulators of branch canals	Dependency on man force High operating expenditure No prior knowledge on water availability and distribution system. Prior planning was not possible Wastage due to human errors and inefficiencies	Centralized Dissemination of information on water scheduling Real time analysis of water availability and distribution system Prior planning
		Development of framework of MIS system for monitoring and also development of mobile based apps	Minimum or no record on water distribution	Information available to help in planning water distribution, planning, comparison, assessment
		Capacity strengthening of IWD, operators, farmers & other Convergent Departments	Handling with Limited capacity in unorganised way	Better management

Sl. No.	Component	Sub-component/ Investment activity	No Project Scenario	With Project Scenario
C	**Flood Management**	Desiltation of Mundeswari river for a length of 20 km from Beguahana to further down stream	Decrease in carrying capacity Frequent occurrence of embankment breaching and flood	Increased irrigation potential Less occurrence of flood Help in ground water recharge Availability of irrigation water during Rabi &Boro season
		De-siltation (Re-sectioning) of other smaller rivers and drainage channels	Decrease in carrying capacity Frequent occurrence of embankment breaching and flood	Increased irrigation potential Less occurrence of flood Help in ground water recharge Availability of irrigation water during Rabi &Boro season
		Armoring of Damodar Right Dwarf embankment to act as Broad Crested Weir to allow controlled spilling of flood water	Soil erosion Embankment breaching	Protection from embankment breaching Restriction of soil erosion
		Improving Damodar Protected Left Embankment by providing adequate free board to withstand flood through construction of flood walls at identified locations	Embankment breaching	Minimizing chances of embankment breaching; Less probability of flood occurrence and inundation; Restriction of soil erosion
		Improving Upper Rampur & Hurhura Channels by providing adequate freeboard through provision of flood wall on Left Embankments	Embankment breaching	Minimizing chances of embankment breaching; Less probability of flood occurrence and inundation; Restriction of soil erosion
		Raising & Strengthening of countryside existing earthen embankments to design section - Damodar Left, Hurhura Left & Lower Rampur left embankments	Embankment breaching Soil erosion	Minimizing chances of embankment breaching; Less probability of flood occurrence and inundation; Restriction of soil erosion
		Protection / River training works on river Damodar / Mundeswari, Hurhura Khal, Upper Rampur and Lower Rampur Khals	Erosion of embankment Seepage loss of canal water	Protect embankment Help in recharging ground water
		Remodeling & Reconstruction of sluices at the outfalls of drainage channels	Defunct sluice gates Un-controlled movement of water towards lower reaches of canal	Better control of available canal water Ease in managing and distribution of available irrigation water
D	**Crop diversification**	**I. Demonstration for diversification and support in Horticulture, providing infrastructure of cultivation and construction of low cost storage structure - Department of Food Processing Industries and Horticulture**		
		Promotion on Cultivation of Hybrid Vegetable	Cultivation of traditional variant of crop Less productivity High water requirement	Less water requirement Sustainable water use Increased productivity hence HH income
		Infrastructure development for promotion of Vermin compost, protected cultivation and post-harvest infrastructure	Use of synthetic fertilizer	Promotion and use of organic fertilizer
		Capacity strengthening of DPIUs and training of farmers and DPIUs officials	Low capacity	Improved efficiency

Sl. No.	Component	Sub-component/ Investment activity	No Project Scenario	With Project Scenario
		II. Agriculture Marketing Dept.		
		Organization Building (Promotion of small sized FPO) and convert them into farmer producer company (FPC) - 44 nos.	Low capacity	Improved efficiency Development of agriculture value chain Better management of agri product
		Construction of aggregation centre/ pack house (1/ FPC)	Non-availability of store house; increased carrying cost for storing at cold storage	Availability of local store house
		Providing equity grant and other financial support to the FPC	Less agri-business activity	Motivating farmers; increase in agri value chain and infrastructure
		Transport subsidy for procurement of motorized van (transportation support) to each FPC	High cost of transportation	Motivating farmers; increase in agri value chain and infrastructure; access to markets
		Training to the FPCs and departmental staff	Low capacity	Improved efficiency
		III. Support for farm mechanization, diversified cropping demonstration, to promote less water consuming and diversified cropping -Agriculture Dept.		
		Formation of Custom Hiring Centre (CHC) to facilitate farmers in hiring of farm machineries (Zero Tillage) at subsidized rate	Low capacity	Improved efficiency Development of agriculture value chain Better management of agri product
		Crop demonstration on Cropping System, Diversification, SARP, SRI, Zero Tillage and Direct Seeding of Rice (Subsidy on Seeds, Pesticides, Fertilizer etc. to promote adoption of new farming practice)	Low capacity	Improved capacity and awareness
		Capacity Building of farmers on Micro Irrigation, Water management, Farm Mechanization and Packaging	In-appropriate distribution of water Conflicts among farmers Loss of water	Scheduling water distribution calendar Optimal use of water Conjunctive use of surface and ground water
		Training and exposure visit of farmers and departmental staff	Low capacity	Improved efficiency
		IV. Promotion of cage based pisciculture along with one time sustenance support- Fisheries Department		
		Promotion of cage culture (providing cages with appurtenant) in the main and branch canal and one time sustenance support (providing fish seed, fish feed, prophylactics, labour) to FPG/ SHG	Restricted pisciculture only at ponds	Creating options for fisher community; promoting fish cultivation hence increase production and productivity
		Capacity strengthening and training of departmental staff	Low capacity	Improved efficiency
		Training and exposure visit of SHG members, facilitators	Low capacity	Improved efficiency

Chapter 6: Environmental and Social Management Framework

The Environmental and Social Management Framework (ESMF) is an instrument to identify and address the potential environmental and social impacts of the project right from the planning stage to its implementation and post-implementation operations. The objective of developing ESMF is to ensure that environmental and social concerns are adequately and appropriately addressed by the project and it is mainstreamed with project planning, implementation and post-implementation stages. Keeping this in view, the present ESMF has been developed for use by the Irrigation and Water Ways Department of Government of West Bengal during rehabilitation and restoration of canal systems and flood management activities with the assistance from the World Bank.

The ESMF would be used by the project authorities for incorporation of environmental and social safeguards in the planning, execution and operation stages of each project activity. Project activities where there may be major environmental or social concerns, will require the preparation of a site-specific Environmental Management Plan (EMP). The ESMF will help in early identification of those activities and sites where major issues can be expected. Based on this, additional efforts should be made to ensure that the environmental and social concerns are appropriately addressed. The ESMF has been prepared based on the preliminary field visits to sample locations, physical observations and consultation with different stakeholders. Preparation of the site-specific EMPs will require further focused field study. Project activities that have no major environmental or social concerns do not require site specific EMPs.

The successful Bidder shall be required to submit an Environmental, Social, Health and Safety (ESHS) Performance Security. Within twenty-one (21) days of the receipt of the Letter of Acceptance from the *Employer*, the successful Bidder shall furnish the Performance Security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security in accordance with the General Conditions of Contract, subject to relevant clauses of ITB, using for that purpose the Performance Security and ESHS Performance Security Forms included in Contract Forms. The performance security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security of a Joint Venture shall be in the name of the Joint Venture specifying the names of all members. Environmental, Social, Safety and Health (ESHS) Performance Security amount is 2% percent of Contract Amount in form of unconditional Bank Guarantee from scheduled or Nationalized Banks in India.

6.1 Objective and Elements

The ESMF is a broad management framework to address social and environmental issues that are expected to arise during planning / design, implementation and post-implementation of the project. It will be used to identify the need for environmental and social assessment for various sub-components or activities of the project.

The ESMF comprises of the following elements:

Screening

- Procedures for screening of project activities (presented in chapter 4).

Environmental Management

- Guidance on avoidance and mitigation of environmental impacts (presented in this chapter 6) (including non-permissible activities, generic mitigation measures, construction related mitigation measures, sample activity-specific ESMPs for project activities, construction work camp management, contractors responsibilities).

- Strategy and Plan for promotion of Integrated Pest and Nutrient Management (presented in chapters 8).

Social Management

- Resettlement Policy Framework (presented in chapter 7).
- Gender equity and social inclusion (presented in chapter 10).
- Tribal people planning framework (presented in chapter 11).
- Consultation framework (Chapter 13)

Systems relevant to both Environmental and Social Management

- Monitoring and Evaluation framework (presented in chapter 12).
- Consultation, information disclosure and grievance redress (presented in chapter 13).
- Institutional arrangements for implementation (presented in chapter 14).
- Budget for ESMF implementation (presented in chapter 15).

6.2 Application of ESMF

The ESMF may be used for different activities of the project at the planning, implementation and post implementation phases to identify the environmental and social concerns, and adoption of applicable strategy to mitigate potential adverse impacts, if any. There could be location / site specific cases where the proposed activity / activities may have substantial environmental and / or social impacts. In such a case, full environmental and social assessment may be required. In rare cases, development of a resettlement action plan may also be called for, including relocation of cultural / common properties of the affected population. Similarly, tribal development plan may have to be prepared if a substantial section of the affected population is tribal.

The Table 66 gives details of the application of the ESMF to the different project stages – planning, implementation and post-implementation. It lists the key ESMF activities and outputs in each stage, the timeframe for implementation, and the responsibilities of implementation. The Figure 16 on ESMF Process presented in Chapter 4 is also a useful reference to understand the ESMF process and its application.

The Table 67 gives details of the various project activities and their requirement for EIA and EMP. This Table summarizes the output of the preliminary screening and categorization detailed in Chapter 6.

Table 65: Application of ESMF in Different Project Stages

Key ESMF Activities	Key Formats/Documents to be Used	Expected Output	Timeframe for ESMF activities	Responsibility
Planning Stage				
Identification of project activities; Referring to the 'List of Non-Permissible Activities' Referring to the 'Categorization of Project Activities'	'List of Non-Permissible Activities' (refer to list in section 6.3.1). 'Categorization of Project Activities' (refer to list in section 4.2).	Confirmation that the activity is not on the list of non-permissible activities. Preliminary identification of activities as belonging to Categories 1, 2 or 3.	Prior to administrative approval	SPMU (Through ESIA Consultant)
E&S Screening of activities using the 'Environment and Social Screening Checklist'	'Environment and Social Screening Checklist' (refer to checklist in section 4.3).	Identification adverse environmental and social impacts; Confirmation of categorization of activities as belonging to category 1 or 2 or 3 (based on the use of the 'Environment and Social Screening Checklist'); Identification of the need for further environmental and social assessments;	Do	Do

Key ESMF Activities	Key Formats/Documents to be Used	Expected Output	Timeframe for ESMF activities	Responsibility
		Determining the scope for further environmental and social assessments. Documentation of the above in the 'Environmental Screening Report'. Providing information to all key stakeholders on the contents of the 'Environmental Screening Report'.		
Undertake activity specific EIA for Category 1 activity (refer to indicative Terms of Reference for EIA given in Annex-I); Or, Undertake rapid assessment using the Rapid Environmental Checklist for Category 2 activity (refer to format for Rapid Environmental Checklist given in Annex -II).	'Sample TOR for conducting EIA' given in Annexure -I and Rapid Impact assessment checklist given in Annexure - II	Baseline environmental condition; Details of potential environmental and social impacts; Documentation of the above in the EIA report for Category 1 activities; Or, Documentation of the above in the Rapid Environmental Checklist for Category 2 activities.	Do	Do
Identification of mitigation measures for the adverse impacts caused by each activity, including identification of entities responsible for execution of mitigation measures, timeframe as well as budget for implementation (refer to the sample activity-specific ESMPs provided in table 70, 71, 72 for guidance).	Generic ESMP for all Construction Works (refer to table 70).; ESMP for Irrigation modernization (refer to Table 71); ESMP for Flood Management (refer to Table 72); ESMP for Crop diversification and Intensification (refer to Table 73)	Formulation of activity specific Environment and Social Management Plan; Documenting the above as a 'Environment and Social Management Plan'.	Do	Do
Implementation Stage				
Procurement and award of contracts	Generic ESMP for all Construction Works (refer to table 70).; ESMP for Irrigation modernization (refer to Table 71); ESMP for Flood Management (refer to Table 72); ESMP for Crop diversification and Intensification (refer to Table 73)	Integration of 'Environment and Social Management Plan' into the bid documents.	After administrative approval and prior to tender floating	DPMU
Implementation of the mitigation measures as specified in the 'Environment and Social Management Plan'	Generic ESMP for all Construction Works (refer to table 70).; ESMP for Irrigation modernization (refer to Table 71); ESMP for Flood Management (refer to Table 72);	Implementation of 'Environment and Social Management Plan'.	During Implementation	Implementing Contractor

Key ESMF Activities	Key Formats/Documents to be Used	Expected Output	Timeframe for ESMF activities	Responsibility
	ESMP for Crop diversification and Intensification (refer to Table 73)			
Monitoring of social and environmental parameters as specified in the 'Environment and Social Monitoring Plan'	Format for Environmental Monitoring Report given in Annexure –V Monitoring of environmental parameters given in section – 11.2	Monitoring reports with compilation of data on social and environmental parameters.	During Implementation (as per the frequency indicated in the 'Environment and Social Monitoring Plan')	Implementing Contractor
Monitoring of implementation of 'Environment and Social Management Plan'.	Format for Environmental Monitoring Report given in Annexure –III Monitoring of environmental parameters given in section -11.2	Monitoring reports with compilation of progress, issues and action plan on social and environmental management. Smooth implementation of mitigation measures as per ESMF due to timely identification and rectification of any issues.	During Implementation (as per the frequency indicated in the chapter 11)	Environmental and Social cum gender specialist at DPMU as well as SPMU
Post-Implementation Stage				
Audit of compliance with ESMF by third party monitor	Format for Environmental Audit Report (refer to Annex - IV)	Environmental Audit Report	At mid-term of the project, and, at end-term of the project	Third Party M&E Agency and SPMU

Table 66: Project component wise EIA/ EMP requirement and responsibility

Sl. No.	Component	Sub-component/ Investment activity	Category (1/2/3)	EIA Needed (If needed, to be undertaken by SPMU through the ESIA Consultant)	EMP Required (If required, to be undertaken by SPMU through the ESIA Consultant)
A	Irrigation modernization	Restoration of carrying capacity of Main & Branch Canals (Earth Work for Re sectioning Channel Section) throughout the area	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Slope stabilization of critically affected reaches by PCC Block lining	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Rehabilitation and upgradation of canal regulating structures wherever required	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Construction of gates/shutters at uncontrolled existing outlets	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Providing controlled structures (Duckbill weir) at tail end of canals and other locations of Level 4 canals.	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Construction of rubber dams at identified location across rivers/channels	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Construction of water retaining structure over small rivers and drainage channels to create storage for use in Rabi crops	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)

Sl. No.	Component	Sub-component/ Investment activity	Category (1/2/3)	EIA Needed (If needed, to be undertaken by SPMU through the ESIA Consultant)	EMP Required (If required, to be undertaken by SPMU through the ESIA Consultant)
		Adoption of Pressurized Irrigation system	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Augmenting induced recharge of ground water	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
B	**Irrigation Management**	Automated gate operation with centralized control only in the main canal and offtake head regulators of branch canals	3	No	No
		Development of framework of MIS system for monitoring and also development of mobile based apps	3	No	No
		Capacity strengthening of IWD, operators, farmers & other Convergent Departments	3	No	No
C	**Flood Management**	Desiltation of Mundeswari river for a length of 20 km from Beguahana to further down stream	1	Yes	Yes. Activity specific
		De siltation (Re-sectioning) of other smaller rivers and drainage channels	1	Yes	Yes. Activity specific
		Armoring of Damodar Right Dwarf embankment to act as Broad Crested Weir to allow controlled spilling of flood water	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Improving Damodar Protected Left Embankment by providing adequate free board to withstand flood through construction of flood walls at identified locations	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Improving Upper Rampur & Hurhura Channels by providing adequate freeboard through provision of flood wall on Left Embankments	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Raising & Strengthening of countryside existing earthen embankments to its design section of Damodar Left, Hurhura Left & Lower Rampur left embankments	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Protection / River training works on river Damodar / Mundeswari, Hurhura Khal, Upper Rampur and Lower Rampur Khals	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Remodeling& Reconstruction of sluices at the outfalls of drainage channels	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
D	**Crop diversification**	***I. Demonstration for diversification and support in Horticulture, providing infrastructure of cultivation and construction of low cost storage structure - Department of Food Processing Industries and Horticulture***			
		Promotion on Cultivation of Hybrid Vegetable	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Infrastructure development for promotion of Vermin compost, protected cultivation and post-harvest infrastructure	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Capacity strengthening of DPIUs and training of farmers and DPIUs officials	3	No	No
		II. Agriculture Marketing Dept.			
		Organization Building (Promotion of small sized FPO) and convert them into farmer producer company (FPC) - 44 nos.	3	No	No

Sl. No.	Component	Sub-component/ Investment activity	Category (1/2/3)	EIA Needed (If needed, to be undertaken by SPMU through the ESIA Consultant)	EMP Required (If required, to be undertaken by SPMU through the ESIA Consultant)
		Construction of aggregation centre/ pack house (1/ FPC)	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Providing equity grant and other financial support to the FPC	3	No	No
		Transport subsidy for procurement of motorized van (transportation support) to each FPC	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Training to the FPCs and departmental staff	3	No	No
		III. Support for farm mechanization, diversified cropping demonstration, to promote less water consuming and diversified cropping -Agriculture Dept.			
		Formation of Custom Hiring Centre (CHC) to facilitate farmers in hiring of farm machineries (Zero Tillage) at subsidized rate	3	No	No
		Crop demonstration on Cropping System, Diversification, SARP, SRI, Zero Tillage and Direct Seeding of Rice (Subsidy on Seeds, Pesticides, Fertilizer etc. to promote adoption of new farming practice)	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Capacity Building of farmers on Micro Irrigation, Water management, Farm Mechanization and Packaging	3	No	No
		Training and exposure visit of farmers and departmental staff	3	No	No
		IV. Promotion of cage based pisciculture along with one time sustenance support- Fisheries Department			
		Promotion of cage culture (providing cages with appurtenant) in the main and branch canal and one time sustenance support (providing fish seed, fish feed, prophylactics, labour) to FPG/ SHG	2	No. Rapid Environmental Checklist	Yes (Activity specific - Based on ESMF)
		Capacity strengthening and training of departmental staff	3	No	No
		Training and exposure visit of SHG members, facilitators	3	No	No

Note: Impact Category 1 indicates – High impact, 2- Medium impact, 3- Low impact

6.3 Avoidance and Mitigation of Environmental Impacts

6.3.1 Avoidance (Non-Permissible Activities)

The project will not support following activities which may have severe, irreversible, long-term, adverse environmental impacts.

List of Non-permissible Activities / Project Financing Limitations

1. Any activity located within a notified Eco Sensitive Zone (ESZ) and is prohibited from being implemented within an ESZ;
2. Any activity that converts or leads to conversion and/or degradation of significant areas of critical natural habitats (areas officially protected) and/or other natural habitats (including wetlands of significance) and designated forest areas;
3. Any activities involving pesticides that are banned by the Government of India[10];

[10] For list of pesticides banned in India, refer to: http://cibrc.nic.in/ibr2012.doc

4. Any activity involving pesticides that are in Classes Ia, Ib and II of the WHO Recommended Classification of Pesticides by Hazard[11]; 5. Any activities involving construction within 100 meters from an archeological site/monument. 6. Any activities involving use of Asbestos Containing Materials (e.g., AC pipes for irrigation, AC sheets for roof); 7. Any activity that violates the provisions of applicable National and State laws; 8. Construction of any new irrigation reservoir dam; 9. Construction of new canals, new branch canals and new offtake structures;

6.3.2 Mitigation Measures

Mitigation measures are measures to remove or reduce the potential adverse environmental impacts of the project activities. These include generic mitigation measures that are applicable to all project supported activities and specific mitigation measures that are specific to each activity.

The mitigation measures are presented as follows:

- Generic Mitigation Measures applicable for all project activities (these are in section 6.4.2.1).
- Construction related Mitigation Measures for all project activities involving construction (these are in section 6.4.2.2).
- Mitigation Measures specific to each activity type presented as part of activity-specific Environmental and Social Management Plans (these are in section 6.4.2.3).

6.3.2.1 Generic Mitigation Measures

This section provides details of the generic mitigation measures applicable for all project activities.

Table 67: Generic Mitigation Measures for All Project Activities

Environmental Aspect	**Generic Mitigation Measures**
Site Selection & Materials	1. The site selected for the activity must not be in areas that are protected areas (National Parks or Wildlife Sanctuaries), archaeological sites, and other sites that are of critical conservation importance. 2. Ensure that materials required for construction are of specified quality and are only procured from authorized suppliers.
Resource Conservation	1. Promotion of water conservation measures by the use of efficient irrigation methods such as drip and sprinkler irrigation, mulching, ridge and furrow method etc. 2. Restricted use of ground water and optimizing surface water for irrigation. 3. Emphasis on crop diversification; discouraging water intensive crops and encouraging less water consuming crops. 4. Encourage adoption of renewable energy where ever feasible (e.g., solar lights, solar water pumps, etc.). 5. Adopt energy efficient farm equipment / machinery (e.g., BEE 3-5 star rated pumps).
Pollution Control	1. All vehicles to be used for the work should have a valid Pollution Under Control (PUC) certificate. 2. Ensure that all generator sets (diesel, petrol, kerosene, LPG, CNG) meet the 'CPCB noise and emission control standards'. 3. Meeting CPCB prescribed "Ambient Air Quality Standards". 4. Avoid release of waste water into water bodies, streams, etc., without any treatment. 5. Ensure that all waste water meets the 'CPCB General Standards' prior to disposal. 6. Ensure that all machinery conforms to noise standards. 7. Dispose toxic and non-biodegradable wastes at locations specified by the government / local body.

[11] For list of pesticides in WHO classes Ia, Ib and II, refer to:
http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf

Environmental Aspect	Generic Mitigation Measures
	8. Proper disposal plan for desilted material shall be formulated by IWD and implementing contractor shall follow mitigation measures as per ESMP (will be provided in final ESIA & ESMP Report). 9. Avoid burning of wastes (crop residues, leaf litter, plastic wastes, etc.).
Biodiversity Conservation	1. Avoid felling of existing trees in the embankment, work place or camp sites. 2. Obtain permission from Dept. of Forest in case tree felling is unavoidable. 3. In case tree felling is unavoidable, compensatory plantation should be done with not less than 10 times of the number of plants cut down / uprooted. 4. Avoid mono species plantation.
Health and Safety	1. Adopting prescribed safety practices during handling of equipment, manual labour, handling of pesticides, etc. 2. Safety measures at the work sites and labour camps (fire safety, chemical safety, etc.) 3. Use of personal protection gear by workers (helmets, safety harness while working at heights, etc.).

6.3.2.2 Mitigation Measures for Construction Related Issues

Table 68: Construction Related Issues and Mitigation Measures

Issues	Mitigation Measures
Loss of top soil	1. Top soil excavated from the site should be collected and stored separately and covered fully. 2. Top soil should be utilised for land filling / land scaping.
Air pollution due to digging and levelling activities	1. Spray / sprinkling of water to minimise dust pollution.
Generation of noise during construction	1. Construction activities that generate noise should be carried out in the daytime only. 2. Acoustic barriers may be used in case residential areas, educational institutional, hospitals, etc., are in the immediate vicinity.
Use of Machinery for Construction	1. Instruments to be used for construction should have maintained properly and having ISI mark and required certification. 2. Only trained workers should be permitted to operate construction equipment.
Pollution due to Vehicle Movement	1. All the vehicles entering the site must have updated PUC (Pollution under control) certificate.
Land and water contamination due to vehicle movement	1. Proper maintenance of vehicles shall be ensured out to avoid any leakage of oil or grease.
Use of DG set and air pollution (use of DG is conditional to non-availability of electricity)	1. DG set to be optimally used with proper orientation and adequate stack height. 2. Stack monitoring carried out on regular basis. 3. Proper maintenance of the DG Set should be carried out on regular basis; Acoustic enclosures are to be provided with the DG sets to minimize the noise levels.
Waste generated at site and its contamination potential	1. Construction waste shall be managed/ disposed as prescribed by the Construction Waste Management Rules 2016.

6.3.2.3 Mitigation Measures Specific to Each Activity Type

Following screening and reconfirmation of the categorization of the proposed activities, an EIA is undertaken for all activities belonging to category 1, and, a Rapid Environmental Checklist is used for all activities belonging to category 2. For both category 1 and 2 activities, an activity-specific EMP is prepared. This section provides samples of the following activity-specific EMPs:

- EMP for all Construction Works (presented in Table 70)
- EMP for Irrigation Modernization (presented in Table 71)
- EMP for Flood Management (presented in Table 72)

- EMP for Crop Diversification and Intensification (presented in Table 73)

In addition to the above, the following sample management plans are prepared for additional emphasis on critical issues:

- Labor Influx and Construction Workers Camp Management Plan (presented in section 6.5)
- Waste Management Plan (presented in section 6.6)
- Strategy and Plan for Pest and Nutrient Management (presented in Chapter 8)

Using the sample plans for guidance, the SPMU in consultation with the EIA Consultant needs to prepare activity-specific EMPs and ensure their integration into the bid documents.

Table 69: ESMP for all construction works and camp site

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
Camp Site						
Establishment of camp and machinery/equipment / stone stacking yard/workshop etc.	Conflict due to use of agriculture land for camp construction	• Establishment of construction camp at buffer area of river/ canal (open space within embankment and river/ canal) or Right of Way of embankment; Campsite shall minimum be 100 m away from water body. • No labour camp will be provided within 1 km from Forest area, Wildlife Sanctuary, National Park or any other protected area. • Approval of camp site from the DPMU.	Approval obtained from the DPMU; Photographic record maintained; Camp established within RoW of the Canal.	At time of camp establishment	Contractor	PMC
	Social conflicts due to influx of external workforce and migrants	• Hiring of work force from local communities; • Awareness raising of laborers/ workers on societal norms, taboos and other cultural practices • Organise awareness creation and educational programmes for all workers and the general public on the behavioral changes required to prevent the spread of HIV/AIDS and other STDs • The 'Labour Influx and Construction Workers Campsite Management Plan' will be implemented.	Camp established at least 500m away from the nearest community; Local hired workforce; Any complaint from the local community.	Fortnightly	Contractor	PMC
	Use of hazardous material for camp construction can lead to health and safety impacts.	• Asbestos containing material (such as AC roofing sheets) shall not be used. Any material that may pose a fire hazard will not be used.	Use of asbestos material	At time of camp establishment	Contractor	PMC
	Conflicts arising due to mixing of local & migratory job seekers	• Preference to provide jobs to local job seekers; • Motivation to the workers for a good workmanship.	Jobs given to locals; Any complaint registered.	Fortnightly	Contractor	PMC
Camp site facilities	Impact on water and local environment	• For migrant laborer the contractor will provide labour camps with all basic facilities sufficiently away from local habitation. • Provisioning adequate arrangements of drinking water, lighting, ventilation, bedding, bathing and other basic facilities in the labour camps; • Provision of proper sewage and waste disposal system. Sanitation facilities have to be provided at the camp sites.	Basic facilities of camp site	At time of camp establishment	Contractor	PMC
Workers safety and hygienic conditions	Health risks due to unsafe and unhygienic	• Experienced contractor with requisite licenses and well-trained workers for the construction works and laid down	Approved OHS Plan. Evidence of OHS	Daily	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
	living environment	Occupational Health & Safety (OHS) Policy to guide the construction activities will only be engaged. • Facilitating healthcare services and medical care in case of sickness. • First aid facilities to be provided at the construction camps. • Any case of disease outbreak may be immediately subjected to medical treatment. • Mosquito control measures will be implemented (including provision of mesh/screens and prevention of water logging). • The camps will maintain cleanliness and hygienic conditions. • Safety measures taken by the Contractor such as installation of firefighting equipment, safe storage of hazardous material, fencing at vulnerable locations; • Ensuring proper health-check-ups of all laborers employed at the project site; • Contingency measures in case of accidents. • Obligatory insurance of Contractors staff and laborers against accidents. • Provision of adequate sanitation, washing, lighting, cooking and dormitory facilities. • Regular OHS trainings (Monthly) to construction and camp staff.	trainings conducted. Accident/ Incident reported.			
Camp site security	Security hazards. Security related conflicts with local community	• Proper fencing of the camp site; • Deployment of guards for security; • Friendly relations with the local community.	Any security issue emerged.	Monthly	Contractor	PMC
Parking/ repair of machinery and equipment	Soil and water contamination due to spillage of liquid wastes (lubricants, fuel, chemicals from the machinery yard)	• Proper maintenance of machinery and equipment; • Ensuring proper storage and disposal of used oil etc.; • Ensuring good housekeeping practices at workshop areas; • Avoiding waste oil spill into soil and nearby water bodies; • Appropriate arrangements such as usage of concrete base drip pans to avoid spills during fueling/oil change.	Any spill observed; Availability of sealed containers for used oils and lubricants; Disposal options (e.g. local vendor) explored.	Daily	Contractor	PMC
Operation of diesel operated generators	Deterioration of air quality; Noise exceeding 55 dB is harmful for receptors	• Proper tuning and maintenance of generators. • All vehicles and machineries should have a valid Pollution Under Control (PUC) certificate.	Low smoke emissions; Noise levels within permissible limits (55dB at day time and 45dB at night time).	Daily	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
Use of water for construction and consumption	Conflict with local water demand	• The contractor has to make his own arrangements for water required for construction ensuring that water availability and supply to nearby communities remain unaffected.	Any conflict on the water availability.	Fortnightly	Contractor	PMC
Water supply to labour camp	Water related health risks (Gastroenteritis, Diarrhea etc.)	• Provision of safe drinking water supply at the camp as well as at working places by the Contractor. • Ensuring safe water quality as confirmed by analysis from a NABL certified laboratory.	Any water borne disease observed; Water quality reports submitted.	Quarterly	Contractor	PMC
Sanitation and waste water disposal	Soil and water contamination	• Providing separate toilet facilities for men and women at the accommodation as well as site; • Avoid disposal of sewage into adjoining water bodies; • Provision of sewage collection arrangement such as lined septic tank and collection chamber; • Provision of sullage collection arrangement such as soak pit. • Pumping of sewage from collection chamber • Prohibition on disposal of sewage and sullage into any water body or open land.	Monitoring compliance to Regular disposal of sanitary waste; Photographic record; Visual inspections.	Monthly	Contractor	PMC
Solid waste generation	Land pollution	• Ensure proper collection and disposal of solid waste generated from camp at designated disposal site authorized by the local government authority and approved by the DPIU; • Prohibition on burning of waste; Good housekeeping practices to minimize waste generation.	Covered disposal containers placed at camp; Designated disposal pit available; Visual inspections.	Weekly	Contractor	PMC
Storage, handling and transport of hazardous materials	Work safety and human health risks	• Provision of double containment for storage of hazardous material (if any).	Record of harmful incident occurred.	Weekly	Contractor	PMC
Restoration of camp area	Low esthetic value if camp site is not restored to its original landscape	• Remove all the material from the camp site.	Camp area restored.	At time of demobilization of the Contractor	Contractor	PMC
Work Places						
Manpower at work	Occupational Health and Safety (OHS) issues	• Experienced contractor with requisite licenses and well-trained workers for the construction works and laid down Health & Safety Policy to guide the construction activities will only be engaged. • The contractor will provide and enforce the use of appropriate personal protective equipment (PPE) such as safety boots, rain coats, hand gloves, earplugs and nose masks.	Approved OHS Plan. Evidence of OHS trainings conducted. PPE provided; First aid facilities provided; Record of injuries/ illness.	Daily	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
		• The selected contractor will have adequate training in first aid, and provide first aid kits on site to treat minor ailments. However, major cases will be referred to the nearest hospital or health centre. • Provision of first aid facilities and emergency vehicle. • Organise Health camps				
	Influx of migrant laborer's additional pressure on the local resources and social infrastructures And Risk of social conflict	• The contractor will preferably engage local labour force except for the laborer's requiring special skills and non-availability of such skilled laborer from local area. • Project to assess and manage labor influx risk based on risks identified in the ESIA. Depending on the risk factors and their level, appropriate site-specific Labor Influx Management Plan and/or a Workers' Camp Management Plan. • Project will incorporate the ESMP into the civil works contract. The responsibilities for managing these adverse impacts will be clearly reflected as a contractual obligation, with a mechanism for addressing non-compliance. • Organise awareness programs on environmental resource management • Awareness program on HIV aids and other communicable disease may be provided to the work force. • Employment of any person under 18 years of age will be strictly prohibited. Contractor will maintain a labour register with name, age and sex with supporting document (preferably copy of Aadhar card or voter's ID card). This will be monitored by Environmental and Social office of contractor. • Contractor and laborer will sign code of conduct to maintain good manners with the community and avoid GBV • Project will undertake awareness raising program for the workers and community on the risk of labor influx **Avoiding Gender Based Violence** • Contractor will prepare and implement robust measures to address the risk of gender-based violence that include(i) mandatory and repeated training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women; (ii) informing workers about national laws that make sexual harassment and				

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
		gender-based violence a punishable offence which is prosecuted; (iii) introducing a Worker Code of Conduct as part of the employment contract, and including sanctions for non-compliance (e.g., termination), and (iv) contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence. • Additional measures can aim to reduce incentives to engage with the local community by providing workers with the opportunity to spend their time off away from the host community, where feasible with a small transport allowance, ideally allowing workers to regularly return for brief visits to their families, spouses and friends, or to visit nearby urban centers that provide a variety of legal social opportunities. For workers who need to travel further it may be attractive to forego weekends off in exchange for longer breaks that would allow for such home leave travel				
Operation and movement of machinery and equipment	Deterioration of air quality due to exhaust gases and dust emissions	• Proper engine tuning of machinery/equipment; • All vehicles and machineries should have a valid Pollution Under Control (PUC) certificate. • Water sprinkling at dust prone areas.	Gas emissions minimized; Dust emissions controlled.	Fortnightly	Contractor	PMC
	Noise from vehicles, compaction rollers, concrete mixers and construction equipment exceeding 55 dB is harmful for receptors	• Proper engine tuning of machinery/equipment; • Avoid night time traffic particularly near communities.	Noise levels within permissible limits (55dB at day time and 45dB at night time).	Daily	Contractor	PMC
Transportation of construction material	Smoke and dust generation; Fall of transported material; Chance of accidents; damage to access roads	• Regular inspection, tuning, and maintenance of transport vehicles; • Material transport in closed containers or covered with canvas (Tarpaulin) sheets. • Avoid night time activity; • Maintain liaison with communities; • Repair of damaged roads. • Traffic management plan.	Vehicles properly maintained; Designated borrow and quarry areas used; No fall of transported material; Damaged road repaired.	Daily	Contractor	PMC
	Soil contamination	• Restriction on repair of vehicles and equipment in the agricultural field.	Monitoring compliance; Log of vehicle and	Fortnightly	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
			equipment repairs; Soil erosion observed			
	Air pollution	• Use of machinery and vehicles with properly tuned to avoid the exhaust emissions; all vehicles and machineries should have a valid Pollution Under Control (PUC) certificate. • Sprinkling of water on site and on routes near communities.	Route maps of vehicle movement; Log of vehicle maintenance.	Daily	Contractor	PMC
	Water pollution	• Avoiding washing of vehicles near water bodies.	Monitoring compliance; Water quality testing.	Quarterly	Contractor	PMC
	Noise pollution	• Use of muffles (silencers) in vehicles to minimize noise; All vehicles and machineries should have a valid Pollution Under Control (PUC) certificate. • Avoiding movement of vehicles at night near communities.	No construction activities at night; Log of vehicle movement; Regular checking of PUC certificate.	Daily	Contractor	PMC
	Occupational, Health and Safety issues	• Experienced contractor with requisite licenses and well-trained workers for the construction works and laid down Health & Safety Policy to guide the construction activities will only be engaged. • Fixing of sign board at detours; Use of PPE; Awareness raising of drivers; • Restriction of public access to construction sites through appropriate measures such as fencing, barricading, caution tape, etc. • Avoiding speedy movement of vehicles near communities; Restrict vehicle speeds to 30km/h.; • Training of construction workers and others; Regular liaison with communities.	Approved OHS Plan. Evidence of OHS trainings conducted. PPEs used by workers; Reflectorized road signs; Visual inspections.	Fortnightly	Contractor	PMC
	Damage to infrastructure	• Restoration/ rehabilitation of damaged infrastructure with entire satisfaction of the affected persons. • Restrict vehicle speeds to 30km/h.;	Visual inspections; Photographic records; Consultations/Interviews, Infrastructure restoration records.	Monthly	Contractor	PMC
Construction works	Soil erosion and contamination	• Proper compaction to minimize wind and water erosion; • Slopes of embankments to be constructed and maintained at a stable gradient according to design specifications to minimize gully erosion; Slope protection measures will be taken to avoid soil erosion;	Erosion observed; Photographic record; contamination signs observed.	Fortnightly	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
		• Locate construction material handling sites away from water body and populated areas • Follow proper operation and handling measures during material handling, construction, demolition and transportation and operation of plant and machineries to minimize exposure to adverse environmental effects. • Embankments will not be left un-compacted during construction works; • No waste effluents will be released to the nearby water bodies.				
	Accident risks	• Experienced contractor with requisite licenses and well-trained workers for the construction works and laid down Health & Safety Policy to guide the construction activities will only be engaged. • Provision of PPEs; Provision of first aid kits and emergency vehicle.	PPEs provided. Record of any accident.	Daily	Contractor	PMC
	Damage to crops and cultivated area	• Community members already cultivating portions of the project site will be allowed to continue temporarily farming at areas of the land which will not be affected by construction of the canal system. Safe temporary access routes will be provided for community members to access their farms during the construction period.	Crop damage observed; Complaints from the communities.	Daily	Contractor	DPMU/ SPMU/PMC
	Loss of natural vegetation and associated fauna	• To compensate loss of flora, if any, or to improve the aesthetics, the project shall have a provision for compensatory plantation. For this purpose, a tree plantation plan will be prepared including the type of species, location for plantation, after care of the saplings and other necessary information. This plan will also compensate any unlikely tree cutting involved during project implementation. • Selection of borrow area with least vegetation cover.	Record of tree felling and plantation; Photographic record.	Daily	Contractor	PMC
	Damage to infrastructure	• Restoration/ rehabilitation of damaged infrastructure with entire satisfaction of the affected persons.	Visual inspections; Photographic records; Consultations/Interviews, Infrastructure restoration records.	Monthly	Contractor/	PMC
	Noise pollution	• Use of noise reduction devices; Regular inspection, maintenance and lubrication of the construction vehicle and	Noise levels measured.	Daily	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
		equipment; All vehicles and machineries should have a valid Pollution Under Control (PUC) certificate. • Use of PPEs such as earplugs and earmuffs by the workers; avoid night time activity.				
	Air pollution	• Proper engine tuning of machinery/ equipment; All vehicles and machineries should have a valid Pollution Under Control (PUC) certificate; • Water sprinkling particularly at work sites near the communities.	Dust emission controlled; Monitoring on stack of machinery and equipment; Evidence of measurement records;	Daily	Contractor	PMC
	Land degradation; soil erosion; pooling of water and drainage problem	• Excavation of borrow sites as per specifications.	Visual inspections; Photographic records.	Fortnightly	Contractor	PMC
	Residual wastes; construction material waste	• Remove any left-over construction material/wastes from the construction sites.	Waste material removed.	End of the rehabilitation works	Contractor	PMC
Safety/health measures for local population	Accident risks, particularly for local population living within/near the project intervention area especially women, children and elderly people	• Public consultation to maintain community integrity and social links; • Public awareness campaigns through displaying sign board at site and haulage routes; • The contractor will use warning signs at vantage points to indicate ongoing works. The contractor will guard all construction site including borrow areas, canals and drains with caution tapes and/or barricades as required. Restriction on movement of machinery on the designated haulage routes for transportation of materials; • The contractor will ensure that all haulage trucks comply with the approved speed limit of 30km/hr within the communities along the haulage road; • The contractor will adjust haul times to ensure trucks do not move to the communities during mornings when school children may be crossing the road to school and during closing time. Availability of first aid box for locals;	Visual observations; Record of accident and near-misses; any complaint from the community.	Daily	Contractor/	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
		• The contractor will enforce proper security at the project site during works to limit entry of unauthorized persons, non-working persons, particularly children to the project site; • Adequate signage to manage traffic at sites, haulage and access roads; • Ensure regular water sprinkling.				
Excavation and restoration of Borrow Area	Chang in land use pattern; Soil erosion; Visual sores in landscape; Public health risks due to mosquito-breeding places; Land disputes; Loss of potential crop land; Loss of vegetation	• Environmental enhancement plan for the borrow pit will be prepared. • Ensuring that cultivated areas are not used as borrow areas to the extent possible.	Visual observation; Photographic records.	Daily	Contractor	PMC
Generation and disposal of solid waste	Soil, water pollution	• The contractor will provide bins on site for collection and disposal of plastic waste and polythene materials such as lubricant containers, drinking water sachets and carrier bags which will be regularly emptied at the nearest approved landfill site (approved by the local government authority).	Visual observation; Photographic records.	Weekly	Contractor	PMC
Environmental damage during flood	Environmental damage from accidental release of toxic, infectious, or otherwise harmful material from construction site during flooding.	• Find alternative material handling sites that is located above flood plain, if possible. • Maintain design features, such as drainage structures, during construction and operation. • Avoid constructing sanitation or other facilities that will use and store harmful materials at flood-prone areas. • Chose dry sanitation options or closed disposal systems, instead of wet ones such as septic tanks or detention ponds	Design Layout, dry sanitation facility	Weekly	Contractor/	PMC
Road impacts and traffic issues	Communities along haulage road, project communities, public	• Provide sirens in vehicles to avoid any collision with human/animals • New roads provided in the designs will be constructed first to serve as alternative roads for the transport of materials obtained in-situ. This will ease pressure on existing community roads.	Repair of damaged road, PUC certificate, alternate road provided	Monthly	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
		• Repair and maintain damaged sections of the road located at project site throughout the construction period. • The contractor will ensure that all haulage trucks hired/contracted are in good condition to prevent breakdowns on roads. • Do not park at unauthorised places to reduce the risk of accidents. • Provisions of Traffic Management Plan to be followed by the Contractor.				
Obstruction of access ways to communities	Community members	• Safe alternative access routes will be provided for access ways that are obstructed/ destroyed during construction works. • Sign posts will be erected at vantage points to guide community members through safe alternative access ways during construction works. • Provisions of Traffic Management Plan to be followed by the Contractor.	Availability of alternate road, Road sign post	Monthly	Contractor/	PMC
Disruption of livelihoods	Community members, farmers	• Community members already cultivating portions of the project site will be allowed to continue temporarily farming at areas of the land which will not be affected by construction of the canal system. For those whose farming areas will be affected by the construction of the canals, they will be allowed to temporarily farm at other areas which will not be affected till the end of the construction works. Affected farmers will be allowed to shift to their previous farm land (owned by IWD) after the completion of construction works to integrate them into the project. Safe temporary access routes will be provided for community members to access their farms during the construction period. • The affected community members (farmers) will be allowed to collect felled tree stems and branches which can be used as poles, fuelwood and fencing material or sold to generate income.	Temporary access road to farms	Quarterly	Contractor/	DPMU/ RAP Implementing Authority under the leadership of concerned District Magistrate
Sanitation issues and public health impacts	Land, water bodies, workers, public	• Adequate waste bins will be provided at the project site for use to minimize indiscriminate disposal of plastic and polythene material, cans and food waste by the workers. These bins will be frequently transported and emptied at approved dump sites. This will prevent the littering of the project site	Availability of waste bin, record on disposal of waste, availability of toilet, training on defecation	Monthly	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
		with cans and bottles which could collect water and breed mosquitoes. • Contractor will regularly remove and dispose construction waste such as metal scrap, wood chippings, rubber seals, nails, etc. for disposal at approved dumpsites. • Contractor will appropriately and immediately cover trenches and/or excavations after they have served their purpose to prevent accidents and collection of stagnant water which could serve as a breeding ground for disease causing vectors. • The contractor will provide temporary toilet facilities at the construction sites for use by the construction workers. The workers will be educated against open defecation or "free range" defecation. • Potable water shall be provided to workers at all time.				
Disturbance of culturally sensitive sites	Project communities	• The Contractor will ensure the communities elders are consulted prior to entry into the communities so that any river stretches and other areas that have cultural/religious significance are not disturbed on festivals and other culturally significant occasions. • Culturally sensitive sites such as sacred groves, shrines and cemeteries (if any) in the project area shall be preserved and incorporated in the project design. • The contractor shall ensure the construction workers are educated about the significance of these sites and instructed to accord the necessary respect to these areas when working close to them.	Availability of culturally sensitive area, prior consultation with community, awareness campaign organized	Monthly	Contractor/	PMC
General	Occupational Health and Safety Issues	• The contractor will ensure that excavators, tractors and other machinery hired for excavation and land leveling and development works are in good condition and are well serviced, and the operators are experienced and well trained. Good conditioned and well-maintained equipment will reduce frequent breakdowns, noise nuisance and smoke emissions which could affect the operators' and other workers' health and safety.	PUC Certificate	Weekly	Contractor	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
	Procurement of sand from unauthorised sand mines	• The sand shall be procured from identified (by Project Implementing Officer - PIO) sand mines as far as possible. If Contractor wishes to procure from other sources he shall obtain the lease agreement of the supplier.	List of vendors, lease agreement	Monthly	Contractor	PMC
	Procurement of construction material	• The construction material shall be procured from authorized vendor having required permission as far as possible. If Contractor wishes to procure from other sources he shall obtain the lease agreement of the supplier.	List of vendors, lease agreement	Monthly	Contractor	PMC
	Stripping, stocking of construction material on agricultural field may cause damage to top soil of agricultural field	• Before taking civil measures for restoration / improvement of embankment, the surface area of the ground to be occupied shall be cleared of all roots and vegetable matter and stripped to a suitable depth as per IS: 4701 – 1982. • Top soil may be preserved and reused in turfing activities if possible in borrow areas, bunds or if excess shall be distributed to farmers for using in the agricultural lands after quality test. • Project activities shall be carried out during lean period and non-monsoon period for minimizing loss. • Storing of excavated material on agricultural field shall be avoided to the extent possible; Excavated earth, if require at all to store on bank side agricultural field located in between river and embankment, shall be stored temporarily. • Tarpaulin lining shall be provided to arrest any kind of leaching from stored excavated material on agricultural field. • Community members already cultivating portions of the project site will be allowed to continue temporarily farming at areas of the land which will not be affected by construction of the canal system. For those whose farming areas will be affected by the construction of the canals, they will be allowed to temporarily farm at other areas which will not be affected till the end of the construction works. Affected farmers will be allowed to shift to their previous farm land (Owned by IWD) after the completion of construction works to integrate them into the project. • Safe temporary access routes will be provided for community members to access their farms during the construction period.	Access road provided, Lining provided on stake material	Weekly	Contractor/	PMC

Component	Expected Impact	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Implementing Entity	Supervising and Monitoring Entity
	Chance of finding Archaeological property	• While excavating or dismantling any structure, if any fossils, coins, articles of value / antiquity and remains of archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per the provisions of the relevant legislation. • The Contractor shall take reasonable precautions to prevent his workforce or any other persons from damaging or removing any such articles. If any articles found shall be brought to the notice of the concerned DPMU official and shall seek the direction of ASI before contractor recommencing the work. • The Chance Find Procedures outlined in Annex ___ shall be complied with.	Record of finding any Archaeological property	Monthly	Contractor/	DPMU/ SPMU/PMC

Table 70: ESMP for Irrigation modernization

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
I. Restoration of carrying capacity of Main & Branch Canals (Earth Work for Re sectioning Channel Section) throughout the area	Loss of vegetation and impacts on flora and fauna including aquatic animals, fish and other benthic communities	Pre-construction & Construction	• Close consultation with community prior to detailed design to identify important flora/fauna habitats. • Vegetation clearance for the restoration works will be limited to weeds in the existing canals. • The Contractor will dispose the vegetative waste (including water hyacinth in the Canals if any), in accordance with the provision of Vegetation Waste Management Plan. • The Contractor for the excavation works will carry out vegetation clearance in sections and will be limited to portions of the canal to be excavated at a particular time. The entire land will not be cleared at a time and this will allow for any fauna to migrate to adjoining bushes. • To compensate loss of flora, if any, or to improve the aesthetics, the project shall have a provision for compensatory plantation. Such compensatory afforestation, to be normally done in the ratio of 1:5 will be carried out by the Contractor in accordance with the provision of Compensatory Afforestation Plan. • Contractor shall take reasonable precaution to prevent his workers from damaging any flora or fauna of the area including fishing or hunting of any animals in the area. • If the working unit observes any wild animal, the contractor shall inform the DPMU and reported to the local Forest Department officials immediately and shall take appropriate steps / measures in consultation with Forest Department Officials. • Contractor will follow the provisions of Fish Conservation Plan during restoration of carrying capacity of Canals by desiltation that may require construction of cross-bundhs across the Canals and bailing out of the impounded water from the zones in between the adjacent cross-bundhs.	Contractor/	SPMU/DPMU/ PMC
	Generation and disposal of solid waste	Construction	• Shrub stems; stock pile of stumps, roots, twigs and leaves will form the bulk of the vegetation clearance waste. The contractor will allow the neighboring communities to collect the shrub stems for use as fuelwood and fencing material. As much as possible, the twigs and leaves will be spread and ploughed into bank side agricultural field/ soil or allowed to decompose. • Excavated soil material will be re-used in backfilling and levelling as much as possible. Excavated material and other waste such as wood chippings which cannot be re-used	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			at the site will be collected and disposed at the nearest approved landfill site. • The contractor will immediately collect any excess excavated soils for backfilling of borrow pits.		
	Removal of excess excavated materials from the canals and its inappropriate dumping which may affect nearby agriculture field and waterbody.	Construction	• The contractor will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess materials will first be used for embankment strengthening and leveling access road. • Excess material may be used to fill existing borrow pits. Possibility shall be explored for filling up of nearby low lying private and Govt. land. • Excess material may be used for construction of new road infrastructure. Dept. of IWD shall formulate proper disposal plan for entire quantum of desilted material. • Testing of excavated materials to assess the appropriateness for use in agricultural fields and for other uses.	Contractor	PMC
	Stripping, stocking of excavated earth on agricultural field may damage top soil of agricultural field	Construction	• Storing of excavated material on agricultural field shall be avoided to the extent possible; • Excavated earth, if require at all to store on bank side agricultural field located in between river and embankment, shall be stored temporarily. • Tarpaulin lining shall be provided to arrest any kind of leaching from stored excavated material on agricultural field. • Community members already cultivating portions of the project site will be allowed to continue temporarily farming at areas of the land which will not be affected by construction of the canal system. For those whose farming areas will be affected by the construction of the canals, they will be allowed to temporarily farm at other areas which will not be affected till the end of the construction works. Affected farmers will be allowed to shift to their previous farm land (Owned by IWD) after the completion of construction works to integrate them into the project. • Safe temporary access routes will be provided for community members to access their farms during the construction period.	Contractor	PMC
	Dust and air pollution from flying of dried up excavated earth	Construction	• Excavated earth shall be staked in earmarked area and proper scientific measures shall be adopted during staking to restrict dust pollution from staked material. • Desilted material shall be wetting regularly by using sprinkler on regular basis.	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			• Tarpaulin covering of huge quantity of desilted material may not be economically feasible option. All truck shall be tarpaulin covered while transporting desilted material.		
II. Slope stabilization of critically affected reaches by PCC Block lining	Loss of vegetation and impacts on flora and fauna	Pre-construction & Construction	• Close consultation with community prior to detailed design to identify important flora/ fauna habitats. • Careful planning of infrastructure alignment prior to construction/ implementation. • Vegetation clearance for the rehabilitation works will be limited to weeds in the existing canals and drains. The Contractor for the construction works will carry out vegetation clearance in sections and will be limited to portions of the land to be developed at a particular time. The entire land will not be cleared at a time and this will allow for any fauna to migrate to adjoining bushes. Disposal of vegetative waste will be made as per provision of Vegetation Waste Management Plan.Any trees removed at the project site will be replanted in 5 folds. Provsions of Compensatory afforestation Plan will be followed by the Contractor in this regard. • To compensate loss of flora, if any, or to improve the aesthetics, the project shall have a provision for compensatory plantation. • Contractor shall take reasonable precaution to prevent his workers from damaging any flora or fauna of the area including fishing or hunting of any animals in the area. • If the working unit observes any wild animal, the contractor shall inform the DPIU as well as DPMU and reported to the local Forest Department officials immediately and shall take appropriate steps / measures in consultation with Forest Department Officials.	Contractor/	PMC
	Soil impacts and sediment transport in streams, canal, water bodies	Pre-construction and construction	• The clearing of vegetation in sections by the contractor will ensure only areas of the land to be developed at a particular time are exposed to agents of erosion. This will also ensure the cleared areas of the land are not left bare over long periods as development at the cleared areas will be carried out immediately. This will minimize erosion and sediment transport from the project site. • Find alternative sites and avoid material handling sites close to rivers, streams, ponds, lakes, etc., and riparian ecosystems (those located next to a water body), which are extremely sensitive. • If no alternative is available, the contractor shall leave sufficient buffer area within the range of 10 to 30 meters width along the banks. The buffer zones will screen any soil sediments transported through run-off water	Contractor/	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			during the re-sectioning and land preparation activities from getting into the water bodies. • The contractor will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits. • The contractor will seek to reduce the quantity of heaped sand and cement by delivery of quantities required for construction over a specified period and ensure that any heaped sand and cement for construction works will be covered with tarpaulin to prevent wind and water transport of sand/ soil/ dust particles. • The contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuels storage areas to reduce the potential impact from spills. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers.		
	Generation and disposal of solid waste	Construction	• Shrub stems; stock pile of stumps, roots, twigs and leaves will form the bulk of the vegetation clearance waste. The contractor will allow the neighboring communities to collect the shrub stems for use as fuelwood and fencing material. As much as possible, the twigs and leaves will be spread and ploughed into bank side agricultural field/ soil or allowed to decompose. • Excavated soil material will be re-used in backfilling and levelling as much as possible. • Left over excavated material and other construction waste such as stone chip, sand, cement, wood chippings, which cannot be re-used at the site will be collected and disposed at the nearest approved landfill site. • The contractor will immediately collect any excess excavated soils for backfilling of borrow pits. • The contractor will adopt efficient construction methods and re-use of construction material to minimize the waste to be generated from the construction works.	Contractor	PMC
	Removal of top soil	Construction	• Generated top soil shall be preserved and suitably reused for filling purpose. • Regular water sprinkling shall be provided to maintain moisture content- which in turn will reduce dust pollution. • Tarpaulin cover shall be provided to restrict dust pollution during transportation of top soil (if require at all)	Contractor	PMC
	Selection of Borrow areas	Pre-construction	• Finalization of borrow areas for earth and all logistic arrangements as well as compliance to environmental requirements, as applicable.	Contractor/ DPIU	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			• Identify potential borrow areas and take permission from District Level Environmental Impact Assessment Authority (DEIAA) before operating any borrow areas. • Borrowing earth from selected borrow area should not be started until the mutual agreement is signed between landowner and Contractor. Copy of the document shall be submitted to the DPMU. • The Contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations 1. The borrow area should not be located in forest areas, The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available; 2. The borrow pits should not be located along the roads / near to embankment; 3. The loss of productive and agricultural land should be minimum and should be avoided first; 4. The loss of vegetation due to this activity should be avoided or should be minimal; 5. Assessing the availability of required quantity and quality of soil; 6. Testing of representative samples from each of the identified borrow areas to understand its quality and application feasibility; It shall be ensured that the fill material compacted to the required density. • Planning of haul roads for accessing borrow areas shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as well as forest areas as far as possible and shall use the existing village roads wherever possible.		
	Extraction of borrow earth can disrupt natural drainage, vegetation and resulting in accelerated erosion and leading to water stagnation, ponding and pollution	Construction	• Earth material should be taken from barren land or selected borrow area during lean period as per IS Code 1498 after taking approval from DEIAA. • Borrow areas should be dug as per IS code:4701 and prior mutual agreement (or no objection certificate - in case of Govt. land) with the land owners should be made by the contractor and ensure the borrow areas should not have any environmental issues like water logging etc. • Borrow pits should be drained to avoid stagnation of water and the bottom should be leveled properly / bottom level of borrow pits should be fixed	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			with reference to the prevailing ground slope towards the nearest natural drainage course.		
III. Rehabilitation and upgradation of canal regulating structures wherever required IV. Construction of gates/shutters at uncontrolled existing outlets V. Providing controlled structures (Duckbill weir) at tail end of canals and other locations of Level 4 canals.	Loss of vegetation and impacts on flora and fauna	Pre-construction and construction	• Vegetation clearance shall be limited to weeds around proposed regulating structure to be rehabilated and upgraded. • Any trees removed at the project site shall be replanted in 5 folds.	Contractor/	PMC
	Soil impacts and sediment transport in streams, canal, water bodies	Construction	• Find alternative sites and avoid material handling sites close to rivers, streams, ponds, lakes, etc., and riparian ecosystems (those located next to a water body), which are extremely sensitive. • If no alternative is available, the contractor shall leave sufficient buffer area within the range of 10 to 30 meters width along the banks. The buffer zones will screen any soil sediments transported through run-off water during the re-sectioning and land preparation activities from getting into the water bodies. • The contractor will immediately collect any excess excavated soils to minimise the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits. • The contractor will seek to reduce the quantity of heaped sand and cement by delivery of quantities required for construction over a specified period and ensure that any heaped sand and cement for construction works will be covered with tarpaulin to prevent wind and water transport of sand/ soil/ dust particles. • The contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuels storage areas to reduce the potential impact from spills. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers.	Contractor/	PMC
	Generation and disposal of solid waste	Construction	• Shrub stems; stock pile of stumps, roots, twigs and leaves will form the bulk of the vegetation clearance waste. The contractor will allow the neighboring communities to collect the shrub stems for use as fuelwood and fencing material. As much as possible, the twigs and leaves will be spread and ploughed into bank side agricultural field/ soil or allowed to decompose. • Excavated soil material will be re-used in backfilling and levelling as much as possible. • Excavated material and other construction waste such as stone chip, sand, cement, wood chippings, which cannot be re-used at the site will be collected and disposed at the nearest approved landfill site.	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			• The contractor will immediately collect any excess excavated soils for backfilling of borrow pits. • The contractor will adopt efficient construction methods and re-use of construction material to minimize the waste to be generated from the construction works.		
	Disposal of debris from dismantling structures and spoil	Construction	• Storage and processing or recycling facilities for construction and demolition waste (C&D Waste) should be done as per the schedule 1 of Solid Waste Management (C&D Waste) Rules, 2015. • To the possible extent the materials like stone and other reusable materials shall be utilized in the construction. • The iron and wood generated, if any, would be disposed-off as a surplus stock and scrap shall be auctioned as per the procedures of IWD.	Contractor	PMC
	Fish migration in water courses may be restricted	Operation	• To modify regulating structure management 1. Allow entry of water in early monsoon to facilitate migration 2. Retain more water in late monsoon to facilitate fish growth • To do this requires: 1. Restriction on catching migrating fish at downstream as well as upstream of regulating structure 2. Fishers represented in regulating structure management committees and 3. Retain enough surface water in dry season where aquatic life is protected	Contractor	PMC
	Natural flow of rivers/channels may alter and take diversion	Operation	• Regular removal of silt and debris from both upstream and downstream of regulating structure.	Contractor	PMC
VI. Construction of rubber dams at identified location across rivers/channels	Water level changes suddenly due to inflation/ deflation and may create a hazard to adjacent people and properties	Operation	• Consult with local community in selecting preferred location of rubber dam construction; • Inform local community prior to inflation and deflation operation	Contractor	PMC
	Flood borne debris, especially sharp objects	Operation	• Inspecting the dam body and surrounding environment to identify if there any presence of unidentified object that may cause to rubber cut or puncture.	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
	Fish migration in water courses may be restricted	Operation	• Establish rubber dam management – 1. Allow entry of water at downstream in early monsoon to facilitate migration 2. Retain more water at downstream in late monsoon to facilitate fish growth • To do this requires: 1. Restriction on catching migrating fish at downstream as well as upstream of rubber dam 2. Fishers represented in regulating rubber dam management committees and • Retain enough surface water at downstream as well as upstream in dry season where aquatic life is protected	Contractor	PMC
VII. Construction of water retaining structure over small rivers and drainage channels to create storage for use in rabi crops	Generation and disposal of solid waste	Construction	• Excavated soil material will be re-used in backfilling and levelling as much as possible. • Excavated material and other construction waste such as stone chip, sand, cement, wood chippings, which cannot be re-used at the site will be collected and disposed at the nearest approved landfill site. • The contractor will immediately collect any excess excavated soils for backfilling of borrow pits. The contractor will adopt efficient construction methods and re-use of construction material to minimize the waste to be generated from the construction works.	Contractor	PMC
VIII. Adoption of Pressurized Irrigation system	Natural flow of rivers/channels may alter and take diversion	Operation	• Regular removal of silt and debris from both upstream and downstream of water storage sump constructed for pressurized irrigation system.	Irrigation Service Provider	PMC/PMU Setup
IX. Augmenting induced recharge of ground water	Rise of water table leading to water logging	Operation	• Yield and ground water level shall be measured before designing recharge shaft. Recharge shall be augmented only at critical or semi critical blocks.	WRIDD	WRIDD

Table 71: ESMP for Flood Management

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
	Impact on Soil quality & River Bed sediments	Pre-construction and Construction	• Toxicity and contamination of desilted material shall be checked prior its disposal for prevention of contamination of water and its impacts on aquatic life. • Disposal of desilted material should be carried out only as per Silt Disposal Plan. •	Contractor/	PMC
	Water Quality	Pre-construction and Construction	• Attempt shall be made to minimizing and optimizing the desiltation requirements by effective assessment and study of the profiles of the river. •	Contractor/	PMC
I. Desiltation of Mundeswari river for a length of 20 km from Beguahana to further down stream II. De siltation (Re-sectioning) of other smaller rivers and drainage channels	Aquatic Ecology- Removal of benthic communities, increasing sediments/ turbidity, disposal of desilted material, increasing depth	Pre-construction and Construction	• Desiltation plan including timeframe should be prepared for each stretch prior initiating desiltation activity. • Desiltation operations should not be carried out during the breeding and spawning season of the valued aquatic species which is from June to August (Monsoon season). Bends and meandering locations are the most potential breeding grounds. • . • During desiltation operation, the Contractor will try to minimize the impact on fishing & benthic community by following provisions of Fish Conservation Plan. • Contractors should submit SOPs and action time chart with risk management plan prior to any desiltation work. Desiltation contractor should follow the defined safety procedures to avoid accidents and spills, and IWD should ensure that local communities are informed prior to commencement of desiltation to avoid any conflict arising from desiltation operation.	Contractor/	PMC

	Location of Socioeconomic importance and socioeconomic environment	Construction	• Desiltation operations should be restricted to day time only, i.e. 6:00 Am-10:00 Pm only to minimize noise impacts on the residents of nearby settlements. Excavators should be equipped with the noise reduction/masking equipment to reduce the noise generation. • Contaminated desilted material should be disposed at approved TSDF sites to prevent any harm to community residing in nearby areas. • Log book should be maintained for recording the accidents at site/ mortality of the any mammal should be maintained. Analysis shall be carried out to assess the reason for the accident/ mortality and measures should be taken to prevent repetition of the event. • Contractors having experience of desiltation and well-trained staff should only be allowed to carry out desiltation. This will help in prevention of spillage of desilted material or any accidents during the desiltation operations. • Desiltation plan should be prepared by contractor and submitted to IWD for approval prior to carrying out desiltation operations. Desiltation plan should be reviewed considering its location w.r.t environmental sensitive locations/ archaeological locations/ cultural festival/ pollution influx in the area/ desilted material quality & texture/ available depth etc. as given in this EIA report and through local sources and past experience. • Contractors should submit method statement & risk assessment plan prior to carrying out any desiltation work. Excavator should follow the defined safety procedures to avoid accidents and spills, and IWD should ensure that local communities are informed prior to commencement of desiltation to avoid any conflict arising from desiltation operation. • Re-use of desilted material should be explored if desilted material is not contaminated. Economically and environmentally feasible options can be adopted to minimize the desilted spoil burdens. Some of such measures include o Desilted material can be explored for its usage for bank protection purpose/flood protection o Use of desilted material can be explored for land filling, as construction material for road foundations, dikes, mounds, noise/wind barriers.	Contractor/ DPIU	DPMU/ SPMU/PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
	Removal of River Weeds before commencement of desiltation	Pre-construction	• Provision for removal of weeds during re-sectioning and community members may be encouraged to prepare vermin compost with the weeds. • PIO shall explore with the concerned authorities of the State Govt. for establishment of vermi-compost units and undertake market survey to explore the feasibility of preparation of ornaments with weed like water hyacinth Provisions of Vegetative Waste Mnagement Plan shall be followed by the Contractor in this regard.	Contractor	PMC
	Desilted material from river canal bed	Pre-construction	• Preparing plan for reusing and dumping of all material. • Testing of desilted materials to assess the appropriateness for use in agricultural fields and for other uses. • In case, if the desilted materials found unsuitable for field or other application, it should be disposed-off as per the waste disposal plan.	Contractor	PMC
	Inappropriate dumping of excavated material which may affect nearby agricultural areas	Pre-construction	• Desilted material will first be used for filling up of nearby low lying private and Govt. land. Possibility shall be explored for use of this material for embankment strengthening and leveling access road. Excess material may be used for construction of new road infrastructure. Dept. of IWD shall formulate proper disposal plan for entire quantum of desilted material.	Contractor	PMC
	Stripping, stocking of desilted material on agricultural field may cause damage to top soil of agricultural field	Pre-construction and Construction	• Before taking civil measures for restoration / improvement of embankment, the surface area of the ground to be occupied shall be cleared of all roots and vegetable matter and stripped to a suitable depth as per IS: 4701 – 1982. • Top soil may be preserved and reused in turfing activities if possible in borrow areas, bunds or if excess shall be distributed to farmers for using in the agricultural lands after quality test. • Project activities shall be carried out during lean period and non-monsoon period for minimizing loss.	Contractor/	PMC
	Dust and air pollution from flying of dried up excavated earth	Construction	• Excavated earth shall be staked in earmarked area and proper scientific measures shall be adopted during staking to restrict dust pollution from staked material. Desilted material shall be wetting regularly by using sprinkler on regular basis. Tarpaulin covering of huge quantity of desilted material may not be economically feasible option. All truck shall be tarpaulin covered while transporting desilted material.	Contractor	PMC
	Impact on different flora / fauna	Pre-construction and Construction	• Close consultation with community prior to detailed design to identify important flora/fauna habitats. • Careful planning of infrastructure alignment prior to construction/ implementation. • Stipulate in Conditions of Contract and provision of site supervision.	Contractor/	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			• To compensate loss of flora, if any, or to improve the aesthetics, the project shall have a provision for compensatory plantation. Such compensatory afforestation (normally done in the ratio of 1:5) should be done by the Contractor in accordance with provisions of the Compensatory Afforestation Plan. • Contractor shall take reasonable precaution to prevent his workers from damaging any flora or fauna of the area including fishing or hunting of any animals in the area. • If the working unit observes any wild animal, the contractor shall inform the DPMU and reported to the local Forest Department officials immediately and shall take appropriate steps / measures in consultation with Forest Department Officials.		
	Impact on near threatened / endangered fish species	Construction	At present, fishing is not very common in all the stretches of the river Damodar and Mundeswaridue to lack of water availability during pre-monsoon (prime construction / desiltation phase). However, with the increased availability of water during monsoon in the river, fisheries potential would also improve. The fish management plan involves various options for management of fishery resources in general and near threatened / endangered species in the river in particular at project stretch. • No use of explosives during construction activities / desiltation operation; • Oscillation of water before the desiltation operation to keep fish species away from desiltation points • During desiltation, local movement of fishes will be affected. Scientific management of the existing stock, more specifically “near Threatened” / “endangered” species needs to be adopted for their conservation. Fish management activity should be undertaken by the project in consultation with the Fisheries Department, Government of West Bengal. Relevant provision of Fish Conservation Plan shall be followed by the Contractor in this regard. • Training / orientation of fishery groups / fish production group / fishery cooperatives on conservation and promotion of nearly threatened / endangered species; • Water quality testing before and after desiltation operation and ensuring remedial measures for restoring turbidity; turbidity arising due to desiltation operation will be temporary in nature. • Discussion with Dept. of Fishery reveals that there are no natural breeding grounds of fish located in the identified desiltation area.	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			• Desiltation will strictly be prohibited during monsoon months; • Involving fishery dept. for conservation of aquatic germplasm resources for nearly threatened and endangered species. Collaboration may also be fostered with National Bureau of Fish Genetic Resources, Lucknow (ICAR Institute) in this regard;		
	Loss of vegetation and impacts on flora and fauna	Pre-construction and Construction	• Close consultation with community prior to detailed design to identify important flora/fauna habitats. Vegetation clearance for the desiltation works will be limited to weeds in the existing river. • The Contractor for the desiltation work will carry out vegetation clearance in sections and will be limited to portions of the river bed to be desilted at a particular time. The entire river bed will not be cleared at a time and this will allow for any fauna to migrate to adjoining bushes. • To compensate loss of flora, if any, or to improve the aesthetics, the project shall have a provision for compensatory plantation. • Contractor shall take reasonable precaution to prevent his workers from damaging any flora or fauna of the area including fishing or hunting of any animals in the area. • If the working unit observes any wild animal, the contractor shall inform the DPMU and reported to the local Forest Department officials immediately and shall take appropriate steps / measures in consultation with Forest Department Officials.	Contractor/	PMC
	Soil impacts and sediment transport	Construction	• The contractor will immediately collect any desilted material to minimize the potential for erosion into water bodies and such materials will be used as per disposal plan for desilted material.	Contractor	PMC
	Disruption of livelihoods due to temporary staking of desilted material in agricultural land located at set back zone	Construction	• To the extent possible areas with habitation / business establishments / cultivable areas will be avoided. • In case of any loss of livelihood, PAP will be assisted under the project as per the agreed entitlement matrix. Those who are earning livelihood at the project site and will be impacted due to project intervention will also be assisted. • The contractor(s) will provide safe temporary access routes for community members to access their farms during the construction period. • The affected community members (farmers) will be allowed to collect felled tree stems and branches which can be used as poles, fuel wood and fencing material or sold to generate income.	Contractor/	DPMU/ RAP Implementing Authority under the leadership of concerned District Magistrate
	Loss of land / properties and	Construction	• To the extent possible, land taking will be avoided in the project.	Contractor/ RAP	DPMU/ RAP Implementing

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
	livelihood; shelter due to land taking		• In case of any land taking, the affected persons/families to be identified in advance and will be compensated at replacement value for the lost asset as per the agreed entitlement matrix. • The affected person will be compensated / assisted before taking physical possession of the asset. • Any displaced person will be resettled (Project may cause temporary shifting of encroached people, temporary staking of desilted material on agricultural land located at setback zone. People will be allowed to shift to their previous land). • Loss of livelihood to be compensated monetarily as well as in form of alternative livelihood • Any loss of sources of livelihood to be compensated.	Implementing Authority under the leadership of concerned District Magistrate	Authority under the leadership of concerned District Magistrate
III. Armouring of Damodar Right Dwarf embankment to act as Broad Crested Weir to allow controlled spilling of flood water IV. Improving Damodar Protected Left Embankment by providing adequate free board to withstand flood through construction of flood walls at identified locations V. Improving Upper Rampur & Hurhura Channels by providing adequate freeboard through provision of flood wall on Left Embankments	Loss of vegetation and impacts on flora and fauna	Pre-construction and Construction	• Close consultation with community prior to detailed design to identify important flora/fauna habitats. • Careful planning of infrastructure alignment prior to construction/ implementation. • Vegetation clearance for the rehabilitation works will be limited to weeds in the existing canals and drains. The Contractor for the construction works will carry out vegetation clearance in sections and will be limited to portions of the land to be developed at a particular time. The entire land will not be cleared at a time and this will allow for any fauna to migrate to adjoining bushes. • Any trees removed at the project site will be replanted in 10 folds. • To compensate loss of flora, if any, or to improve the aesthetics, the project shall have a provision for compensatory plantation. • Contractor shall take reasonable precaution to prevent his workers from damaging any flora or fauna of the area including fishing or hunting of any animals in the area. • If the working unit observes any wild animal, the contractor shall inform the DPMU and reported to the local Forest Department officials immediately and shall take appropriate steps / measures in consultation with Forest Department Officials.	Contractor/	PMC
	Soil impacts and sediment transport in streams, canal, water bodies	Construction	• The clearing of vegetation in sections by the contractor will ensure only areas of the land to be developed at a particular time are exposed to agents of erosion. This will also ensure the cleared areas of the land are not left bare over long periods as development at the cleared areas will be carried out immediately. This will minimize erosion and sediment transport from the project site.	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
VI. Raising & Strengthening of countryside existing earthen embankments to its design section of Damodar Left, Hurhura Left & Lower Rampur left embankments VII. Protection / River training works on river Damodar / Mundeswari, Hurhura Khal, Upper Rampur and Lower Rampur Khals			• Find alternative sites and avoid material handling sites close to rivers, streams, ponds, lakes, etc., and riparian ecosystems (those located next to a water body), which are extremely sensitive. • If no alternative is available, the contractor shall leave sufficient buffer area within the range of 10 to 30 meters width along the banks. The buffer zones will screen any soil sediments transported through run-off water during the re-sectioning and land preparation activities from getting into the water bodies. • The contractor will immediately collect any excess excavated soils to minimise the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits. • The contractor will seek to reduce the quantity of heaped sand and cement by delivery of quantities required for construction over a specified period and ensure that any heaped sand and cement for construction works will be covered with tarpaulin to prevent wind and water transport of sand/ soil/ dust particles. • The contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuels storage areas to reduce the potential impact from spills. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers.		
	Generation and disposal of solid waste	Construction	• Shrub stems; stock pile of stumps, roots, twigs and leaves will form the bulk of the vegetation clearance waste. The contractor will allow the neighboring communities to collect the shrub stems for use as fuelwood and fencing material. As much as possible, the twigs and leaves will be spread and ploughed into bank side agricultural field/ soil or allowed to decompose. • Excavated soil material will be re-used in backfilling and levelling as much as possible. Excavated material and other construction waste such as stone chip, sand, cement, wood chippings, which cannot be re-used at the site will be collected and disposed at the nearest approved landfill site. • The contractor will immediately collect any excess excavated soils for backfilling of borrow pits. • The contractor will adopt efficient construction methods and re-use of construction material to minimize the waste to be generated from the construction works.	Contractor	PMC
	Removal of top soil		• Generated top soil shall be preserved and suitably reused for filling purpose.	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
	Borrow areas- extraction of materials like earth etc., can disrupt natural drainage, vegetation and resulting in accelerated erosion and leading to water stagnation, ponding and pollution		• Finalization of borrow areas for earth and all logistic arrangements as well as compliance to environmental requirements, as applicable. • Identify potential borrow areas and take permission from District Level Environmental Impact Assessment Authority (DEIAA) before operating any borrow areas. • Borrowing earth from selected borrow area should not be started until the mutual agreement is signed between landowner and Contractor. Copy of the document shall be submitted to the DPMU. • The Contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations 1. The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available; 2. The borrow pits should not be located along the roads / near to embankment; 3. The loss of productive and agricultural land should be minimum and should be avoided first; 4. The loss of vegetation due to this activity should be avoided or should be minimal; 5. Assessing the availability of required quantity and quality of soil; 6. Testing of representative samples from each of the identified borrow areas to understand it quality and application feasibility; It shall be ensured that the fill material compacted to the required density. • Planning of haul roads for accessing borrow areas shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as well as forest areas as far as possible and shall use the existing village roads wherever possible.	Contractor	PMC
	Transportation of earth from borrow areas for construction	Pre-construction and Construction	• Contractor shall not be permitted to borrow areas in forest areas • Contractor shall identify location of borrow areas and get approval from DPMU staff. • Earth material should be taken from barren land or selected borrow area during lean period as per IS Code 1498 after taking approval from DPMU / Executive Engineer. • Borrow areas should be dug as per IS code: 4701 and prior approval from the competent authorities must be taken before execution and mutual agreement with the land owners should be taken by the contractor and	Contractor/	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			ensure the borrow areas should not have any environmental issues like water logging etc. • Borrow pits should be drained to avoid stagnation of water and the bottom should be leveled properly / bottom level of borrow pits should be fixed with reference to the prevailing ground slope towards the nearest natural drainage course. • Borrow areas should be avoided in agricultural areas as well as forest areas. • Required permission should be obtained from the authorized person as stipulated in the West Bengal state minor minerals act and if operating in private lands mutual agreement and no objection certificate need to be produced to the DPMU / EE by the contractor.		
	Disruption of livelihoods due to temporary staking of desilted material in agricultural land located at set back zone	Construction	• To the extent possible areas with habitation / business establishments / cultivable areas will be avoided. • In case of any loss of livelihood, PAP will be assisted under the project as per the agreed entitlement matrix. Those who are earning livelihood at the project site and will be impacted due to project intervention will also be assisted. • The contractor(s) will provide safe temporary access routes for community members to access their farms during the construction period. • The affected community members (farmers) will be allowed to collect felled tree stems and branches which can be used as poles, fuel wood and fencing material or sold to generate income.	Contractor/	DPMU/ RAP Implementing Authority under the leadership of concerned District Magistrate
	Loss of land / properties and livelihood; shelter due to land taking	Construction	• To the extent possible, land taking will be avoided in the project. • In case of any land taking, the affected persons/families to be identified in advance and will be compensated at replacement value for the lost asset as per the agreed entitlement matrix. • The affected person will be compensated / assisted before taking physical possession of the asset. • Any displaced person will be resettled (Project may cause temporary shifting of encroached people, temporary staking of desilted material on agricultural land located at setback zone. People will be allowed to shift to their previous land). • Loss of livelihood to be compensated monetarily as well as in form of alternative livelihood • Any loss of sources of livelihood to be compensated.	Contractor/ RAP Implementing Authority under the leadership of concerned District Magistrate	DPMU/ RAP Implementing Authority under the leadership of concerned District Magistrate

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
	Displacement of public utilities like electric pole,		• SIO should Identify the electric poles which may be a hinderance as per the designs. During survey and detailed estimate, a contingency plan for shifting if necessary should be done and the utilities need to be shifted if necessary with the appropriate permission from the electricity department as per the provisions		
	Higher within channel or river velocity will cause more bank erosion and river bed scouring	Construction	• Concrete lining at strategic point of river bank and bed; Avenue plantation along embankment; proper operation of different control structure specially during high tide. • Sheet pile with cap bean and flood wall is provided in strategic point to reduce effect of scouring and soil erosion.	Contractor	PMC
	More sediment trapping at downstream river channels	Operation	• Regular desiltation of side channel shall be performed by IWD. Proper operation of different control structure specially during high tide.	Contractor	PMC
	Less silt deposited on land affecting fertility	Operation	• Awareness raising on using bio-fertiliser; Promotion and use of vermin composting with the help of Agricultural department	Dept. of Agriculture	PMC
	Reduced soil fertility due to reduced aquatic vegetation and micro-biota	Operation	• Awareness raising on using bio-fertiliser; Promotion and use of vermin composting with the help of Agricultural department; Cultivation and use of blue green algae	Dept. of Agriculture	PMC
	Decline in quality of sub-surface and surface waters due to loss of flushing effect of floods	Operation	• Regular desiltation of side channel shall be performed by IWD. Proper operation of different control structure specially during high tide. Protecting natural drains.	Contractor	PMC
	Soil and water pollution from use of agrochemicals	Operation	• Awareness raising on using bio-fertiliser; Promotion and use of vermin composting with the help of Agricultural department	Dept. of Agriculture	PMC
	Loss of land / properties and livelihood; shelter due to land taking	Construction	• To the extent possible, land taking will be avoided in the project. • In case of any land taking, the affected persons/families to be identified in advance and will be compensated at replacement value for the lost asset as per the agreed entitlement matrix. • The affected person will be compensated / assisted before taking physical possession of the asset. • Any displaced person will be resettled	Contractor/ RAP implementing Authority under the	DPMU/ RAP implementing Authority under the leadership of concerned District Magistrate

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			• Loss of livelihood to be compensated monetarily as well as in form of alternative livelihood • Any loss of sources of livelihood to be compensated.	leadership of concerned District Magistrate	
	Decline in capture fisheries	Construction & Operation	• Promotion of cage-based fisheries, Restriction on catching migrating fish at downstream as well as upstream of regulating structure	Dept. of Fishery	PMC
VIII. Remodeling & Reconstruction of sluices at the outfalls of drainage channels	Loss of vegetation and impacts on flora and fauna	Construction	• Vegetation clearance shall be limited to weeds around proposed regulating structure to be rehabilitated and upgraded. Any trees removed at the project site shall be replanted in 10 folds.	Contractor/	PMC
	Soil impacts and sediment transport in streams, canal, water bodies	Pre-construction & Construction	• Find alternative sites and avoid material handling sites close to rivers, streams, ponds, lakes, etc., and riparian ecosystems (those located next to a water body), which are extremely sensitive. • If no alternative is available, the contractor shall leave sufficient buffer area within the range of 10 to 30 meters width along the banks. The buffer zones will screen any soil sediments transported through run-off water during the re-sectioning and land preparation activities from getting into the water bodies. • The contractor will immediately collect any excess excavated soils to minimise the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits. • The contractor will seek to reduce the quantity of heaped sand and cement by delivery of quantities required for construction over a specified period and ensure that any heaped sand and cement for construction works will be covered with tarpaulin to prevent wind and water transport of sand/ soil/ dust particles. • The contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuels storage areas to reduce the potential impact from spills. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers.	Contractor/	PMC
	Generation and disposal of solid waste	Construction	• Shrub stems; stock pile of stumps, roots, twigs and leaves will form the bulk of the vegetation clearance waste. The contractor will allow the neighboring communities to collect the shrub stems for use as fuelwood and fencing material. As much as possible, the twigs and leaves will be spread and ploughed into bank side agricultural field/ soil or allowed to decompose.	Contractor	PMC

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			• Excavated soil material will be re-used in backfilling and levelling as much as possible. Excavated material and other construction waste such as stone chip, sand, cement, wood chippings, which cannot be re-used at the site will be collected and disposed at the nearest approved landfill site. • The contractor will immediately collect any excess excavated soils for backfilling of borrow pits. The contractor will adopt efficient construction methods and re-use of construction material to minimize the waste to be generated from the construction works.		
	Disposal of debris from dismantling structures and spoil	Construction	• Storage and processing or recycling facilities for construction and demolition waste (C&D Waste) should be done as per the schedule 1 of Solid Waste Management (C&D Waste) Rules, 2015. • To the possible extent the materials like stone and other reusable materials shall be utilized in the construction. • The iron and wood generated, if any, would be disposed-off as a surplus stock and scrap shall be auctioned as per the procedures of I&W Department.	Contractor	PMC
	Fish migration in water courses may be restricted	Operation	• Modify sluice gate management - Allow entry of water in early monsoon to facilitate migration Retain more water in late monsoon to facilitate fish growth • To do this requires: • Restriction on catching migrating fish at sluices Fishers represented in sluice management committees and Retain enough surface water in dry season where aquatic life is protected	Contractor	PMC
	Natural flow of rivers/channels may alter and take diversion	Operation	• Regular removal of silt and debris from both upstream and downstream of dam.	Contractor	PMC

Table 72: ESMP for Crop diversification and Intensification

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
I. Demonstration for diversification and support in Horticulture, providing infrastructure of cultivation and construction of low cost storage structure - Department of Food Processing Industries and Horticulture					
Promotion on Cultivation of Hybrid Vegetable	Increase in use of fertilizer and pesticide	Operation	Integrated Pest and Nutrient Management Plan (detailed in chapter 8) will be implemented.	Farmer /FPO/FPC	Department of Food Processing Industries and Horticulture
	Agriculture run off may be containing excess fertilizer promotes the excessive growth of aquatic plants (such as algae, weed and water hyacinth).	Operation	• Optimum use of fertilizer, promotion of the use organic manure and bio-fertilizer. • Prevention of agricultural runoff to flow in to the canal / river / water bodies by adoption of efficient irrigation methods;. • Promotion of IPNM strategies among the farmers in the command area by training, demonstrations and hand holding support. • Supply of IEC materials on specific doses of application of fertilizer for different crops during different seasons, in accordance with the earlier researches.	Farmer /FPO/FPC	Department of Food Processing Industries and Horticulture
	Deterioration of groundwater quality	Operation	• Promotion of organic farming that encourages use of organic fertilizers and pesticides. • Optimum use of chemical fertilizer and pesticides. • Discouraging ground water extraction for agricultural and meeting high water consumption requirements in critical / semi-critical / unsafe zones. • Sensitization / awareness of farmers on ground water extraction potential and ground water conservation. • Participatory Ground Water Management through ground water user groups may be promoted, more specifically in semi-critical groundwater zones.	Farmer /FPO/FPC	Department of Food Processing Industries and Horticulture
	Soil quality degradation due to excess use of Fertilizer and pesticide.	Operation	• Training farmers for promoting adoption of integrated weed and pest management practices such as use of certified and disease tolerant seed varieties, use of early maturing seed varieties, proper land preparation, early planting, following recommended planting space between rows and plants, timely/early weeding, suitable water management practices and the use of agrochemicals where necessary. This will minimize the rate of agrochemical use. • Dept. of Horticulture and Agriculture will ensure successful	Farmer /FPO/FPC	Department of Food Processing Industries and Horticulture

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			implementation of IPNM (given in chapter-). • Dept. of Horticulture and Agriculture will sensitize farmers to, preferentially, use selective pesticides with low environmental impact quotient (EIQ) where appropriate, rather than broad-spectrum products, to minimize impacts on non-target species. • Under minimum/reduced tillage, the stocks and leaves of harvested crops will be left on the field as much as possible to serve as mulch to conserve soil moisture and also improve soil biological condition on decomposition. • The farmers will be encouraged to use organic manure to minimize the use of inorganic manure and improve soil biological conditions.		
Infrastructure development for promotion of Vermin compost, protected cultivation and post-harvest infrastructure	Throwing of non-degradable plastic material in agriculture field	Operation	Owner shall provide waste collection bin at each establishment and collect and dispose it on regular basis; plastic waste shall be dumped to nearby approved dumping site; throwing of plastic materials in agricultural field shall be avoided; owner shall aware all workers regarding detrimental effect of plastic.	Owner/ Farmer /FPO/FPC	Department of Food Processing Industries and Horticulture
	Storing of construction material on agriculture field	Construction	Construction work shall not be carried out during monsoon season; to minimize impact on cultivated crop, construction work shall be carried out only when firm land is devoid of any crop; any left-out waste or construction material shall be stored and collected and disposed properly; metal waste shall be sold to authorised recycler. ESMP for construction work given in table 70 shall be implemented.	Contractor	Department of Food Processing Industries and Horticulture
	Use of metal structure on agriculture field	Construction	metal waste shall be sold to authorised recycler. ESMP for construction work given in table 70 shall be implemented.	Contractor	Department of Food Processing Industries and Horticulture
	Drainage and water logging	Construction	Construction work shall not be carried out during monsoon season; to minimize impact on cultivated crop, construction work shall be carried out only when firm land is devoid of any crop; proper drainage channel along the (protected cultivation) all shaded establishment shall be provided to avoid any issue of water logging into agricultural field. ESMP for construction work given in table -70 shall be implemented.	Contractor	Department of Food Processing Industries and Horticulture
	Crop damage during construction	Construction	Construction work shall not be carried out during monsoon season; to minimize impact on cultivated crop, construction work shall be carried out only when firm land is devoid of any crop. In	Contractor	Department of Food Processing Industries and Horticulture

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
			occurrence of any kind of crop damage- Department of Food Processing Industries and Horticulture shall provide crop compensation to affected farmers.		
II. Agriculture Marketing Dept.					
Construction of aggregation centre/ pack house (1/ FPC)	Storing of construction material on agriculture field	Construction	Construction work shall not be carried out during monsoon season; aggregation centre or pack house shall not be constructed on agricultural field; any left-out waste or construction material shall be stored and collected and disposed properly; metal waste shall be sold to authorised recycler. ESMP for construction work given in table 70 shall be implemented.	Contractor	Department of Food Processing Industries and Horticulture
	Drainage and water logging	Construction	Construction work shall not be carried out during monsoon season; proper drainage channel along the aggregation, pack house shall be provided to avoid any issue of water logging. ESMP for construction work given in table 70 shall be implemented.	Contractor	Department of Food Processing Industries and Horticulture
	Generation of solid waste	Operation	Huge quantum of solid waste will be generated on day to day bass. Solid waste shall be collected regularly to maintain aesthetic value of nearby area and maintain hygiene condition. Options shall be explored for utilization of waste material in vermin compost plant for generation of bio-fertilizer. ESMP for construction work given in table 70 shall be implemented.	Owner/ FPC	Department of Food Processing Industries and Horticulture
Transport subsidy for procurement of motorized van (transportation support) to each FPC	Air, water, soil and noise pollution	Operation	Comply with emission norms and regular renewal of PUC certificate.	Owner/ FPC	Department of Food Processing Industries and Horticulture
	Worker and public safety	Operation	Proper safety measures shall be provided and adopted by driver and conductor; vehicle speed shall be kept under permissible limit at all time.	Owner/ FPC	Department of Food Processing Industries and Horticulture
III. Support for farm mechanization, diversified cropping demonstration, to promote less water consuming and diversified cropping -Agriculture Dept.					
Crop demonstration on Cropping System, Diversification, SARP, SRI, Zero Tillage and Direct Seeding of Rice (Subsidy on Seeds, Pesticides, Fertilizer etc. to	Impacts associated with agro-chemical use	Operation	Integrated Pest and Nutrient Management Plan (detailed in chapter 8) will be implemented.	Farmer	Department of Food Processing Industries and Horticulture

Sub-component/ Investment activity	Expected Impact	Project Stages	Mitigation Measures	Implementing Entity	Supervising and Monitoring Entity
promote adoption of new farming practice)					
IV. Promotion of cage based pisciculture along with one-time sustenance support- Fisheries Department					
Promotion of cage culture (providing cages with appurtenant) in the main and branch canal and one-time sustenance support (providing fish seed, fish feed, prophylactics, labour) to FPG/ SHG	Pollution from overstocking and overfeeding	Operation	Avoiding overfeeding; Avoiding or minimize or control use of medication	FPG/ SHG	Fisheries Department
	Risk of cultivation of exotic species that may impact native populations	Operation	Maintain proper stocking density; Avoiding stocking exotic and invasive species;	FPG/ SHG	Fisheries Department

6.4 Labor Influx and Construction Workers' Camp Management Plan

During implementation phase, large numbers of worker population is likely to influx in the project area. Management of this labor influx and of issues related to the labor campsite are a critical part of environmental and social management of the project.

For each construction activity, prior to the bidding process, the ESIA consultant is required to prepare a Labour Influx and Construction Workers' Camp Management Plan.

For each construction contract, within 14days of the appointed date, the contractor is required prepare and submit a Labour Influx and Construction Workers' Camp Management Plan to Sr. Environmental Expert at SPMU level (as one activity may be packaged as one or as multiple contracts). The Contractor's obligation to provide and maintain these facilities and undertake these activities must be included in contract document.

These Plans spells out specific measures that will be undertaken to control degradation of the surrounding landscape due to the location and operation of the proposed construction camp and willminimize the impact on the local community. The Plans will include elements such as details on living condition and ancillary facilities, worker codes of conduct, training programs on HIV/AIDS, etc.

The key elements that will enable the preparation of the Labour Influx and Construction Workers' Camp Management Plan are:

- List of key environmental and social aspects to be considered for preparation of a Labor Influx and Construction Workers' Camp Management Plan (presented in section 6.5.1)
- Guidelines for locating construction workers' campsites (presented in section 6.5.2)
- Sample Labour Influx and Construction Workers' Camp Management Plan (presented in section 6.5.3)

6.4.1 Key environmental and social aspects to be considered for preparation of a Labor Influx and Construction Workers' Camp Management Plan

The key environmental aspects to be considered for preparation of a Labor Influx and Construction Workers' Camp Management Plan include:

1. Sufficient supply of potable water may be provided at camps and working sites. If the drinking water is obtained from the intermittent public water supply then storage tanks must be provided;
2. Adequate washing and bathing facility must be provided in clean and drained condition;
3. Adequate sanitary facilities may be provided within camp. The place must be cleaned daily and kept in strict sanitary condition. Separate latrine must be provided for women. Adequate supply of water must be provided;
4. Collection of domestic waste and its disposal may be carried out;
5. The contractor must ensure that there is proper drainage system to avoid creation of stagnant water bodies;
6. Periodic health check-ups may be conducted. These activities may be provided in consultation with State Public Health Department;
7. At every Camp first aid facility may be provided, ambulance must be provided to take injured or ill person to the nearest hospital;
8. Adequate supply of fuel in the form of kerosene or LPG may be provided to construction labours to avoid felling of trees for cooking and other household activities. No open fires may be allowed in camps;
9. The sites should be secured by fencing;
10. Proper lighting and cross ventilation must be provided;
11. Construction camps may be located away from forest areas, settlements, cultural heritage & historical sites and water bodies & dry river beds;

12. It should be ensured by the construction contractor that area of the construction camp be cleared of the debris and other wastes deposited on completion of construction. The land should be restored back to its original form and condition as it was prior to the establishment of the construction camps.

The key environmental aspects to be considered for preparation of a Labor Influx and Construction Workers' Camp Management Plan:

(i) Mandatory and repeated training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women;
(ii) Informing workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted;
(iii) Introducing a Worker Code of Conduct as part of the employment contract including sanctions for non-compliance, manual scavenging, engagement with local residents, child labour, non-discrimination, harassment of co-workers including women and those belonging to SC and STs and other minority social groups,
(iv) Contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.
(v) Training programs on HIV/AIDS and other communicable diseases,
(vi) Workers' Camp Management Plan addressing specific aspects of the establishment and operation of workers' camps provided the ULB/ Executing Agency is unable to cater to the demand for affordable housing for this additional workforce in terms of rentals, hostels, apartments etc.; and
(vii) Compliant handling Mechanism at the project level

Additional measures that aim to reduce incentives to engage with the local community by providing workers with the opportunity to spend their time off away from the host community, where feasible with a small transport allowance, ideally allowing workers to regularly return for brief visits to their families, spouses and friends, or to visit nearby urban centers that provide a variety of legal social opportunities. For workers who need to travel further it may be attractive to forego weekends off in exchange for longer breaks that would allow for such home leave travel.

While clear and decisive measures by the contractor are critically important, the effectiveness of these measures often depends on complementary actions by the SPMU. Those are typically focused on public administration and law enforcement, such as: (i) reinforcing local police in a remote setting, where services may not be sufficiently staffed or equipped to maintain public order after the influx, (ii) ensuring that complaints about gender-based violence are taken seriously by local law enforcement, which may be supported by (iii) deploying female officers to the project area, and (iv) participating in preventive training with workers to demonstrate the presence of government authority in the project area.

6.4.2 Guidelines for locating Construction Worker's Campsites

Table 73: Guidelines for Construction Camp Site Selection

1.	1.
1. Lands within 300 m of residential area and 200 m of schools and health care centres; **2. Irrigated agricultural land;** **3. Lands under village forests;** **4. Lands within 100 m of community water bodies, water sources such as rivers and also other watercourses;** **5. Low lying lands, marshy areas;** **6. Lands supporting dense vegetation** **7. Lands where there is no willingness of the landowner to permit its us**	**1. Waste land other than Low lying lands, marshy areas;** **2. Lands belonging to owners who look upon the temporary use as a source of income;** **3. Community lands or government land not used for beneficial purposes;** **4. Private non-irrigated lands where the owner is willing; and** **5. Lands with an existing access road**

6.4.3 Sample Labour Influx and Construction Workers' Campsite Management Plan

This section provides a generic labour influx and construction worker's campsite management plan which may be used as a reference by the ESIA consultant to prepare an activity specific plan and by the contractor to prepare a contract specific plan (as one activity maybe may be packaged as one or as multiple contracts).

In addition to the details presented in Table 75, the activity specific plan must provide basic information on the likely number of workers, the locations identified for the campsite along with details of key features in the vicinity (habitations, water bodies, etc., with distances), model layout for the campsite, etc.

In addition to the details presented in Table 75, the contractor's plan must provide basic information on the campsite including: number of male and female workers to be housed, number of non-working adults and children to be housed, layout of the campsite showing location of all key infrastructure (residential quarters, community kitchen, male and female washrooms, male and female toilets, crèche facility, waste disposal facility, etc.), plan of the residential quarters (indicating type of construction, people to be housed per unit, ventilation, etc), etc.

Table 74: Generic Camp Site Management Plan

Activity	Responsibility		Monitoring and Supervision
	Primary	Secondary	
Pre-Construction Stage			
Site Selection: 1. Identify the site for construction camp in consultation with the individual owners in case of private lands and the Gram Panchayat / concerned Dept. in case of government lands. Preference should be given to uncultivated fallow land / government land during site selection; 2. The camp site shall be identified and located not less than 500 meters from the local habitation / village. As the state is densely populated, it is expected that habitations are relatively close to each other. In such case, suitable site may be selected taking into account the local land availability conditions. 3. In case, no government land / fallow and unutilised govt. land is available and where use of private land is the only alternative, necessary arrangements should be worked out with the private owner of the land for setting up of facilities during the construction. The arrangement should have both facility creation and site restoration (pre-construction stage) component. 4. The contractor shall obtain documents highlighting arrangements made with the private land owner / local GP / concerned Govt. Dept. for land use for construction, i.e., (1) Written No-objection certificate; (2) Extent of land required and duration of the agreement; (3) Photograph of the site in original condition; (4) Details of site redevelopment after completion. 5. A detailed layout plan should be prepared for the development of construction camp, indicating the various structures to be constructed including the temporary structures to be put up, site roads,	Contractor	DPMU	1. The suitable sites shall be selected and finalized in consultation with the Sr. Environmental and Social cum gender safeguard specialist of the SPMU. 2. Verification of finalised site by the Jr. Environmental and Social cum gender safeguard specialist of the DPMU and approval for site camp construction. 3. Arrangements will be verified by the Sr. Environmental and Social cum gender safeguard specialist of the SPMU to avoid future conflict. 4. The agreement, layout plan and site restoration plan documents shall be submitted to the Jr. Environmental and Social cum gender safeguard specialist of the DPMU for verification by the Sr. Environmental and Social cum gender safeguard specialist of the SPMU 5. The plan shall be finalized or approved by the respective APD at SPMU.

Activity	Responsibility		Monitoring and Supervision
	Primary	Secondary	
drainage, lighting and other facilities etc. and should be submitted to the DPMU. 6. A site restoration plan should also be prepared detailing the measures for restoration of the campsite after the completion of the construction works. 7. It should be ensured that there is no use of hazardous construction materials such as Asbestos Containing Materials (ACM) in the construction of the camp. 8. Provision of free of cost temporary living in the camp site for all the workers employed by contractor for the total work period.			
***Facilities*:** 1. The camp should have adequate space for accommodating the workers. In case of women workers and families, the accommodation units should provide adequate privacy. 2. The camp should have all common minimum required facilities like ventilation, bed / bed roll for the workers, electricity supply, water supply, kitchen, separate toilet and bathrooms for ladies and gents, etc. 3. Identification of potable drinking water source/s and seeking permission from local authority / GP for accessing the source. In case, potable drinking water source is not available in the vicinity, provision of water filter should be made in the camps to make water potable. 4. Storage of drinking water should be made in cleaned / hygienic containers and should be placed at a distance of not less than 15m from any wastewater / sewage drain, toilet or other source of pollution.	Contractor	DPMU	Periodic verification of facilities by the Sr. Environmental safeguard specialist of the SPMU.
Hygiene and Sanitation: 1. Suitable washing facility for clothes and utensils at the camp level, with mechanism for proper draining and disposal of waste water. 2. Separate bathing facility for male and female workers in conveniently accessible locations and shall be kept in clean and hygienic conditions. 3. Sanitary arrangements, latrines and urinals in every work place. The type of latrine chosen must be culturally appropriate / acceptable. The latrines must be suitable for use in shallow groundwater / flood prone areas. 4. Separate toilet facility for male and female works with proper sign board in language that are understood by the workers along with picture. 5. For 15-20 female and male workers, separate toilet provision should be made. 6. The latrines and urinals shall be adequately lighted and hygienic condition shall be maintained (proper cleaning and sanitisation).	Contractor	DPMU	Supervision by Sr. Environmental safeguard specialist of the SPMU from time to time and submission of camp / site specific report to respective APD of SPMU.

Activity	Responsibility		Monitoring and Supervision
	Primary	Secondary	
7. Water shall be provided in or near the latrines and urinals (piped water or by storing water in drums).			
Arrangements for Waste Disposal: 1. Disposal of sanitary wastes and excreta shall be into septic tanks. Dry sanitation (toilet) facility shall be provided at flood prone area. 2. Kitchen wastes (excluding solid waste) shall be disposed into soak pits. Wastewater from campsites will be discharged and disposed in a kitchen soak pit located at least 15 meters away from any waterbody. 3. Capacity of the pit should be at least 1.3 times the maximum volume of wastewater discharged per day. 4. The bottom of the soak pit should be filled with coarse gravel and the sides shored up with board, etc. to prevent erosion and collapse of the soak pit. 5. Solid wastes generated in the construction site shall be reused if recyclable or disposed-off in land fill sites approved by local authority.	Contractor	DPMU	Supervision by Jr. Environmental safeguard specialist of the DPMU from time to time and submission of camp / site specific report to Sr. Environmental safeguard specialist of the SPMU.
Health Care Management: 1. Availability of first aid box / facilities with all recommended medicines / non-consumables in each construction site. 2. An educated person in the camp site should be oriented on administering first aid treatment and the box should be placed under his/her command. 3. Arrangement should be made by which she/he would be available at the time of requirement. 4. In case of any eventuality which demand hospitalisation, transport facility should be provided using available project vehicle or immediate transportation through ambulance service to nearby health facility. 5. Periodic visit by a qualified medical doctor (PHC/CHC/SDH etc.) to the campsite for health check-up of workers, at least once in 15 days. A register of all health problems must be maintained by the doctor and available at the campsite. 6. Provision of health insurance of all workers for stipulated period of their engagement in construction sites.	Contractor	DPMU	Periodic supervision of health care measures like first-aid box, regular site visits by a qualified medical doctor, register of health problems, etc., by the Jr. Environmental safeguard expert at DPMU. Copy of health insurance certificate available with DPMU.
Storage Facility: 1. Storage site within the camp should be at a minimum distance of 30 meter from the living area of the workers. 2. Liquids like oil / fuel / lubricants etc. should be stored at a height from the ground level for which a brick-based platform with sand flooring should be prepared to avoid soil and water contamination due to spillage. 3. Similarly, cement can be stored at a height from the ground level in a damp-proof area.	Contractor	DPMU	Periodic supervision by the Sr. Environmental safeguard specialist at SPMU

Activity	Responsibility		Monitoring and Supervision
	Primary	Secondary	
Other Safety and Security Measures 1. Provision of fire extinguishers / Fire-fighting arrangements at the camps. Each area shall be earmarked based on fire zone category (Fire zone-1, 2 & 3). Arrangement shall be available at each facility like living area, material storage area, hazardous building. At least one fire lift and water storage tank shall also be provided at each camp site. 2. Display of fire station number in prominent place for easy visibility. 3. In case the campsite has a common kitchen facility, it must be ensured that the common kitchen (and any other kitchens in the campsite) is located at least 20 m away from the living area. Only LPG stoves are to be used. Use of fuelwood stoves shall not be permitted for use in camp site. 4. Provision of identity cards to labourers and residents of construction camps.	Contractor	DPMU	Verification of installation of fire-fighting instruments in the camp/s and periodic supervision by the Sr. Environmental safeguard expert at SPMU.
Construction Phase			
1. Construction camps shall be maintained free from litter and in hygienic condition. 2. It should be kept free from spillage of oil, grease or bitumen. 3. Any spillage should be cleaned immediately to avoid pollution of soil, water stored or adjacent water bodies. 4. Precautions need to be taken in construction camps are like (1) no leaching of oil and grease into water bodies or water sources, including canals take place; (2) non-disposal of wastewater into water bodies; (3) collection and appropriate disposal of solid wastes on regular basis; (4) hygienic condition of the toilet, its regular maintenance and keeping it clean and (5) availability of first-aid care provision in the camp, (6) display of emergency numbers (fire, police, ambulance, medical hospital etc,) in a common place visible to others.	Contractor	DPMU	Verification of construction sites from time to time by the Jr. Environmental safeguard expert at DPMU and submission of verification report to Sr. Environmental Expert at SPMU for necessary action.
Post-Construction Phase			
1. At the completion of construction, all construction camp facilities shall be dismantled and removed from the site. 2. The site shall be restored to a condition in no way inferior to the condition prior to commencement of the works. 3. Various activities to be carried out for site restoration are like (1) cleaning / removal of oil and fuel contaminated soil and its disposal in approved waste disposal areas. (2) construction campsite shall be grassed and planted with trees as per the restoration design; (3) Sealing / filling up of soak pits and septic tanks; (4) disconnection of electricity supply; (5) disposal of all garbage in the disposal site only (site approved by local authority).	Contractor	DPMU	The restored site shall be inspected by the Sr. Environmental safeguard expert at SPMU and verified as per the initial restoration plan. DPMU should issue a clearance certificate before final settlement of claims.

6.5 Waste Management Plan

Management of the following types of waste generated from the construction activity is a key aspect of the ESMF:

- General construction and demolition waste
- Waste from desiltation and desiltation

For each construction activity, prior to the bidding process, the ESIA consultant is required to prepare a Waste Management Plan.

For each construction contract, within 30 days of the appointed date, the contractor is required prepare and submit a Waste Management Plan to Sr. Environmental Expert at SPMU level (as one activity maybe may be packaged as one or as multiple contracts). The Contractor's obligation for proper waste management must be included in contract document.

These plans spell out specific measures that will be undertaken to segregate, store and appropriately dispose wastes generated from the proposed construction activities.

The key elements that will enable the preparation of the Waste Management Plan are:

- Guidelines for Waste Management (presented in section 6.5.1)
- Sample Waste Management Plan (presented in section 6.5.2)

6.5.1 Guidelines for Waste Management

6.5.1.1 Guidelines for Construction and Demolition Waste Management

- Contractor shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorised processing facilities.
- Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains.
- Contractor (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall prepare and submit comprehensive waste management plan for waste generated within their jurisdiction and get appropriate approvals from the local authority (UDD in the State Government) before starting construction or demolition or remodeling work,
- Contractor shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar, keep the concerned authorities informed regarding the relevant activities from the planning stage to the implementation stage and this should be on project to project basis.
- Contractor shall ensure that other waste (such as solid waste) does not get mixed with this C&D waste and is stored and disposed separately.
- Contractor shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C & D Waste.
- Contractor shall remove all construction and demolition waste in consultation with the concerned local authority (UDD in the State Government) on their own or through any agency.
- Contractor shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;

6.5.1.2 Guideline for Hazardous Waste Management

- Contractor shall follow following steps for management of hazardous and other wastes
  (a) prevention; (b) minimization; (c) reuse (only non-hazardous waste) and (d) safe disposal.
- The contractor shall implement safe and environmentally sound management practice for handling of hazardous and other wastes.
- The hazardous and other wastes generated at any of project site shall be sent or sold to an authorised actual user or shall be disposed of in an authorised disposal facility.
- The hazardous and other wastes shall be transported from an project site to an authorised actual user or to an authorised disposal facility in accordance with the provisions of Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2015.
- To prevent accidents and limit their consequences on human beings and the environment, contractor shall consider all the safeguard aspects, provide appropriate training, equipment and necessary information to the persons involved in managing hazardous and other wastes to ensure their safety.
- Contractor shall obtain Consent to Establish (CtE), Consent to Operate (CtO) and Authorization letter from WBPCB for handling and management of hazardous and other wastes
- Handling and management of any hazardous and other wastes by contractor (implementing project activities) shall be limited to collection, storage, packaging, transportation, offering for sale, transfer activities. Treatment, processing, use, destruction, recycling, recovery, pre-processing, co-processing, utilisation, disposal of the hazardous wastes shall not be permitted to the contractor implementing project activities. However, contractor may reuse and dispose only construction and demolition waste, other non-hazardous waste.
- Contractor shall maintain a maintain records of hazardous and other wastes generation, reuse (only non-hazardous waste), sale and dispose. Record book (in a passbook issued by the State Pollution Control Board) shall contain name and address of purchaser, area of dispose with date wise quantity.
- The contractor shall not store any kind of hazardous and other wastes for more than ninety days and shall maintain a record of sale, transfer, storage, reuse (only non-hazardous waste) and disposed quantity.
- Contractor shall ensure proper packaging and leveling (as per Form 8) of all hazardous and other wastes in a manner suitable for safe handling, storage and transport. The label shall be of non-washable material, weather proof and easily visible.
- The contractor shall provide the transporter with the relevant information in Form 9**,** regarding the hazardous nature of the wastes and measures to be taken in case of an emergency.
- In case of transportation of hazardous and other waste for final disposal to a facility existing in a State other than the State where the waste is generated, the contractor shall obtain 'No Objection Certificate' from the State Pollution Control Board of both the States.
- In case of transportation of hazardous and other waste, the responsibility of safe transport shall be either of the sender (contractor) or the receiver whosoever arranges the transport. This responsibility should be clearly indicated in the manifest.
- The authorisation for transport from the concerned State Pollution Control Board shall be obtained either by the sender (contractor) or the receiver on whose behalf the transport is being arranged.
- Where an accident occurs at the facility of the contractor handling hazardous or other wastes or during transportation, the contractor shall immediately intimate the State Pollution Control Board through telephone, e-mail about the accident and subsequently send a report in Form 11.
- The contractor and receiver of the disposal facility shall be liable for all damages caused to the environment or third party due to improper handling and management of the hazardous and other waste.

6.5.1.3 Guidelines for Desiltation Waste Management

Sediment Management:

The project intends to minimize siltation in the river by adopting desiltation method for desilting. Desiltation involves the removal of deposits and their conveyance to some other point, while water storage is being maintained. While desiltation, suitable measures would be taken to prevent deposition of the desilted silt in the natural channel where it is discharged. The following basic principles should be followed for silt management.

Sediment management is made a part of the overall environment management plan of the project with exclusive focus on its disposal.
Justification for removal or disturbance of silt must be evidence based by specific location. Where justified, silt management actions must follow best practice to minimize damage to the environment/river morphology. Annual silt requirement for different users may be estimated and critically aggrading river reaches and their sections in the vicinity may be analysed in their physical mode for supplementing. The same can be clubbed with silt removal as is given above wherever possible.

Before taking any desiltation/desiltation work, the following guidelines should be followed:

A study should be conducted of the river reach selected for desiltation/ desiltation along with study of historical behavior of the river.

Desiltation for desilting may be adopted when no other suitable and sustainable alternative is available.

The study should also cover sediment flux studies and morphological studies to confirm no significant adverse effect on downstream or upstream reach of the river including the safety and effectiveness of river crossings, water intakes, existing river bank / flood protection measures etc. Post desiltation, sediment flux studies should also be carried out to quantify the amount of silt likely to be deposited in future.

Negative impact on ecology and environment due to desilting may also be studied and should be invariably made part of DPR.

The quantity of sediments to be removed from rivers is usually very high. Since it is very difficult to find lands for silt disposal, therefore it should be ensured that all silt removed from river should be utilized in some works.

The desiltation work should also contain environmentally acceptable, practically possible silt disposal plan. River gravels/sands/silts could be used gainfully in construction works, including housing, roads, embankment and reclamation works.

Under no circumstances, disposal should create any contamination of water bodies, harmful to the flora and fauna existing adjacent to the disposal sites or disposed material should come back into the river again.

Desilted material should not be used for filling up of wetlands and water bodies, as these are important for recharging the ground water and providing base flow in rivers during lean season.

The modus operandi for silt disposal should be finalized before carrying out desiltation. The methodology to be adopted should be clearly laid down before starting the desiltation work.

Quantity of desiltation/ desiltation:
The quantities of silt removed from the river shall be limited to the extent to which it does not harm the ecology of river or gainfully utilized in developmental works, whichever is less. Exploitable quantities should be determined "a-priori" and the reach should be monitored for excessive exploitative practices. Also, the safety

and stability of the structures around such sites should also be monitored for adverse conditions. Quantities approved can be reduced/ increased depending on the concurrent observations.

To safeguard the structural integrity (different structures like barrage or a weir), desiltation activity upstream of structure will not be allowed within approximately 200 m.

Desiltation downstream of the structures will not be allowed within a distance of 800 m. Maximum volume of extraction on downstream shall be decided by proper monitoring so that it will not have any effect on the integrity of the structure.

No desiltation will be allowed within 150 m distance from the intake structures for safeguarding structural integrity. However, desiltation may be allowed if the water flow to the intake structures has been obstructed by excessive sedimentation. The desiltation activity shall be restricted so that the water level reduction will not lead to functional difficulties in diverting water in to the intakes.

No desiltation will be allowed within 150 m of any bridge crossing to safeguard the structural integrity of the bridge. This shall not be applied where water way has been obstructed by excessive sediment deposit and is causing flooding of upstream reaches.

No desiltation will be allowed at least within 100 to 150 m. of any pipelines that is buried below the river bed. Additional restrictions may be required for any pipeline located on or above the river bed. Such restrictions could be developed on a case by case basis;

No desiltation will be allowed within 60 m of the most upstream and downstream point of the bank stabilization structure;

No desiltation will be allowed at least within 50 m of the support structure for high tension lines passing over the river. Restrictions regarding other manmade structures, identified during the implementation stage, may be determined on a case to case basis.

Natural rock or hard deposits located in the riverbed may act as riverbed controls and/or may increase aquatic habitat diversity. Care should be taken during desiltation not to dislodge such hard deposits and restrictions concerning natural rock deposits will have to be dealt case by case basis.

Desiltation close to riverbanks have a high potential to adversely impact the stability of those banks, especially when desiltation occurs near the outside of sharp river bends. Bank erosion induced by such desiltation can result in the loss of land, damages to man-made structures, and adverse impact to environmental resources. Therefore, no desiltation will be allowed within a minimum of 60 m of the most upstream and downstream point of such banks.

6.5.2 Sample Waste Management Plan

This section provides a generic waste management plan which may be used as a reference by the ESIA consultant to prepare an activity specific plan and by the contractor to prepare a contract specific plan. In addition to the details presented in Table 76, the plans must provide basic information including: inventory of wastes to be generated (types, description and quantities), location and layout of the waste segregation and temporary storage area, test report of desilted sediment/silt samples, etc.

Table 75: Waste Management Plan

Activity	Site Responsibility	Monitoring Responsibility
Project Planning and Design Stage		
1. Preparation of guidelines for locating waste disposal sites for toxic and non-toxic wastes; 2. Identify existing landfill sites, if available, for disposal of toxic materials; 1. In case no existence of landfill sites in the district, identification of landfill site located in nearby district by DPMU	Jr. Environmental Expert at DPMU (in consultation with APD)	Sr. Environmental Expert at SPMU
2. Site specific plan should be prepared based on guideline provided at section 6.6.1- to minimise waste generation, its possible reuse, recycling and disposal; 3. Identify the type of wastes as well as sources of waste during construction and suggest options for possible reuse; 4. Obtaining required site-specific clearances from appropriate authorities. 5. Waste disposal plan should be a part of the bid document as special condition of contract which should be abided by the contractor.	Contractor	Sr. Environmental and Social safeguard specialist at the DPMU level
Pre-Construction Stage		
1. Identify the activities during construction, that have the potential to generate waste and work out measures for the same in the construction schedule to be submitted to the DPMU; 2. Identifying the location for disposal of non-toxic wastes in consultation with the local GP / dept. authorities. Priority should be given to existing waste disposal sites, if available. 3. The contractor shall implement safe and environmentally sound management practice for handling of hazardous and other wastes. 4. The hazardous and other wastes generated at any of project site shall be sent or sold to an authorised actual user or shall be disposed of in an authorised disposal facility. 5. Disposal of any toxic materials shall be in nearby existing landfill sites located at P. S. -Sutahata Dist- Purba Midnapore, Haldia- 721 635 (W.B.) [12] complying with Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2015. 6. Obtaining No-objection Certificate (NOC) from the land owner / community prior to disposal of construction and demolition wastes in the private / community land; 7. Orientation of workers, supervisors and other persons associated with construction work on waste management principles, waste disposal mechanism, safety and security measures during waste disposal, management of disposal sites etc.	Contractor	Arrangements will be verified by the Sr. Environmental Safeguard Specialist at DPMU level.
Construction & Post Construction Phase		
1. Either reuse, recycle or dispose the waste generated during construction depending upon the nature of waste; 2. The reuse of waste shall be carried out by the contractor only after carrying out the specific tests and ascertaining the quality of the	Contractor	The waste management practices adopted by the Contractor, including the management of

[12] Source: http://cpcbenvis.nic.in/tsdf.html#

Activity	Site Responsibility	Monitoring Responsibility
waste materials used and getting the same approved by the West Bengal Pollution Control Board (WBPCB); 3. The contractor shall adopt required precautions while reusing wastes for construction; 4. In case of filling of low-lying areas with the generated construction wastes, it needs to be ensured that the level of filling site matches with the surrounding areas; 5. In cases where low lying area is used for filling with the generated non-toxic wastes, care should be taken that these low-lying areas are not part of water bodies;		wastes at construction camps shall be reviewed Jr. Environmental Safeguard specialist at DPMU level. He/she should submit periodic report to the SPMU on the progress and status of waste management as per the approved plan.
Post Construction Phase		
1. Hand over the site after cleaning and clearing the site of all debris/wastes to the designated authority at the DPMU level and obtaining the handover certificate; 2. In case of disposal of wastes on private land, certificate of Completion of Reclamation is to be obtained by the Contractor from the landowner that the land is restored to his satisfaction. 3. Suitable species may be planted in the waste disposal site.	Contractor	Handover certificate and completion certificate should be placed before DPMU for settlement of dues.

Chapter 7: Social Management Framework (SMF)

Social Management Framework (SMF) will help to identify and address the potential social concerns or impacts of a project throughout the project cycle. The objective of SMF is to help project in taking informed decisions and mainstream social concerns in the project design.

7.1 Need for Social Management Framework

Since feasibility report is under preparation, the exact nature and scale of impacts will be known later. Therefore, a Social Management Framework (SMF) has been prepared to 'guide' the planning and design elements of the project components. The framework will help in integrating and harmonizing the social management principles at the various stages of project preparation and execution.

This SMF forms part of the comprehensive social management approach that has been adopted for addressing the potential social impacts of the project. This SMF defines (a) the approach for identifying the social issues associated with the project, (b) the requirements for conducting social screening and social assessment studies, and (c) measures to prevent, mitigate and manage adverse impacts and enhance positive ones. This SMF includes a simplified screening checklist, which will be used to determine the degree of social assessment. Based on screening results, Social Impact Assessment (SIA) will be carried out and Resettlement Action Plan (RAP) and Tribal Peoples Development Plan (TPDP) for specific initiatives will be prepared if required. This SMF includes a resettlement policy framework describing mechanisms for addressing the possible loss of land, livelihood, sources of livelihood, temporary disruption of services and income, and temporary restrictions on access to facilities while the construction work is ongoing in the project area. The SMF includes guidance on preparing of tribal people development plan, gender action plan; consultation mechanism; capacity building measures and a monitoring mechanism.

7.2 Objectives of Social Management Framework

The SMF seeks to:

- Establish clear procedures and methodologies for screening, reviewing and managing social issues.
- Consolidate and facilitate understanding of all essential policies and regulations of the GoI; GoWB as well as the World Bank's social safeguards regime that are applicable to the Project
- Provide guidance on preparing mitigation plans for adverse impacts and implementation of the environmental and social management measures.
- Specify institutional arrangements, including appropriate roles and responsibilities for managing, reporting and monitoring social concerns.
- Provide a framework for consultation and information disclosure.
- Determine the other institutional requirements, including those related to training and capacity building, needed to successfully implement the provisions of the SMF.

The application and implementation of the SMF therefore, will:

- Support the integration of social aspects into the decision-making process at all stages related to planning and design by identifying, avoiding and/or minimizing adverse social impacts early-on in the project cycle.
- Enhance the positive/sustainable social outcomes through improved/appropriate planning, design and implementation.
- Build the capacity of IWD to take-up and coordinate responsibilities related to the application and implementation of the SMF, including preparation of Social Assessment and Management Plans.
- Provide guidelines and procedures for further consultations during project implementation.

- Provide a systematic guidance to address potential risks and to enhance quality, targeting, and benefits to the neighboring communities.
- Ensure that stakeholders, irrespective of whether they benefit from or are adversely affected by the project interventions, are well informed and are able participate in the decision-making process.
- Support compliance with applicable legal/regulatory requirements of GOI and state government; as well as with the requirements set forth in the relevant Bank policies.
- Minimize adverse impacts on cultural property and other common property resources.

This social management framework includes (i) Resettlement Policy Framework; (ii) Indigenous Peoples Planning Framework (IPPF); (iii) Gender Assessment and Development Framework (GAD); and (iv) Consultation framework.

7.3 Social Assessment Process

The SA begins with the screening and identification of social issues and stakeholders and communities, including socially and economically disadvantaged communities, for each project activity. The SA focuses on (i) Identification of key social issues associated with the proposed project activities and specify the social development outcomes; and (ii) prepare based on available data the profile of the population and available infrastructure facilities for services (disaggregated by gender, ethnicity, vulnerable groups, socially and economically backward communities, youth and aged, economic aspects, etc.) in the project affected area.

7.4 Potential Impact of Project Activities

The activities under the project are unlikely to involve any need for land acquisition as the rehabilitation and modernization of irrigation and drainage systems will take place on infrastructures already exists. However, there could be temporary relocation of residences / business establishments on the existing embankments. In case of such exigencies, the SMF will be applied and implemented. Possible impacts of the project can be categorized in three broad groups, i.e., (1) loss of immovable assets i.e. agricultural land, homestead land, cattle sheds, trees, community infrastructure etc.; (2) loss of livelihood or income opportunity on account of loss of business establishments; and agricultural land; and (3) impact on the community in terms of loss of common property resources or access to such resources, such as grazing land, other land used by commons etc. The impacts can be either temporary (for the duration of construction activities) or permanent.

7.4.1 Screening and Survey of Affected Households and Assets

During the project preparation, alternative designs will be examined to avoid / minimize land taking and other assets and to reduce adverse socio-economic impacts. All components of the projects shall be screened for their likely adverse impacts in the planning stage. Screening process to be adopted during the planning stage to assess the adverse impacts including land taking. Where land taking is must, a census will be carried out to assess affected assets and affected households.

Screening is the first step in the SMF process. The purpose of screening is to get an overview of the nature, scale and magnitude of the issues in order to determine the need for conducting Social Impact Assessment (SIA) and preparing Resettlement Action Plan (RAP) and / or Tribal People Development Plan (TPDP). Once issues are identified, the applicability of the Bank's environment and social safeguard policies will be established along with Government of India's and state government's regulatory requirements. Based on this, boundaries and focus areas for the SIA along with the use of specific instruments will be determined.

The outcome of the screening process will help prioritize the social mitigation process in a timely manner. This will also assist in sequencing /phasing of project intervention sites in overall project implementation. This shall help ensure that no project activity is delayed merely due to social issues. The social screening checklist is given below:

Table 76: Social screening checklist

S. No.	Screening Criteria	Assessment of Category (High/ low)	Remarks /Explanatory note for categorization
1	Is the project in an eco-sensitive area or adjoining an eco-sensitive area? (Yes/No) If Yes, which is the area? Elaborate impact accordingly.		
2	Will the project create significant/ limited/ no social impacts?		
a	Land acquisition resulting in loss of income from agricultural land, plantation or other existing land-use.		
b	Land acquisition resulting in relocation of households.		
c	Any reduction of access to traditional and river dependent communities (to river and areas where they earn for their primary or substantial livelihood).		
d	Any displacement or adverse impact on tribal settlement(s).		
e	Any specific gender issues.		
3	Will the project create significant / limited / no Social impacts during the construction stage?		
a	Flooding of adjacent areas		
b	Improper storage and handling of substances leading to contamination of soil and water		
c	Elevated noise and dust emission.		
d	Disruption to traffic movements		
e	Damage to existing infrastructure, public utilities, amenities; common properties; etc.		
f	Failure to restore temporary construction sites		
g	Possible conflicts with and/or disruption to local community		

7.4.2 Establishing Impacts

Having identified the potential impacts, action plans to mitigate the impacts will be prepared. This will require social impact assessment. The Project Authority will undertake a survey for identification of the persons and their families likely to be affected by the project. Every survey shall contain the following municipality / ward or village-wise information of, the project affected families:

- Members of families who are residing, practicing cultivation, any trade, or any other vocation in the project affected area;
- Project Affected Families who are likely to lose their house, commercial establishment, agricultural land, employment or are alienated wholly or substantially from the main source of their trade occupation or vocation or losing any other immovable property.
- Agricultural labourers and non-agriculture labourers.
- Losing access to private property or common property resources
- Loss of common property resources

The project on completion of the survey will disseminate the survey results among the affected community. Based on the social impact assessment survey, will prepare an action plan to mitigate or minimize the adverse impacts as identified during the survey. The draft mitigation plan in form of resettlement action plan (RAP) will be again disseminated among the affected individuals / community. The feedback received from the affected groups will be incorporated to the extent possible before finalization of the RAP.

7.5 Stakeholder's Consultations

Stakeholder consultations are integral to development projects and need to be carried out all through the project life. These are an effective way to communicate about the priorities for both the project and the stakeholders should be used extensively as the project progresses. These consultations can provide insights that may elude designers and help unravel inexplicable responses to proposals effectively. Ensuring an open and transparent information exchange right from start is a key ingredient of successful project implementation. Recognizing this, IWD has begun consultations right from the start of the project.

Consultations with stakeholders across the spectrum are needed early and continuously in the project. The identified stakeholders include project affected people-with an emphasis on disadvantaged groups, youth, local NGOs, private sectors, local leaders, officials from other state government departments. Some sites may have special groups that may need to be sensitively handled like Scheduled Tribes and Castes. Project should be geared up to carry out consultations from the Identification stage, through project planning and design, as well as during implementation.

At the identification stage of the project activities, the general public in the area would be informed regarding the project activity specific possible interventions and feedback would be sought on the overall picture.

Second round would start once iteration has happened with design response to the first round of inputs from stakeholders. There should be clarity regarding what is accepted, what is not accepted for consideration for integration with project design. There should be clear and convincing reasons for each choice made to maintain the integrity and sanctity of the process and to nurture trust among the stakeholders.

These consultations would:

- Make project aware of community needs and preferences,
- Identify what design work best and have minimum adverse impact on the stakeholder resources;
- Identify mitigation measures for adverse impacts and enhancement of positive impacts informing the selection of the measures in the ESMP
- Identify any opportunities to involve local stakeholders in subsequent project activities, including providing feedback
- Disseminate information regarding avenues available for redressing grievances, including those about environmental quality.

7.6 Resettlement Policy Framework

A Resettlement Policy Framework (RPF) is required when the extent of resettlement cannot be known at appraisal stage. This framework provides for any situation that may arise where need for temporary or permanent land acquisition or resettlement and rehabilitation is inevitable. Resettlement and compensation activities should be conceived and executed in a sustainable manner. The RPF is intended for use as a practical tool, to guide the preparation of the Resettlement Action Plan (RAP) depending upon the scale and severity of impacts.

The objective of the RPF is to ensure that the Project Affected Persons (PAPs) get compensation for their loss, are offered resettlement measures, and are supported in improving or at least restoring their levels of living and income after the project impact to pre-project levels. The RPF is intended to safeguard the interests of the population impacted by the project, especially the poor and vulnerable. The RPF is based on applicable Policies of State government (**GITANJALI Scheme**) and World Bank.

Both the RFCTLARR Act 2013 and the World Bank Operation Policy on involuntary resettlement aim to ensure that involuntary resettlement should be avoided or minimized, wherever feasible, exploring all viable alternative project designs, and where displacement is unavoidable, people losing assets, livelihood or other resources shall be assisted in improving or at a minimum regaining their former status of living at no cost to themselves.

Also, World Bank safeguards policy requires consultation with PAPs during planning and implementation of resettlement action plan and tribal development plan and public disclosure of drafts. Once the draft is prepared it is to be made available at a place accessible to, and in a form, manner and language understandable to the displaced or affected people and local NGOs. Based on the detailed comparative analysis of RFCTLARR Act 2013 and the World Bank Operation Policy on involuntary resettlement, **key differences** identified and addressed under the Resettlement Policy Framework (RPF) are listed in the table below:

Table 77: Gap in RFCTLAR&R Act 2013 and the World Bank policy on involuntary resettlement

Sr. No.	Topics/Issues/ Areas	World Bank OP4.12	RFCTLAR&R	Measures taken to address in ESMF
1	Application of LA	Direct economic and social impacts that both result from Bank-assisted investment projects. Applies to all components of the project that result in involuntary resettlement, regardless of the source of financing.	***Section 2*** Applicable to projects where government acquires land for its own use, hold and control, including PSU and for public purpose; for PPP where ownership of land continues to vest with govt; private companies where 80% of **land owners** [13] have given consent or 70% in case of PPP.	
	Principle of avoidance	Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project design	Alternatives to be considered as Act in chapter II, point # 4 (d) says "extent of land proposed for acquisition is the absolute bare minimum needed for the project; and (e) says land acquisition at an alternate place has been considered and found not feasible.	In line with bank OP 4.12
	Linkages with other projects	OP 4.12 applies to all components of the project that result in involuntary resettlement, regardless of the source of financing. It also applies to other activities resulting in involuntary resettlement, that in the judgment of the Bank, are(a) directly and significantly related to the Bank-assisted project,(b) necessary to achieve its objectives as set forth in the project documents; and(c) carried out, or planned to be carried out, contemporaneously with the project.	No such provision	The ESMF will be applicable for all components of the project that or any linked project necessary to achieve its objective.
2.	Application of R&R	Same as above	In addition to the above, ***Section 2(3)*** land purchased by private company as prescribed by Govt. or when part acquired by govt	Provision of OP 4.12 to apply.
3.	Affected area	Involuntary take of land resulting in loss of shelter, loss of assets or access to assets, loss of income sources or means of livelihood	***Section3(b)***: Area notified for 'acquisition'	Provisions of OP 4.12 will be applicable

[13] Land Owner – whose land and immovable property acquired and land assigned by state or central govt under any scheme (Section 3 c (i) and (v))

Sr. No.	Topics/Issues/ Areas	World Bank OP4.12	RFCTLAR&R	Measures taken to address in ESMF
4.	Family	All adversely affected people whether have formal legal rights or do not have formal legal rights on land	***Section 3(m)*** includes person, his and her spouse, minor children, minor brothers and sisters dependent. Widows, divorcees, abandoned women will be considered as separate family.	The definition of family given in RFCTLAR&R Act 2013 will be followed for both titleholders and non titleholders.
5.	Affected family for eligibility		***Section 3 (a)***: whose land and other immovable property acquired. ***(b)&(e)***: Family residing in affected area such as labourers, tenants, dependent on forest and water bodies, etc whose primary source of livelihood is affected due to acquisition ***(c)***Scheduled tribes and other forest dwellers whose rights recognized under the Forest Dwellers Act 2006. ***(f)*** Family assigned land by state or central government under any schemes ***(g)*** Family residing on any land in urban area that will be acquired or primary source of livelihood affected by acquisition.	
6.	Cut-Off date	Date established by the borrower and acceptable to the Bank. It is the date of census.	***Section 3 c (ii), (iv) (vi)***: Families residing for preceding 3 yrs or more prior to "acquisition of land".	Provisions of OP 4.12 will be followed as RFCTLAR&R Act has no such provision for people living on public land. Moreover, RFCTLAR&R Act requires proof of residing in the project area at least three years prior to initial notice on LA.
7.	Non-application of Chapter II	Stand-alone SIA for all investments	***Section 6(2):*** Irrigation projects where EIA is required under other laws, provisions of SIA not applicable.	Provision of OP 4.12 will be followed.
7.	Consultation – Phase I during preparation	Consultation a continuous process during planning and implementation	***Section 4(1)*** date issued for *first consultation* with PRIs, Urban local bodies, Municipalities, etc to carry out SIA. ***Section 5***: Public hearing of SIA in affected area. Provide adequate publicity of date and time.	Provisions of OP 4.12 will be followed. The draft and final SIA will be disclosed in public as per the provision given in RFCTLAR&R Act, 2013.
8.	Time duration to prepare SIA and SIMP	Draft Social Assessment, Resettlement Action Plan and or Social Management Framework prepared before appraisal.	***Section 4 (2)***: ***within six months*** from the date of its commencement.	No gap found. RFCTLAR&R Act specifies a timeframe which is followed by the client.
9.	Disclosure – Stage I	To be disclosed before appraisal.	***Section 6(1)***: Translated in local language available in PRI institutions	No gap found.

Sr. No.	Topics/Issues/ Areas	World Bank OP4.12	RFCTLAR&R	Measures taken to address in ESMF
			and local urban government bodies; district administrative offices and websites of concerned government agency.	
10.	Formation of Expert Group to appraise SIA and SIMP	Appraised by Bank staff	***Section 7(1):*** Constitute a multi-disciplinary Expert Group include members of decentralized govt Institutes (PRIs, ULBs).	No gaps found.
11.	Time stipulated for Group to submit its report	Before the decision meeting for appraisal	***Section 7(4):*** Submit its report ***within two months from the date of its constitution***	No gaps found.
12.	Scope of work of the Expert group	Social Assessment, resettlement action Plan reviewed and appraised by Bank staff and approved by Regional safeguard advisor	***Section 7 (4) (a&b)***: assess whether it serves any public purpose or not; if social costs outweigh potential benefits then should be abandoned; ***Section 7 (5) (a&b)***: if serves public purpose, then it has considered minimum land acquisition, and alternate options to minimize displacement; potential benefits outweigh social costs	No gap found.
13.	Consultation – Phase II during appraisal	In practice consultation workshops are organized in project affected areas at district and state level.	***Section 2 (2):*** Prior consent of 80% and 70% of land owners in PPP and where private company has approached the govt to acquire balance land has been obtained,	No gap found.
14.	Disclosure – Stage II	Information dissemination through the planning and implementation	Section 7 (6): recommendations of expert group under 7(4&5) to be made public in local language in district and block administrative office and PRIs	No gap found.
15.	Minimize impact on multi-crop land	Select feasible design that has minimal adverse impact.	***Section 10:*** In case multi-crop land is to be acquired under exceptional circumstances, the area to be acquired cannot exceed aggregate of land of all projects in district or state. The area to be acquired cannot exceed the total net sown area of the district or state. Wasteland equivalent to twice the area acquired will be developed.	No gap found.
16.	Information dissemination of preliminary notice	Continuous part of the preparation and participation	***Section 11 (1), (2) & (3)***: Notice published in local language and meetings called of gram sabhas, municipalities to provide full information about the purpose of the project, summary of SIA and particulars of administrator appointed for R&R' summary of R&R scheme	No gap found.
17.	Updating land records	To be part of RAP	***Section 11 (5)***: Once established that the land is required for public purpose, accordingly notice to be issued ***under section 19 following which land***	No gap found.

Sr. No.	Topics/Issues/ Areas	World Bank OP4.12	RFCTLAR&R	Measures taken to address in ESMF
			records to be updated within two months	
18.	Census and preparation of R&R schemes	To be part of RAP including both titleholders and non-titleholders	***Section 16 (1) (2)***: carry out census of affected people and their assets to be affected, livelihood loss and common property to be affected; R&R scheme including time line for implementation.	RFCTLAR&R Act takes only titleholders into account. Provision of OP 4.12 to be followed.
19.	Information dissemination and Public hearing - Stage III	Consultation throughout the process is mandatory	***Section 16(4) & (5)***: mandatory to disseminate information on R&R scheme including resettlement area and organize public hearing on the Draft R&R scheme in each Gram Sabha, Municipality and consultations in Scheduled area as required under PESA.	Provisions of OP 4.12 to be followed.
20.	Approval of R&R Scheme	As part of RAP prior to appraisal	***Section 17 & 18***: Draft R&R Scheme to be finalized after addressing objections raised during public hearing and approved.	No gap found
21.	Final declaration of R&R Scheme	Approved RAP including budgetary provisions to implement it	***Section 19 (2)***: Only after the requiring body has deposited the money will the govt issue the notice along with **19(1)**.	No gap found.
22.	Time period stipulated.	Included in RAP - Time line synchronized with Government's procedures or adopts innovative methods to reduce the time which is based operated on the principles of participation and transparency.	***Section 19 (2):*** the entire process to update land records, disseminate information, preliminary survey, census, hearing of objections, preparation of R&R schemes and approval, deposit of money must ***complete within 12 months*** from the date on which section 11, the preliminary notice issued. ***Section 19 (7)***: If the final declaration not made within 12 months of section 11 (1), the process will lapse, except under special circumstances.	No gap found.
23.	Preparation of land acquisition plans	Included in RAP.	***Section 20:*** Land marked, measured for preparation of acquisition plans.	No gap found.
24.	Hearing of claims		***Section 21(1) (2)***: Notices issued indicating govt's intension to take possession of land and claims on compensation and R&R can be ***made not less than one month and not more than six months*** from the date of issue of section 21(1).	
25.	Time period stipulated for declaring the award		***Section 25:*** It is required to announce the award ***within 12months of issue of Section 19 (final declaration to acquire land, approved R&R scheme)*** after completing land acquisition plans, hearing of objection, settling individual claims for declaration of the award. If	

Sr. No.	Topics/Issues/ Areas	World Bank OP4.12	RFCTLAR&R	Measures taken to address in ESMF
			award not made within the stipulated time, the entire proceedings will lapse.	
26.	LA Act 1984 deem to lapse and RFCTLAR &R is applicable		***Section 24***: where award is not declared under section 11, or where made five years ago but land not taken in possession or where award declared but money not deposited in the account of majority of beneficiary.	No gap found.
27.	Methodology for determining market value for land	Full replacement Cost	***Section 26 and First Schedule:*** Recognizes 3 methods and whichever is higher will be considered which will be multiplied by a factor given in Schedule First; compensation given earlier will not be considered; if rates not available floor price can be set; steps to be taken to update the market value.	No gap found.
28.	Valuation of structures	Full Replacement cost	***Section 29 (1)*** without deducting the depreciated value.	Provisions of OP 4.12
29.	Solatium and interest		***Section 30(1)*** 100% of the compensation amount ***Section 30(3)***: 12% per annum on the market rate from the date of notification of SIA to the date of ward or land taken over	No gap found.
30.	R&R Award	Total cost included in RAP to resettle and rehabilitate the affected persons and assist in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher	***Section 31, Second Schedule***: A family as a unit will receive R&R grant over and above the compensation and those who are not entitled to compensation. ***Second Schedule:*** Homeless entitled to constructed house, land for land in irrigation projects in lieu of compensation, in case of acquisition for urbanization 20% of developed land reserved for owners at a price equal to compensation' jobs or onetime payment or annuity for 20 years' subsistence grant, transportation, land and house registered on joint name husband and wife, etc	No gap found
31	Transparency		***Section 37(1):*** Information of each individual family including loss, compensation awarded, etc will be available on the website.	No gap found.
38.	Possession of land	Taking of land and related assets may take place only after compensation has been paid and, where applicable, resettlement sites and moving allowances have been provided to the displaced persons.	***Section 38(1)***: Land will be taken over by the government within three months of compensation and 6 months of R&R benefits disbursed; infrastructure facilities at resettlement sites will be completed within 18 months from the date of award made under section 30 for compensation; in case of irrigation and hydel projects R&R completed six months prior to submergence.	No gap found.

Sr. No.	Topics/Issues/ Areas	World Bank OP4.12	RFCTLAR&R	Measures taken to address in ESMF
39.	Multiple displacement		***Section 39:*** Additional compensation equivalent to compensation determined will be paid to displaced	No gap found.
31.	Acquisition for emergency purpose	Not permeable in bank funded projects	***Section 40 (5)***: 75% additional compensation will be paid over and above the compensation amount	Provisions of OP 4.12 will be followed.
32.	Prior consent before acquisition and alienation	Mandatory to carry out Free, Prior, Informed Consultation with Indigenous people.	***Section 41(3)*** Mandatory to get consent from Gram Sabha, Panchayat, Autonomous Councils in Scheduled areas.	No gap found.
33.	Development plans for SC and ST	Indigenous Peoples' Development plan required along with RAP. Land for land for is an option across all sectors.	***Section 41:*** Separate development plans to be prepared, settle land rights before acquisition; provision of for alternate fuel fodder, non-timber produce on forest land to be developed within 5 years; 1/3rd compensation amount to be paid as first instalment and rest at the time of taking possession; ST to be resettled within Scheduled area; land free of cost for community purpose; land alienation will be null and void and ST and SC considered for R&R benefits; fishing rights restored in irrigation and hydel projects; if wish to settle outside the district additional benefits to be provided in monetary terms; all rights enjoyed under other laws will continue. ***Second Schedule***: additional provisions for SC&ST for land for land in irrigation projects, additional sum over and above the subsistence grant,	No gap found.
34.	Institutional arrangement	Institutional arrangement must be agreed upon and included in RAP, IPDP.	***Section 43-45:*** Appointment of administrator, R&R Commissioner, when more than 100 acres of land is to be acquired, R&R Committee will be formed at project level, social audit to be carried out by Gram Sabha and Municipalities.	No gap found.
35.	Change of land use	Compensation and R&R assistance should be disbursed before taking physical possession of land.	***Section 46(4):*** Land will not be transferred to the requisitioning authority till R&R is not complied with in full	No gap found.
36	Monitoring and Evaluation	Indicators and monitoring system included in RAP and IPDP	***Section 48-50:*** Set up National and State level Monitoring Committee to review and monitor progress	No gap found
37.	Authority to settle claims		***Section 51-74:*** The Authority will be set up settle any legal disputes that arise from acquisition and R&R, the aggrieved party can move to the high court thereafter.	No gap found

Sr. No.	Topics/Issues/ Areas	World Bank OP4.12	RFCTLAR&R	Measures taken to address in ESMF
38.	Exempt from tax and fee	Project to bear all taxes and other expenses if new assets are purchased by the PAP	***Section 96:*** Compensation and agreements will not be liable to tax	No gap found
39.	No change in status of land acquired		***Section 99***: Once the land is acquired for a particular purpose, its purpose cannot be changed	No gap found
40.	Return of unutilized land		***Section 101:*** If the acquired land remains unutilized for 5 years, then it will be returned to original owner, heir or included in land bank	No gap found
41.	Distribution of increased value of land transferred		***Section102***: 40% of appreciated value of acquired land will be distributed to owners provided no development has taken place.	No gap found

7.6.1 Broad Principles

The Policy aims to resettle and rehabilitate the affected persons on account of its sub projects in a manner that they do not suffer from adverse impacts and shall improve or at the minimum retain their previous standard of living, earning capacity and production levels. It is also the endeavor of the project that the resettlement shall minimize dependency and be sustainable socially, economically and institutionally. Special attention will be paid for the improvement of living standards of marginalized and vulnerable groups.

This policy recognizes that involuntary resettlement dismantles a previous production System and a way of life, all such rehabilitation programs will adopt a developmental approach rather than the welfare approach. These guidelines detail out the assistance in re-establishing the homes and livelihoods of the Project Affected People (PAP) during the course of projects.

1) All information related to resettlement preparation and implementation will be disclosed to all concerned, and community participation will be ensured in planning and implementation.
2) The principles of mutual consent and negotiated settlement will also be used for land acquisition as required.
3) The persons affected by the project who does not own land or other properties but who have economic interest or lose their livelihoods will be assisted as per the broad principles brought out in this policy.
4) Before taking possession of the acquired lands and properties, compensation and R&R assistance will be made to those who are available and willing to receive the entitlements in accordance with this policy.
5) There would be no/or minimum adverse social, economic and environmental effects of displacement on the host communities but if needed specific measures would be provided.
6) Broad entitlement framework of different categories of project-affected people has been assessed and is given in the entitlement matrix. Provision will be kept in the budget. However, anyone moving into the project area after the cut-off date will not be entitled to assistance.
7) Three tier appropriate grievance redress mechanism has been established at project level to ensure speedy resolution of disputes.
8) All activities related to resettlement planning, implementation, and monitoring would ensure involvement of women. Efforts will also be made to ensure that vulnerable groups are included.
9) All consultations with PAPs shall be documented. Consultations will continue during the implementation of resettlement and rehabilitation works.
10) As required, a Resettlement Action Plan will be prepared including a fully itemized budget and an implementation schedule.

The broad principles of the Resettlement and Rehabilitation (R&R) policy are as given below;

1. All negative impacts including displacement should be avoided or minimized wherever feasible by exploring all viable alternative project designs.
2. Where negative impacts are unavoidable, efforts should be made either to improve the standard of living of the affected persons or at least assist them in restoring their previous standard of living at no cost to them.
3. Ensure people's participation during the course of the project cycle.
4. Effort should be made towards the enhancement of the positive impact of the projects.

The project will broadly have three impacts that require mitigation measures. These are:

1. Loss of immovable assets viz., land, house, commercial establishments wells, ponds etc.
2. Loss of livelihood or income opportunities viz, for agriculture labours, helping hands in commercial establishments etc.
3. Impact on the community in terms of loss of common property resources.

The first two categories represent direct impacts on an identified population. The people likely to be affected will be surveyed and registered, and project monitoring and evaluation will compare long term impacts against baseline socio economic data.

The third category represents a group impact, where gains and losses of a group-oriented nature are not quantifiable in terms of impact on the individual. Mitigation and support mechanism will be collectively oriented, and the monitoring will focus on impact on such groups.

The provisions of Rights to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 and in case the State Government has specific policies for mutual consent and negotiated settlement, the provisions of such policy could be used subject to their adherence to the provisions are within the broad framework of the Act and the World Bank Safeguard Policies.

1. Support will be extended under the broad principles of this policy to meet the replacement value of the assets and loss of livelihood.
2. The policy further recognizes extension of support to non-titleholders for the loss of livelihood and replacement value for assets other than land.
3. The common property resources will be replaced as far as feasible and if not, then assistance will be provided at replacement value to the group.

The implementation of solar projects would involve transportation of equipment during the installation phase and all efforts will be made during implementation to minimize any disturbance in the daily activities of the local people.

Before taking possession of the acquired lands and properties, all compensation, resettlement and rehabilitation would be made in accordance with this policy.

In case of displacement, resettlement sites will be developed as part of the project. In such circumstances care should be taken so that there is no/or minimum adverse social, economic and environmental effects of displacement on the host communities and specific measures would be provided in the Resettlement and Rehabilitation Action Plan (RAP) to mitigate any such impacts.

Before taking possession of acquired land, sufficient time would be provided to harvest the crop.
The implementation of the R&R Action Plan will be synchronized with the execution of works under the project.

The project will ensure that no civil works are initiated before compensation and assistance to affected population has been provided in accordance with this policy.

7.6.2 Definitions

The following definitions are used in the documents:

Cut-off Date: In the cases of land acquisition affecting legal titleholders, the cut-off date would be the date of issuing the publication of preliminary notification u/s 11(I) of RFCTLAR Act, 2013 & for the Non-Titleholders cutoff date would be the date of Census Survey.

Project Affected Person: Person who is affected in respect of his/her land including homestead land and structure thereon, trade and occupation due to construction of the project.

Project Displaced Person: A displaced person is a person who is compelled to change his/her place of residence and/or work place or place of business, due to the project.

Projected Affected Family: Family includes a person, his or her spouse, minor children, minor brothers and minor sister's dependent on him. Provided that widows, divorcees and women deserted by families shall be considered separate families;

Explanation - An adult of either gender with or without spouse or children or dependents shall be considered as a separate family for the purpose of this Act.

Land Owner: Land owner includes any person - whose name is recorded as the owner of the land or building or part thereof, in the records of the authority concerned; or Any person who is granted forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 or under any other law for the time being in force; or Who is entitled to be granted Patta rights on the land under any law of the State including assigned lands; or any person who has been declared as such by an order of the court or Authority.

Marginal Farmers: Marginal farmer means a cultivator with an un-irrigated land holding up to one hectare or irrigated land holding up to one half hectare, or as may be defined by the concerned state government.
Small Farmer: Small farmer means a cultivator with an un-irrigated land holding up to two hectares or irrigated land holding up to one hectare, but more than the holding of a marginal farmer, or as may be defined by the concerned state government.

Encroacher: A person who has trespassed Government/ private/community Land, adjacent to his or her land or asset to which he/she is not entitled and who derives his/her livelihood and housing there from prior to the cutoff date.

Squatter: A squatter is a person who has settled on publicly owned land for housing or livelihood without permission or who has been occupying publicly owned building without authority prior to the cutoff date.
Landless/Agriculture Labour: A person who does not hold any agriculture land and has been deriving his main income by working on the lands of others as sub-tenant or as an agriculture labour prior to the cut-off date.

Below Poverty Line: A household, whose annual income from all sources is less than the designed sum as fixed by the planning commission of India, will be considered to be below poverty line (BPL).
Vulnerable Person: The Vulnerable group may include but not be limited to the following:
Those people falling under Below Poverty line category/ vulnerable community as defined by the central government.

1. Member of Scheduled caste/tribe community/other backward community.
2. Women Headed households.
3. Senior citizen-person above the age of 60 years.

4. Landless
5. Village artisan

7.6.3 Resettlement Action Plan (RAP)

In case the project requires involves land acquisition against compensation or loss of livelihood or shelter, the project shall ensure that a satisfactory RAP has been prepared under the ESA study and shared with the affected person and the local community. The contractor shall not start the works until compensation and assistance has been made available in accordance with the framework.

RAP document provides a link between the impacts identified and proposed mitigation measures to realize the objectives of involuntary resettlement. The RAPs will consider magnitude of impacts and accordingly prepare a resettlement plan that is consistent with this framework for Bank approval before the project activities are accepted for Bank financing.

I. In case project affects more than 200 people due to involuntary land taking and/or physical relocation and where a full Resettlement Action Plan (RAP) must be produced and in case affected persons are less than 200 people, project will require an abbreviated RP (Resettlement Plan).
II. The above plans will be prepared as soon as component wise project activities are finalized, prior to Bank's approval of corresponding civil works bid document.
III. Projects that are not expected to have any land acquisition or any other significant adverse social impacts; on the contrary, significant positive social impact and improved livelihoods are exempted from such interventions.

Every- Resettlement Action Plan (RAP) prepared shall contain the following particulars.

- **Baseline:**
  - Village-wise or municipality-wise list of project affected families and likely number of displaced persons by impact category.
  - Family-wise and the extent and nature of land and immovable property in their possession indicating the survey numbers thereof held by such persons in the affected zone.
  - Socio-economic survey of affected people including income/asset survey of PAPs.
  - Information on vulnerable groups or persons for whom special provisions may have to be made

- **Impact:**
  1. The extent of area to be acquired for the project, the name(s) of the corresponding village(s) and the method employed for acquiring land with the relevant documentation.
  2. Adverse impact on common property resources including cultural properties
  3. Impact on host community due to labour influx
  4. Any indirect impact

- **Quantification of impacts in terms of number of**
  a. agricultural labourers in such area and the names of such persons whose livelihood depend on agricultural land to be acquired;
  b. persons who have lost or are likely to lose their employment or livelihood or who have been alienated wholly and substantially from their main sources of occupation or vocation consequent to the acquisition of land and / or structure for the project;
  c. occupiers on the government land, if any;
  d. number of public utilities,government buildings, cultural properties which are likely to be affected.

- **Mitigation Measures and Entitlements:**
  a. Comprehensive list of benefits and packages which are to be provided to project affected families by impact category.
  b. Measures to address impact on host community due to influx of migrant labour.

c. Gender Action Plan

- **Relocation:**
  a. Details of the extent of land available which may be acquired in settlement area for resettling and allotting of land to the project affected families.
  b. Details of the basic amenities and infrastructure facilities which are-to be provided for resettlement.

- **Consultation Results and incorporation of community suggestions / feedback in project design**

- **Implementation Arrangements**
  a. Institutional mechanism for RAP implementation.
  b. Consultation strategy; a disclosure plan and a capacity building plan
  c. Grievance redressal mechanism
  d. The time schedule for shifting and resettling the displaced families in resettlement zones.

- **Monitoring and Evaluation**
  - Mechanism for internal monitoring
  - Mechanism for external evaluation
  - Indicators for monitoring and evaluation; and

- **Budget**

The RAP will be developed based on the Right to Fair Compensation and transparency in land Acquisition, Rehabilitation and Resettlement Act, 2013; Memorandum of Government of West Bengal as per its Gazette notification for direct purchase of land; and World Bank Operational Policy 4.12 on involuntary resettlement.

7.6.4 R &R Benefits for Project Affected Families

The resettlement and rehabilitation (R&R) benefits shall be extended to all the Project Affected Families (PAF) whether belonging to below poverty line (BPL) or non-BPL. The details are to be provided in the entitlement matrix (presented below). Contractor will ensure that access to residences or business or agricultural land is not blocked during construction or subsequently. The easement rights for the villagers shall be ensured while planning the layouts for the solar parks. The NGO responsible for RAP implementation and M&E consultants will bring it to the notice of project authorities if contractor fails to do so.

For tribal the following provisions will be adhered to:

1. Each Project Affected Family of ST category shall be given preference in allotment of land.
2. Tribal PAFs will be re-settled close to their natural habitat in a compact block so that they can retain their ethnic/linguistic and cultural identity
3. The Tribal Land Alienated in violation of the laws and regulations in force on the subject would be treated as null and void and-the R&R benefits would be available only to the original tribal land owner.

Table 78: Entitlement Matrix

S. No.	Application	Definition of Entitled Unit	Entitlement	Details
A. Loss of Private Agricultural, Home-Stead & Commercial Land				
1	Land for the Project	Titleholder family. and families with traditional land Right	Compensation at Market value, Resettlement and Rehabilitation	a) Land for land, if available. Or, Cash compensation for the land at replacement value, which will be determined as provided under section 26 of RFCTLARR Act 2013. b) The land if allotted will be in the name of both husband and wife. c) If post-acquisition, residual land is economically unviable, the land owner will have the choice of either retaining or sell off rest of the land. d) Refund of stamp duty and registration charges incurred for replacement land to be paid by the project; replacement land must be bought within a year from the date of payment of compensation to project affected persons. e) Subsistence allowance of Rs. 36000 as one-time grant f) One-time grant of Rs. 500,000 or annuity g) Compensation at market value for loss of crops if any
	Residual land	Titleholder family and families with traditional land Right	Compensation at replacement value, Resettlement and Rehabilitation	In case residual land is found to be economically unviable, PAPs have the choice of: a) selling off the residual land at the market value to the project b) take 25% of the compensation value and retain the land parcel.
B. Loss of Private Structures (Residential/Commercial)				
2	Loss of Structure	Title Holder/ Owner	Compensation at Market value, Resettlement & Rehabilitation Assistance	a) Cash compensation for the structure at Market value which would be determined as per as per section 29 of the RFCTLARR Act 2013. House under Indira AwasYojana in rural area or Rs 50000 in lieu off and house under RAY in urban area or Rs 100,000 in lieu off. The house if allotted will be in the name of both husband and wife. b) Right to salvage material from the demolished structures. c) Three months' notice to vacate structures. d) Refund of stamp duty and registration charges for purchase of new alternative houses/shops at prevailing rates on the market value as determined in (a) above. Alternative houses/shops must be bought within a year from the date of payment of compensation. e) In case of partially affected structures and the remaining structure remains viable, additional10% to restore the structure. In case of partially affected structures and the remaining structure becomes unviable additional 25% of compensation amount as severance allowance. f) Subsistence allowance equivalent to Rs. 36000 as one-time grant. g) Each affected family getting displaced shall get a one-time financial assistance of Rs 50,000 as shifting allowance. h) Each affected family that is displaced and has cattle, shall get financial assistance of Rs 25,000/- for construction of cattle shed. i) One-time grant of Rs. 50,000 as resettlement assistance

S. No.	Application	Definition of Entitled Unit	Entitlement	Details
				j) Each affected person who is a rural artisan, small trader or self-employed person and who has been displaced (in this project owner of any residential-cum commercial structure) shall get a one-time financial assistance of Rs 25,000/-for construction of working shed or shop. k) One-time grant of Rs. 500,000
3	Structure	Tenants/ Lease Holders	Resettlement & Rehabilitation Assistance	a) Registered lessees will be entitled to an apportionment of the compensation payable to structure owner in case the lessee has erected any art of1 the structure as per applicable local laws. b) In case of tenants, three months written notice will be provided along with Rs 50,000 towards shifting allowance.
C. Loss of Trees and Crops				
4	Standing Trees, Crops	Owners and beneficiaries (Registered/ Un-registered tenants, contract cultivators, leaseholders & sharecroppers	Compensation at market value	a) Three months advance notice to project affected persons to harvest fruits, standing crops and removal of trees. b) Compensation to be paid at the rate estimated by: i) The Forest Department for timber trees ii) The State Agriculture Extension Department for crops iii) The Horticulture Department for fruit/flower bearing trees. c) Registered tenants, contract cultivators & leaseholders & sharecroppers will be eligible for compensation for trees and crops as per the agreement document between the owner and the beneficiaries. d) Un-registered tenants, contract cultivators, leaseholders & sharecroppers will be eligible for compensation for trees and crops as per mutual understanding between the owner and the beneficiaries.
D. Loss of Residential/ Commercial Structures to Non-Titled Holders				
5	Structures on Government land	Owners of Structures or Occupants of structures identified as per Project Census Survey	Resettlement & Rehabilitation Assistance	a) Non-vulnerable encroachers shall be given three months' notice to vacate occupied land b) Vulnerable encroachers will be provided cash assistance at replacement cost for loss of structures as described in section 29 of the RFCTLARR Act 2013. c) Any encroacher identified as non-vulnerable but losing more than 25% of structure used will be paid cash assistance at replacement cost for loss of structures. The amount will be determined as per section 29 of the RFCTLARR Act 2013. d) All squatters to be paid cash assistance for their structures at replacement costs which will be determined as mentioned in section 29 of the RFCTLARR Act 2013. e) All squatters (other than kiosks) will be eligible for one-time grant of Rs 36000 as subsistence allowance. f) All squatters other than Kiosks will be given shifting allowance of Rs 50,000 per family as one-time grant for a permanent structure and Rs. 30,000 for a semi-permanent structure and Rs. 10,000 for a temporary structure. g) Each affected person who is a rural artisan, small trader or self-employed person assistance' of Rs 25,000/- for construction of working shed or shop.

S. No.	Application	Definition of Entitled Unit	Entitlement	Details
				h) In case of Kiosks, only Rs. 5000 will be paid as one-time grant.
E. Loss of Livelihood				
6	Families living within the project area	Title Holders/ Non-Title holders/ sharecroppers, agricultural labourers and employees	Resettlement & Rehabilitation Assistance	a) Subsistence allowance of Rs. 36,000 as one-time grant. (PAPs covered under 1(f), 2 (f) and 5 (e) above would not be eligible for this assistance). b) Training Assistance of Rs 10,000/- for income generation per family. c) Temporary employment in the project construction work to project affected persons with particular attention to vulnerable groups by the project contractor during construction, to the extent possible and preference in the employment of semi-skilled and unskilled jobs in the project with adequate training for the job.
F. Additional Support to Vulnerable Families				
7	Families within project area	As per definition of vulnerable	Resettlement & Rehabilitation Assistance	One-time additional financial assistance of Rs. 50,000. Squatters and encroachers already covered under clause 5 are not eligible for this assistance.
G. Loss of Community Infrastructure/Common Property Resources				
8	Structures & other resources (e.g. land, water, access to structures etc.) within the project area	Affected communities and groups	Reconstruction of community structure and common property resources	Reconstruction of community structure and Common property resources in consultation with the community.
H. Temporary Impact During Construction				
9	Land & assets temporarily impacted during construction	Owners of land & Assets	Compensation for temporary impact during construction e.g. damage to adjacent parcel of land / assets due to movement of vehicles for transportation of equipment's, machinery and construction activities for infrastructure development.	Compensation to be paid by the contractor for loss of assets, crops and any other damage as per prior agreement between the 'Contractor' and the 'Affected Party'.
I.	**Resettlement Site**			
10	Loss of residential structures	Displaced titleholders and non-titleholders	Provision of resettlement site/ vendor market	Resettlement sites will be developed as part of the project, if a minimum of 25 project displaced families opt for assisted resettlement. Vulnerable PAPs will be given preference in allotment of plots/flats at the resettlement site. Plot size will be equivalent to size lost subject to a maximum

S. No.	Application	Definition of Entitled Unit	Entitlement	Details
				of provision given in RFCTLARR Act 2013. Basic facilities shall be provided by the project at resettlement site as per the provisions given in the Third Schedule of RFCTLARR Act 2013. Similarly, if at least 25 displaced commercial establishments (small business enterprises) opt for shopping units, the Project Authority will develop the vendor market at suitable location in the nearby area in consultation with displaced persons. Basic facilities such as approach road, electricity connection, water and sanitation facility, will be provided in the vendor market by the project. Vulnerable PAPs will be given preference in allotment, of shops in vendor market. One displaced family will be eligible for only one land plot at resettlement site or shop in the vendor market.
J.	**Land on lease**			
11	Titleholders	Land Owners/ Titleholders	Annual Lease rental for use of land	a) Annual Lease Rent as per pre-agreed rate with the land owners giving consent for sparing their land for the project b) Provisions regarding the increase in lease rent on predetermined rates and timeframe c) Provisions related to loss of structure/ trees/ crops as per the provisions of Clause 2 and 4 respectively
12	Agricultural Labour	Non-Title holders/ sharecroppers, agricultural labourers and employees		As per Clause 6 above

7.6.5 Disclosure

Disclosure of information including RAP, should take place in the affected area. The detailed process and feedback of all public disclosure meeting would be recorded. There should be *sua sponte* disclosure of information related to RAP and its implementation progress and solutions against the received grievances.

Chapter 8: Strategy and Plan for Promotion of Integrated Pest and Nutrition Management

The project interventions on improved irrigation may lead to agricultural intensification and associated use of agro-chemicals such as pesticides and fertilizers. Therefore, the ESMF of the project includes a strategy to introduce Integrated Pest and Nutrient Management (IPNM) to the farmers in the project area. The project will support IPNM as the key strategy to enable farmers to combat pests, diseases and nutrient deficiencies. Effective implementation of IPNM practices will reduce the risk of water pollution through leaching of chemicals from farmlands to water sources, both surface and sub-surface.

8.1 Objectives of IPNM

IPNM seeks to promote and support safe, effective and environmentally sound pest and nutrient management.

The specific objectives relating to pest management are the following:

1. Minimize crop loss, augment farm production with scientific application of synthetic pesticides;
2. Reduce environmental pollution caused due to the application of synthetic pesticides;
3. Introduction and adoption of biological and cultural methods for managing pests below the Economic Threshold Level (ETL);
4. Reduction in health hazards arising due to chemical pesticides during handling;
5. Minimizing pesticide residues through the application of appropriate doses;
6. Promotion of bio pesticides.

The specific objectives relating to nutrient management are the following:

1. Improving and sustaining soil fertility and land productivity;
2. Reducing environmental degradation due to overuse of synthetic fertilizers;
3. Addressing nutrient deficiencies identified through systematic soil testing;
4. Introduction and adoption of organic methods for meeting plant nutrition needs.

8.2 Salient Features of the Project Approach

1. Popularizing IPNM approach among the farming community through awareness, training and exposure;
2. To play a catalytic role in transfer of innovative IPNM skills/methods/techniques to farmers through extension services;
3. Human Resource Development in IPNM by imparting training on IPNM to training of individual service providers, irrigation operators and farmers.

8.3 Major Activities under IPNM Promotion

Table 79: IPM Strategy and Key Activities

Key Activities	Execution Strategy	Responsibility
Training of individual service providers and irrigation operators on IPNM.	Orientation training by crop type	DPMU with technical support from Department of Agriculture
Training of Farmers on IPNM through trained individual service providers and irrigation operators	Crop specific orientation on IPM in phased manner	
Developing IEC materials	IEC materials on crop specific IPNM in local language with visual display	

8.4 Capacity Building on IPNM

The project will adopt a cascading approach for the capacity building of farmers where resource persons will be developed through Training of Trainers (TOT) programme. The ground force available for irrigation management, specifically the individual service providers and the irrigation operator staff, will be trained on IPNM initiatives. They will provide support to farmers on IPNM in consultation with the local agriculture officer.

For capacity building, a need assessment related to IPNM will be done with the stakeholders, including mapping of current practices. Based on the findings of Training Need Assessment (TNA), relevant training modules and IEC materials will be developed covering crop specific IPNM practices (crops grown in different agricultural seasons). Trainings will be organized before the on-set of agricultural seasons, i.e., at least 30-45 days before sowing / planting. It will help the farmers to get acquainted with the IPNM and its adoption during actual cropping period. Hand holding support will be rendered to the farmers through the individual service providers and irrigation operators during different stages of crop growth. The capacity building activities plan is presented in the table 81.

Table 80: Capacity Building Activities and Follow-Up

Capacity Building	Location in the DV Command (Command Villages)						
	Preparatory Stage	Pre-Kharif	Kharif	Pre-Rabi	Rabi	Pre-Boro	Boro
A. Preparatory Phase							
Assessment of Training Needs							
Preparation of Training Content							
Designing Training Modules / IEC Materials							
Piloting of the Training Materials							
Finalising Training Window / Session Plan							
Coordinate with Irrigation Operators and Individual service Providers							
B. Organisation Phase							
Training of Irrigation Operators and Individual service Providers							
Training of farmers							
C. Follow Up Phase							
Monitoring							
Field Guidance							

8.5 Monitoring of IPNM

Key monitoring indicators covering the capacity building efforts on IPNM will be assessed periodically as part of internal monitoring and periodic monitoring by third party.

Table 81: Monitoring of IPNM Promotion

Sl. No.	Activity	Monitoring Areas	Monitoring Indicators	Responsibility	Time Frame
1	Development of IPNM learning materials and its distribution to farmers / farmer's organisations	Learning materials cover crop specific IPNM practices	No. and type of learning materials developed	SPMU	6 months from project inception
		Distribution of learning materials to individual service providers, irrigation operators and farmers	No. of farmers provided with IPNM related learning materials	SPMU, DPMU	1 month from printing of documents
2	Training and awareness creation	Training of individual service providers, irrigation operators and farmers on IPNM	No. of farmers of different holding categories trained on IPNM No. of individual service providers trained on IPNM No. of women farmers / tenants trained on IPNM	SPMU, DPMU	Annually throughout project duration

8.6 Details on Integrated Pest Management Practices

The Integrated Pest Management (IPM) Practices that will feed into the capacity building program on IPNM are detailed in this section.

8.6.1 Monitoring Pest Populations

Field monitoring helps to keep track of the pests and their potential damage, which forms the base of IPM. So, the process starts with monitoring, which includes inspection and identification, followed by the establishment of Economic Threshold Level (ETL) (crop specific). This provides knowledge about the current pests and crop situation and is helpful in selecting the best possible combinations of the pest management methods. Identification of minor and major pests, diseases in the project areas will be conducted regularly for the purpose. Package of practices developed by the State Agriculture Universities can be adopted accordingly. Based on the findings, an Insect Scouting Chart (ISC) should be prepared as given in the table.

Table 82: Insect Scouting Chart

SN	Insect / Pest	June	July	Aug.	Sept.	Oct.	Nov	Dec.	Jan
1									
2									
3									
4									
5									
6									
7									

8.6.2 Selection of IPM Methods Based on Assessment of Economic Threshold Level

The ETL differs by pest and also by crop types. Pest population is expected to be maintained at levels below those causing economic loss. It is generally assumed that pest tolerant capacity of different crops is limited

and when it exceeds or approaching the ETL, chemical control methods can be used. Different pest / disease control methods of IPM will be applied, based on the determination of ETL and pest density.

A priority list of different control methods of IPM is presented below.

Table 83: Adoption of IPM Methods and its Priority

IPM Procedures	Methods of Executing	Priority in Application
Cultural	Avoidance of monoculture Improved disease resistant varieties. Summer ploughing. Optimum plant densities. Avoiding excessive irrigation. Avoiding high nitrogenous fertilization. Trap crops	To be given preference as preventive mechanism
Biological	Conservation / promotion of bio agents like birds, parasites & pathogens for biological control of pests.	Second Priority
Mechanical	Damage/Destroying all the eggs of the insect; Destroy any material infested by insect, pest and diseases.	Third Priority
Chemical	Chemical Control when the loss is beyond ETL Use of recommended chemicals only	Last Priority when crop loss is beyond ETL

8.6.3 Criteria for Pesticide Selection and Use

The criteria to be followed for the selection and use of pesticides are (1) they must have negligible adverse human health effects, (2) they must be shown to be effective against the target species and (3) they must have minimal effect on non-target species and the natural environment. Secondly, the pesticides banned by Govt. of India should be avoided in the selection and use along with pesticides listed by WHO under Ia, Ib and II.

8.6.4 Pesticide Storage, Handling and Disposal

8.6.4.1 Precautionary Measures

When administering the pesticides, general precautions to be taken are as follows. Farmers will be educated / aware of taking required protective measures during administering pesticides.

Using Personal Protective Equipment: Personal protective equipment will prevent pesticides from coming in contact with the body or clothing. These also protect the eyes and prevent the inhalation of toxic chemicals. Personal safety gear includes clothing that covers the arms, legs, nose, and head. Farmers will be educated to wear gloves and boots to protect the hand and feet, and hats, helmets, goggles, and face masks to protect the hair, eyes, and nose. Respirators are used to avoid breathing dust, mist or vapour.

Body Wear: Body wear made of cotton are the best but should not be worn without additional protective clothing. When there is a chance of contacting wet spray, large sleeves with cuff-buttons, and pants with buttons at the bottom offer good protection. Aprons: Waterproof rubber or plastic aprons are effective. They should be long enough to protect the general clothing.

Head protection: Dust and mist settle easily on hair. Hats that are water resistant, wide brimmed with sweatbands are effective in protecting it. Many helmets provide attachments for face shields and goggles.

Eye Galss / Goggles: Farmers will be educated / oriented to protect their eyes from splashes, spills, mist, and droplets by using glasses / goggles. Goggles with plain lenses and full side shields are preferable. The lenses may become coated with pesticide droplets during spraying; hence cleaning tissues or an extra pair of goggles are a must.

Face shield: A face shield is a transparent acetate or acrylic sheet which covers the face and prevents it from splashes or dust. Face shields allow better air circulation and provide a greater range of vision than goggles

Hand and feet protection Gloves: Dermal exposure occurs the most in the hand region. The use of gloves reduces this risk. Gloves should be up to 2 to 3" long below the elbow i.e., they should extend to the mid forearm. Waterproof gloves, such as those made of rubber, latex or PVC are preferable. After use, they should be discarded away from ponds, wells, and animals or even incinerated.

Footwear: Shoes made of rubber or synthetic materials like PVC and nitrite can be used to prevent dermal exposure of feet. Protective footwear should be calf-high and worn with the legs of the protective pants on the outside to prevent spray from getting in. Leather or fabric shoes should never be worn as they absorb pesticides. Shoes should be checked for any leakage or damage before use.

Respiratory equipment: A respirator is a device that offers protection to the lungs and respiratory tract. Different kinds of respiratory equipment are used based on the type and toxicity of pesticides. They include nose filters/disposable masks, cartridge respirators, canister-type respirators/gas masks, positive pressure breathing apparatus, self-contained breathing apparatus, and powered air cartridge respirator.

Safety in Application of Pesticides: Misuse of pesticides can be extremely dangerous. Apart from polluting the environment, they may prove fatal to human beings, animals, birds, and fish. Phytotoxicity often results when used in excess in plants. Judicious use, and careful and safe handling may prevent hazards. Safe handling of pesticides involves their proper selection and careful handling during mixing and application.

Safety during Application:

This reduces risk and prevents pollution. It also ensures safety to animals, which may be nearby. The following precautions may be taken while applying pesticides.

1. Wearing protective body cover / personal protective equipment (PPE) by the operator (hand gloves, mask like air purifying / air supplied etc.);
2. Spraying should be done in the windward direction, taking care to see that there are no animals, people, or animal feed nearby;
3. Applying correct dosage and avoiding use of higher dosages than recommended;
4. Checking the sprayer and spraying equipment for leaks before use, using properly maintained and functioning equipment.
5. While applying pesticide, restraining from taking food items, drink or smoke;
6. Do not blow, suck or apply the mouth to any sprayer nozzle or other spraying equipment.
7. Washing hands, face and other body parts with soap after spraying;
8. Wash overalls and other protective clothing at the end of every working day in soap and water and keep them separate from the rest of the family's clothes.
9. In case if any part of the body is exposed and come in contact with the pesticide, it should be washed-off immediately;
10. Change clothes immediately after spray and cleaning body properly.
11. Visit to doctor in case of feeling unwell.

8.6.4.2 Storage

Precautions to be taken in storing the pesticides are (1) keeping the place of storing of pesticides away from human and animals, (2) keeping away from water sources, (3) keeping at a height which should be out of reach of children, (4) keeping away from exposure to sunlight and moisture, (5) well ventilated place of storing, (6) well stacking to avoid of spillage, (7) away from food / consumable items / must not be soted with food items, and (8) the place of storage should be out of reach of children.

8.6.4.3 Transportation

Pesticides should be transported (1) in well-sealed and labelled containers, (2) should be transported separately, i.e. not with any other consumable items, cloths, drugs etc., (3) proper stacking to prevent leakage, (4) display of warning notice on the vehicle transporting pesticides, if transported in bulk with regular checking during transportation.

8.6.4.4 Disposal System

1. At the end of the day's work, the inside of the spray pump should be washed and any residual pesticides should be flushed out;
2. The rinsing water should be collected and carefully contained in clearly marked drums with a tightly fitted lid. This should be used to dilute the next day's tank loads or disposed properly at disposal sites like pits or digs;
3. Pouring the remaining pesticides into surface water sources like stream, nala, rivers, wells or any drinking-water sources is strictly prohibited;
4. Decontaminate containers where possible. For glass, plastic or metal containers this can be achieved by triple rinsing, i.e. part-filling the empty container with water three times and emptying into a bucket or sprayer for the next application;
5. All empty packaging should be kept away from common approach space and should be returned to the designated organisation / individual for safe disposal. Re-use of empty insecticide containers will be prohibited. The used packages shall not be left outside to prevent their re-use. Used packages shall be broken and buried away from habitation.
6. While purchasing, date of manufacture and date of expiry will be reviewed, as per the print;
7. In case the stock remained unutilised and crossed the date of expiry, it should be returned to the supplier.

Table 84: Safety Precautions in different stages of application of Pesticides

SN	Particulars	Safety Measures
1	Purchase	1. Always purchase only required quantity of pesticides and avoid bulk purchase; 2. Purchase as per the prescription of experts from Ag. Dept. / KVKs etc.; 3. Never purchase loose or unsealed containers. Purchase pesticides before the expiry date ends; 4. Don't purchase pesticides without proper label.
2	Storage	1. Avoid storage of pesticides in house premises or near grain storage; 2. Never keep any pesticide near food; 3. Keep all pesticides away from reach of children and livestock; 4. Don't expose them to sunlight for longer period; 5. Keep all pesticides in original container in intact seal;
3	Handling	Never transport any pesticides along with food material.
4	While preparing solution	1. Always use clean water; 2. Always protect your nose, eyes, mouth, ears and hands with clothes; 3. Use hand gloves; 4. Don't eat, drink, smoke or chew while filling the spray tank; 5. Don't smell pesticides; 6. Never mix granules with water except those wettable granules; 7. Avoid spilling of pesticides solution while filling the spray tank.
5	Equipment	1. Select right kind of equipment and nozzle; 2. Don't blow nozzle with mouth; 3. Don't use unwashed sprayer for weedicide or insecticide.
6	While applying pesticides	1. Apply only recommended dose and spray solution; 2. Apply insecticides preferably in the evening. Avoid rainy or hot sunny or windy days; 3. Don't apply pesticides against the wind direction; 4. Thoroughly wash the sprayers & buckets with soap water after spraying; 5. Buckets used for spraying should not be used for domestic purpose; 6. Avoid entry of animals & workers in the field immediately after spraying.
7	Disposal	1. Left over spray solution should not be drained in to ponds / tanks / water bodies; 2. Should not be disposed off near open well / shallow wells or drinking water source; 3. Used empty containers should be crushed and buried deep in soil; 4. Never re-use empty pesticide container for any other purpose.

8.6.5 Major Insect Pests by Cultivated Crops and IPM Strategy

Table 85: IPM Strategy by Crop Type

Crop	Major insect pest / diseases	Diseases	IPM strategy
Paddy	Stemborer Leaf folder Gall midge Green leaf hopper Hispa Mites Thrips Gundy bug	Bacterial leaf blight Leaf spot Leaf Blast Neck blast Stem rot Sheet rot Sheet blight False smut Dirty panicle	**Nursery:** 1. Raise pre-crop kharif grow Sesbania or sunhemp and incorporate 45 days old crop in soil during land preparation wherever possible. 2. Select suitable resistant or moderately resistant variety. 3. Use disease and insect free pure seed. 4. Seed treatment (for diseases) with carbendazim 50% WP @ 2 g/kg seed or Trichoderma/Pseudomonas @ 5-10 g/ha of seed for seed or soil borne diseases and carbosulfan 2 g/kg of seed for root nematodes or as per local recommendations. In termites, endemic areas, seed treatment with chlorpyriphos 20% EC @ 10000 ml/ha along with 10% solution of gum arabica or imidacloprid 200 SL (20%) @ 0.25 litre/100 kg seed along with 10% solution of gum Arabica in 3.75 litre of water just before sowing. 5. Timely planting/sowing. 6. Pre-sowing irrigation: Many weeds can be controlled by applying pre-sowing irrigation to area where nursery or seedlings are to be transplanted. The emerged weeds can be ploughed under. 7. Raising of healthy nursery. 8. As far as possible rice seedling should be free from weed seedlings at the time of transplanting. 9. Destruction of left over nursery, removal of weeds from field and cleaning of bunds. 10. Normal spacing with 30-36 hills/ m2 depending on the duration of the variety. 11. 30 cm alley formations at every 2.5 to 3 m distance in plant hopper and sheath blight endemic areas. 12. Balanced use of fertilizers and micro-nutrients as per local recommendations. Proper water management (alternate wetting and drying to avoid water stagnation) in plant hopper, bacterial blight and stem rot endemic areas. Maintain a thin layer of water on soil surface to minimize weed growth. 13. In direct sown rice, the crop should be sown in lines at recommended spacing to facilitate inter-weeding operations. Mechanical methods of weed should be practiced after 2-3 weeks and second time if necessary after 4-6 weeks of sowing. 14. In nursery, spray Chlorantraniliprole (18.5SC) @200ml/Ha in 150-200ltl of water (Or) In the main field, between 15-20 DAT, as a prophylactic measure, apply granules of Chlorantraniliprole (0.4GR) @ 10kg/Ha. (Or) if the pest still persists, at ETL level repeat the spray Chlorantraniliprole (18.5 SC) @200ml/Ha in 150-200l of water. (Or) At both nursery stage and main field, at ETL spray Flubendiamide (40 SC) @125ml/Ha in 150-200lts of water. **Main Crop:** 1. Collection of egg masses and larvae of pest to be placed in bamboo cages for conservation of biocontrol agents. 2. Removal and destruction (burn) of diseased/pest infested plant parts.

Crop	Major insect pest / diseases	Diseases	IPM strategy
			3. Clipping of rice seedlings tips at the time of transplanting to minimize carryover of rice hispa, case worm and stem borer infestation from seed bed to the transplanted fields. 4. Use of coir rope in rice crop for dislodging case worm, cut worm and swarming caterpillar and leaf folder larvae etc. on to kerosinized water (1 L of kerosene mixed on 25 kg soil and broadcast in 1ha). 5. Trichogramma japonicum and T chilonis may be released @ 1 lakh/ha on appearance of egg masses / moth of yellow stem borer and leaf folder in the field. 6. Natural biocontrol agents such as spiders, drynids, water bugs, mirid bugs, damsel flies, dragonflies, meadow grasshoppers, staphylinid beetles, carabids, coccinellids, Apanteles, Tetrastichus, Telenomus, Trichogramma, Bracon, Platygaster etc. should be conserved. 7. Collection of egg masses of borers and putting them in a bamboo cage-cum-percher till flowering which will permit the escape of egg parasites and trap and kill the hatching larvae. Besides, these would allow perching of predatory birds. 8. Habitat management: Protection of natural habitats within the farm boundary may help in conserving natural enemies of pests. Management of farmland and rice bunds with planting of flowering weeds like marigold, sun hemp increases beneficial natural enemy population and also reduce the incidence of root knot nematodes. Provide refuge like straw bundles having charged with spiders to help in build up spider population and to provide perch for birds. 9. Spray Dinetofuran (20SG) @200ml/Ha in 150-200 lt of water. (Or) -Spray Pymetrozine (50WG) @300ml/Ha. (Or) Spray Buprofezin (25SC) @750ml/Ha in 150-200lt of water (for green leaf hopper); 10. Spray Spiromesifen (240SC) @500ml/Ha. (Or) Spray Spirotetramet (150 OD) @600ml/Ha in 150-200lt of water (for Mits). 11. Spray Spinosad (45SC) @ 187.5ml/Ha. (for Thrips) 12. Spray Streptocyclin @25gr/Ha. (Or) -Spray Propineb (70WP) @750gr/Ha. (Or) -Spray Mancozeb (75%WG) @1250gr/Ha. (Or) Spray Azoxystrobin (23SC) @750ml/Ha. (Or) -Spray Picoxystrobin (250EC) @320ml/Ha. (Or) -Spray Pyraclostrobin (250EC) @300ml/Ha. (Or) -Spray Kresoximmethyl (50WG) @312.5gr/Ha. (for diseases like bacterial leaf blight, leaf spot, leaf blast); 13. Spray Pencycuron (250SC) @ 187.5ml/Ha. (Or) Spray Thifluzamide (240SC) @375ml/Ha. (Or) Spray Validamycin (3L) @1000ml/Ha. (for sheet blight); 14. Spray Azoxystrobin (23SC) @750ml/Ha. (Or) Spray Picoxystrobin (250EC) @320ml/Ha. (Or) Spray Pyraclostrobin (250EC)@300ml/Ha. (Or) Spray Kresoximmethyl (50WG) @312.5gr/Ha. (for false smut); 15. Spray Azoxystrobin (23SC) @750ml/Ha. (Or) Spray Picoxystrobin (250EC) @320ml/Ha. (Or) Spray Pyraclostrobin (250EC) @300ml/Ha. (Or) Spray Kresoximmethyl (50WG) @312.5gr/Ha. (for Dirty Panicle)
Potato	Potato scab Tuber moth Aphids Jassids Mites Spodoptera	Early blight Late blight Bacterial rot Mosaic virus	**Pre-Sowing:** 1. Deep ploughing in Summer 2. Soil solarization during summer. 3. Field sanitation, rogueing. 4. Avoid water logged conditions in the field.

Crop	Major insect pest / diseases	Diseases	IPM strategy
			5. Follow crop rotation. 6. Apply manures and fertilizers as per soil test recommendations 7. Sow/plant 4 rows of maize, sorghum, bajra (pearl millet) around the potato crop field as a guard/barrier crop 8. Apply FYM @ 8 t/acre or vermi compost @ 4-6 t/acre 9. Apply 2 Kg each of Azospirillum and Phosphobacterium with 10 Kg FYM /acre as soil application before planting. 10. Destroy all the germinated weeds by shallow ploughing before sowing 11. Light irrigation and covering the beds with polythene sheet of 45 gauge (0.45 mm) thickness for three weeks before sowing. 12. Raising African marigold in the nursery 15 days prior to sowing against cyst nematode. 13. Raised seed beds of more than 35cm height (for better water drainage). Biological control: 14. Applying neem cake@ 80 Kg/acre. **Sowing:** 1. Use resistant/tolerant varieties. 2. Use healthy, certified and weed seed free tubers 3. Dip cut pieces of tuber (seed) for 10 minutes in recommended Plant Growth Regulators (PGR) solution. 4. Adopting recommended agronomic practices like field preparation, time of sowing, row and plant spacing, gap filling etc. to obtain the healthy plant stand to reduce the weed menace. 5. If weed flora of the field is known based on previous season experience the preemergence recommended herbicide oxyflourfen 23.5% EC @170-340 ml in 200-300 l water/ acre be applied within 3-4 days after sowing. 6. Tubers stored in oxygen deficient structures should not be used 7. Soaking potato seed tubers in streptocycline 40 to 100 ppm solution for half an hour prior to planting or with carbendazim 25%+ mancozeb 50% WS @ (1.5 + 3.0) to (1.75 + 3.5) for 10 Kg seed (tuber) or with carboxin 37.5% + thiram 37.5% DS@ (1.5 + 3.0) to (1.75 + 3.5) for 10 Kg seed (tuber). **Vegetative / Tuber Stage** 1. Collect and destroy crop debris 2. Judicious use of fertilizers 3. Provide irrigation at critical stages of the crop 4. Avoid water logging 5. Avoid any stress to the crop as much as possible 6. Enhance biocontrol activity by avoiding chemical spray, when 1-2 natural enemies are observed. 7. Collect and destroy disease infected and insect infested plant parts 8. Collect and destroy eggs and early stage larvae 9. Handpick the older larvae during early stages of crop 10. Use yellow and blue sticky traps @ 4-5 trap/acre 11. Use light trap @ 1/acre and operate between 6 pm and 10 pm 12. Install pheromone traps @ 4-5/acre for monitoring adult moths activity (replace the lures with fresh lures after every 2-3 weeks) 13. Erect bird perches @ 20/acre for encouraging predatory birds such as King crow, common mynah etc.

Crop	Major insect pest / diseases	Diseases	IPM strategy
			14. Set up bonfire during evening hours at 7-8 pm 15. Conserve natural enemies through ecological engineering 16. Augmentative release of natural enemies 17. Two to three sprays of (streptomycin sulphate 9% + tetracylin hydrocloride 1%) SP @ 40 to 50 ppm solution at an interval of 20 days. First spray 30 days after planting (for bacterial wilt) 18. Spray aureofungin 46.15% w/v. SP @ 0.005% in 300 l of water/acre or captan 50% WG @ 600 g in 200 l of water/acre (second spray after 5 days interval) or captan 50% WP @ 1 Kg in 300- 400 l of water/acre or captan 75% WP @ 666 g in 400 l of water/acre. (second spray after 8 days interval) or chlorothalonil 75% WP @ 350-500 g 240-320 l of water/acre (second spray after 14 days interval) or mancozeb 35% SC @ 0.5% or 500 g/100 l water 500 l water or as required depending upon crop stage and equipment used or mancozeb 75% WP@ 600-800 g in 300 l of water/acre or hexaconazole 2% SC @ 1.2 l in 200 l of water/acre (second spray after 21 days interval) or kitazin 48% EC @ 0.20% or 200 ml in 200 l of water or propineb 70% WP @ 300 g in 100 l of water or 0.30% as required depending upon crop stage and plant protection equipment used (second spray after 15 days interval) or zineb 75% WP @ 600- 800 g in 300-400 l of water/acre or captan 70% + hexaconazole 5% WP @ 200-400 g in 200 l of water/acre (second spray after 21 days interval).
Mustard	Mustard sawfly Aphids Painted bug	Powdery mildew, White rust Aternaria blight	**Nursery / Pre-Planting:** 1. Deep ploughing during summer; 2. At the time of field preparation, adopt stale seed bed technique to minimize the weeds menace in field. 3. Prepare the level and well drained field to reduce the incidence of Sclerotinia rot. 4. Destruction of plant debris. 5. For club rot management, soil amendment with lime (@ 1 Kg/m2) to raise soil pH to 7.2 or apply Neem cake @ 0.5 Kg/m2 6. Early sowing to avoid damage due to mustard-aphid, and major diseases. 7. Use tolerant varieties. 8. Early planting to escape the damage. 9. Use yellow sticky traps. 10. Destroy the affected part along with aphid population in the initial stage 11. Control Alphide by 2 percent Neem oil and 5 per cent Neem Seed Kernel Extract (NSKE) effective against the mustard aphid; 12. Adopt crop rotation, if there is infestation of Orobanche in previous season, pulse crop should be sown in place of mustard in that field. 13. Early sowing in line with weed free certified seeds. 14. Adopt recommended agronomic practices with respect to row spacing, plant spacing, fertilizers application, water management etc. to obtain the healthy plant stand. 15. Adopt intercropping with wheat/pulses/ sugarcane 16. Apply oxadiargyl 6% EC @ 600 ml in 200 l of water/acre 0-3 days after sowing. As pre-emergence herbicide followed by one hand weeding at 30 days after planting, if required

Crop	Major insect pest / diseases	Diseases	IPM strategy
			17. Malathion 50% EC @ 400 ml in 200-400 l of water/acre to control Aphids **Vegetative / Flowering:** 1. Use of yellow sticky trap before onset of flowering for Aphids; 2. Uproot Orobanche plants and burning them to reduce spread of Orobanche seeds (Weed Control); 3. Powdery mildew control by timely sowing, proper field sanitation, applying potash; 4. Bacterial blight control by proper crop and field sanitation 5. In case powdery mildew becomes severe, use of Karathane or carbendazim @ 0.05 – 0.1% will be helpful;
Tomato	Fruit borer; White fly; Aphids; Nematodes	Damping off; Early blight; Late blight; Bacterial spot; Buck eye rot; Leaf curl; Root knot nematode	**Nursery**: 1. Preparing raised nursey beds about 10 cm above ground level for good drainage to avoid damping off etc.; 2. Following soil solarisation for 2-3 weeks using 0.45 mm thick polythene sheet tightening sides of sheet to enable avoid escape of heat. Sufficient moisture should be present in the soil for solarization; 3. Mix 50 g of effective strain of fungal antagonist Trichoderma in 3 kg FYM and leave for 7 -14 days for enrichment followed by mixing of Trichoderma enriched FYM in the soil nursery in 3 m2 bed; 4. Use of nylon net (40-50 gauge) to avoid vectors like white fly; 5. Seed treatment with effective strain of Trichoderma @ 10 g / kg or captan 75 % WP @ 0.25 % a.i. and need based soil drenching with captan 75 WP @ 0.25 %; 6. Raise marigold nursery 20 days before tomato nursery. **Main Crop**: 1. Seed treatment (for diseases) with carbendazim 50% WP @ 2 g/kg seed or Trichoderma/Pseudomonas @ 5-10 g/ha of seed for seed or soil borne diseases. In termites' endemic areas, seed treatment with chlorpyriphos 20% EC @ 10000 ml/ha along with 10% solution of gum arabica 2. Transplant 45 days marigold seedlings in a pattern of one row of marigold for every 16 rows of tomato for flowering synchronization. First and last row of field should be marigold and it should be sprayed with HaNPV @ 250 LE / ha.; 3. Adopt wide spacing of 60 x 45 cm (for varieties) and 90 x 60 cm (for hybrids) to reduce the chance of spread of diseases; 4. Apply neem cake @ 250 kg / ha at 20 days after transplanting (DAP) to reduce fruit borer, leaf miner and nematode incidence; 5. 2-3 sprays of 5% NSKE are also effective against leaf-miner, aphids and mites; 6. Need based spray of thiamethoxam 25 WG for white fly control; 7. Install pheromone traps @ 2 / acre for monitoring fruit borer activity. Replace the lures with fresh lures at every 20-25 days interval; 8. Monitor top three leaves for fruit borer eggs; 9. Release of egg parasite, Trichogrammachilonis @ 1.0 lakh / ha 4-5 times at weekly interval; 10. Spray HaNPV (250 LE) on marigold flowers and buds to kill the fruit borer in them;

Crop	Major insect pest / diseases	Diseases	IPM strategy
			11. Spray good quality HaNPV (250 LE / ha) (2 x 109 POB) @ 28 DAP and repeat two more times at weekly interval. Mix 2% jaggery and spray in the evening to prevent fast degradation due to UV light; 12. Collection and destruction of leaf curl affected plants in the initial stages and tomato fruits infested at regular intervals; 13. If high incidence of fruit borer is noticed, spray novaluron 10 EC @ 750 ml / ha in 500 lit water; 14. Give prophylactic or protective spray with captan 50 WP @ 2.5 kg or captan 75 WP @ 1667 g or zineb 1.5-2 kg / ha in 1000 lit water or mancozeb 35 SC @ 2.5 lit / ha in 500 lit water or mancozeb 75 WP @ 1.5-2 kg / ha in 750 lit water against early and late blight. Cyazafamid 34.5 % SC @ 200 ml / ha in 500 lit water can also be used as need-based spray against late blight and early blight, respectively. 15. Spray seedlings with streptocycline 40 to 100 ppm solution and in main field to manage bacterial spot; 16. Stake plants to reduces buck eye rot and need based application of mancozeb 75 WP @ 1.5-2.0 kg, or propineb @ 1.5 kg / ha in 500 lit water. 17. The commonly seen natural enemies of pests in tomato cropping system should be protected from unwanted and excessive sprays of chemical pesticides. 18. To protect from Brown plant hopper, application of buprofezin 25% SC @800 ml/ha. can be made.
Cabbage / Cauliflower	Diamond back moth; Tobacco caterpillar; Stem borer; Cabbage aphid	Damping-off and wire stem; Downy mildew; Alternaria leaf spot; Bacterial black rot	**Nursery Stage**: 1. Prepare raised nursey beds about 10 cm above ground level for good drainage to avoid damping off etc.; 2. Follow soil solarisation for 2-3 weeks using 0.45 mm thick polythene sheet. Sufficient moisture should be present in the soil for solarization; 3. Treat the soil with neem cake at 50 g / m2 impregnated with 10-15 g effective strain of Trichoderma; 4. Seed treatment with effective strain of Trichoderma @ 4 g / kg seed to manage rots. Seedling dip for 30 min with Trichoderma viride 1 % WP @ 10 g / lit water to manage collar rot in cabbage can also be followed; 5. Need based soil drenching with captan 75 WP @ 0.25 % or captan 75 WS @ 0.3 % to manage damping off; 6. Spray NSKE 5% for management of H. undallis which appears in rainy season nursery sometimes. **Main Crop**: 1. Adopt wide spacing of 60 x 50 cm to reduce the spread of diseases; 2. Growing of Indian mustard as trap crop after every 25 rows of cabbage. (One row of mustard is sown 15 days before cabbage planting and second 25 days after planting of cabbage). First and last row should be of mustard; 3. Mustard traps 80-90% of diamond back moth (DBM) population and other pests like aphids. Mustard be sprayed with dimethoate 30 EC @ 660 ml in 500-1000 lit or dichlorvos 76 EC / ha @ 627 ml water. Spray fenvalerate 5 % EC @ 300 ml / ha in 600 lit water to manage DBM in trap crop mustard. 4. Spraying of B. thuringiensis var.kurstaki 5 WP @ 50 g a.i./ ha or 3 gm / litre at 10 DAP for DBM; 5. Installation of light traps / bulb @ 3 / acre for DBM. Adults are attracted to light trap and fall in water bucket. Within 3-4 days most of the adults get killed;

Crop	Major insect pest / diseases	Diseases	IPM strategy
			6. Release egg parasitoid Trichogrammatoideabactrae at 1.0 lakh / ha 3-4 times at weekly interval (optional) 7. Spray mancozeb 75 WP or zineb 75 WP @ 1.5-2 kg / ha in 750-1000 lit water to manage leaf spot; 8. Removal of basal and infected leaves to reduce Alternaria leaf spot and bacterial black rot of early stage; 9. Spray Neem Seed Kernal Extract (NSKE) 5% or malathion 50 EC @ 1500 ml / ha in 1000 lit water for stem / head borer. Spray NSKE 5% at primordia formation (18-25 DAP-head initiation stage - most critical stage) for DBM control. Repeat, if DBM is >1 / plant at 10-15 days interval. Maximum of 3-4 NSKE sprays in one crop season are required. When NSKE are sprayed, thorough coverage of the entire plant surface is must. Use sticker with spray. This will control aphids as well as tobacco caterpillar. 40 kg / ha of NSKE powder is required; 10. Need based spray of spinosad 2.5 SC @ 600 ml or novaluron 10 EC @ 750 ml / ha in 500-1000 lit water for DBM control; 11. Spray acetamiprid 20 SP @ 75 g ha in 500-600 lit water for aphids in late cauliflower; 12. Installation of yellow sticky traps for trapping winged aphids; 13. Collection of egg masses and larvae of tobacco caterpillar as they are gregarious in nature. Scout for papery patches & apply baits; 14. Set up sex pheromone traps @ 5 / ha for mass trapping and to monitor the activity of adult moths; 15. Spray SlNPV @ 250 LE / ha (2x109 POB) 2-3 times in evening with jiggery 2% when larvae are young; 16. Need-based spray of cyantraniliprole 10.26 OD @ 600 g / ha in appr. 500 lit water for tobacco caterpillar;
Brinjal	Hadda beetle; Aphids; Leaf roller; Leaf hopper; Shoot and fruit borer; Mites (Red spider mite); Nematodes	Damping off; Phomopsis blight and fruit rot; Little leaf; Root-knot nematode	**Nursery Stage**: 1. Green manuring with sunhemp / Dhaincha in July-August; 2. Raised seed bed about 10 cm above ground level for good drainage to avoid damping off etc.; 3. Cover the nursery beds with polythene sheet of 45 gauge (0.45 mm) thicknesses for three weeks during June for soil solarisation which will help in reducing the soil borne insects, diseases like bacterial wilt and nematodes. However, care should be taken that sufficient moisture is present in the soil for its solarization; 4. Seed (5 g / kg seed), nursery (250 g in 50 lit water drenched over 400 sq. mt area) and seedling root dip (1% for 15 min) treatment with Trichoderma viride 1 % to manage damping off or root rot etc. and need based soil drenching with captan 75 WP @ 0.25 %; 5. Selection of fruit borer resistant varieties / hybrids. **Main Crop**: 1. Setting up of yellow sticky / Delta traps @ 2-3 / acre for white fly; 2. Give 2-3 sprays of NSKE 5% at weekly interval for the control of sucking pests and leaf folder; 3. If incidence of white fly and other sucking insect pests is still above ETL, apply diafenthiuron 50 WP @ 600 g / ha in 500-750 litres water or spiromesifen 22.9 SC @ 400 ml / ha (mites) in 500 lit water; 4. Pheromone traps @ 100 / ha should be installed for monitoring and mass trapping of shoot & fruit borer moths. Replace the lures with fresh lures after every 15-20 days interval;

Crop	Major insect pest / diseases	Diseases	IPM strategy
			5. Clipping of damaged shoots from time to time in initial stages; 6. Bird perches @ 10 / acre should be erected; 7. Sprays of NSKE also brings down the borer incidence significantly. Neem oil (Azadirachtin based 1%) application is also helpful in reducing borer infestation, though marginally; 8. Release egg parasitoid T. brasiliensis @ 1-1.5 lakh / ha for shoot & fruit borer, 4-5 times at weekly interval; 9. Apply neem cake @ 250 kg / ha (in two splits) in soil along the plant rows at 25 and 60 DAT for reducing nematodes and borer damage. Don't apply neem cake when there is heavy wind velocity or temperature is above 30^0 C.; 10. Need-based alternate sprays of chlorantraniliprole 18.5 SC @ 200 ml / ha in 500-750 lit water or emmamectin benzoate 5 SG @ 200 g / ha in 600 lit water at 15 days interval effectively controls shoot & fruit borer; 11. Collection & destruction of little leaf affected plants, phomopsis blight affected fruits & field sanitation; 12. Spray zineb 75 WP @ 1.5-2 kg / ha in 750-1000 lit water or carbendazim 50 WP @ 300 g / ha in 600 lit water to manage Phomopsis blight and leaf spot diseases; 13. Continuous cropping of brinjal leads to more borer and bacterial wilt infestation. Therefore, crop rotation with non-solanaceous crops may be followed. 14. The commonly seen natural enemies of pests in brinjal cropping system should be protected from unwanted and excessive sprays of chemical pesticides.
Chillies	Thrips; Aphids; Borers (Tobacco caterpillar, Fruit borer)	Damping off; Cercospora Leaf spot; Die-back & Anthracnose; Fusarium wilt; Powdery mildew; Begomo virus; Mites (Broad mite)	**Nursery Stage**: 1. Prepare raised nursery beds about 10 cm above ground level for good drainage to avoid damping off etc. 2. Cover the beds with polythene sheet of 45 gauge (0.45 mm) thickness for three weeks for soil solarisation for soil borne pests. Sufficient moisture should be present in the soil for solarisation. 3. Mix 50 g of effective strain of Trichoderma from reliable source in 3 kg of FYM and leave for 7-14 days for enrichment followed by mixing of Trichoderma enriched FYM in the soil of a 3 m2 bed. 4. Seed treatment with effective strain of Trichoderma from reliable source @ 10 g / kg seed to manage damping off and sucking pests in the initial stage in direct seeded chilli. 5. Pseudomonas fluorescens (TNAU Strain, ITCC BE 0005 @ 10 g / kg seed or Trichoderma viride (TNAU Strain ITCC 6914 @ 4g / kg seed can also be used as seed treatment. 6. Need based soil drenching with captan 75 WP @ 0.25 % or captan 75 WS @ 0.2-0.3 % or mancozeb 75 WP @ 0.3 % to manage damping off / rots; 7. Erect Khaskhas shading / support on one side of nursery beds of bell pepper to avoid the exposure to cold / frost during winter (December-January). Cover the beds with polythene sheets at nights to avoid frost injury. However, remove the sheets during day time to expose them to sun. **Main Crop**: 1. At the time of planting, dip the seedlings in Pseudomonas fluorescens solution @ 5 ml / litre for ten minutes. 2. Erect bird perches @ 10 / acre for facilitating visits of predatory birds.

Crop	Major insect pest / diseases	Diseases	IPM strategy
			3. Install delta traps @ 2 / acre for hoppers, aphids and white fly etc. 4. Spray with P fluorescens @10 g / l twice (at vegetative and flowering stage) at evening time for overall health and growth of plants. 5. Spray of neem products / NSKE 5% against aphids, thrips, hoppers and white fly. Spray NSKE 5% 2-3 times against thrips at 15-20 days after transplanting (DAT) when rating is between 1-2. If the population of thrips& white fly is still high, then spray pyriproxyfen 10 EC @ 500 ml or spinosad 45 SC @ 160 g / ha in 500 lit water (thrips). 6. Rouging out and destroying of leaf-curl disease / mosaic complex affected plants periodically. 7. Erection of pheromone traps @ 5 / ha for H. armigera / S. litura for monitoring of adults for egg laying. 8. Periodic releases of egg parasitoid, Trichogrammasp @ 1.5 lakh / ha for fruit borer (H. armigera) 9. 2-3 sprays of HaNPV / SlNPV (250 LE / ha) (2 x 109 POB) / ha in initial stages or as and when needed. 10. Only need based spray of insecticides viz; spinosad 45 SC @ 160 ml or emmamectin benzoate 5 SG @ 200 during initiation of flowering & fruiting stage for fruit borer, H. armigera is highly effective. Apply these pesticides preferably during evenings. 11. Periodic removal and destruction of damaged fruits due to borer. 12. Protective spray with mancozeb 75 WP or zineb 75 WP @ 1.5-2.0 kg / ha in 750-1000 lit water or propineb 70 WP @ 0.5 % and need based application of captan 70 % + hexaconazole 5 WP @ 500-1000 g / ha in 500 lit water to manage fruit rot and die back. 13. Spray sulphur 52 SC @ 2 lit / ha in 400 lit water or sulphur 80 WP @ 3.13 kg / ha in 750-1000 lit water against powdery mildew. 14. Need based spray of hexaconazole 2 SC @ 3 lit / ha or against powdery mildew and fruit rot. 15. At the time of planting, apply effective strain of Trichoderma from reliable source @ 5 kg / ha along with well rotten FYM to manage fungal wilts. 16. Crop rotation be followed if wilt occurs regularly every year. 17. The commonly seen natural enemies of pests in bell pepper cropping system should be protected from unwanted and excessive sprays of chemical pesticides.
Okra	Leaf hopper; Shoot and fruit borer; White fly; Aphid	Yellow vein mosaic; Powdery mildew; Mites (Red spider mite); Nematodes (Root knot nematode)	1. Sow YVM resistant varieties; 2. Sowing of sorghum or maize all around okra field as a barrier crop for shoot & fruit borer adult moths and white flies. 3. Spray NSKE @ 5 % (Azadirachtin based) 2-3 times at weekly interval for sucking pests 4. Setting up of yellow sticky traps / delta traps @ 2 per acre 5. Spray of propargite 57 EC or dicofol 18.5 EC @ 2ml / litre for red spider mite management 6. Erection of bird perches @ 10 / acre in the field for facilitating bird predation. 7. Need–based spray of thiamethoxam 25 WG @ 100 g / ha in 500 lit water for hoppers, aphids and other sucking pests. Give another spray after two weeks. 8. Removal and destruction of YVM affected plants, borer affected shoots and flower beetles time to time.

Crop	Major insect pest / diseases	Diseases	IPM strategy
			9. Installation of pheromone traps @ 2 / acre for monitoring the activity of shoot & fruit borer. Change lures after every 15-20 days. 10. Spray neem oil based azadirachtin 0.03% @ 2-2.5 lit / ha in 500 lit water or spray sulphur 80 WP @ 3.13 kg / ha in 750-1000 lit water to manage powdery mildew. 11. Release of egg parasitoid, Trichogrammachilonis @ 1.0 lakh / ha 4-5 times at weekly interval. 12. Shoot & fruit borer infestation, if crosses ETL (5.3 %), spray chlorantraniliprole 18.5 SC @ 125 ml / ha in 500 lit water. 13. Removal and destruction of crop residues, stubbles of okra plants and deep ploughing after harvest. 14. Use reflective mulches of silver black colour of 7 µ thickness to deter white flies in early stages; 15. The commonly seen natural enemies of pests in bell pepper cropping system should be protected from unwanted and excessive sprays of chemical pesticides.
Onion	Thrips	Damping off; Stemphyllium blight; Purple blotch Nematodes (Rice root-knot nematode)	**Nursery Stage**: 1. Raised nursery beds up to 10 cm above ground level with good drainage and rice bran ash. 2. Mix entire nursery bed with effective strains of Trichoderma spp.@ 50 g / 3 sq. m with FYM / vermicompost 3. Need based spray of urea @ 0.2% to reduce yellowing caused due to unprecedented rains during January-February **Main Crop**: 1. Planting outer row maize as barrier crop against onion thrips. 2. Seedling dip in Pseudomonas inflorescence before transplanting @ 5 ml / litre. 3. Give adequate irrigation during crop season as thrips pupae get rotten in soil with continuous retention of moisture. 4. Irrigating fields through sprinkler wash off the thrips. 5. Install blue coloured sticky traps @ 20 / acre for thrips management. 6. Need based application of sulphur 80 WP @ 0.2% or for sulphur deficiency. 7. Need based application of neem cake @ 250 kg / ha for nematode management. 8. Spray zineb 75 WP @ 1.5-2 kg / ha in 750-1000 lit water against downy mildew and blight. 9. The commonly seen natural enemies of pests in bell pepper cropping system should be protected from unwanted and excessive sprays of chemical pesticides.
Ginger	White grubs	Rhizome rot; Bacterium wilt; Nematodes	1. Use well decomposed FYM impregnated with Trichoderma harzianum at 250 g / q FYM. 2. Soil solarization of the fields with transparent 0.45 mm thick polythene sheet for 15-20 days may be done before sowing. 3. Seed rhizomes can also be solarized by keeping inside the polythene for two hours. 4. Treat the seed rhizome with fungicides like carbendazim 50 WP @ 100 g + mancozeb 75 WP (250g) dissolved in water or with Trichoderma harzianum at 6-8 g / liter of water for 30 minutes 5. Give hot water treatment to seed rhizomes at 51o C for 10 minutes before planting. 6. In standing crop, drench the fields with carbendazim 50 WP @ 0.2% along the roots of one-month old crop or at the onset of monsoon. 7. Treat the rhizomes meant for seed (75-80 kg) purpose with carbendazim 50 WP (100 g) + mancozeb 75 WP (250 g)

Crop	Major insect pest / diseases	Diseases	IPM strategy
			mixed in 100 litres of water for one hour and shade dry before storage. Empty space may be filled with dry grass. The pit is covered with a wooden piece and cemented with cow dung.

***Note**: In the changing scenario, consultations will be made with local SAUs, KVKs, Agriculture Dept. on recommended package of practices for IPM in crops that are specific to a particular geographical area / project location.*

8.7 Details on Integrated Nutrient Management Practices

The Integrated Nutrient Management (INM) Practices that will feed into the capacity building program on IPNM are detailed in this section.

INM embraces soil, nutrient, water, crop, and vegetation management practices, tailored to a particular cropping and farming system. The INM aims at improving and sustaining soil fertility and land productivity and reducing environmental degradation. It optimizes the condition of the soil, with regard to its physical, chemical, biological and hydrological properties, for the purpose of enhancing farm productivity, while minimizing land degradation. It not only provides tangible benefits in terms of higher yields, but also conserve the soil resource.

INM also contributes to pest management. Stressed crops are more susceptible to disease and to the effects of pest attacks. Crops growing in poorly structured soil, under low or unbalanced nutrient conditions or with inadequate water supply will be stressed. Responding to disease or pest attacks by applying pesticides is a costly symptomatic approach to a syndrome which is better addressed by improving the ecological conditions and systems within which the crops are cultivated.

INM practices combine use of inorganic, organic and biological resources in a reasonable way to balance efficient use of limited resources and ensure ecosystem sustainability.

At the farm level, integrated and synergistic approach will be adopted under INM, involving the following.

1. Matching the land use requirements with the land qualities present in the area, i.e., the biological, chemical and physical properties of the soil, and the local climatic conditions (temperature, rainfall etc.);
2. Seeking to improve yield by identifying and overcoming the most limiting factors that influence yield;
3. Better plant management, i.e., (i) planting at the beginning of the rain to increase protective ground cover to enhance infiltration and biological activity and (ii) timely weeding to reduce crop yield losses;
4. Promotion of complementary crop, livestock and land husbandry practices in combination to maximize addition of organic materials and recycle farm wastes, so as to maintain and enhance soil organic matter levels;
5. Land management practices that ensure favourable soil moisture conditions for the proposed land use (e.g. moisture conservation in low rainfall areas, drainage in high rainfall areas);
6. The replenishment of soil nutrients through an integrated plant nutrition management approach like organic manuring, application of crop residues, rhizobial N-fixation, Phosphorous and other nutrient uptake;
7. Efficient fertiliser use with application of appropriate quantities and method of application to minimizes losses (for example, rather than broadcasting, project will educate farmers to apply fertilizer into the soil directly).
8. Combinations of crop, livestock and land husbandry practices that reduce rainfall impact, improve surface infiltration, and reduce the velocity of surface run-off thereby ensuring soil loss below the ‘tolerable’ level;
9. Crop rotation, agro-forestry and soil restorative practices that maintain and enhance the soils physical properties thereby encouraging root development and rainfall infiltration;
10. Promotion of crop-livestock system in project clusters as a part of integrated nutrient management strategy;

11. Nutrient monitoring during growing stage by using colour chart and application of nutrients accordingly.

Chapter 9: GENDER EQUITY AND SOCIAL INCLUSION (GESI)

In different development projects, especially project of this nature, women either remains excluded or benefited in a limited way. Attempts to mainstream gender concerns into the project planning and implementation also remain inadequate in many cases. In order to make the project more inclusive and participatory, it is required that women associate themselves in different activities which they find feasible. This approach of inclusion and equity, specifically involvement and engagement of women will be helpful to attain social justice and reduce marginalization of women and empower them to avail maximum benefit from the project. Thus, incorporating gender and other social issues in the development projects helps to improve project performance and facilitate achievement of the Bank's goal of poverty reduction. A gender approach in the overall project framework takes care of key gender issues and brings in parity in association and participation of women and minimises gap between male and female at the project level. Minimising gender-based disparity and improving scope for equal participation of male and female would be encouraged through gender-based approach in the project planning and execution strategy.

During the social assessment, consultations were organised with different stakeholders to understand the gender issues and possible measures that can help women in ensuring their participation in the overall process. The assessment helped to identify certain key issues pertaining to women and their involvement in different livelihood activities. It is observed that while participation of women in different development activities have been poor in general, their association in agricultural decision making remains marginal. Though, their contribution is significant in different stages of farm activities, still their contribution has been ignored to a great extent. In the labour front, the wage rate paid to the women workers is comparatively less than their male counterpart. Though Government has been taking required measures for giving land rights to women in shape of registering land jointly with the male counterpart, still in most of the earlier record of rights, male in most cases are title holder. This creates an imbalance as far as land holding is concerned. Access to market by women is also limited due to factors like social stigma, low quantum of sellable produce, distance of the market place from the village etc.

9.1 Policy Provisions

The constitution of India provides provisions to secure equality in general and gender equality in particular. Various articles in the Constitution safeguard women's rights by putting them at par with men socially, politically and economically. The Preamble, the Fundamental Rights, Directive Principles of State Policies (DPSPs) and other constitutional provisions provide several general and special safeguards to secure women's human rights.The Preamble to the Constitution of India assures justice, social, economic and political; equality of status and opportunity and dignity to the individual. Thus, it treats both men and women equal.

9.1.1 Fundamental Rights

The policy of women empowerment is well entrenched in the Fundamental Rights enshrined in our Constitution. For instance:

1. Article 14 ensures to women the right to equality;
2. Article 15(1) specifically prohibits discrimination on the basis of sex;
3. Article 15(3) empowers the State to take affirmative actions in favour of women;
4. Article 16 provides for equality of opportunity for all citizens in matters relating to employment or appointment to any office.

These rights being fundamental rights are justifiable in court and the Government is obliged to follow the same

9.1.2 Directive Principles of State Policy

Directive principles of State Policy also contains important provisions regarding women empowerment and it is the duty of the government to apply these principles while making laws or formulating any policy. Though these are not justifiable in the Court but these are essential for governance nonetheless. Some of them are:

1. Article 39 (a) provides that the State to direct its policy towards securing for men and women equally the right to an adequate means of livelihood.
2. Article 39 (d) mandates equal pay for equal work for both men and women.
3. Article 42 provides that the State to make provision for securing just and humane conditions of work and for maternity relief.

9.1.3 Fundamental Duties

Fundamental duties are enshrined in Part IV-A of the Constitution and are positive duties for the people of India to follow. It also contains a duty related to women's rights. Article 51 (A) (e) expects from the citizen of the country to promote harmony and the spirit of common brotherhood amongst all the people of India and to renounce practices derogatory to the dignity of women.

9.1.4 Other Constitutional Provisions

Through 73rd and 74th Constitutional Amendment of 1993, a very important political right has been given to women which is a landmark in the direction of women empowerment in India. With this amendment women were given 33.33 percent reservation in seats at different levels of elections in local governance i.e. at Panchayat, Block and Municipality elections. Thus, it can be seen that these Constitutional provisions are very empowering for women and the State is duty bound to apply these principles in taking policy decisions as well as in enacting laws.

9.1.5 Specific Laws for Women

Some specific laws, which were enacted by the Parliament in order to fulfil Constitutional obligation of women empowerment are;

1. The Equal Remuneration Act, 1976.
2. The Dowry Prohibition Act, 1961.
3. The Immoral Traffic (Prevention) Act, 1956.
4. The Maternity Benefit Act, 1961.
5. The Medical termination of Pregnancy Act, 1971.
6. The Commission of Sati (Prevention) Act, 1987.
7. The Protection of Women from Domestic Violence Act, 2005
8. The Prohibition of Child Marriage Act, 2006.
9. The Pre-Conception & Pre-Natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994.
10. The Sexual Harassment of Women at Work Place (Prevention, Protection and) Act, 2013.

Above mentioned and several other laws are there which not only provide specific legal rights to women but also gives them a sense of security and empowerment.

9.1.6 International Commitments

India is a part to various International conventions and treaties which are committed to secure equal rights of women. One of the most important among them is the Convention on Elimination of All Forms of Discrimination against Women (CEDAW), ratified by India in 1993.Other important International instruments for women empowerment are: The Mexico Plan of Action (1975), the Nairobi Forward Looking Strategies (1985), the Beijing Declaration as well as the Platform for Action (1995) and the Outcome Document adopted by the UNGA Session on Gender Equality and Development & Peace for the 21st century, titled "Further

actions and initiatives to implement the Beijing Declaration and the Platform for Action". All these have been whole-heartedly endorsed by India for appropriate follow up.

9.1.7 National Policy for Women

In the year 2001, the Government of India launched a National Policy for Empowerment of Women which was revised in the year 2016. The National Policy for Women, 2016 (draft) having the vision of "A society in which, women attain their full potential and are able to participate as equal partners in all spheres of life and influence the process of social change". The objectives of the policy are

1. Creating a conducive socio-cultural, economic and political environment to enable women enjoy de jure and de facto fundamental rights and realize their full potential;
2. Mainstreaming gender in all-round development processes/programmes/projects/ actions;
3. A holistic and life-cycle approach to women's health for appropriate, affordable and quality health care;
4. Improving and incentivizing access of women/ girls to universal and quality education;
5. Increasing and incentivizing work force participation of women in the economy;
6. Equal participation in the social, political and economic spheres including the institutions of governance and decision making;
7. Transforming discriminatory societal attitudes, mindsets with community involvement and engagement of men and boys;
8. Developing a gender sensitive legal-judicial system;
9. Elimination of all forms of violence against women through strengthening of policies, legislations, programmes, institutions and community engagement;
10. Development and empowerment of women belonging to the vulnerable and marginalized groups;
11. Building and strengthening stakeholder participation and partnerships for women empowerment;
12. Strengthen monitoring, evaluation, audit and data systems to bridge gender gaps.

9.1.8 World Bank Approach

The World Bank's approach to promoting gender equality makes all staff responsible for ensuring that the Bank's work is responsive to the differing needs, constraints and interests of males and females in client countries. Gender equality is now a core element of the Bank's strategy to reduce poverty. There is a clear understanding that until women and men has equal capacities, opportunities and voice, the ambitious poverty-reduction agenda set out in the Sustainable Development Goals will be difficult to achieve.

9.2 Issues of Significance

Mainstreaming gender equity and empowerment is already a focus area in the project. In the sub projects, activities related to livelihood restoration will address women's needs. A Gender Development Framework is being designed under the project as part of ESMF which will help analyze gender issues during the preparation stage of sub project and design interventions. At the sub project level, gender analysis will be part of the social assessment and the analysis will be based on findings from gender specific queries during primary data collection process and available secondary data. The quantitative and qualitative analysis will bring out sex disaggregated data and issues related to gender disparity, needs, constraints, and priorities; as well as understanding whether there is a potential for gender based inequitable risks, benefits and opportunities. Based on the analysis, the specific interventions will be designed and if required gender action plan will be prepared. The overall monitoring framework of the project will include sex disaggregated indicator and gender relevant indicator.

The participation of beneficiaries and focus on poverty reduction are two other key determinants of the effectiveness and sustainability of any project. Any project must address the constraints on women's participation in project design, construction, and monitoring and evaluation (M & E). The project must also focus on the linkage between gender and poverty, by identifying, for example, households headed by females and those households' special needs. An adaptive, learning, and process-oriented approach works better than

a blue print approach; continuous dialogue between the SPPD and the beneficiaries / PAPs is therefore important. Project beneficiaries are likely to have a stronger sense of ownership when the project gives them enough time, design flexibility, and authority to take corrective action. In this way, they find it easier to incorporate their earlier learning and negotiate with project staff and service providers. Therefore, a mechanism must be built into the project to allow such two-way interactions between the beneficiaries and the service providers.

Three major tools are used to identify and deal with gender issues in the project cycle: gender analysis, project design, and policy dialogue.

Gender analysis should be an integral part of the initial social assessment at the screening stage itself. The issues identified can be scaled up during the feasibility and detailed analysis can be carried out during the project preparation stage.

The project designs should be gender responsive based on the gender analysis, and should be included in the ESIA document. The findings and recommendations from the gender analysis during project planning and feedback from beneficiaries during implementation must be discussed thoroughly to determine the need for further action.

Consultations were organised with different stakeholders to understand the gender issues and possible measures that can help women in ensuring their participation in the overall process. The consultations helped to identify certain key issues pertaining to women and their involvement in agricultural activities. It is observed that while participation of women in different development activities have been poor in general, their association in agricultural decision making remains marginal. Though, their contribution is significant in different stages of farm activities, still their contribution has been ignored to a great extent. In the labour front, the wage rate paid to the women workers are comparatively less than their male counterpart. Though Government has been taking required measures for giving land rights to women in shape of registering land jointly with the male counterpart, still in most of the earlier record of rights, male in most cases are title holder. This creates an imbalance as far as land holding is concerned. Access to market by women is also limited due to factors like social stigma, low quantum of sellable produce, distance of the market place from the village etc. However, in primary level value addition (drying, cleaning, grading and sorting), their involvement is quite significant at domestic front.

9.2.1 Gender issues that have significance for the Project are;

1. Low land holding and hence low production and insecure livelihood
2. Women earn less wage for the same duration of work, especially in informal / private sector;
3. Occupational health issues due to prolonged duration of engagement during farm activities;
4. Drudgery of women in agricultural activities due to less usable agricultural equipment;
5. Limited access to extension services and institutional facilities;
6. Few women holding of agricultural productive resources such as land, animals, and machinery.
7. Negligible or no role of women in farm related decision-making process;
8. Women perform all un-mechanized agricultural tasks / multiple tasks, which add more burden to them;
9. Active participation in community institutions is limited to a few women and large section either do not participate or remain passive;
10. Access to formal financial credit institution for agricultural activities is limited for women headed farming households and hence investment in agriculture;
11. Poor Capital Investment capacity for agricultural and allied activities

Listed below are the key action points:

9.2.2 General Check list

1. Identify key gender and women's participation issues.
2. Identify the role of gender in the project objectives.

3. Prepare terms of reference (TOR) for the gender specialist or social development specialist of the client
4. Conduct gender analysis as part of overall Social Assessment.
5. Draw up a socioeconomic profile of key stakeholder groups in the target population and disaggregate data by gender.
6. Examine gender differences in knowledge, attitudes, practices, roles, status, wellbeing, constraints, needs, and priorities, and the factors that affect those differences.
7. Assess men's and women's capacity to participate and the factors affecting that capacity.
8. Assess the potential gender-differentiated impact of the project and options to maximize benefits and minimize adverse effects.
9. Identify government agencies and nongovernmental organizations (NGOs), community-based organizations (CBOs), and women's groups that can be used during project implementation. Assess their capacity.
10. Review the gender related policies and laws, as necessary.
11. Identify information gaps related to the above issues.
12. Involve men and women in project design.
13. Incorporate gender findings in the project design.
14. Ensure that gender concerns are addressed in the relevant sections (including project objectives, scope, poverty and social measures, cost estimates, institutional arrangements, social appendix, and consultant's TOR for implementation and M & E support).
15. List out major gender actions.
16. Develop gender-disaggregated indicators and monitoring plan.

9.2.3 Core Requirement for Mainstreaming Gender

1. All data should be disaggregated by gender, caste, ethnicity, location and age
2. Issues of division of labour, access to resources and decision-making power (who is doing what, who has access to what, who makes the ultimate decision) have to be assessed for their gender differential impact on women and men of different social identity group.
3. Assessment of policies, programs, institutional arrangements, human resources issues and M&E system has to be done from a gender perspective of project, project authorities and community groups.

9.2.4 Steps of Gender Mainstreaming

Three major tools will be used to identify and deal with gender issues in the project cycle: initial gender assessment, gender action plan, and policy note. The initial gender assessment should be an integral part of the initial social assessment at the screening stage. The issues identified can be scaled up during the feasibility study and detailed analysis can be carried out during the detailed project report stage. The project design should be gender responsive based on the gender analysis and should be included in the detailed project report in the form of a gender action plan. The findings and recommendations from the gender analysis during project planning and feedback from beneficiaries during implementation must be discussed thoroughly to determine the need for further action.

9.3 Gender Action Plan through the Project Cycle

Involvement of women groups in the identification of impacts and opportunities through project activities shall form the basis for preparation of gender sensitive project activities. The procedure to be followed and process and outcome are presented in the following matrix.

Table 86: Key Activities in Different Project Stages

Project Stages	Key Activities	Responsibility
Planning Stage	• Identify gender concerns / issues related to the project with due consultation with women group	Social Development Specialist,

Project Stages	Key Activities	Responsibility
	• Organize women stakeholders' meeting to inform about the project Activities, its benefits and key expectations from the project. • Sensitize and discuss on the project and its components. • Sensitize other stakeholders on gender concerns/issues; • Identify key areas of constraints that may be improved through the project; • Prepare project component wise activity plan where women can be engaged in different project activity.	DPMU SPMU
Implementation Stage	• Implementation of provisions of project activity specific plan addressing gender concerns as per the GAP; • Monitoring engagement of women in different project activities, skilled and unskilled works; • Monitor safety and security measures of women in work and camp sites; • Monitor women specific provisions and facility created in the project site and camps. • Supervising adherence to wage payment norms	Social Development Specialist, DPMU PMU External M&E Agency
Post-Implementation Stage	• Continuation of activities initiated under the project; • Monitoring sustenance of project inputs and its benefits accessed by women	Social Development Specialist, DPMU SPMU

9.4 Monitoring Gender Action Plan

The indicators, frequency and agency recommended for monitoring are presented in the table.

Table 87: Monitoring Indicators

Aspects	Monitoring Indicators (Process and Outcome)	Frequency	Monitoring Responsibility
Economic	• No. of women engaged in different activities and their proportion to total workforce; • Days of engagement of women in different wage / non-wage activities and proportional days of engagement in comparison to their male counterpart; • Growth in income of women due to such engagements; • Reduction in no. of days of migration (if migrating earlier); • No. of women having additional / new market oriented employable skills for self-engagement; • No. of women accessed different govt. schemes / provisions including beneficial enrolment in agricultural interventions; • Improvement in asset holding of women (productive and household assets).	• Planning Stage: for the base line data • Half yearly Monitoring • Mid Term Review (MTR) • Final Impact Assessment	DPMU Third party Monitor along with PMU
Social	• Improvement of association of women in local institutional and decision-making process (membership, management position etc.);	• Planning Stage: for the base line data • Half yearly Monitoring • Mid Term Review (MTR)	DPMU Third party Monitor along with PMU

Aspects	Monitoring Indicators (Process and Outcome)	Frequency	Monitoring Responsibility
		• Final Impact Assessment	

9.5 Implementation Arrangements

The preparation, implementation and monitoring of Gender Action Plan (GAP) is the responsibility of the project implementing entities. The Social Development specialist, at the PMU level will facilitate and supervise this process of preparation and implementation of Action Plan. All efforts will be made to coordinate and work with associated line departments and other department, more specifically the Women and Child Development department, State Livelihood Mission, Panchayati Raj and Rural Development department to help dovetailing with their development programs for the socio-economic development of women.

Chapter 10: Tribal People's Planning Framework

The Indigenous People (IPs) in India are categorized as tribal who often become vulnerable in development projects because of their cultural autonomy which is usually undermined and also because this group endure specific disadvantages in terms of social indicators of quality of life, economic status and usually as subject of social exclusion. The term "Indigenous Peoples" is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:

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

The key objective of the TPPF is to give special attention and focus to the tribal issues and concern during the implementation of the project.

Under the Disclosure Policy, this TPPF will be discussed with and disclosed to the key stakeholders. This framework encompasses suggestions and recommendations received from different sections during its preparation. Further, this framework shall be disclosed to the public on the project web-site of IWD; and printed copies of the framework will be placed in government offices and other public locations for easy access by the tribal population.

10.1 Objective of TPPF

The objectives of the TPPF are to ensure that

1. The tribal populations are adequately and fully consulted by the project;
2. Tribal take part in the entire process of preparation, implementation and monitoring of project activities;
3. Project benefits are equally accessible to the tribal living in the project area; they are provided with special assistance as per prevailing laws and policies because of their culture identities and to minimize further social and economic imbalances within communities;
4. Developing an institutional and implementation arrangements as well as capacity building measures for the implementation of the TPPF, associated disclosure mechanisms and addressing any grievances; and
5. Monitoring and reporting arrangements, including mechanisms and benchmarks appropriate to the project. This includes a grievance redress mechanism has also been developed to resolve grievances, if any.

This Planning Framework will be adopted on a full scale in the scheduled areas and as deemed necessary in the other areas.

10.2 Tribal Inclusion Approach

The project will have exclusive strategic focus for greater inclusion and representation of tribal in scheduled areas and their active association in project interventions. The strategy proposed for inclusion of tribal communities is discussed below.

Table 88: Project Approach and Strategy for Tribal Development

Project Stages	Project Approach and Strategy	Expected Outcome
Preparatory Phase	Discussion with tribal families / farmers of the project area in general and exclusively in scheduled areas on project component and activities; Identifying key issues in the way of their greater involvement and benefitting from the project intervention; Preparing a priority list of actions, based on the identified issues and interest of tribal farmers / families of the project area. Preparing cluster specific plan of action for better inclusion of tribal in different activities that are feasible for their greater participation.	Key intervention areas are identified and guidelines prepared for improved participation of tribal in general and tribal farmers, in particular. List of actions finalized for implementation to ensure greater involvement and participation of tribal by activities
Implementation Phase	Implementing priority actions that are finalized during preparatory phase; Initiatives for convergence with tribal development schemes of Government at the village / block level; Priority action in inaccessible scheduled areas (project village) for establishment of infrastructures that are planned under the project, based on feasibility; Equal opportunity to dispersed tribal (living in a mixed community) for accessing project benefits, as per the plan for beneficiary coverage; Ensuring greater participation of tribal community in activities / sub-activities taken up under each component / sub-components of the project; Taking measures, adhering to the scope of the project, to build the capacity of tribal farmers in agricultural technologies, marketing, institution management etc., as per the project requirements; Taking measures that are legally binding under PESA; Monitoring of actions taken under the project for inclusion of tribal by project component / sub-components and initiating corrective measures accordingly; Documenting success and learning from different initiatives undertaken by the project that ensures greater participation of tribal.	Participation of tribal / tribal farmers in different activities implemented under the project; Project supported infrastructure and services in less accessible scheduled areas / tribal dominated areas; Inclusion of tribes and their active involvement ensured with better operational and management capabilities; Adoption of improved farming technologies by the tribal farmers and hence better yield from the available land.

10.3 Tribal Development and Inclusion Framework

OP 4.10 requires that special planning measures be established to address particular issues concerning tribal people. More specifically, the policy requires the undertaking of a social assessment and free, prior and informed consultation process leading to the broad community support by tribal for the project, and the development of an instrument for indigenous peoples in the form of a Tribal Peoples Plan (TPP). Generally, an TPP is prepared with appropriate measures identified during the social assessment and consultation process.

The following describes the processes and procedures that will be followed under the project in order to fully address the Bank's OP 4.10, *Indigenous Peoples*.

10.3.1 Project Information Dissemination and Vulnerability Awareness Building

Prior to the ESIA, the project will disseminate project information to all stakeholders through various means, such as mass media, project brochures/posters and a dedicated project site on the internet. The project, with the help of the Safeguard Coordinator and the Third-Party Service Provider, will also develop the capacity of the project implementation agencies and oversight bodies at all levels at the onset of the project on safeguard issues relevant to the project including processes and required actions as well as responsibilities of the concerned parties.

10.3.2 Ethnic Screening

At the early stage of the FS, an ethnic screening will be conducted in order to determine if ethnic minorities are present or have collective attachment in the area of influence of the proposed irrigation modernization project. The third-party service provider will assist the FS team, under the supervision of the Safeguard Coordinator at the PMU and ensure that ethnic screening would be conducted according to this TPPF and the Bank OP 4.10.

At the time of FS, only main canals and some parts of secondary, tertiary canals may have been identified for rehabilitation under the project, and lower category canals may not have been identified in all places. Tribal screening should nonetheless cover the entire catchment area of the respective irrigation scheme, because the rehabilitation of the main canals will affect the entire canal systems within the scheme.

Where tribal communities are found to be present or have collective attachment in the area of influence of the irrigation rejuvenation and/ or flood management project, the steps that are described below will be taken. It is to note that the OP 4.10 will be triggered and the following steps will be taken if tribal communities are present in or have collective attachment in the areas of influence even if no negative impact is likely to occur.

Because tribal communities live within varying and changing historical, cultural, political and economic contexts, no precise and coherent term has been found to define them. Indigenous peoples, or ethnic minorities, may be referred to in different countries by such terms as "indigenous ethnic minorities," "hill tribes," "minority nationalities," and "tribal groups." Under OP 4.10, the determination as to whether a group is to be defined as indigenous peoples is made by reference to the presence (in varying degrees) of four identifying characteristics:

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

10.3.3 Social Assessment (SA) and Free, Prior and Informed Consultations

If tribal screening finds a tribal community to be present in or have collective attachment to the catchment area of the proposed irrigation project, a participatory Social Impact Assessment (SIA) that will be conducted as part of FS will address all elements of Social Assessment (SA) defined under OP 4.10, including, at minimum, the following:

- Identify key stakeholders of affected tribal minorities and establish an appropriate framework for their participation in the selection, design, implementation, and monitoring and evaluation of the relevant project activities;
- Assess the demographic, socioeconomic, cultural and other relevant characteristics of affected ethnic minorities in the catchment area of the respective irrigation rehabilitation sites, establish social baseline and identify potential barriers to their full participation in benefiting from project activities;
- Review relevant legal and institutional framework applicable to tribal minorities;
- Assess, based on free, prior, and informed consultation with the affected tribal minorities, the potential impact of project activities and, where adverse impacts are identified, determine how they can be avoided, minimized, or substantially mitigated;
- Propose specific measures to ensure that affected tribal minority people will, meaningfully and in a culturally appropriate manner, participate in project activities, benefit from the project, and mitigate and mitigate negative impacts; and
- Develop institutional arrangements and implementation procedures to assist tribal farmers to voice grievances and have them addressed in ways that are socially sound, in line with the procedures described in this ESMF.
- Assess the nature, scale and scope of displacement that occurred when the proposed irrigation rehabilitation and flood management project were originally constructed, as part of the due diligence of the proposed irrigation modernization project. Assess also the current state of the livelihood of the formerly displaced tribal minority population.

The third-party service provider, under the guidance of Safeguard Coordinator at PMU, will provide necessary support to the FS team so that all requirements under OP 4.10 would be addressed in the respective SIA. Free, prior and informed consultations with affected tribal minorities will also be conducted as part of the SIA. Notice of consultation meetings will be disseminated at least one weeks prior to the meetings and in a language or modes that are understandable to affected people. Care will be exercised so that not only beneficiary farmers but a broad range of local people will also be invited. The SIA will cover the entire catchment area of the respective irrigation modernization project given the potential impact of rehabilitating main canals on lower hierarchy canals, even if ethnic minorities are not expected to be present near project main canals. Also, the SIA will be conducted even if no negative impact is anticipated under the respective irrigation modernization project.

If broad community support cannot be ascertained from affected tribal communities, the project activities will not be financed for the scheme/ site, as relevant.

10.4 Entitlement

Based on the Operational Policy 4.10 of the World Bank and as one of its significant R&R requirements; special provisions for the Scheduled Tribes (ST) has been made in the project R&R Policy (apart from the general compensation and assistance to be received as Project Affected Persons (PAPs)/ Project Affected Households (PAHs) of proposed project activities for loss of assets. Apart from compensation at replacement value and R&R assistance for any adverse impact, each IP family will be entitled for additional benefits as one-time grant

10.5 Tribal Peoples Plans (TPP)

On the basis of the SIA and free, prior and informed consultation conducted as part of the process, a Tribal Peoples Plan (TPP) will be prepared for each project site. The third-party service provider, under the guidance of the SPMU Safeguard Coordinator, will provide necessary support so that all requirements under OP 4.10 would be addressed in TPP(s). One TPP(s) may bundle more than one project activity, depending on the proximities of sites, similarities in socioeconomic impact, timing of investment preparation and financing, and other relevant conditions. A TPP should include the following elements, as needed:

- The description of the project objective and activities, in particular on project activities that will be conducted for the site;
- A summary of the SIA including the results of the free, prior, and informed consultation with affected tribal communities and verification of their broad community support for the project;
- Description of potential negative impacts and measures to address them;
- A framework to ensure that affected tribal communities can meaningfully participate in the project activities, and in the process to minimize and mitigate negative impacts. Where tribal farmers share the same farmer owned systems and participate in the same irrigation system, an integrated framework will be developed that will ensure both tribal and marginal farmers would collaborate in minimizing and mitigating negative impacts for common benefits.[14]
- Mechanisms through which affected tribal communities are able to voice concerns and grievances and have them addressed;
- Mechanisms and benchmarks for monitoring, evaluating, and reporting on the implementation of TPP; and
- The financing plan for TPP implementation.

10.5.1 Suggested Format for IPDP

The suggested format for the IPDP is as follows:

i. Description of sub projects and implications for the indigenous community
ii. Gender disaggregated data on number of tribal households by impact category
iii. Social, cultural and economic profile of affected households
iv. Land tenure information
v. Documentation of consultations with the community to ascertain their views about the project design and mitigation measures
vi. Findings of need assessment of the community
vii. Community development plan based on the results of need assessment
viii. Modalities to ensure regular and meaningful consultation with the community
ix. Institutional arrangement and linkage with other national or state level programmes
x. Institutional mechanism for monitoring and evaluation of IPDP implementation and grievance redress
xi. Implementation Schedule and cost estimate for implementation

10.5.2 Key Elements of IPDP and Participatory Approach

The key elements in an IPDP include:

i. All development plans for indigenous people should be based on full consideration of the options and approaches that best meet the interests of the communities.

[14] A similar framework will be developed to help beneficiary farmers form WUGs, and minimize and mitigate, based on participatory processes, negative impacts that may fall on fellow members through in-kind assistance, and will be applied to all farmer owned irrigation systems .

ii. Scope and impact be assessed and appropriate mitigation measures are identified
iii. Project should consider the social and cultural context of affected peoples, and their skills and knowledge relating to local resource management
iv. During project preparation, formation and strengthening of indigenous people's organization; communication to facilitate their participation in project identification, planning, execution and evaluation should be promoted.
v. In case project doesn't have the capacity of preparing and implementing IPDP, experienced community organizations / NGOs can be involved as intermediaries.

10.5.3 Approval and Disclosure

Once the draft TPP(s) and the associated SIA Report(s) are drafted, they will be submitted to PMU for review and approval. PMU will translate them into relevant ethnic languages, make them available in its website as well as in locations accessible to affected ethnic minorities, and consult them with affected tribal communities for comments. PMU will also disclose them in IWD's webpage, finalize them considering the comment received, and submit them to the Bank for review and clearance. The Bank will disclose the TPP(s) through the Info shop as well as at the country office website.

10.6 Implementation Arrangements

The overall responsibility of the implementation of this TPPF rests with the PMU under the assistance of the Safeguard Coordinator in the PMU. A competent person with a long experience in Bank safeguard policies will be hired as the Safeguard Coordinator who will ensure a full compliance of all actions taken at the central as well as village levels, and supervise the third-party service provider. Safeguard Coordinator will prepare the safeguard capacity development plan at the beginning of the project in which existing capacity gaps to implement this TPPF are identified and measures to fill the gaps will be presented. The safeguard capacity development plan will be shared with the Bank for review and comments. Safeguard Coordinator will implement the safeguard capacity development plan to train other PMU staff, relevant line department officers who will work on the project, and all implementing contractor. Refresher training will be organized at the mid-term.

At village level, the Project Management Unit (PMU) will assume the overall responsibility for the implementation of this TPPF. PMU will include a Safeguard Focal Point who will be responsible for safeguard related issues at the block level, in close coordination with the third-party service provider and under the supervision of the Safeguard Coordinator.

The third-party service provider will play a key role in identifying and consulting with affected tribal community and minimize and mitigate social impacts that may fall on them, if any. A team of consultants with sufficient experience and qualification in Bank OP 4.10, community consultation and participation, and dispute handling mechanisms will be hired. The Terms of Reference of the third-party service provider will be reviewed by the Bank. The third-party service provider will provide on-going capacity development of all project staff at the block level, and monitor safeguard implementation and compliance at the village level, including collecting grievances affected tribal community may have and assisting farmers develop proper minutes of meetings. The third-party service provider will also ensure that negative impacts that may fall on local tribal community who may not directly benefit from the project will be fully addressed.

10.7 Monitoring and evaluation

Throughout the implementation of the project, the third-party service provider under the guidance of the Safeguard Coordinator will monitor the project compliance with Bank safeguard policies. The third-party service provider will visit at least on a monthly basis since the planning till 2 months after the completion of civil works the project sites and meet the affected tribal communities including both the direct project beneficiaries (i.e. the users of project rehabilitated irrigation system) and those who do not directly receive project benefits (i.e. non-farmers). Upon the completion of a TPP, the IWD, under the assistance of the PMU Safeguard Coordinator, will carry out an TPP completion assessment to confirm that all measures under this

TPP have been fully implemented and that the negative impacts on tribal communities have been adequately addressed.

Monitoring group will be created in each tribal inhabitated project areas which will ensure that all actions would be undertaken in line with this TPPF and, in case of irregularities, contact the PMU. The participatory Monitoring and Evaluation (M&E) will be conducted, under the facilitation of the third-party service provider, whereby affected people including both beneficiary farmers and non-beneficiary tribal community are encouraged and facilitated to report outstanding issues and air grievances. The meeting is attended by district PMU members and village authorities. The minutes of the meeting will be prepared and measures will be taken to address the recorded issues in the subsequent annual cycle. This record will be submitted to SPMU through DPMU.

All DPMUs / DPIUs will have an TPPF focal point who will regularly supervise and monitor TPP implementation. PMU focal points will report to PMU Director on TPPF related matters, and request support of the Safeguard Coordinator if needed. S/he will travel to the sites and spot check if the actions are taken and information provided in conformity with the TPPF.

The project MIS system will collect key data on TPPF such as the presence and absence of tribal community in the command areas of respective irrigation system, the number of tribal population and their name of ethnicity, dates of consultation meetings conducted. The Third-Party Service Provider will go to all project schemes at least on a monthly basis during and planning and implementation of civil works, prepare a back to office report upon return from the field, and develop the quarterly progress report. The Back to office reports during the report period will be attached to the quarterly progress report, which will be shared with the Bank. The project webpage will have a dedicated section where such reports will be disclosed.

10.8 Gender Issues among Tribes

The tribal women play an important role in the community and family. Women normally constitute half of the total population in any project area and for survival tied themselves to land and forest. These women work as agricultural labourers. Even in agricultural household, women share with men the burden of agricultural operations like transplanting, weeding, harvesting, threshing, winnowing, etc. The concentration of women in agricultural and allied activities is due to the decline of rural industries leading to large-scale reduction of labour force within non-agricultural sector.

In TPP, therefore, efforts will be made to (i) create an institutional framework to make gender sensitive decisions. Project in consultation with Women and Child Welfare Department shall constitute Women Interest Groups (WIGs) within a village and Gender Advisor Committee at district and state level, (ii) women members would be trained for upgradation of skills to initiate viable irrigation related income generation activities for their economic empowerment. In addition, women members will be trained in fisheries, animal husbandry, value addition to NTFP, development of kitchen garden, home orchards; production of mushroom, rice-cum-fish culture, or any other locally required trades that can help them to generate additional income, (iii) through training, women members will be provided information to make them an active participant in various developmental activities.s. The activities include (a) provide information on developing a WIG sub plan, (b) linking with other women's development programs of line department, and (iv) NGO will focus on women's need for social development

Chapter 11: ESMF Monitoring and Evaluation Framework

The M&E framework of ESMF is designed to assess the progress and achievements made in line with the identified risks and mitigation measures. By providing a feedback loop, the M&E will enable decision makers to take up mid-course corrections if required. The M&E framework is designed to measure the impacts that have taken place; evaluate the performance of mitigation measures proposed; suggest improvements in management plan, if so required; achievement of benefits expected from the implementation of safeguard measures; and ensure compliance with the legal obligations.

The M&E is to be undertaken at 2 levels:

- Monitoring and Audit of the ESMF of the project as a whole: The application and effectiveness of ESMF elements including screening, assessment, formulation and implementation of the ESMPs, monitoring, capacity building and institutional arrangements will be monitored. An audit of the environmental and social management aspects of the project will also be undertaken (detailed in section 12.1).

- Monitoring of E & S management in activities under the project: This will monitor the effectiveness of implementation of the identified mitigation measures, and the environmental quality parameters relevant to each project activity (detailed in section 12.2).

- The successful Bidder shall be required to submit an Environmental, Social, Health and Safety (ESHS) Performance Security. Within twenty-one (21) days of the receipt of the Letter of Acceptance from the *Employer*, the successful Bidder shall furnish the Performance Security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security in accordance with the General Conditions of Contract, subject to relevant clauses of ITB, using for that purpose the Performance Security and ESHS Performance Security Forms included in Contract Forms. The performance security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security of a Joint Venture shall be in the name of the Joint Venture specifying the names of all members. Environmental, Social, Safety and Health (ESHS) Performance Security amount is 2% percent of Contract Amount in form of unconditional Bank Guarantee from scheduled or Nationalized Banks in India.

11.1 Monitoring and Audit of the ESMF of the project as a whole

11.1.1 Monitoring of the ESMF implementation by the SPMU

The Environment Expert of SPMU will undertake ongoing monitoring of the ESMF implementation in order to identify issues, good practices and required actions. Reports based on the monitoring will be prepared by the SPMU Environment Expert, at least every quarter and submitted to the Project Director. The reports will be shared with the DPMUs, the DPIUs, and, other implementing agencies. The monitoring of the ESMF implementation will cover the following aspects:

Screening of project activities:

- Has the categorization of the project activities (into categories 1, 2, 3) been done accurately?
- Has the Environmental Screening Checklist been used in all applicable activities?
- Has the scoping for further assessment been done comprehensively for all applicable activities?

Monitoring of E&S aspects in project activities:

- Is the DPMU undertaking periodic and regular monitoring of the E&S implementation in the project activities?

Institutional arrangements for management of E&S aspects:

- Are the E&S Specialists at the DPMU available?

Capacity building arrangements for management of E&S aspects:

- What training programs on E&S aspects have been organized for the DPMU staff?
- What training programs on E&S aspects have been organized for the contractors?

The format for the 'Monitoring Report on ESMF Implementation' is provided in Annex -3.

11.1.2 Audit of the Environmental and Social Management in the Project

The Third-Party M&E Agency hired by the SPMU will undertake an audit of the ESMF implementation in order to identify issues, good practices and make recommendations for strengthening E&S management. The audit will be undertaken twice in the project duration – at mid-term and at the end of the project. The audit reports will be shared by the SPMU with the DPMUs, the DPIUs, other implementing agencies and the World Bank. The audit of the ESMF will cover the following aspects.

Screening of project activities:

- Has the categorization of the project activities (into categories 1, 2, 3) been done accurately?
- Has the Environmental Screening Checklist been used in all applicable activities?
- Has the scoping for further assessment been done comprehensively for all applicable activities?

Assessment of project activities:

- Has the EIA or Rapid Environmental Assessment of the project activities (for categories 1 and 2 respectively) been done accurately?

ESMPs of project activities:

- Were comprehensive ESMPs prepared for all relevant project activities?

Monitoring of E&S aspects in project activities:

- Is the SPMU and DPMU undertaking periodic and regular monitoring of the E&S implementation in the project activities?

Institutional arrangements for management of E&S aspects:

- Are the E&S Specialists at the SPMU and DPMU available?

Capacity building arrangements for management of E&S aspects:

- What training programs on E&S aspects have been organized for the SPMU and DPMU staff?
- What training programs on E&S aspects have been organized for the contractors?

The format for the 'Audit Report on ESMF Implementation' is provided in Annex -4.

11.2 Monitoring of E & S management aspects in project activities

11.2.1 Environmental and Social Management Aspects to be Monitored

The key environmental and social aspects, that have significance for the project are to be monitored periodically. It will give the direction and indicate the milestones achieved as per the national / state benchmarks / norms. The following specific environmental and social parameters can be quantitatively and qualitatively measured and compared over a period of time to understand the progress made as per the plan.

Table 89: Environmental and Socio-economic Aspects to be Monitored

Environmental Aspects	**Socio-economic Aspects**
1. Soil Contamination & Soil Erosion	1. Employment (Local / Migrants) / Child Labour
2. Air Quality	2. Living Standards at Camps

3. Water Quality	3. Rehabilitation and Resettlement
4. Noise Levels around sensitive locations	4. Land Acquisition / Purchase of Land
5. Restoration of Borrow Pits	5. Livelihood Restoration
6. Construction Site / Camp Management	6. Skill Development
7. Debris and Sediment Clearance and Disposal	7. Income Growth
8. Flora and Fauna in the Working and Dumping Sites and at sensitive locations	8. Women Employment and Gender Concerns
9. Safety and Security	9. Wages (Equal Wage Norms)
10. Statutory Environmental Compliances	10. Compliance to Social Safeguard norms

11.2.2 Details on environmental aspects to be monitored

11.2.2.1Monitoring of Statutory Compliances

For every contract under the project, statutory compliances of the contractor will be monitored. The statutory compliances include availability of (1) labour license, (2) permits/ clearance for stone quarry and borrow areas, (3) WBSPCB consent to establish and operate for desiltation operations, batching plants, etc.

11.2.2.2Ambient Air Quality (AAQ) Monitoring

Ambient air quality parameters which are recommended for monitoring of are PM10 (Particulate Matter having less than 10 micron) or PM2.5 (Particulate Matter having less than 2.5 micron), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), NH_3 etc. (refer table). These parameters are to be monitored at work sites and disposal areas periodically and compared with the baseline figure. National Ambient Air Quality (NAAQ) Standards, 2009 will be used for comparison and monitoring along with the baseline figure.

Table 90: Air Quality Index (AQI) Category

AQI Category, Pollutants and Health Breakpoints								
AQI Category (Range)	**PM_{10} 24-hr**	**$PM_{2.5}$ 24-hr**	**NO_2 24-hr**	**O_3 8-hr**	**CO 8-hr (mg/m^3)**	**SO_2 24-hr**	**NH_3 24-hr**	**Pb 24-hr**
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.5 –1.0
Moderately polluted (101-200)	101-250	61-90	81-180	101-168	2.1- 10	81-380	401-800	1.1-2.0
Poor (201-300)	251-350	91-120	181-280	169-208	10-17	381-800	801-1200	2.1-3.0
Very poor (301-400)	351-430	121-250	281-400	209-748*	17-34	801-1600	1200-1800	3.1-3.5
Severe (401-500)	430 +	250+	400+	748+*	34+	1600+	1800+	3.5+

Source: Ministry of Environment, Forest and Climate Change, Govt. of India
Note: PM: Particulate Matter; NO2: Nitrogen Dioxide; O3: Ozone; CO: Carbon Monoxide; SO2: Sulphur Dioxide; NH3: Ammonia; Pb: Lead

Table 91: Air Quality Index and Health Impacts

AQI	**Associated Health Impacts**
Good (0–50)	Minimal Impact
Satisfactory (51–100)	May cause minor breathing discomfort to sensitive people.
Moderately polluted (101–200)	May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults.
Poor (201–300)	May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease
Very Poor (301–400)	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases.

Severe (401-500)	May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity.

Source: Ministry of Environment, Forest and Climate Change, Govt. of India

11.2.2.3Ambient Noise Monitoring

The measurement for monitoring the noise levels to be carried out at the work sites / desiltation area / desilting area and near dumping areas in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB). Noise shall be recorded using digitized noise monitoring instrument. The equivalent Noise Level will be recorded for comparison with prescribed limit and baseline data.

11.2.2.4 Water Quality Monitoring

Water quality of the (1) canal network, (2) local water stream adjacent to the dumping site that is used by local community, (3) water quality in the desilted segments on downstream of the disposal area at various distances and (4) other sensitive areas such as fishery sites shall be monitored on quarterly basis during the construction phase. Along with surface water quality, ground water quality will also be monitored on quarterly basis within 100 meters from the desilted sediment disposal area. The physical and chemical parameters recommended for analysis of water quality are pH, turbidity, total solids, total suspended solids, total dissolved solids, COD, BOD, DO, Oil and Grease, Chloride, Iron, heavy metals, Pesticide residue, etc. Monitoring parameters will be as per CPCB guidelines and baseline data.

11.2.2.5Soil / Sediment Quality

The soil quality of the surrounded fields of the working site and waste disposal site will be monitored to understand the impact on soil quality. The quality of the desilted sediment will be monitored. The physio-chemical parameters recommended for analysis are:

Physical Parameter: Soil Texture, Grain Size, Gravel, Sand, Silt and Clay
Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen and Absorption Ratio.
For desilted sediments and desilted materials, the parameters to be tested will include: PCBs, heavy metals (Arsenic, Lead, Mercury, Chromium, Cadmium), organochlorine pesticides, etc. Monitoring parameters will be as per international standards.

No specific standards are defined in India for disposal of desilted material. If desilted material is toxic / harmful then these sediments would be disposed-off in landfill sites. If any criteria developed by Government during the implementation of the project, it will be adhered to or else relevant international criteria will be followed. Criteria followed in US are given in the table below.

Table 92: Criteria for Harmful Bottom Sediments
Source: EIA Report of National Waterways-1, Volume 8

Level of Pollution (mg./ kg. dry)	Cd.	Cr.	Cu.	Pb.	Zn.
Threshold Effect Level (TEL)	0.68	52.3	18.7	30.2	124
Probable Effect Level (PEL)	4.2	160.4	108.2	112.2	271
Non-Polluted	-	<25	<25	<40	<90
ModeratePolluted	>6	>75	>50	>60	>200
HeavilyPolluted	>6	>75	>50	>60	>200

Source: US-EPA
Note: Probable Effect Level (PTL) i.e. the values above which adverse biological affected would frequency occur
Threshold Effect Level (TEL) is the value below which adverse biological effects would be infrequently expect

11.2.2.6Erosion Control Measures

Inspection of identified (during project inception) vulnerable locations such as embankment slopes, borrow areas, etc. will be carried out on periodical basis, at least once before and after monsoon.

11.2.2.7Debris Clearance and Disposal

Clearance and disposal of construction and demolition wastes will be monitored on a quarterly basis. A record of the types and quantities of the waste generated, their clearance and disposal mechanisms will be recorded along with details of residual wastes. This aspect will also cover the sanitation situation at the construction camp sites. Monitoring will be carried out on periodical basis at quarterly frequency. Waste management registers will be maintained for each construction contract along with photographic evidence.

11.2.2.8Site Restoration

The restoration of all the temporary sites utilized for construction such as borrow areas, stock yards, camp site, etc. will be monitored after completion of works to ensure that appropriate restoration measures are taken and it is in improved or in the same condition before its use for the works purpose. Plantation works will also be monitored if such activity is planned for the site/s.

11.2.2.9Safety and Security

For each construction activity, safety aspects at the work and camp sites will be supervised on day to day basis by the site supervisor/ Engineer to ascertain (1) number of labourers – men and women – working at the site, (2) percentage of workers using PPEs, (3) safe access to worksite and safe working platform, (4) availability of first-aid kit, (5) display of emergency numbers in a prominently visible place, (6) orientation of workers on safety protocols to be followed at camp and work sites, (7) periodic health check-up of workers and health issues reported, (8) number and type of safety incidents including minor injuries, major injuries requiring hospitalization, near-miss incidents, fatal injuries, etc.

11.2.2.10 Flora and Fauna

Construction activities and its impacts on local flora and fauna will be monitored at least on quarterly basis during construction phase. Along with this, monitoring would also cover the afforestation / plantation works taken up under proposed project activities in different locations. The key aspects to be monitored on quarterly basis would be (1) local bio-diversity and its management, (2) water quality and its impact on aquatic flora and fauna, (3) fish species and any change in its density / availability etc.

11.2.3 Details on social aspects to be monitored

11.2.3.1Employment of Local Population

Percentage of local and migrant labour engaged for different works will be assessed periodically to indicate total employment generated verses local employment status.

11.2.3.2Living Standard of Workers

Normally, camps are placed for the workers nearer to working site, especially for outside labourers. The stand of living at the camp sites will be periodically assessed to understand the provisions of basic facilities for the workers, its use and maintenance, including sanitation and hygiene.

11.2.3.3Livelihood Restoration

Livelihood restoration measures and its impact will be monitored where displacement is involved. There will be periodic monitoring on different measures taken for livelihood restoration such as schematic convergence, skill development, engagement in different sectors, engagement in project etc.

11.2.4 Environmental and Social Monitoring Plan for Project Activities

The project will take up monitoring and evaluation of the ESMF covering process, output and outcome indicators in different intervals during the life of the project. Key monitoring indicators, frequency of monitoring and responsible agency details is presented in the table.

Table 93: Monitoring Indicators and Plan for Monitoring

Sl. No	Environment & Social Parameters	Performance Indicators	Implementing Entity	Monitoring Agency	Frequency
Environmental					
1	Compliance to Statutory Requirements	1. Labour License obtained 2. Permission for borrow area (If the Contractor operate its own new borrow area) 3. Permission for stone quarry (If the Contractor operate its own new stone quarry) 4. Explosive permit (In case blasting is required) 5. Consent to Establish and Operate for desiltation operations, batching plants, diesel generator, hot mixing plant etc.	Contractor	DPMU and SPMU	During Inception of Work
2	Air Quality	Number and Percentage of samples meeting National Ambient Air Quality Standards	Contractor (Testing through Approved / NABL accredited or MoEF recognised Environmental Laboratory)	DPMU and SPMU	Half Yearly
3	Noise Monitoring	Noise level during different times of a day at construction sites and community sites and its deviation from the prescribed standards by CPCB.	Contractor (Testing through Approved / NABL accredited or MoEF recognised Environmental Laboratory)	DPMU and SPMU	Half Yearly
4	Water Quality	pH, turbidity, total solids, total suspended solids, total dissolved solids, COD, BOD, DO, Oil and Grease, Chloride, Iron, heavy metals, Pesticide residue, etc.	Contractor (Testing through Approved NABL accredited or MoEF recognised Environmental Laboratory)	DPMU and SPMU	Quarterly
5	Soil Quality	Physical Parameter: Soil Texture, Grain Size, Gravel, Sand, Silt and Clay Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen and Absorption Ratio	Contractor through Approved / NABL accredited or MoEF recognised Environmental Laboratory	DPMU and SPMU	Quarterly
6	Sediment Quality	PCBs, heavy metals (Arsenic, Lead, Mercury, Chromium, Cadmium), organo chlrorinepesticides	Contractor through Approved / NABL accredited or MoEF recognised Environmental Laboratory. Tests must be carried out as per US-EPA guidelines	DPMU and SPMU	Quarterly
7	Erosion Control Measures	No. of inspections conducted and site-specific measures taken for erosion control	DPMU	SPMU	Once in a quarter
8	Debris Management	1. Quantity of construction and demolition waste generated 2. Quantity and percentage of construction and demolition waste disposed as per the approved Waste Management Plan 3. Quantity of desilted sediment generated	Contractor	DPMU and SPMU	Quarterly

Sl. No	Environment & Social Parameters	Performance Indicators	Implementing Entity	Monitoring Agency	Frequency
		4. Quantity and percentage of desilted sediment disposed as per the approved Waste Management Plan 5. Clean and hygienic conditions at worker's campsite (visual observation)			
9	Site Restoration	Mapping and photo documentation of pre and post work site situation, including plant site, borrow area, camp site.	Contractor	DPMU and SPMU	After completion of works & before demobilization of the contractor
10	Public and Personnel Safety	1. Percentage of workers supplied with PPEs 2. Percentage of workers using PPEs 3. Incidents including minor injuries, major injuries requiring hospitalization, near-miss incidents, fatal injuries, etc. 4. Use of public safety mechanism near public areas like safety tape, road diversion indicator, using siren while crossing public place, restrict honking in sensitive zone etc.	Contractor	DPMU and SPMU	Weekly
11	Aquatic life	Water quality at downstream fishery sites; Fish catch at downstream fishery sites	Contractor (Testing through Approved / NABL accredited or MoEF recognised Environmental Laboratory; Fish catch details from Fishery Dept.)	DPMU and SPMU	Quarterly
12	Integrated Pest Management	1. No. of farmers adopted IPM practices by crop types; 2. Area (in Ha.) and crops covered under IPM; 3. No. of farmers adopting recommended doses and type of pesticides; 4. Reduction in the use of banned / restricted pesticides.	Dept. of Agriculture / Horticulture	DPMU & SPMU	During Cropping Seasons (Kharif, Rabi and Boro)
Social					
12	Land purchase	1. Land purchased against total land to be purchased; 2. Notices issued as per the government order; 3. No. of consultations carried out with affected persons; 4. Land purchase committee in place.	DPMU	SPMU	Once in the project cycle
13	Dissemination of information on project and social issues	1. No. of consultations carried out with the community in the project area; 2. Proceedings recorded	DPMU	SPMU	Throughout the project cycle
14	Information on modes of valuation of assets, payment schedules and	1. No. of consultations carried out with the affected persons; 2. Proceedings recorded	DPMU	SPMU	Throughout the implementation stage

Sl. No	Environment & Social Parameters	Performance Indicators	Implementing Entity	Monitoring Agency	Frequency
	disbursement modes				
15	Acquisition of house/ structure	1. Number of houses / structures to be acquired 2. No. of consultations carried out with the affected persons 3. No. of PAPs compensated and assisted	DPMU	SPMU	Pre-construction phase till RAP implementation completed
16	Loss of livelihood or sources of livelihood affected	1. No. of affected persons 2. No. of affected persons re-engaged 3. No. of affected persons assisted	DPMU	SPMU	Throughout the implementation stage
17	Displacement of non-titleholders	1. No. of households displaced 2. No. of households assisted	DPMU	SPMU	Pre-construction phase till RAP implementation completed
18	Worker / Labour Living Standards	Provision of all basic facilities at labour camp as per RAP and EMP	Contractor	DPMU and SPMU	Weekly
19	Employment	1. Number of people engaged, 2. Average days of engagement, 3. Average income from project association, 4. No. of SC/ST engaged; 5. Skill development (No. trained) etc. 6. Reduction in outmigration	Implementing Entity	DPMU and PMU Through third party	Half Yearly
20	Gender issues	1. No. of women engaged; 2. Proportional engagement of women to total human resource engagement; 3. No. of women engaged from women headed / vulnerable households; 4. Income from engagement; 5. Days / period of engagement; 6. Safety measures for women; 7. Health and hygiene facilities	Implementing Entity	IA and SPMU	Monthly
21	Functioning of GRC	1. No. of grievances recorded and No. of cases disposed off; 2. Percentage of aggrieved persons satisfied with GRC.	Implementing Entity	SPMU	Quarterly

Chapter 12: Consultation, Information Disclosure, and Grievance Redress Mechanism

Stakeholder consultation is an integral part of the environmental and social assessment and provides inputs for the preparation of Social and Environment Management Framework (ESMF). The overall objective of such consultations was to document the concerns of the stakeholders with specific reference to the project planned interventions. The consultation meetings were organized basically for two important purposes, i.e., (1) to share project objectives and proposed project interventions with the identified stakeholder groups and (2) to consult with the stakeholders and document their concern, with particular reference to social and environmental impacts of the proposed project interventions.

To understand the expected project benefits / risks and people's perception on the project, field visits were conducted to different places within the planned project jurisdiction. In the process of assessment, mapping of stakeholders was done in the visited areas to understand how the project is going to impact upon these stakeholders. The field visit and stakeholder consultations were conducted in five project districts, namely Bankura, West Bardhhaman, East Bardhhaman, Hooghly and Howrah. The interaction with different stakeholders covered farmers of different social and economic categories, local service providers etc. in project districts to understand their concerns.

12.1 Stakeholder's Consultation on ESMF

In the process of preparation of ESMF, stakeholder consultations were carried out in all the five project districts, covering different stakeholders such as farmers of different holding category, local service providers, state and district level line departments and agencies, extension institutions (for example, ATMA and Krishi Vignan Kendra) etc. The details of consultations held in the five districts are given in annexure- 8.

12.1.1 Stakeholder Identification and Analysis

The proposed project will influence a large section of the society in the project districts. Stakeholders, identified in the process are either the individuals or group/s of individuals or their institutions in the village / project area that will be influenced by the activities of the proposed project and vice versa. Different stakeholders were identified in the process who have a direct or indirect stake in the project.

Table 94: Identified Stakeholders in Different Execution Levels

Project Level	**Stakeholders**	
	Direct	**Indirect**
Village / Cluster	1. Farmers: Marginal and Small Farmers 2. Scheduled Tribe (ST) 3. Farmers of other Marginalised Section (Scheduled Caste) 4. ST Women Farmers 5. Women Farmers in Other Social Categories 6. Farmers with Orchard / Horticultural Crops 7. Local Ag. Extension Worker/s 8. Land Lease Holders 9. Farmer Producers Companies / Organisations 10. Members of FPCs 11. Fishery Community	1. Medium, Semi-Medium and large farmers 2. Ag. Labourers 3. Daily Wage Labourers 4. Small Traders 5. Input Suppliers (Seeds Corporation, Pvt. Input Suppliers 6. Ag. Extension Workers 7. Seed Growers (Farmers) 8. Local Aggregators 9. Contractors 10. Community Organisations (CBOs) 11. NGOs working in the locality 12. Financial Services providing entities 13. Agricultural Women Workers (Landless families) 14. Tribal Families 15. Common Villagers 16. Local Ward Member / PRI members
Gram Panchayat	1. Sarpanch / Deputy / Vice Sarpanch 2. Ward Members	1. Traders 2. Aggregators

Project Level	Stakeholders	
	Direct	**Indirect**
	3. Village Council / Gram Sabha 4. Entrepreneurs (agri-business)	3. Input suppliers 4. Entrepreneurs (Agri-Processing Units) 5. Local Mandis / Market Yards
Block	1. Official of Ag. Department 2. Officials of Irrigation Dept. 3. Contractors 4. PRI members of Block Panchayat 5. Line Department Officials (Convergence Promotion)	1. Input Suppliers 2. Aggregators 3. Traders 4. Credit Institutions (formal/informal) 5. Weather Centre Officials 6. Insurance Agencies 7. APMC 8. NGOs / CBOs 9. Farmer's Associations 10. Officials of Forest Department
Project District	1. Dist. Project Management Unit (DPMU) 2. District Project Implementation Unit (DPIU) 3. Agriculture Department 4. Agri- Marketing Department 5. Dept. of Fisheries 6. Horticulture Department 7. Irrigation Department 8. Zilla Parishad / Dist. Admn.	1. Credit Institutions 2. Insurance Agencies 3. Weather Information Provider 4. Traders 5. Agro-Industries 6. Farm Machinery Suppliers 7. APMC 8. Pvt. Input Suppliers 9. Forest Department / its Officials
State and National Level	1. Project Management Unit (PMU) 2. Department of Agriculture 3. Dept. of Agri-marketing 4. Dept. of Fisheries 5. Water Resources Investigation & Development Department 6. Department of Horticulture 7. Department of Irrigation 8. Department of Tribal Development 9. State Ag. Universities 10. Technical Service Providing Institutions (Govt. / Pvt.) 11. West Bengal Pollution Control Board 12. West Bengal Biodiversity Board (WBBB) 13. River Research Institute (RRI), Haringhata 14. Damodar Valley Corporation (DVC) 15. West Bengal State Watershed Development Agency 16. Seed Corporation 17. Other Departments (Convergence) 18. West Bengal State Marketing Board	1. ICAR and its Institutions 2. Ministry of Forest and Environment, Govt. of India 3. Ministry of Tribal Affairs, Govt. of India 4. Pvt. Input suppliers 5. Financial Service Providers 6. Weather Information Provider 7. Insurance Companies (Crop / Weather Insurance) 8. Agro-Processing Agencies 9. Marketing Agencies 10. State Marketing Board (WBSMB) 11. Different associations / organizations of farmers / traders etc.

At the village level, basically the direct beneficiary of the project will be the small and marginal farmers belonging to different social categories. The local FPOs/FPCs and members associated with them will also be directly benefitted due to the agricultural value chain development and agri-business promotion. Similarly, at the GP/block level they can be associated in agri-business promotion activity. The project is having a number of indirect stakeholders who can influence or can be influenced / benefited by the project such as agriculture universities, input suppliers, weather service providers, processing and marketing agencies / agents, credit institutions, insurance service providers etc.

12.1.2 Stakeholder's Consultation

During reconnainance survey stakeholder's consultation was carried carried out to capture their view regarding proposed project implementation. Basic information related to baseline environmental and social condition, presence of ecologically sensitive area, presence of protected area, endangered flora & fauna species, cultural property resource were collected. Date and place wise consultation matrix is given in annexure- 8.

12.1.3 Stakeholder's Concerns / Opinion

12.1.2.1Pre-Implementation Stage:

Environmental:

Inundation / water logging in agriculture land is common phenomenon at Hooghly district which should be addressed under the project.

Social:

1. No land shall be acquired
2. Enough compensation shall be provided for any kind of relocation or loss of assets
3. Spreading of water borne diseases after flood is commonly observed which need to be addressed appropriately

12.1.2.2Construction Stage:

Environmental:

1. Avenue plantation shall be done through entire stretch of canal/ river;
2. Any construction or waste material generated during construction shall not be stored on nearby agricultural field, rather it shall be stored on inner side of embankment without disturbing road transportation;
3. Desilted sand materials shall not be stored or thrown away to nearby agricultural field;
4. Construction labour shall not through away any plastic bag/ materials to nearby agricultural field;
5. Mud / clay portion of desilted material shall be used for filling up, strengthening and raising of embankment and village road network;
6. Sand mining from Mundeswari and other river shall strictly be restricted;
7. All meandering pond shall also be desilted to increase storage capacity;

Social:

1. No activity shall be carried out during monsoon season and night time;
2. Contractor shall employ local labour during construction and operation;
3. Canal embankment where encroachment has occurred, shall be avoided from rehabilitation work;
4. Contractor shall engage woman workers from nearby Adivasi community;
5. Contractor shall provide equal wage for women workers and shall not force them to work during night time;
6. Separate toilet block shall specifically be provided for women workers;
7. Small temple located on embankment shall not be disturbed at any circumstances;
8. Non-availability of sufficient agricultural value chain actors for different crop may not support project component on crop diversification. So, a suitable mechanism should be developed for agribusiness promotion (Agriculture).

12.1.2.3Operational Stage:

Environmental:

1. Beautification of embankment and nearby park, picnic spot may be done;
2. Operator shall be engaged at each outlet point to control irrigation structure;
3. Proper water delivery schedule and mechanism shall be developed and maintained to equally distribute water among tail as well as head users;
4. Construction of Boro band shall not be permitted within river bed, it aggravates flood damage;
5. Ground Water table is depleting rapidly due to excessive use of shallow tube well. There is regular occurrence of pump failure during summer season.

Social:

1. Spreading of water borne diseases after flood is commonly observed which need to be addressed appropriately;
2. Loss of standing crop in Bankura district by periodic attack by the wild elephants for which farmers needs to be compensated;
3. Modernisation of irrigation infrastructure will ultimately lead to more agriculture coverage which could trigger excess use of pesticide and fertilizer. Practice of vermi-compost may be introduced;
4. Less or almost non-availability of irrigation water during Rabi &Boro season in current scenario which need to be focused upon;
5. Emphasis should be given for agribusiness promotion

12.1.4 Issues of Significance for the Project

Need Prioritization and Inclusion of need of Marginal and Small farmers: As the project, will benefit directly to the farmers, it may happen that interest of big farmers may impact upon the small and marginal farmers. Their accessibility to the project created resources may be limited.

Adoption of INM / IPM: Farmers with small operational holdings may not be interested to adopt the INM / IPM due to time and cost factors (it is perceived that such scientific practices will enhance farm level engagement period and may cost them high).

Adoption of water use efficiency enhancing instruments: Accessibility of small and marginal farmers to micro irrigation systems may be limited due to initial investment requirement and fragmented land parcels.

Existence of FPCs: Inaccessible / poorly accessible pockets may not have FPOs / FPCs which may limit / delay execution of certain project activities like agro-processing and value addition activities under agribusiness promotion.

Women membership in FPC and their active involvement: Active involvement of women farmers in agribusiness activities may be limited due to poor market exposure and less understanding of value chain and supply chain aspects.

12.1.5 Issues addressed in ESMF

The ESMF addresses all such issues that are identified to have potential for adverse impact. The ESMF takes care of encroachment and land alienation issues building upon avoidance principles. Involvement of small and marginal holders is ensured through inclusion and equity norms in different project activities. Further, women participation and their safety and security are addressed in the gender equity and social inclusion plan. Pollution and environment related issues are taken care in the ESMF under environment management plan. Further, to mitigate the adverse impact of the use of pesticides, pest management plan is prepared with focus on adoption of other means of treatment when crop loss is under economic threshold level.

Table 95: Issues Addressed in ESMF

Environmental		Social / Agricultural	
Issues	**Addressed in ESMF**	**Issues**	**Addressed in ESMF**
Addressing water logging in agriculture land	This is a major component of the project to restrict water logging / flooding. Implementation of measures in an environment friendly manner is covered in the ESMF.	No land shall be acquired	Project is not intended to acquire any private land. However, RAP is proposed for encroachment related issues, if so arises.
Avenue plantation shall be done through entire stretch of canal/ river	ESMF suggests for avenue plantation and management of local biodiversity	Enough compensation shall be provided for any kind of relocation or loss of assets	The package to be provided is elaborated in detail in RAP which will be as per the norms.
Any construction or waste material generated during construction shall not be stored on nearby agricultural field, rather it shall be stored on inner side of embankment without disturbing road transportation	Management framework suggested for debris / sediments	Spreading of water borne diseases after flood is commonly observed which need to be addressed appropriately	As project will reduce occurrence of flood, so also related diseases will be reduced.
Desilted sand materials shall not be stored or thrown away to nearby agricultural field	Management plan suggested for desilted materials / sediment	No activity shall be carried out during monsoon season and night time	ESMF suggests specific activities which will not be taken up during night and monsoon period.
Construction labour shall not throw away any plastic bag/ materials to nearby agricultural field	The management plan covers labour camp management including sensitisation of workers on this aspect.	Contractor shall employ local labour during construction and operation	ESMF proposes giving priority to local labour force in the work
Mud / clay portion of desilted material shall be used for filling up, strengthening and raising of embankment and village road network	ESMF suggests scientific application and disposal of desilted materials	Canal embankment where encroachment has occurred, shall be avoided from rehabilitation work	ESMF suggests avoidance as one of the principles and in cases, where it is highly necessary for the project and cannot be avoided, RAP will be followed.
Sand mining from Mundeswari and other river shall strictly be restricted	Desiltation of river bed for improving water carrying capacity and flood control is part of the project intervention and ESMF suggests scientific management of sediments and its disposal	Contractor shall engage woman workers from nearby Adivasi community	Inclusion principles are made a part of the ESMF
All meandering pond shall also be desilted to increase storage capacity	Out of the scope of the project	Contractor shall provide equal wage for women workers and shall not force them to work during night time	Equal wage for equal work will be followed and included in the framework.

Environmental		Social / Agricultural	
Issues	**Addressed in ESMF**	**Issues**	**Addressed in ESMF**
Beautification of embankment and nearby park, picnic spot may be done	Plantation and related measures for RoW is suggested in the ESMF	Separate toilet block shall specifically be provided for women workers	Included in ESMF as a part of labour camp management procedures.
Operator shall be engaged at each outlet point to control irrigation structure	In modernised / automated structures, no operator will be required.	Small temple located on embankment shall not be disturbed at any circumstances	No such cultural properties envisaged to get affected by the project.
Proper water delivery schedule and mechanism shall be developed and maintained to equally distribute water among tail as well as head users	Renovation / installation of irrigation regulation structures and scientific regulatory mechanisms will improve distribution and efficiency.	Local farmers organisation / Gram Panchayat involvement	For water management, local farmers organisation will play a role along with GP.
Construction of Boro band shall not be permitted within river bed, it aggravates flood damage	ESMF suggested no construction of boro bunds during monsoon	Drip/ sprinkler irrigation may be introduced for horticulture with 50-70% subsidy	Under irrigation efficiency and productivity improvement, micro irrigation promotion is made a part of the ESMF.
Ground Water table is depleting rapidly due to excessive use of shallow tube well. There is regular occurrence of pump failure during summer season	Increase in irrigation system will help to reduce ground water exploitation and promote conjunctive water use	Excess use of pesticide and fertilizer. Practice of vermi-compost may be introduced	ESMF suggests adoption of IPM as a scientific strategy to deal with along with restriction of using banned pesticides and pesticides categorized as 1a, 1b and II by WHO.
		Less or almost non-availability of irrigation water during Rabi &Boro season in current scenario which need to be focused upon	Improvement in irrigation structure and system along with promotion of conjunctive water use will improve water availability.
		Emphasis should be given for agribusiness promotion	Agribusiness promotion is one of the interventions of the project.

A state level stakeholders consultation meeting on ESMF was conducted on 12th October, 2018 at NIC hall, Jalsampad Bhawan, Salt Lake, Kolkata- 700091. Gist of issue raised during consultation and attendance sheet is given in Annexure- 13.

12.2 Stakeholder's Consultation Framework

This section describes the stakeholder consultation process that needs to be undertaken during the detailed assessments of the project activities.

The IWD through the ESIA consultants should consult all key stakeholders on the project safeguard documents at least once (for category B projects) during the process of assessment. The Stakeholder Consultation will provide a summary of the proposed project´s objectives and a summary of the ESIA conclusions.

Consultation, participation, and disclosure will ensure that information is provided and feedback on proposed design is sought early, right from the preparation phase, so that the views/preferences of stakeholders including potential beneficiaries and affected person can be adequately considered, and continue at each stage of the

activity preparation, processing, and implementation. Meaningful stakeholder consultation and participation is part of the activity preparation and implementation strategy.

The key stakeholders to be consulted during project activity preparation and implementation include:

a. Project beneficiaries, and project affected persons
b. Elected representatives, community leaders, and representatives of community-based organizations; business and industrial associations, etc.,
c. Relevant local NGOs;
d. Local government and relevant government agencies, including the authorities responsible for land acquisition, protection and conservation of forests and environment, archaeological sites, religious sites, and other relevant government departments (regulatory, administration and infrastructure services related)
e. Residents, shopkeepers, business people, farmers, fisheries (owners and workers) who live and work alongside the canal embankment and near sites where facilities will be built; custodians, and users of socially and culturally important buildings;
f. Vulnerable groups, women groups etc.

At the minimum, the proponent must meet with the principal stakeholders to inform them about the proposed project activity and to solicit their views about it. More extensive consultations are required for specific project activities that have significant impacts. The methods and results of the consultations shall be documented in the ESIA Report.

All consultations need to be a two-way dialogue with the aim of informing the stakeholders about the potential impacts (positive/negative) and obtain their feedback and views about the project activities and the proposed mitigation measures. All consultations need to be inclusive of all groups and gender, transparent and documented.

The implementing agencies will conduct meaningful consultations with all relevant stakeholders who are directly or indirectly affected. For this purpose, SPMU will prepare a consultation plan with all stakeholders. The proceedings and outcomes of these consultations will be recorded. For the ESIA, the SPMU will, with the support of participants, summarize how the consultations were conducted, key topics discussed, and the decisions arrived at. These decisions will be incorporated into the ESIA and EMP. Photographic records and signatures of participants will be recorded in the ESIA report.

SPMU will draft ESIA and ESMP after discussions with all stakeholders. The implementing agencies will inform stakeholders and communities about the project activities, obtain their views, and hear their comments and complaints. Through periodic consultations with the local community, SPMU will engage them in project planning, implementation, and monitoring. Consultations will be conducted in an atmosphere that is conducive to the project development and beneficial to the community and local population. The SPMU will ensure that the consultations are free of coercion and intimidation, are gender-inclusive, and tailored to the needs of disadvantaged and vulnerable groups. All relevant stakeholders will be informed in advance about the timing and format of the consultations. This will be done through advertisements in local newspapers and / or written letters to the district magistrates, representatives of relevant departments, heads of the local village councils, representatives of urban local bodies, and NGOs in the vicinity of the project sites. During the consultations, information about the project, its rationale, scope, benefits, and costs, including potential environmental impacts and mitigation measures, will be presented by the SPMU with the support of the ESIA consultants.

Comments and suggestions of all stakeholders will be noted and their queries will be clarified. The signatures of all participants will be collected. Photographs of the consultations will be taken for the record. The comments and suggestions will be recorded and how these have been addressed will be detailed in the ESIA report. During project implementation, safeguards experts will have informal discussions with the locals residing in the vicinity of the proposed project activity sites. They will note the grievances, if any, due to construction. The purpose of consultations is to give factual information about the project to the stakeholders

and to clarify misconceptions if any. This process helps in enhancing local ownership and ensures smooth project implementation in the long run.

A variety of approaches can be adopted, and stakeholders should be consulted throughout the project implementation. At minimum, the following consultation activities should be conducted. This is indicative and SPMU can also adopt more effective methods and approaches, which are locally appropriate.

Table 96: Stakeholder's Consultation Activities

Project Stage	Consultation Activities	Remarks
Project activity preparation	Household level consultations through sample questionnaire surveys on service levels, needs, priorities for project preparation	At the start of the project
	Consultation with all line departments (Agri, fishery, Horticulture & Agri Marketing) and other Govt. (WBPCB, electricity, forests, irrigation and etc. as well as private agency	At the start of the project
	Focus group discussions with people residing/working near the project sites	During the visits to project sites
	Consultations with affected persons: affected persons shall be consulted to ensure: • incorporate their views/concerns on compensation/resettlement assistance • incorporate their views/concerns on mitigation measures for identified impacts • inclusion of vulnerable groups in project benefits • identify assistance required by affected persons during rehabilitation, if any • Avoid potential conflicts for smooth project implementation. It will also provide adequate opportunities for consultation and participation to all stakeholders and inclusion of the poor, vulnerable, marginalized, and affected persons in the project process	At various stages, especially during, the preparation and implementation of resettlement plan
Activity Implementation	Focus group discussions with the people residing/working near the project sites	During the EMP monitoring at work sites
	Informal discussions with the construction workers and construction supervision staff (contractor, consultants and PIU)	During the EMP monitoring at work sites
	Informal discussions with commuters and general public along the roads where works are implemented	During the EMP monitoring at work sites

Outline for preparation of minutes of stakeholder consultation meetings is given at Annexure - 9.

Guidance to ensure the participation of all eligible farmers in project activities is presented in Annexure - 10.

12.3 Information Disclosure

12.3.1 Information Disclosure on ESMF

The draft and final versions of the ESMF will be disclosed for public knowledge through the website of the IWD and the World Bank. The Executive Summary of the ESMF will also be disclosed in both Bengali and English languages at these locations.

12.3.2 Information Disclosure Procedures

Project related information shall be disclosed through public consultation and making relevant documents available in public locations. The SPMU and associated line departments shall provide relevant safeguards information in a timely manner, in an accessible place and in a form and languages understandable to affected person and other stakeholders. For illiterate people, other suitable communication methods will be used.

At minimum, the following documents shall be made available at the offices of SPMU, district level offices of line departments - Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept., Fisheries Department, DM's Office, State and District Libraries, Local municipal and *gram panchayat* office and other public places for public reference, and shall also be uploaded on respective websites.

a. Summary of project and draft ESMF (English)
b. Draft ESMF Report (in English)
c. Final ESMF Report (in English)
d. Updated/amended ESMF (in English)
e. Corrective action plan prepared during project implementation (English)
f. Semi-annual Environmental Monitoring Reports (English)

A concise summary of project and draft ESMF report, providing all necessary details of proposals, implementation arrangements, project locations, likely issues and mitigation and monitoring measures and grievance redress mechanism, shall be made available to the stakeholders. This should also provide contact information of project agency. This summary shall also be displayed at the notice boards of SPMU, district level offices of line departments - Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept., Fisheries Department DM's Office, State and District Libraries, Local municipal and *gram panchayat* office and other public places. During project implementation, relevant information about any major changes to project scope will be shared with beneficiaries, affected persons, vulnerable groups, and other stakeholders.

The following documents will be submitted to the World Bank for disclosure on Bank's website. SPMU will send written endorsement to The World Bank for disclosing these documents:

a. Draft ESMF;
b. Final ESMF;
c. A new or updated ESMF and corrective action plan prepared during project implementation, if any; and
d. Environmental monitoring reports

12.3.3 Information to be disclosed

Table below specifies the type of additional information and frequency of dissemination:

Table 97: Information disclosure matrix

Topic	Documents to be Disclosed	Frequency	Where
Environmental and Social Impact Assessment; Resettlement, Rehabilitation and Land Acquisition	ESIA, ESMP and Resettlement Action Plan (RAP).	Once in the entire project cycle. But to remain on the website and other disclosure locations throughout the project period.	World Bank's website. On the website of IWD, The client would make the ESIA, EMP and RAP available at a place accessible to displaced persons and local NGOs, in a form, manner, and language that are understandable to the PAPs in the following offices: Local IWD office DM's Office State and District Libraries Local municipal and *gram panchayat* office Office of the contractor
	Resettlement & Rehabilitation Policy translated in Bengali	Once in the entire project cycle.	Distributed among Project Affected Persons (PAP)

Topic	Documents to be Disclosed	Frequency	Where
	Information regarding impacts and their entitlements in Bengali	Once at the start of the project and as and when demanded by the PAP.	Through one-to-one contact with PAPs. Community consultation List of PAPs with impacts and entitlements to be pasted in IWD office and website of IWD,
	R&R and LA monthly progress report.	10th day of every month	Website of IWD. Hard copy in the office of contractor in local language
	RAP Impact Assessment Report	At midterm and end of the RAP implementation	IWD website in local language.
	Land Acquisition notifications	As required under the direct purchase GO of state government	IWD website. Hard copy in the office of contractor in local language
	Grievance redressal process.	Continuous process throughout the project cycle.	World Bank's website. On the web sites of IWD Hard copies in local language in the following offices: DM's Office *gram panchayat* office Office of the contractor PAPs to be informed on one to one contact
Public Consultation	Minutes of Formal Public Consultation Meetings	Within two weeks of meeting	On the web sites of IWD Hard copies in local language in the following offices: DM's Office *gram panchayat* office Office of the contractor

In addition to the information specified in the table, the following information shall also be displayed / disseminated, wherever applicable.

i. Project specific information need to be made available at each contract site through public information kiosk
ii. Project information brochures shall be made available at all the construction sites as well as the office of SPMU / DPMU / DPIU and the office of Engineer in charge.
iii. Reports and publications, as deemed fit, shall be expressly prepared for public dissemination e.g., English versions of the ESIA, EMP and RAP and Executive Summary of ESIA, EMP and RAP in local language.
iv. Wherever civil work will be carried out a board will be put up for public information which will disclose all desired information to the public, for greater social accountability.
v. All information will be translated into local language and will be disclosed to the public through the Panchayat, District Magistrate's office, concerned project offices, websites of IWD.

12.4 Grievance Redress Mechanism

Effective grievance redressal mechanism gives an opportunity to the organization to implement a set of specific measures to ensure good governance accountability and transparency in managing and mitigation of environmental and social issue of a particular project. This consists of defining the process for recording/receiving complaints and their redressal in respect of environmental and social matters.

An integrated system will be established with Grievance Redressal Cell (GRCs), with necessary officers, officials and systems, at the state as well as IWD. Grievances, if any, may be submitted through various mediums, including in person, in written form to a noted address, e-mail, or through direct calls to concerned official/s. The Social and Environmental Expert in the concerned agency shall be responsible for coordination of grievance/complaints received

The grievance redress mechanism should be in place at the time of initiating the implementation of RAP and civil construction activities in the area. A platform for grievance redressal should be organized and its regular meetings may be conducted so as to allow people to put forth their grievances. It will help the appropriate authority to find solutions and amicably address the issues. The project, apart from web-based mechanism, will have three-tire grievance redressal mechanism, i.e., (1) at the project site level (up to DPMU level), (2) State level (SPMU level) and (3) Judiciary level.

Web based grievance mechanism[15]: In case of grievances received through toll free number or web-based system, a person will be made in-charge of screening and resolution of the same/communicating with the concerned divisions for resolution of the same. The person in-charge based on nature of complaint, will forward the same to the concerned official. A ticket or a unique number will be generated for all such complaints. The complainant will follow up based on that unique number. All calls and messages will be responded within two weeks. If response is not received within 15 days, the complaint will be escalated to project head.

Tier I: Under this project, the local Gram Panchayat and Community level organizations will serve as the first-tier mechanism to handle complaints and grievances. The local Sarpanch of the Gram panchayat will be the focal point who will receive, address, and keep record of the complaints and feedbacks. The grievance focal point will first review the grievances submitted. If grievances or disputes cannot be solved at the GP level within 30 days of the submission of the grievances, the issue will be brought to DPMU level for mediation. DPMU is expected to inform aggrieved persons or parties to disputes of the resolution in 30 days.

Tier II: If the aggrieved person is not satisfied with the verdict of site level grievance cell, he or she can escalate the grievance to state level grievance cell. The tier II cell will be under the Chairmanship of Secretary, Department of Water Resources. The other members will include Chief Engineer; Project Director and Environmental and Social Officer of the Project. The second level of grievance cell will provide its view within 30 days of receiving the grievance.

Tier III: The aggrieved person if not satisfied with the verdict given by State level grievance cell, will have the right to approach the Judiciary. Project will help the aggrieved person in all respect if person wants to approach the judiciary.

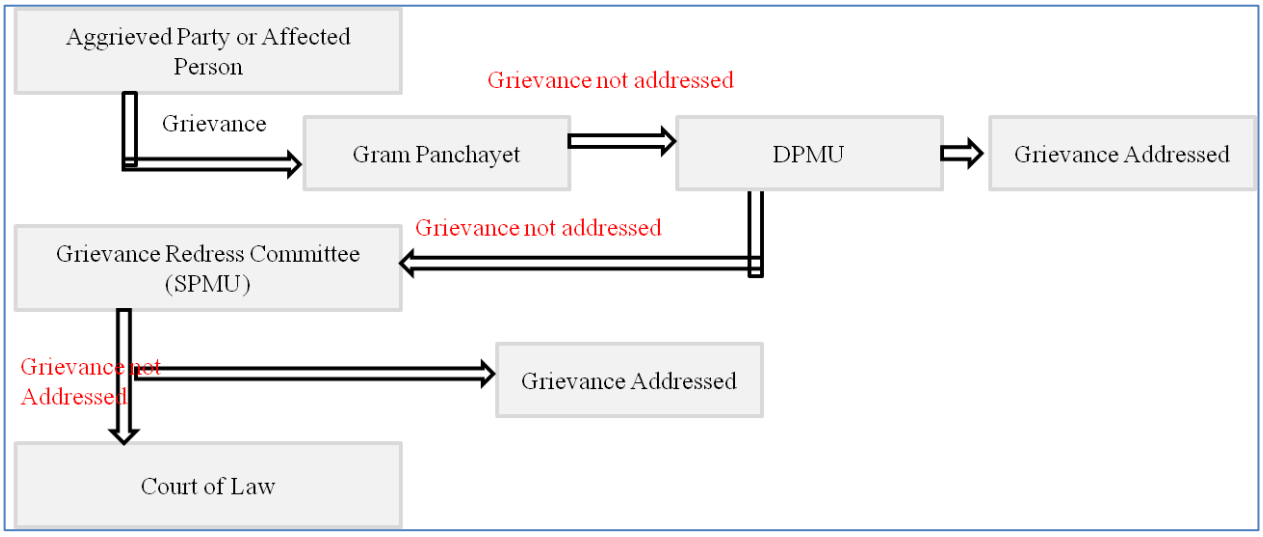

Figure 14: Overall project grievance redress mechanism

[15] IWD website will include a link where affected person(s) can register their complaints online. A telephone number will also be on the website of IWD and the project sites, so that the general public can register their complaint with the SPMU office.

Chapter 13: Institutional Arrangement for Implementation

Irrigation & Waterways Department (IWD) would be the nodal department for the implementation of West Bengal Major Irrigation and Flood Management Project (WBMIFMP). To manage and oversee implementation of the project, a dedicated State Project Management Unit (SPMU) and two District Project Implementation Units (DPMUs) will be constituted. The SPMU will be headed by a Project Director in the rank of Chief Engineer and the DPMUs will be headed by Additional Project Directors in the rank of Superintending Engineers (Civil). In addition to the dedicated SPMU and 2 DPMUs, four Irrigation Divisions (i.e. Howrah Irrigation Division, Hooghly Irrigation Division, Bardhhaman Irrigation Division and Right Bank Irrigation Division) under the Irrigation & Waterways Directorate will be constituted for implementing field works of the project exclusively, and these Divisions will be designated as District Project Implementation Units (DPIUs) of the Department[16]. The overall institutional arrangement for the implementation of the project is outlined in the diagram.

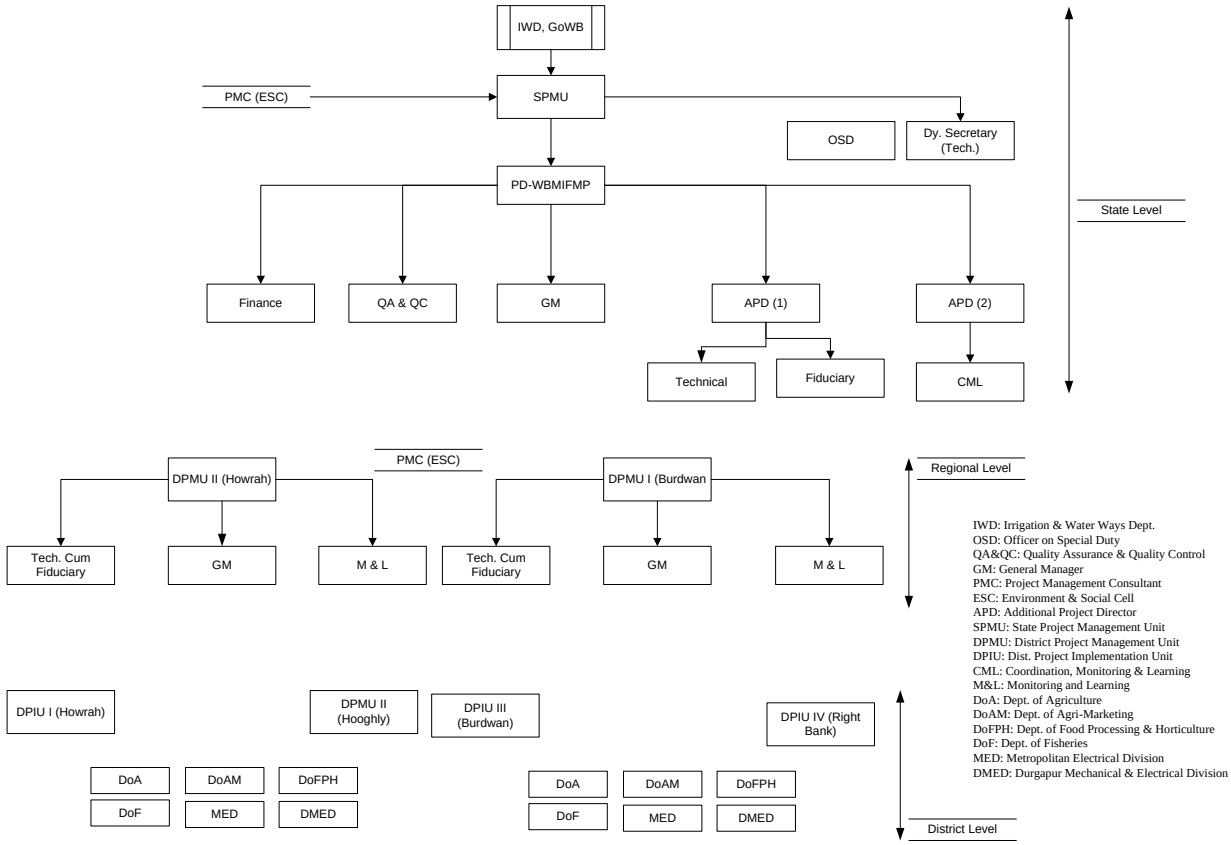

Figure 15: Project Implementation Arrangement

SPMU will be responsible for overall planning and implementation of the entire project. The SPMU and DPIUs will have different sub-units for their effective functioning. The SPMU and DPMUs will be staffed

[16]Orders for opening of new SPMU and DPMUs, manning of the Department staff in the said SPMU, DPMUs and also in DPIUs along with restructuring and redistribution of jurisdiction of these DPIUs have since been brought out in the Notification on Restructuring of the Irrigation & Waterways Department, vide No.12-W/2017-18 dated 8th August 2017 (Para-7 and Annex - 10 & 11 of the said Notification)

with the engagement of consultants, experts and various other categories of contractual staff to support the project.

13.1 Project Management Consultant (PMC)

The Project / State Project Management Unit (SPMU) will engage a consulting firm, as Project Management Consultant (PMC) for providing technical support to the project and facilitate implementation of project framed activities. SPMU will ensure that ESIA is conducted and ESMPs are prepared and that the ESMP as well as ESMF is followed during project implementation. SPMU will make required institutional arrangement to ensure compliance of the project components as per the ESMF. The project management consulting (PMC) firm to be engaged under the proposed loan will have one experienced Senior Environmental and one Senior Social cum Gender development specialist at SPMU level and 2 Environmental (Junior) and 2 Social cum Gender development specialist (Junior) at DPMU level. The environmental and social safeguard experts of the PMC will assist SPMU in updating/ modifying ESIA (including ESMP). Environmental and social safeguard experts will work closely with the SPMU, DPMUs and DPIUs, different institutional partners, facilitating agencies, project implementing agencies / line departments that are associated with the project from time to time. Safeguard experts will ensure that the project interventions are consistent with the agreed strategies and framework. These experts will assist SPMU and DPMU in implementing and monitoring environmental and social mitigation measures as per ESMF and ESIA (including ESMP). Safeguard specialist together will also assist SPMU in preparing semi-annual safeguards monitoring reports as required by the World Bank.

Specific roles of the PMC with regard to ESMF implementation would include the followings.

Preparatory Stage:

1. Preparing activity schedule in line with the ESMF;
2. Sharing the framework with the SPMU-IWD and finalizing the framework;
3. Initial field visit to project sites and assessment of environmental and social aspects of project activities;
4. Discussion with different stakeholders, including implementing agencies (Dept. of agriculture, Horticulture, Fishery and Agri-Marketing) on safeguard measures and their expected role;
5. Preparing / finalizing assessment framework in line with the Environment and Social indicators;
6. Finalizing TOR of the contractors incorporating safeguard measures to be taken;
7. Facilitate / organize training / workshops on safeguard measures for the stakeholders;
8. Designing study / assessment tools for periodic assessment, its piloting and finalization.

Implementation Stage:

1. Conducting periodic site visits and observe the measures taken as per the safeguard norms;
2. On the spot guidance to contractor / implementing agencies on safeguards;
3. Preparation of site specific reports and sharing with SPMU-WBMIFMP;
4. Documentation of learning cases for sharing and dissemination;
5. Visual documentation of site specific safeguard measures;
6. Tracking activity specific environmental and social monitoring indicators;
7. Organizing / facilitating refresher training courses for stakeholders;
8. Monthly and quarterly progress report preparation and submission to SPMU-WBMIFMP.

Post-Implementation Stage:

1. Consolidation of periodic monitoring reports;
2. Support in conducting environment and social audit;
3. Consolidation of good practice documents and its submission to SPMU-WBMIFMP;
4. Final sharing workshop on environment and social safeguard practices and its outcome.

13.1.1 Senior Safeguard Specialist at SPMU level (under PMC)

13.1.1.2Environmental Specialist

The Environmental specialist at the SPMU level will look after environment issues in line with the ESMF. He/ she will guide the project team on environmental aspects and support in building environmental parameters to be built in the bids. He/ she will also guide the contracts and monitor their works with regards to ESMP implementation from time to time. In case of requirement, he/ she will prepare a detail environment management plan for different activities to be executed by the project. The expert will be guided by the Project Director and reporting to the Project Director directly. The detailed Terms of Reference for the Environment Expert is provided in Annex.

13.1.1.1Social cum Gender development specialist

The Social cum Gender development specialist at the SPMU level will be the responsible person to guide the overall process related to social and gender aspects. The district / sub-district level implementing agencies will execute and monitor the social / gender components in consultation with the Social cum Gender development specialist. She / he will be associated in the screening process of such activities that require acquisition of land and/or involvement of women and/or need special focus on tribal involvement. She/he will monitor the social processes followed in execution of the planned activities and realisation of the social / gender inclusion parameters. She / he will be looking after social / gender aspects of the project, including monitoring of social / gender indicators and coordinating with different agencies / institutions. The expert will be guided by the Project Director and reporting to the Project Director directly.

13.1.2 Junior Safeguard Specialist at DPMU level (under PMC)

In the similar phason like SPMU, there will be two Environmental Expert (Junior) and two Social cum Gender expert (Junior) at each DPMU level to facilitate and support in implementation of ESMP.

13.2 M&E Agency

Along with PMC, one M&E agency will be engaged to monitor and periodic evaluation of project implementation work. M&E agency will evaluate implementation of ESMP along with other monitoring activities. Agency will be responsible for conducting quarterly monitoring of environmental parameters for Air, Surface Water, Ground Water, Soil and Noise quality and mid-term as well as end-term evaluation of ESMP implementation.

13.3 Capacity Building Strategy

The concerned officials at the SPMU and DPMU / DPIU will be oriented on different social and environment aspects by which they will be equipped well to manage the related issues effectively and efficiently. The capacity building would take in to account the current issues that may influence the project activities, measures that are required to be taken to ensure greater involvement of socially and economically backward families and deprived sections of the society. A capacity building plan on social and environmental aspects are suggested here for concerned officials involved in carrying out the project activities.

Table 98: Capacity Building Strategy

Stakeholders	Capacity Building Area	CB Events	Responsible Entity
SPMU / DPMU / DPIU	The project and ESMF of the Project; Required Environment and Social Safeguard Measures in the project; Environment Screening Process and use of screening checklist; Role & Responsibility of different institutions / agencies; Reporting and Documentation; Monitoring and Evaluation.	In-House Training; Exposure; Field Visit; Periodic Review and Orientation Sessions	Irrigation and Waterways Department / SPMU
Contractors	Statutory Compliance Procedures; Safeguard Obligations; Management of Work Camps; Safety and Security of workers; Management of Desilted Materials and Waste Management; Works Management; Responsibility towards local Community; Reporting / Documentation	Training / Orientation Review Meetings	SPMU / DPMU
Workers	Personal Safety and Security; Personal Responsibility in Work Area cleanliness & Hygienic Practices	On-Site Training Periodic Review and Orientation	Contractor / DPIU
Other Implementing Agencies (Ag. Dept. / Community Organisations / Farmers Organisations etc.)	Integrated Nutrition Management; Integrated Pest Management Crop Diversification / Intensification / Crop Rotation Irrigation Efficiency and Water Productivity; Climate Resilient Agricultural Practices; Market Linkage and Agri-business promotion	In-House Training; Field Demonstrations; Exposure Visits Periodic Review and Refreshers	SPMU / DPMU

Note: This capacity building plan is exclusively to educate / orient / train the project personnel / dept. and other stakeholders on different aspects of ESMF and required measures to be taken during the execution of the project activities. The plan excludes other proposed trainings / capacity building related to different project components.

Chapter 14: Budget for ESMF Implementation

As the technical details have not yet been finalized for the project investments, an estimated lump sum amount has been designated to for ESMP implementation. This is an estimate and will need to be updated once the FS/design of project investments has been finalized during project implementation. An implementation period of 60 months is considered for the preparing following costs. One SPMU, two DPMUs and four DPIUs are considered.

Table 99: Indicative Cost of Environmental and Social Management Framework Implementation

SN	Budget Heads	Unit	Qt.	Unit	Qt.	Unit Cost	Total Cost	Reference
A	Regulatory Clearance							
	Consent for establishment of hot mixing plant, HMM, batching plants, diesel generator and etc. (to be built into Contractor's contract specifications)			Lumpsum			18,00,000	Built into project cost
	Permission for tree cutting			Lumpsum			6,40,000	Built into project cost
B	Workers Safety and Construction Camp							
	Camp establishment (to be built into Contractor's contract specifications)						40,00,000	Built into project cost
	Workers EHS Measures						67,50,000	Built into project cost
C	Compensatory plantation		3720	Nos.		3,000	1,18,20,000	Included in Provisional Sum
D	Waste Management							
	Disposal of desilted material (Except Mundeswari River)		4290236	Cum		113	48,47,96,668	
	Vegitation waste			Lumpsum			7,00,000	Built into project cost
	Disposal of C&D Waste		558863	Cum		111	6,20,33,793	Built into project cost
E	Environmental Quality Monitoring by Contractor			Lumpsum			25,50,000	Built into project cost
	Environmental Quality Monitoring by M&E agency		3	Times		10,74,833	94,94,700	Built into M&E cost
	EQM of other parameters			Lumpsum			40,00,000	Built into project cost
	Post Project EQM (2 Years)		2	Times/ Year	47	30,000	28,20,000	
F	Human Resource							
	SPMU-Social & Gender Expert	No.	1	Month	60	1,50,000	90,00,000	
	SPMU-Environment Expert	No.	1	Month	60	1,50,000	90,00,000	
	DPMU-Social & Gender Asst.	No.	2	Month	60	75,000	90,00,000	
	DPMU-Environment Asst.	No.	2	Month	60	75,000	90,00,000	
	Sub-Total						3,60,00,000	
G	Capacity Building							
	Training with Refresher							
	SPMU	Days	5	Person	6	3,500	1,05,000	Built into project cost
	DPMU	Days	5	Person	15	2,500	1,87,500	Built into project cost

	DPIU	Days	5	Person	25	2,000	2,50,000	Built into project cost
	Contractors	Days	3	Person	75	1,000	2,25,000	Built into project cost
	Farmers / FPO training on IPNM	Days	3	Person	5000	500	75,00,000	Built into project cost
	Sub-Total						82,67,500	
	Exposure							
	SPMU	Days	5	Person	6	5,000	1,50,000	Built into project cost
	DPMU	Days	5	Person	5	3,500	87,500	Built into project cost
	SPIU	Days	5	Person	5	3,500	87,500	Built into project cost
	FPOs	Days	2	Person	25	3,000	1,50,000	Built into project cost
	Lead Farmers	Days	3	Person	500	1,500	22,50,000	Built into project cost
	Sub-Total						27,25,000	
	Demonstration							
	INM	No.	25	Blocks	41	15,000	1,53,75,000	Built into project cost
	IPM	No.	25	Blocks	41	15,000	1,53,75,000	Built into project cost
	Climate Resilient Farming Tech.	No.	50	Blocks	41	15,000	3,07,50,000	Built into project cost
	Sub-Total						6,15,00,000	
H	Awareness Drive							
	Workers / Labour Force	No.	2	Camps	41	15,000	12,30,000	Built into project cost
	Villages / Community	No.	5	Blocks	41	25,000	51,25,000	Built into project cost
	IEC Materials	No.	3	Copy	50,000	10	15,00,000	Built into project cost
	Sub-Total						78,55,000	
I	EMR report preparation	Quarter	2	Year/ Package	5	1,20,000	2,40,00,000	
	Environment & Social Audit	No.	2	Times		80,00,000	1,60,00,000	
	Sub-Total						4,00,00,000	
	Grand Total						**74,77,52,661**	

Note: Budget is tentative and to be finalized during finalization of project cost. There are certain activities which will be the line activity of the project. Such activities will be part of the overall project budget, such as Waste management, compensatory tree plantation, cost toward temporary relocation and etc.

Annexure- 1: Indicative TOR for Conducting ESIA Study for Category 1 Activities

A. Objective

To improve the existing irrigation network, optimizing conjunctive and sustainable use of ground and surface water across in the project area and throughout the year, and to reduce flooding The Government of West Bengal (GoWB) has proposed "West Bengal Major Irrigation and Flood Management Project (WBMIFMP)". The Government of West Bengal (GoWB) has applied for USD 290 million financing from the International Bank for Reconstruction and Development (IBRD) and from the Asian Infrastructure Investment Bank (AIIB) towards the cost of the WBMIFMP.

The project aims at modernization of irrigation system, with special emphasis on conjunctive use of ground and surface water in the Damodar Valley Project Command Area of the State, in the districts of Purba & Paschim Bardhhaman, Bankura, Hooghly and Howrah and improvement of flood management infrastructure in Lower Damodar Sub-basin, mainly in the districts of Hooghly and Howrah. Prime objective of proposed project is to rejuvenate and rehabilitate existing irrigation network for sustainable development in DVC area and management of floods in Lower Damodar Sub-Basin in West Bengal. Proposed project has mainly four broader objectives namely 1) *Irrigation Modernization, 2) Irrigation Management, 3) Flood Management and 4) Crop Diversification.* Project will also promote conjunctive use of surface and ground water for agriculture. The expected results of the project are to improve irrigation in order to benefit agriculture in the DVCA, and to reduce annual flooding in the Lower Damodar sub-basin area.

The World Bank's Environmental and Social Safeguard Policies (Safeguard Policies) will be applied since (i) they are consistent with the Bank's Articles of Agreement and materially consistent with the provisions of the Bank's Environmental and Social Policy and relevant Environmental and Social Standards; and (ii) the monitoring procedures that the World Bank has in place to ascertain compliance with its Safeguard Policies are appropriate for the Project. An Environmental and Social Impact Assessment (ESIA) will be conducted to assess potential environmental and social impact due to implementation of proposed project activities.

ESIA shall achieve the following objectives:

- Establish the environmental and social baseline in the study area, and to identify any significant environmental and social issues;
- Assess the impacts of the proposed technical solutions to address the challenges that the project area is facing, and provide for measures to address the adverse impacts by the provision of the requisite avoidance, mitigation and compensation measures;
- Integrate the environmental and social issues in the project planning and design;
- Develop appropriate management plans for implementing, monitoring and reporting of the environmental and social mitigation and enhancement measures suggested.

B. Key Tasks and Methodology

Screening and scoping

The process of preparing the environmental and social screening checklist and scoping will typically cover:

- Describing the need for the project
- Describing the proposed project or options.
- Identification of the issues or problems to be addressed.
- Identifying the potential environmental and social impacts of the projects or options.
- Consulting local officials on the project or options, and the potential impacts.

- Preliminary consultation with relevant agencies and local community to assess the gravity of these issues and impacts from the perspective of the stakeholders. The focus of these consultations would be to inform the local community, reviewing the likely issues and problems.
- Undertaking a preliminary evaluation of the potential environmental and social impacts of the project or options.
- Selecting a preferred project option or short list of options. (The appraisal of the available Feasibility study reports should be included from an environmental and social perspective).
- Identifying the regulatory approvals required from WBPCB, CPCB and other regulatory agencies.
- Determining the type and scope of EIA study. Developing terms of reference (ToR) for an Environmental and Social Assessment Study of the preferred option.

While more extensive data is likely to be required for ESIAs, some data on baseline conditions (mostly secondary sources) will generally be required for screening to compare the environmental and social impacts of project options and to assess the extent of any environmental and social impacts.

The robustness of screening will often be dependent on the quality of data on baseline conditions and the assessment of projects induced environmental and social impacts.

Environmental and Social Impact Assessment

The ESIA is the most commonly used tool to ensure that environmental and social aspects are considered during decision making – by influencing design to prevent /minimize, and where unavoidable, mitigating the residual adverse impacts and/or enhancing positive impacts. It also provides a platform for getting views from stakeholders including the directly affected population to improve the design. Detailed guidance regarding the EIA/SIA contents is available in the OP4.01 /OP 4.12 of World Bank. The key steps in preparing the ESIA would involve:

i. Defining the scope in line with the already completed screening, and the Operational Policies of the World Bank. Indicative TOR for Conducting ESIA Study for Category 1 Activities provided in **Annexure-1** shall act as a guidance document. Rapid environmental checklist (Given in Annexure-2) shall be used to assess potential environmental and social impact due to implementation of category 2 project activities.
ii. Obtaining information from primary or secondary sources regarding the current conditions of environmental and social features within the influence area of the project activity.
iii. Carrying out extensive stakeholder consultation in the proposed project activity impact zone to identifying any environmental, social, cultural, gender specific and indigenous community concerns/issues. This shall also include landless labourers / marginalized communities whose livelihood may be impacted due to proposed project activities.
iv. Identifying feasible alternatives for proposed design / components in close collaboration with the project design team.
v. Identifying and estimating quantitatively (to the extent possible), key impacts and classify these for ease of understanding and determination of significance (by severity, duration, project phase – if any, etc.)
vi. Selecting measures that can help manage these impacts in cost effective manner – reduce the negative ones; and enhance positive ones and estimate the residual impacts, including those that may need further study.
vii. Clarifying the institutional arrangements, any capacity building needs, and resource requirements including grievance redress mechanism and budget as part of the preparation of environmental and social management plan.

Environmental & Social Baseline Information

The assessment of baseline conditions should take into account:

i. Past trends in environmental and social quality
ii. Community preferences and competing demands for resources

iii. Other current or proposed development programs in the project area.

Good maps are generally required to indicate the spatial relationship between the sources and recipients of the environmental and social impacts. Google Earth and other open source satellite imagery data can also be very useful in identification and indicating changes in land use and other environmental features. Following are the essential maps:

- A map specifying the location coordinates of the proposed project
- A study area map indicating features such as locations of human settlements, agriculture land, neighbourhood industries with details, if any
- Schematic layout of the project.
- A map specifying the land use patterns / drainage / topography of the project site and study area.
- A map marking the sensitive zones in the study area, such as national parks and sanctuaries, forests, defence installations, international border, protected areas, and airports (if applicable).

Probable Impacts

Environmental and social impact analysis of a project consists of comparing the expected changes in the biophysical and socioeconomic environment with and without the project. For each potential environmental or social impact, the analysis should predict the nature and significance of the expected impacts or explain why no significant impact is anticipated.

Key environmental issues / impacts identified that would require detailed investigations during the ESIA stage are listed below. A summary of the issues and potential impacts is presented in the following paragraphs to guide preparation of project ESIA and ESMP.

(a) Environmental Impacts

(b) Impacts on Private Land, Livelihood and Human Environment

The proposed project may not require any additional land but rehabilitation of embankments may require temporary relocation of residences and business establishments those who have encroached upon the canal embankments. Relocation of business establishment may result in temporary loss of income and / or sources of income. The preliminary results do not indicate any probable loss of common property resources such as religious places and cremation ground. However, there could be impact on host community due to influx of construction workers.

(c) Impact of labour Influx

The influx of workforce will put additional pressure on existing resources. The workforce normally consists of solitary migrant males and that can be potential risk for host population. Specifically, influx of labour force can lead to:

1. Risk of conflict and social unrest due to cultural differences between the labourers and local community
2. Risk of spread of communicable diseases due to interaction of the labourers and the local community
3. Risk of gender-based violence

Health hazard for host community due to lack of sanitation facilities and waste management

Content of ESIA report

The following will be the outline contents for each ESIA under the project:

i. Executive Summary
ii. Project Description
iii. Policy, Legal and Institutional Framework
iv. Current (Baseline) Environmental & Social Status
v. Potential Environmental & Social Impacts

vi. Analysis of Alternatives
vii. Stakeholder Consultations, including Community Consultations / Public Disclosure
viii. Environmental & Social Management Plan (including additional studies, if any)
ix. Grievance Redressal Mechanism
x. RAP depending upon the likely R&R impacts; else would be addressed under the EMP document.
xi. Recommendations and Conclusion
xii. Annexes (including data sources, List of EIA preparers, consultation details, etc.)

C. Stakeholder Consultation

List of all potential stakeholders are already identified and included in section 12.1.1 on Stakeholder Identification and Analysis. Stakeholder consultation during conducting ESIA study shall be governed by stakeholder's consultation procedure outlined in section 12.2 on "Stakeholder's Consultation Framework. Outcome of consultation process shall be minuted as per Appendix- 9 on "Outline for preparation of minutes of stakeholder consultation meetings"

D. Key Output

The key output ESIA-ESMP document will include the following:

Objectives and description of the project activity	Objectives of the project activity. Description of the project activity including: • Physical location and area of influence • Technical details of the activity (including maps and designs in the annex) • Implementation program including the schedule of works
Baseline status	Baseline status will sharply bring out the data and analysis on: • Land use • Soils and topography • Hydrology and hydrogeology • Water quality • Sediment quality • Air quality • Existing land use in the project activity's area of influence (including worksite and disposal site) • Sensitive receptors in the project activity's area of influence (including worksite and disposal site) • Ecological sensitive habitats/features in the project activity's area of influence including tree cover • Culturally significant sites/features (including archeological/ historic sites) in the project activity's area of influence • Sensitive social issues Most of the information has to be compiled through a rapid survey of the area of influence, review of secondary information at the district and block level, interaction with relevant line departments, and consultation with key stakeholders. Baseline status on water quality, air quality, sediment quality, etc. Baseline status on tree cover, ecologically and culturally sensitive sites/features will require rapid field study, consultation with conservation agencies (Govt. and NGO), and consultation with the local community.
Identification of environmental impacts and	Impact identification should cover physical, biological and socio-cultural elements. Stake holder consultation will be a necessary step in impact identification process. The exercise should examine impacts on the following carefully: • Environmental Flows

mitigation measures	• Water availability • Water quality • Air quality • Land and soil resources • Sensitive receptors • Ecologically sensitive areas • Culturally significant sites • Public and worker health • Waste management Impacts due to the activity location, construction and operation should be considered. Cost-effective and feasible mitigation measures may be suggested, in consultation with the engineering team, to reduce potentially significant adverse environmental impacts to acceptable levels. Measures to enhance the positive environmental impacts of the activity should also be considered (for example, use of fly ash-based materials in the construction). Each of such measure shall be briefly described with reference to the impacts to which they relate and the conditions under which these are required.
Analysis of alternatives	As the Feasibility Study would have identified the project activities after an analysis of alternatives, here the focus will be on analysis of alternatives within the project activity design (for example, choice of technology, materials, alignment, etc.). The analysis should be done on primary environmental, techno-economic and social criteria.
Stakeholder Consultation	Stakeholder analysis – list of all key stakeholder groups and their role/interest in the project activity (including community groups such as local male and female residents, farmers, relevant line departments, NGOs, etc.). Stakeholder consultation – description of the stakeholder consultation process and outcomes specifying the key issues discussed, the key concerns noted, and, their integration into the EMP.
Environmental Management Plan	Environmental Management Plan will primarily deal with management measures to be implemented during the construction and the operation phase of the activity. The EMP will have three sub-plans namely the Mitigation Sub-plan, Monitoring Sub-plan and the Institutional Arrangements Sub-plan. Project activity wise mitigation will summaries the identified adverse environmental impacts and give details of feasible and effective mitigation measures. For each mitigation measure, the following will be spelled out clearly: • The key responsible entities for implementation of the mitigation measure • The key responsible entities for monitoring the implementation of the mitigation measure • The time frame for implementation of the mitigation measure • The reference to the relevant clauses in the contract conditions or the s.no. in the Bill of Quantities in the bid documents If the mitigation measures are likely to have any secondary impacts, their significance will require evaluation. Environmental Monitoring Sub-plan will include two key areas: • Monitoring implementation of mitigation measures: This specifies the monitoring indicators, key responsibility for monitoring, frequency and format for reporting. The monitoring will also include indicators specified in

	the Waste Management Plan, Labour Influx and Construction Worker Campsite Management Plan and Integrated Pest and Nutrition Management Plan. A limited set of effective indicators must be identified. • Monitoring environmental quality: This will cover monitoring and reporting on the air, water, soil/sediment, biodiversity against the baseline values of the indicators. The key responsibility for monitoring, frequency and format for reporting will be specified. General monitoring parameters are furnished at attachment –I. Institutional Arrangements Sub-plan will comprise the following elements; • Key roles and responsibilities for mitigation and monitoring in the IWD and other relevant departments at the state, district, division levels. • Key roles and responsibilities of the contractor for mitigation and monitoring • Capacity building plan: Capacity building needs of key stakeholders (including Contractors and their workers); Training and IEC plan for meeting the identified capacity building needs.
Budget for EMP implementation	List of all EMP activities and indication of how the cost has been integrated into the project activity cost.

E. Disclosure Procedure:

Final ESMF as well as ESIA will be disclosed as per outline given in section 12.3 on "Information Disclosure".

F. Team composition:

Team composition for conducting ESIA study is given below which will comprise:

Table 100: Team composition for conducting ESIA study and developing ESMP as well as RAP

Sl.No.	Position	Educational Qualification	Professional Experience
1	Team Leader cum Environmental Expert	Graduation in Civil Engineering and Post-graduation in Environment Engineering / Environment Science.	15 years of demonstrated experience in the preparation of Environmental and Social Management Framework in developed countries, and carrying out EIAs for managing and monitoring environmental impacts on natural habitats, conservation/degradation of natural habitats in forests, protected wetlands areas, ecosystem of drainage channels, rivers and also including social impacts during and after implementation of large-scale infrastructure project. The specialist should also be fully conversant with formulation of Resettlement people's Framework/ Action Plan, Indigenous People's Framework/ Action Plan in accordance with the safeguard policies of the World Bank.
2	Social Impact Assessment Expert	Post-graduation in Sociology / other relevant field.	15 years of demonstrated experience in designing and implementing social assessment programs in large-scale infra-structure projects. The specialist should have working experience on issues pertaining to vulnerable community; religion and gender. Should also have wide experience of handling consultations with multiple stakeholders and large-scale database of individual households. The specialist should also be fully conversant with the national law and regulations related to land acquisition and resettlement and safeguard policies of the World Bank.
3	Public Consultation /	Post-graduation in Social Science	15 years, with extensive experience in preparation of social impact assessments and mitigation/ management strategies

Sl.No.	Position	Educational Qualification	Professional Experience
	Participation Specialist	/ other relevant field.	and the planning and implementation of community consultation programs, and in Rapid Rural appraisal (RRA).
4	Agricultural Expert/Agronomist	Post-graduation in Agriculture / Agronomy.	At least 10 years professional experience in Agriculture sec- tor and expertise in study of impacts of fertilizers & pesticides and formulating Integrated Pest Management Plan etc.
5	Hydraulic Structural Engineer	Post-graduation in Civil / Structural Engineering.	At least 10 years professional experience in design of major irrigation projects involving dams and barrages.
6	Irrigation Expert	Post-graduation in Irrigation, Soil & Water Cons. Engg., civil	At least 10 years of experience in irrigation sector; implementing, managing and operating major, minor and medium irrigation project.
7	Ecology and Biodiversity Expert	Graduate in Botany, ecology, biology	At least 10 years of experience in impact assessment study, biological assessment
8	Water resource expert	M. SC or B.tech in Geology, hydrology, water engineering	At least 12 years of experience in ground water assessment, deep tube well construction, hydro-geological study, water quality analysis
9	GIS Expert	M.Sc (RS & GIS), PG Diploma in RS & GIS	At least 7 years of experience in GIS domain, preparing GIS based maps

G. Time frame:

Entire ESIA study shall be completed within a period of 6 months.

Attachment I

Item	Monitoring Parameters	Monitoring Locations
Surface water quality	pH BOD COD Conductivity TDS Ammonia Nitrate-N Phosphate *Heavy metals (Pb, Cr, Fe) ***Herbicide and Pesticide and Coli forms	River water, pond water (located in and around)
Ground water quality	pH BOD COD Conductivity Salinity Ammonia Nitrate-N Phosphate * Heavy metals (Pb, Cr, Fe) **Arsenic/ fluoride	Shallow Tube wells and low capacity deep tube wells
Air quality	Parameters as included in National Ambient Air Quality Standards specially for project activity where magnitude of construction activities is likely to be high	
Noise level	As per prescribed National Standards for Noise level	

*** Only for arsenic/fluoride affected areas*

**** Only for any of project activities using surface water from streams passing through a catchment of intensely developed agriculture*

Annexure- 2: Rapid Environmental Checklist for Category 2 Activities

A. Location of the project activity:

Agro-climatic zone:

District: Block: Mouza:

B. Environmental Features of the Project Activity Site

		Fill in the Details
	LAND USE	
1	What is the land use at the activity site (including worker camp site)? (mention all relevant land uses: Irrigation canal/structure; Rural/Urban habitation; Agricultural land; Forest area; Pond; Waste land; Any other)	
2	What is the land use within 300 m of the activity site (including worker camp site)? (mention all relevant land uses: Irrigation canal/structure; Rural/Urban habitation; Agricultural land; Forest area; Pond; Waste land; Any other)	
	ENVIRONMENTALLY SENSITIVE AREAS	
3	If the activity site (including worker camp site) located in or within 3 km of any environmentally sensitive areas, answer 3.1 to 3.5 (Crosscheck with the Environmental and Social Screening Checklist):	_____ Activity site (including worker camp site) is located in or within 3 km of any environmentally sensitive areas _____ Activity site (including worker camp site) is NOT located in or within 3 km of any environmentally sensitive areas
3.1	Protected Areas (reserve forests, wildlife sanctuaries, national parks): Give details on name, type, area and location with map specifying distance from activity site (including worker camp site).	
3.2	Environmentally sensitive areas (areas known to be habitat of vulnerable or endangered species such as the Fishing Cat, Gangetic Dolphin, etc.): Give details on name, type, area and location with map specifying distance from activity site (including worker camp site).	
3.3	Culturally significant areas (sacred groves, archeological/historical sites, religious sites, etc.): Give details on name, type, location with map specifying distance from activity site (including worker camp site).	
3.4	Heavily polluted areas (areas located close to industries and experiencing water and air pollution): Give details on name, type, location with map specifying distance from activity site (including worker camp site).	
3.5	Fishery sites (areas known to be habitat for vulnerable or endangered fish species, or, areas that are a natural breeding site for fishes, or, areas that are rich in fishery): Give details on name, type, location with map specifying distance from activity site (including worker camp site).	
3.6	Sensitive Receptors (areas close to schools, hospitals, etc.): Give details on name, type, location with map specifying distance from activity site (including worker camp site).	
	OTHER ENVIRONMENTAL FEATURES	
4	Give details of other Environmental Features of the Activity Site: Annual Rainfall: Soil type:	

		Fill in the Details
	Slope (%): Water Quality (include test report from NABL accredited lab) Air Quality (include test report from NABL accredited lab) Noise Level (include test report from NABL accredited lab) Soil/Sediment Quality (include test report from NABL accredited lab)	

C. Environmental Impacts and Risks from the Project Activity

	Environmental Impacts	**Yes / No**	**Details**
	Loss of Trees (mention no. of trees, species of trees)		
	Disruption of utilities (mention any disruption to utilities such as water supply, electric supply, etc., to the local community because of the project works – along with duration of disruption and population affected)		
	Disruption to connectivity (mention any disruption to roads, bridges, etc., because of the project works – along with duration of disruption and population affected)		
	Disruption of water flows (give details of duration)		
	Hazardous material use (give details of any use of asbestos containing materials, hazardous pesticides, inflammable materials, explosive materials, etc. – along with estimated quantities to be used)		
	Construction and Demolition Waste to be generated (give details of type of waste and estimated quantity)		
	Desiltation/Desiltation Waste to be generated (give details of type of waste and estimated quantity)		
	Aquatic weed waste (give details of type of waste and estimated quantity)		
	Heavy machinery (give details of type and estimated number of heavy construction machinery, heavy agriculture machinery, etc.)		
	Construction plants (give details of type, estimated number and location of batching plants)		
	Transport fleet (give details of estimated no. of construction/haulage vehicles)		
	Construction Workers Camp (give details of estimated no. of workers, location of construction camp site)		
	Any other impact or risk (please specify):		

D. Public Consultation

Date of Public Consultation Meeting	Location of Public Consultation Meeting	Number of participants (Specify Men and Women separately)	Key stakeholder groups that were consulted	Key themes discussed during the consultation meetings

Note: Attach Minutes of Stakeholder Consultation Meeting

E. Clearances/ Permits required before Activity execution

Type of permit/ clearance	**Required /Not Required**	**Taken / Not Taken**	**Remarks**
i. Water abstraction			Permits are required from SWID

Type of permit/ clearance	**Required /Not Required**	**Taken / Not Taken**	**Remarks**
ii. Felling and removal of trees			Permission from the Divisional Forest Officer
iii. No Objection Certificate from SPCB			NOC is required under the provisions of the Water Act and the Air Act
iv. Consent to Establish (CtE)			
v. Consent to Operate (CtO)			
vi. Authorization letter			Required under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2015
vii. Opening up new quarries			Short term mining lease is required from DM/DLRS of the district for new quarries
viii. Disposal of spoils			Permission from local Panchayat Samity or Municipalities

Submitted by:
Signature with designation and official seal

Reviewed by:
Signature with designation and official seal

Date:

Remarks of the Reviewing Authority:

Annexure- 3: (A) Format for Monitoring Report on ESMF Implementation

(To be filled by the SPMU)

Quarterly Report

Project director with the help of safeguard specialist at SPMU shall periodically review ESMF implementation status. Contract specific ESMF implementation matrix shall be prepared and record shall be maintained. Any best practice shall be recorded on separate sheet. Quarterly report on ESMF implementation shall periodically be submitted to the World Bank.

Package Description

Contract Package	
Name of the Contractor	
Name of the project activity	

Conducting ESIA:

Review Date		Project Activity	Impact Category (1/ 2/3)	Screening Checklist Filled-up	Comprehensiveness of scoping for further assessment (Excellent/ Good/ Average)	Rapid EIA Checklist/ Detail EIA conducted	EMP Prepared	EMP Included in Bid Documents

Was ESMF Disclosed: Yes/ No

Date of Review	Date of Disclosure	List of Document	Place of Display	Issue Raised	Issue addressed in ESMP (Yes/ No)

Availability of safeguard specialist at SPMU/ DPMU:

Date of Supervision by SPMU	No. of expert at SPMU/ DPMU	Name of Expert:
	SPMU: Environment: 0/1	
	Social cum Gender: 0/1	
	DPMU: Environment: 0/1/2	1) 2)
	Social cum Gender: 0/1/2	1) 2)
	SPMU: Environment: 0/1	
	Social cum Gender: 0/1	
	DPMU: Environment: 0/1/2	1) 2)
	Social cum Gender: 0/1/2	1) 2)
	SPMU: Environment: 0/1	
	Social cum Gender: 0/1	
	DPMU: Environment: 0/1/2	1) 2)
	Social cum Gender: 0/1/2	1) 2)

	SPMU: Environment: 0/1	
	Social cum Gender: 0/1	
	DPMU: Environment: 0/1/2	1) 2)
	Social cum Gender: 0/1/2	1) 2)
	SPMU: Environment: 0/1	
	Social cum Gender: 0/1	
	DPMU: Environment: 0/1/2	1) 2)
	Social cum Gender: 0/1/2	1) 2)

Implementation of Different Strategy

Date of Supervision by SPMU	Component		Rating (Excellent/ good/ average)	Issue Observed	Recommendation
	1) Implementation of stakeholder consultation strategy	Project activity preparation			
		Project activity preparation			
	2) Implementation of pest and nutrient management strategy				
	3) Implementation of RAP				
	1) Implementation of stakeholder consultation strategy	Project activity preparation			
		Project activity preparation			
	2) Implementation of pest and nutrient management strategy				
	3) Implementation of RAP				
	1) Implementation of stakeholder consultation strategy	Project activity preparation			
		Project activity preparation			
	2) Implementation of pest and nutrient management strategy				
	3) Implementation of RAP				

Monitoring of E&S Implementation by DPMU

Date of Supervision by SPMU	Regular Monitoring by DPMU (Y/N)	Issues observed by DPMU	Date of Observation	Action taken by DPMU	Date of Action Taken	Recommendation by SPMU
		1.				
		2.				
		3.				
		1.				
		2.				
		3.				
		1.				
		2.				

		3.				
		1.				
		2.				
		3.				

Training programs Organized

Date of Supervision by SPMU	Date of Training	Training Tropic	Number of Participant	Name of Participant		
				SPMU Staff Contractor	DPMU Staff	Contractor
		1				
		2				
		3				
		1				
		2				
		3				
		1				
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		3				
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		3				
		1				
		2				
		3				
		1				
		2				
		3				

Third Party Audit

Date of Supervision by SPMU	Mid-term Evaluation	End-term Evaluation	Environmental Audits
	Date:	Date:	Date:
	Evaluating Agency Name:	Evaluating Agency Name:	Evaluating Agency Name:
	Date:	Date:	Date:
	Evaluating Agency Name:	Evaluating Agency Name	Evaluating Agency Name:
	Date:	Date:	Date:
	Evaluating Agency Name:	Evaluating Agency Name	Evaluating Agency Name:

Date of Supervision by SPMU:				
Reviewed by:				
Signature:				

(B) Format for Monitoring Environmental & Social Management Plan (EMP) Implementation

(To be filled up by Jr. Environmental Expert at DPMU)

1. Details of Statutory Clearance

No	Name of the project activity	Name of the Contract Package	Date of Agreement	Date of Completion	Date of Commencement of Civil work	Permission/ clearance from State Dept*		Labour License Details Validity*		Insurance undertaken validity*	
						Working Permission *	Date obtained	From	To	From	To

(Note: * Attach relevant papers)

2. Details of Quarries / Vendors

No	Name of the project activity	Name of the Contract Package	Quarries Established (Yes/ No)	Name of Vendors	Details of Vendors Environmental Clearances Validity*					
					Sand		Stone Products		Boulders	
					From	To	From	To	From	To

(Note: * Attach relevant papers)

3. Details of Environmental Monitoring / Testing

No	Name of the project activity	Name of the Contract Package	Env. Monitoring / Testing particulars*			
			Parameters	No. of locations Samples tested	Date of Testing	Parameters Exceed Permissible Limit
			Surface water			
			Ground Water			
			Silt/Sediment			
			Soil			
			Air			
			Noise**			

(Note: Env. Testing should be from the MoEF or NABL Approved Laboratory as mentioned in the ESMP
* Attach relevant papers and summary of test report)

4. Details of Borrow Earth

No	Name of the project activity	Name of the Contract Package	Earth requirements as per estimate in Cum		Details of Execution in Cum	
			Filing	Cutting	Filling	Cutting

5. Details of Borrow Earth for each Contract package

No	Name of the Farmer	Name of the Village	Quantity of Earth Extracted in Cum	Written Consent from Land owner submitted *	Earth Permit obtained from Tehsildhar*	Applied to (DEIAA) for NOC *

*(Note: * Attach relevant papers)*

Signature of Jr. Environmental

Name of Jr. Environmental Expert

Date of Sign

Expert Signature of APD

Name of APD:

Date of Sign

Annexure- 4: Format for Audit report on ESMF Implementation

Section I: Project Background:

1.1 Project Overview and Contextual Relevance
1.2 Project Development Objectives
1.3 Project Components and Activities
1.4 Environmental Management Framework
1.5 Social Management Framework

Section II: Regulatory Requirement and Compliances

2.1 Environmental Regulatory Requirements and Compliances (Project Specific)

2.1.1 Consent to Establish and Consent to Operate under Air & Water Pollution
2.1.2 Letter of Authorization for handling hazardous Waste (if applicable)
2.1.3 Tree cutting permission from DFO
2.1.4 Permission from DEIAA for Borrowing earth
2.1.5 Clearance for Disposal of Desilted materials from WBPCB (site specific clearance)
2.1.6 Agreement letter with Pvt. Land owner for borrowing earth (if required)
2.1.7 GP Clearance for establishment of Labour Camp
2.1.8 PUC Compliance / Certificate from RTO
2.1.9 Authorization / Permission of Material Supplier
2.1.10 Any other compliances that are required

2.2 Social Regulatory Requirements and Compliances

2.2.1 SIA Notification (if land acquisition is involved)
2.2.2 Notification for Land Acquisition (as per LARR Act), if any
2.2.3 Labour License
2.2.4 Any other compliances that are required

Section III: Environmental Performance

3.1 Soil Pollution
3.2 Water Pollution
3.3 Noise Pollution
3.4 Waste Management / Sediment Disposal & Management
3.5 Pest Management
3.6 Management of Flora and Fauna / Local Bio-diversity
3.7 Physical Cultural Resources, its Protection and Management

Section IV: Social Performance

4.1 People's Understanding and Awareness of the Project
4.2 Land Acquisition, Rehabilitation and Resettlement (if required)
4.3 Gender Inclusion
4.4 Tribal Inclusion and Safeguards
4.5 Project Impact on Vulnerable Groups
4.6 Safety and Security of Workers

Section V: Monitoring and Supervision

5.1 Monitoring of Environmental Parameters and Measures Taken

Annexure- 5: ToR for Position of Environmental Expert at SPMU and DPMU

5.A Terms of Reference (TOR) for Senior Environmental Specialist in proposed WBMIFMP Project

Position: Senior Environmental Specialist
No. of Position: One

Project Description:

To improve the existing irrigation network, optimizing conjunctive and sustainable use of ground and surface water across in the project area and throughout the year, and to reduce flooding The Government of West Bengal (GoWB) has proposed "West Bengal Major Irrigation and Flood Management Project (WBMIFMP)". The Government of West Bengal (GoWB) has applied for USD 290 million financing from the International Bank for Reconstruction and Development (IBRD) and from the Asian Infrastructure Investment Bank (AIIB) towards the cost of the WBMIFMP.

The project aims at modernization of irrigation system, with special emphasis on conjunctive use of ground and surface water in the Damodar Valley Project Command Area of the State, in the districts of Purba & Paschim Bardhhaman, Bankura, Hooghly and Howrah and improvement of flood management infrastructure in Lower Damodar Sub-basin, mainly in the districts of Hooghly and Howrah. Prime objective of proposed project is to rejuvenate and rehabilitate existing irrigation network for sustainable development in DVC area and management of floods in Lower Damodar Sub-Basin in West Bengal. Proposed project has mainly four broader objectives namely 1) *Irrigation Modernization, 2) Irrigation Management, 3) Flood Management and 4) Crop Diversification.* Project will also promote conjunctive use of surface and ground water for agriculture. The expected results of the project are to improve irrigation in order to benefit agriculture in the DVCA, and to reduce annual flooding in the Lower Damodar sub-basin area.

Project Duration:

The project duration is for five years.

Project Area:

The project will be implemented in selected locations five districts of West Bengal, namely East & West Bardhaman, Bankura, Hooghly and Howrah.

Scope for Senior Environmental Specialist:

Senior environmental expert will be responsible for providing input and guidance on implementation of environmental management and safeguards to the contractor, DPIU and DPMU/ SPMU and assisting in building environmental management capacity of SPMU, DPMU, DPIU, line departments - Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept. and Fisheries Department.

Specific focus of the assignment

Specifically, the Senior Environmental Specialist will:

(i) Ensure the necessary national environmental approvals are obtained in a timely manner to advance project implementation;
(ii) Review of site specific management plan prepared by contractor;
(iii) Prepare site specific environmental performance criteria;
(iv) Monitor the update and implementation of project activity specific 'ESMPs;

(v) Monitor routine environmental monitoring activities as defined in Environmental and Social Monitoring Plan;
(vi) Monitor project activity sites against any unexpected environmental impacts;
(vii) Advise Contractor, SPMU, DPMU on environment problems and/ or requirements, and recommend mitigating measures;
(viii) Prepare environmental monitoring reports on ESMP implementation and compliance and submit it to the World Bank;
(ix) Take part in project performance monitoring and evaluation activities; and
(x) Assess and prepare capacity building program on environmental issues at the SPMU, DPMU, DPIU, line departments - Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept. and Fisheries Department.
(xi) Arrange and participate in safeguard review missions by the World Bank and AIIB.
(xii) Liaise with the West Bengal State Pollution Control Board, Biodiversity Board, all line departments on project-related environmental issues;

Professional Profile:

1. Master degree in environmental science/ management.
2. Minimum 15 years of professional experience of working in assessing environmental impact and monitoring environment safeguards.
3. Familiarity with the World Bank's, ADB's, IFC's environmental guidelines is preferred.
4. Experience in similar irrigation projects and geographic areas are an added advantage.
5. Proficiency in both written and spoken English, and knowledge of locally spoken language - Bengali are an advantage
6. Experience of working in rural areas and willingness to travel to project areas / locations;
7. Knowledge on Project Management principles;
8. Efficiency in computer Knowledge;
9. Having proficient communication Skill in English, including preparation of reports, documents, IEC materials etc. in English;
10. Prior experience of working in similar projects will be an added advantage.

Age Limit:
Maximum age limit is 45 years;

Reporting:
The Specialist would report to the Project Director or any person designated as Reporting Authority by the Project Director, WBMIFMP on monthly, quarterly and annual basis.

Work Station:
The Specialist would be based in the WBMIFMP Project office at the State Headquarters and would make at least 10 field visits or field visits as per the requirement in every month to project sites. However, if so wished and found necessary by the Project Director, she / he may be placed at the DPMU level for required period of time, to be specified by the SPMU of WBMIFMP.

Duration of Engagement:
The Specialist would be engaged initially for a period of 1 year on full time and contractual basis.The engagement period may be extended subject to satisfactory performance and mutual consent of the SPMU-WBMIFMP and the Specialist, not exceeding the project period.

5.B Terms of Reference (TOR) for Environmental Specialist in proposed WBMIFMP Project

Position: Environmental Specialist (Jurior)
No. of Position:

Project Description:

To improve the existing irrigation network, optimizing conjunctive and sustainable use of ground and surface water across in the project area and throughout the year, and to reduce flooding The Government of West Bengal (GoWB) has proposed "West Bengal Major Irrigation and Flood Management Project (WBMIFMP)". The Government of West Bengal (GoWB) has applied for USD 290 million financing from the International Bank for Reconstruction and Development (IBRD) and from the Asian Infrastructure Investment Bank (AIIB) towards the cost of the WBMIFMP.

The project aims at modernization of irrigation system, with special emphasis on conjunctive use of ground and surface water in the Damodar Valley Project Command Area of the State, in the districts of Purba & Paschim Bardhhaman, Bankura, Hooghly and Howrah and improvement of flood management infrastructure in Lower Damodar Sub-basin, mainly in the districts of Hooghly and Howrah. Prime objective of proposed project is to rejuvenate and rehabilitate existing irrigation network for sustainable development in DVC area and management of floods in Lower Damodar Sub-Basin in West Bengal. Proposed project has mainly four broader objectives namely 1) *Irrigation Modernization, 2) Irrigation Management, 3) Flood Management and 4) Crop Diversification.* Project will also promote conjunctive use of surface and ground water for agriculture. The expected results of the project are to improve irrigation in order to benefit agriculture in the DVCA, and to reduce annual flooding in the Lower Damodar sub-basin area.

Project Duration:

The project duration is for five years.

Project Area:

The project will be implemented in selected locations five districts of West Bengal, namely East & West Bardhaman, Bankura, Hooghly and Howrah.

Scope for Senior Environmental Specialist:

Environmental Expert will be responsible for providing input and guidance on implementation of environmental management and safeguards to the contractor, DPIU and DPMU/ SPMU and assisting in building environmental management capacity of SPMU, DPMU, DPIU, line departments - Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept. and Fisheries Department.

Specific focus of the assignment

Specifically, the Junior Environmental Specialist will:

(i) Ensure the necessary national environmental approvals are obtained in a timely manner to advance project implementation;
(xiii) Review of site specific management plan prepared by contractor;
(xiv) Prepare site specific environmental performance criteria;
(xv) Monitor the update and implementation of project activity specific 'ESMPs;
(xvi) Monitor routine environmental monitoring activities as defined in Environmental and Social Monitoring Plan;

(xvii) Monitor project activity sites against any unexpected environmental impacts;
(xviii) Advise Contractor, SPMU, DPMU on environment problems and/ or requirements, and recommend mitigating measures;
(xix) Prepare environmental monitoring reports on ESMP implementation and compliance and submit it to the World Bank;
(xx) Take part in project performance monitoring and evaluation activities; and
(xxi) Assess and prepare capacity building program on environmental issues at the SPMU, DPMU, DPIU, line departments - Department of Food Processing Industries and Horticulture, Agriculture Marketing Dept., Agriculture Dept. and Fisheries Department.
(xxii) Arrange and participate in safeguard review missions by the World Bank and AIIB.
(xxiii) Liaise with the West Bengal State Pollution Control Board, Biodiversity Board, all line departments on project-related environmental issues;

Professional Profile:

11. Master degree in environmental science/ management.
12. Minimum 8 years of professional experience of working in assessing environmental impact and monitoring environment safeguards.
13. Familiarity with the World Bank's, environmental guidelines is preferred.
14. Experience in other linear projects and geographic areas are an added advantage.
15. Proficiency in both written and spoken English, and knowledge of locally spoken language - Bengali are an advantage
16. Experience of working in rural areas and willingness to travel to project areas / locations;
17. Knowledge on Project Management principles;
18. Efficiency in computer Knowledge;
19. Having proficient communication Skill in English, including preparation of reports, documents, IEC materials etc. in English;
20. Prior experience of working in similar projects will be an added advantage.

Age Limit:
Maximum age limit is 35 years;

Reporting:
The Specialist would report to the Additional Project Director (APD) at the District Project Management Unit (DPMU) level or any person designated as Reporting Authority by the APD-DPMU, WBMIFMP on monthly, quarterly and annual basis.

Work Station:
The Specialist would be based at the DPMU of WBMIFMP Project office at the District Headquarters and would make at least 15 field visits or field visits as per the requirement in every month to project sites. However, if so wished and found necessary by the APD, she / he may be placed at the DPIU level for required period of time, to be specified by the DPMU of WBMIFMP.

Duration of Engagement:
The Specialist would be engaged initially for a period of 1 year on full time and contractual basis. The engagement period may be extended subject to satisfactory performance and mutual consent of the DPMU / SPMU-WBMIFMP and the Specialist, not exceeding the project period.

5.C Terms of Reference (TOR) for Senior Social Cum Gender Development Specialist in proposed WBMIFMP Project

Position: Senior Social cum Gender Development Specialist
No. of Position: One

Project Description:
To improve the existing irrigation network, optimizing conjunctive and sustainable use of ground and surface water across in the project area and throughout the year, and to reduce flooding The Government of West Bengal (GoWB) has proposed "West Bengal Major Irrigation and Flood Management Project (WBMIFMP)". The Government of West Bengal (GoWB) has applied for USD 290 million financing from the International Bank for Reconstruction and Development (IBRD) and from the Asian Infrastructure Investment Bank (AIIB) towards the cost of the WBMIFMP.

The project aims at modernization of irrigation system, with special emphasis on conjunctive use of ground and surface water in the Damodar Valley Project Command Area of the State, in the districts of Purba & Paschim Bardhhaman, Bankura, Hooghly and Howrah and improvement of flood management infrastructure in Lower Damodar Sub-basin, mainly in the districts of Hooghly and Howrah. Prime objective of proposed project is to rejuvenate and rehabilitate existing irrigation network for sustainable development in DVC area and management of floods in Lower Damodar Sub-Basin in West Bengal. Proposed project has mainly four broader objectives namely 1) *Irrigation Modernization, 2) Irrigation Management, 3) Flood Management and 4) Crop Diversification.* Project will also promote conjunctive use of surface and ground water for agriculture. The expected results of the project are to improve irrigation in order to benefit agriculture in the DVCA, and to reduce annual flooding in the Lower Damodar sub-basin area.

Project Duration:
The project duration is for five years.

Project Area:
The project will be implemented in selected locations five districts of West Bengal, namely Purba& Paschim Bardhaman, Bankura, Hooghly and Howrah.

Need for Social cum Gender Development Specialist:
The Social Cum Gender Development Specialist will be primarily responsible for developing necessary strategy to ensure that the project is achieving its social development objective i.e. equity, inclusiveness and transparency by institutionalizing participatory process. The specialist will guide, mentor, monitor and evaluate the functioning and performance of social mobilization work, establishing systems to achieve the social development objectives of the project and work closely with environment expert and other key stakeholders of the project. One of the prime role of the specialist would be to ensure execution of social safeguards as per the Environment and Social Management Framework (ESMF) / Environment and Social Impact Assessment (ESIA).

Scope of Work:

1. Guide the project stakeholders and facilitatecollection and analysis of social, cultural and economic information that are relevant to the project and in line with the ESMF / EIA requirements;
2. Support in institutionalising the social safeguard parameters, as per ESMF / EIA in project framed activities;
3. Conduct periodic field visits and consult / discuss with the local community organisations / associations of farmers and related other stakeholders, as identified in the project;
4. Discuss with contractors and associated Govt. Departments from time to time to ensure that gender balance and inclusive approach is adopted in project activities;
5. Facilitate in increasing participation of women in construction and other project activities;

6. Coordinate, organise and impart training on social safeguard measures to be taken for different category of stakeholders;
7. Prepare, design and conduct workshop/seminar for the project staff and other stakeholders on social development aspects, mapping of indicators and appraising the learning cases;
8. Facilitate collection of gender disaggregated data and conduct analyse of project benefits by social, economic and sex (male / female) categories;
9. Facilitate documentation of learning cases with regard to social safeguard measures / practices and its wider dissemination;
10. Preparation of leaflets / pamphlets / IEC materials for sensitisation of stakeholders and community on the project benefits and its socio-economic dimensions;
11. Conduct period review meetings with the stakeholders, including Government Departments to ensure gender inclusion and equity aspects of project activities along with key achievements as per the social indicators.
12. Conducting internal monitoring and evaluation of project activities and mapping the progress in line with the social indicators.
13. Collate the internal monitoring reports for M&E of the project and preparing internal monitoring reports, covering social management aspects of the project;
14. Periodic appraisal of progress in line with the social safeguard to the project director;
15. Carrying out other activities as assigned by the PD-SPMU or designated person of SPMU.

Professional Profile:

21. Master's degree in Sociology/Anthropology/ Social work.
22. At least 15 years of professional experience of working in related field of rural development programme/ Irrigation Improvement Project of Govt. or Non-government organization.
23. Fluency in English and workable knowledge of Bengali is an added advantage;
24. Experience of working in rural areas and willingness to travel to project areas / locations;
25. Knowledge on Project Management principles;
26. Efficiency in computer Knowledge;
27. Having proficient Communication Skill in English, including preparation of reports, documents, IEC materials etc. in English;
28. Prior experience of working in similar projects will be an added advantage.

Age Limit:
Maximum age limit is 55 years;

Reporting:
The Specialist would report to the Project Director or any person designated as Reporting Authority by the Project Director, WBMIFMP on monthly, quarterly and annual basis.

Work Station:
The Specialist would be based in the WBMIFMP Project office at the State Headquarters and would make at least 10 field visits or field visits as per the requirement in every month to project sites. However, if so wished and found necessary by the Project Director, she / he may be placed at the DPMU level for required period of time, to be specified by the SPMU of WBMIFMP.

Duration of Engagement:
The Specialist would be engaged initially for a period of 1 year on full time and contractual basis.The engagement period may be extended subject to satisfactory performance and mutual consent of the SPMU-WBMIFMP and the Specialist, not exceeding the project period.

5.D Terms of Reference (TOR) for Social Cum Gender Development Specialist in proposed WBMIFMP Project

Position: Social (Juniou) cum Gender Development Specialist
No. of Position: Two

Project Description:
To improve the existing irrigation network, optimizing conjunctive and sustainable use of ground and surface water across in the project area and throughout the year, and to reduce flooding The Government of West Bengal (GoWB) has proposed "West Bengal Major Irrigation and Flood Management Project (WBMIFMP)". The Government of West Bengal (GoWB) has applied for USD 290 million financing from the International Bank for Reconstruction and Development (IBRD) and from the Asian Infrastructure Investment Bank (AIIB) towards the cost of the WBMIFMP.

The project aims at modernization of irrigation system, with special emphasis on conjunctive use of ground and surface water in the Damodar Valley Project Command Area of the State, in the districts of Purba & Paschim Bardhhaman, Bankura, Hooghly and Howrah and improvement of flood management infrastructure in Lower Damodar Sub-basin, mainly in the districts of Hooghly and Howrah. Prime objective of proposed project is to rejuvenate and rehabilitate existing irrigation network for sustainable development in DVC area and management of floods in Lower Damodar Sub-Basin in West Bengal. Proposed project has mainly four broader objectives namely 1) *Irrigation Modernization, 2) Irrigation Management, 3) Flood Management and 4) Crop Diversification.* Project will also promote conjunctive use of surface and ground water for agriculture. The expected results of the project are to improve irrigation in order to benefit agriculture in the DVCA, and to reduce annual flooding in the Lower Damodar sub-basin area.

Project Duration:
The project duration is for five years.

Project Area:
The project will be implemented in selected locations five districts of West Bengal, namely Purba& Paschim Bardhaman, Bankura, Hooghly and Howrah.

Need for Social cum Gender Development Specialist:
The Social Cum Gender Development Specialist will be primarily responsible for developing necessary strategy to ensure that the project is achieving its social development objective i.e. equity, inclusiveness and transparency by institutionalizing participatory process. The specialist will guide, mentor, monitor and evaluate the functioning and performance of social mobilization work, establishing systems to achieve the social development objectives of the project and work closely with environment expert and other key stakeholders of the project. One of the prime role of the specialist would be to ensure execution of social safeguards as per the Environment and Social Management Framework (ESMF) / Environment and Social Impact Assessment (ESIA).

Scope of Work:

1. Establish regular field contact and rapport building with the local community where the project will be executed;
2. Guide the project stakeholders and facilitatecollection and analysis of social, cultural and economic information that are relevant to the project and in line with the ESMF / EIA requirements;
3. Support in institutionalising the social safeguard parameters, as per ESMF / EIA in project framed activities;
4. Conduct periodic field visits and consult / discuss with the local community organisations / associations of farmers and related other stakeholders, as identified in the project;

5. Discuss with contractors and associated Govt. Departments (district level / DPIUs) from time to time to ensure that gender balance and inclusive approach is adopted in project activities;
6. Facilitate in increasing participation of women in construction and other project activities;
7. Coordinate, organise and impart training on social safeguard measures to be taken for different category of stakeholders;
8. Collection of gender disaggregated data and analyse of project benefits by social, economic and sex (male / female) categories;
9. Documentation of learning cases with regard to social safeguard measures / practices;
10. Preparation of leaflets / pamphlets / IEC materials in Bengali for sensitisation of stakeholders and community on the project benefits and its socio-economic dimensions;
11. Conduct period review meetings with the stakeholders, including Government Departments to ensure gender inclusion and equity aspects of project activities along with key achievements as per the social indicators.
12. Conducting internal monitoring of project activities and mapping the progress in line with the social indicators.
13. Periodic appraisal of progress in line with the social safeguard to the APD-DPMU and Senior Social Cum Gender Development Specialist of the SPMU;
14. Carryng out other activities as assigned by the APD-DPMU and Senior Specialist of SPMU.

Professional Profile:

1. Master's degree in Sociology/Anthropology/ Social work.
2. At least 7 years of professional experience of working in related field of rural development programme/ Irrigation Improvement Project of Govt. or Non-government organization.
3. Fluency in Bengali and English;
4. Experience of working in rural areas and willingness to travel to project areas / locations;
5. Knowledge on Project Management principles;
6. Efficiency in computer Knowledge;
7. Having proficient Communication Skill, including preparation of reports, documents etc. in Bengali and English;
8. Prior experience of working in similar projects will be an added advantage.

Age Limit:
Maximum age limit is 40 years;

Reporting:
The Specialist would report to the Additional Project Director (APD) at the District Project Management Unit (DPMU) level or any person designated as Reporting Authority by the APD-DPMU, WBMIFMP on monthly, quarterly and annual basis.

Work Station:
The Specialist would be based at the DPMU of WBMIFMP Project office at the District Headquarters and would make at least 15 field visits or field visits as per the requirement in every month to project sites. However, if so wished and found necessary by the APD, she / he may be placed at the DPIU level for required period of time, to be specified by the DPMU of WBMIFMP.

Duration of Engagement:
The Specialist would be engaged initially for a period of 1 year on full time and contractual basis.The engagement period may be extended subject to satisfactory performance and mutual consent of the DPMU / SPMU-WBMIFMP and the Specialist, not exceeding the project period.

Annexure- 6: Guidance on Chance Find Procedures

(To be annexed to the EMP for All Construction and Desiltation Works)

1. PCR Definition

Physical Cultural Resources (PCR) refer to: "movable or immovable objects, sites, structures or groups of structures having archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance".

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2. Procedure upon Discovery

Suspension of Work

If a PCR comes to light during the execution of the works, the contractor shall stop the works. After stopping work, the contractor must immediately report the discovery to the respective APD (III or IV) at DPMU level. The contractor may not be entitled to claim compensation for work suspension during this period. The Resident Engineer may be entitled to suspend work and to request from the contractor some excavations at the contractor's expense if he thinks that a discovery was made and not reported.

Respective APD (III or IV) at DPMU level immediately inform PD at SPMU level regarding the discover. Depending on the magnitude of the PCR, PD at SPMU level should check with the Archaeological Survey of India (ASI) for advice on whether *all works* should be stopped, or only the works immediately involved in the discovery, or, in some cases where large buried structures may be expected, all works may be stopped within a specified distance (for example, 50 meters) of the discovery.

Demarcation of the Discovery Site

With the approval of the respective APD (III or IV) at DPMU level, the contractor is then required to temporarily demarcate, and limit access to, the site.

Non-Suspension of Work

The PD in consultation with the ASI will decide whether the PCR can be removed for the work to continue, for example in cases where the find is one coin.

Chance Find Report

The contractor should then, at the request of the respective APD (III or IV) at DPMU level, and within 7 days, make a *Chance Find Report*, recording:

- Date and time of discovery;
- Location of the discovery;
- Description of the PCR;
- Photo documentation of the PCR;
- Estimated weight and dimensions of the PCR;
- Temporary protection implemented.

The Chance Find Report should be submitted to the PD, ASI and other concerned parties as agreed with the ASI, and in accordance with national legislation. The PD is required to inform the ASI accordingly.

Arrival and Actions of Cultural Authority

The ASI will be requested to arrive at the discovery site within 24 hours, and determine the action to be taken. Such actions may include, but not be limited to:

- Removal of PCR deemed to be of significance;
- Execution of further excavation within a specified distance of the discovery point;
- Extension or reduction of the area demarcated by the contractor.

These actions should be taken within 5 days. The contractor may or may not be entitled to claim compensation for work suspension during this period.

If the ASI fails to arrive within the stipulated period, the PD may have the authority to extend the period by a further stipulated time. If the ASI fails to arrive after the extension period, the PD may have the authority to instruct the contractor to remove the PCR or undertake other mitigating measures and resume work. Such additional works can be charged to the contract. However, the contractor may not be entitled to claim compensation for work suspension during this period.

Further Suspension of Work

During this 5 day period, the ASI may be entitled to request the temporary suspension of the work at or in the vicinity of the discovery site for an additional period of up to, 15 days. The contractor may, or may not be, entitled to claim compensation for work suspension during this period.

Annexure- 7: Report of the Independent Assessment Study on Dam Safety

There are 5 reservoirs across river Damodar and its tributaries in Jharkhand. Of these reservoirs, four reservoirs constructed by Damodar Valley Corporation (DVC) about 6 decades back and one reservoir by the Government of Jharkhand about 3 decades back. Apart from this, a barrage is constructed at Durgapur across river Damodar in Bardhhaman district by the DVC and handed over to the Government of West Bengal in 1964. Tenughat reservoir constructed by the Government of Jharkhand would also come under the unified command of DVRRC from 2016-17, which would further help in flood moderation in West Bengal as well as would provide more water for cultivating Boro paddy in the post winter period. So, availability of water at source is not an issue of concern. West Bengal regularly receives its share of allocated and earmarked quantum of water from DVC reservoirs for irrigation (Kharif and Rabi), drinking and other municipal and industrial uses. Apart from the committed allocation, surplus water in the post monsoon season after meeting other committed needs is also released for irrigating Boro (post winter) paddy in West Bengal.

Dam	Konar Dam	Tilaiya	Maithon	Panchet
Construction Year	1954	1953	1957	1959
Location	On Konar river in Hazaribagh District, Bihar	Barakar, a major tributary of river Damodar	On the Barakar river in Dhanbad district	On the Damodar river in Dhanbad district
Drainage Area	996.72 sq.km.	984.2 km2.(380 sq. Km)	6293.7 sq.km.	10,966 sq. km.
Design flood peak	5805.6 cumec	3823 m3/s	14727 cumec	19,256 cumec
Average Annual rainfall over the catchment (1891-1966)	127 cm	111.76 cm.(44 in)	114.17 cm	114.17 cm
Height of dam above deepest river bed level	49.07 m	30.18 m	103.63 m	42.7 m
Maximum observed discharge at dam site	1812.48 cumec.	5994 m3/s	10,449 cumec	12432
Type of dam	Rolled fill earth structure with concrete gravity spillway in the river bed	Straight Concrete Gravity	Composite (Earth and Concrete)	Composite (Earth and Concrete)
Top of dam	EL.431.29 m	376.12 m	156.06 m	139.3 m
Dead storage	6044.27 hec.m	7478 Ha-m	9317 Ha-m	18257 Ha-m
Discharging capacity of spillway at EL 427.94 m	5409 cumec	47600 cusec	13592 cumec	16608 cumec
Sluice gates – number and size	2 Nos. of 19 cm dia size.	Vertical Lift, 5 nos, 2, 1.016 m X 1.664 m	Vertical Lift, 5 nos, & 1.7 m X3.0 m	Vertical Lift, 9 nos, & 1.7 m X3.0 m Butterfly type, 1 no, 1.7 X 3.0 m
Length of dam	3806.04 m	365.76 m	4426.76 m	6777 m
Spillway design flood	5805.6 cumec	3,823 m3/s. (1,35,000 cusec)	14724 cumec	17840 cumec
Road width at top of dam	5.79 m	3.66 m	6.71 m	9.75 m

Dam Safety Review Panel (DSRP) has conducted dam safety study of Konar, Maithon, Panchet and Tilaiya dam during the year 2013-14. The depth of sand in the river bed varies from 1.5 m to 2.5 m and fresh rock is available almost immediately below the sand. Major components like concrete dam, spillway, rode over top of the dam, hydraulic and mechanical structures including standby generators are affected over the decade. Upstream as well as downstream slope of all these dams are in bad conditions. Lot of vegetable and tree growth was observed on visible cracks on upstream as well as downstream slope of Panchet and Tilaiya dam. Top of rip-rap was disturbed at few locations of Konar dam. Some croaks and opens are observed in inspection, access, drainage gallery. Sweating was observed on the wall of the foundation gallery of Maithan dam. Seepage was observed through few drainages and formed holes of Panchet dam. Eventually electrical installations are likely to get damaged by short circuiting, etc. due to wet conditions in the gallery. Floors of the bell mouths for Konar dam were not examined since the execution of the project and needs inspection.

Review committee has recommended many measures like involvement of expert agency for geophysical investigation of dam body, grouting of the cracks, testing for alkali aggregate reaction, evaluate the quality of concrete and its strength and other properties like porosity, density etc. Testing for alkali aggregate reaction may be done. It was recommended to urgently vet PMF value of all three dams from CWC. Review committee also suggested to entrust security to reliable agency like CISF. Presently it was observed that home guards are doing watch and ward of the dam and related structure. Review committee therefore recommended to immediately adopt aforementioned necessary action to protect dam, human life and restrict devastating flood occurrence due to dam failure.

Annexure- 8: Stake-holder consultation

Date	District	Place	No. of Participant	Name of Participant	Issue Raised
21st March, 2018	Bankura	Vill. - Patrasayer, GP. - Patrasayer, Block- Patrasayer	8	Female: 1. Simanti Murmu, Male: 1. Sk. Imam, 2. Siraj Mallik, 3. Ajizul Mallik, 4. Sushanta Murmu, 5. Akbar Midda, 6. Sk Hafijul, 7. Nur Alam Midda	1. People living in command area are not aware of proposed upcoming project. 2. No land shall be acquired 3. Enough compensation shall be provided for any kind of relocation or loss 4. No activity shall be carried out during monsoon season and night time 5. Avenue plantation shall be done through entire streach of canal/ river 6. Contractor shall employ local labour during construction and operation 7. Canal embsankment where encroachment occured shall be avoided from rehabilitation work 8. Any construction or waste material generated during construction shall not be stored on nearby agricultural field, rather it shall be stored on inner side of embankment withought disturbing road transportation. 9. Desilted sand materials shall not be stored or thrown away to nearby agricultural field 10. Construction labour shall not through away any plastic bag/ materials to nearby agricultural field 11. Contractor shall engage woman workers from nearby Adivasi community. 12. Contractor shall provide equal wage for women workers and shall not force them to work during night time 13. Separate toilet block shall specifically be provided for women workers. 14. Small temple located on embankment shall not be disturbed at any circumstances
21st March, 2018	West Bardhhaman	Vill.- Malandighi, GP.- Malandighi, Block- Kanksa	7	Female: 1. Mrs. Ila Mukherjee Male: 1. Tapan Kesh, 2. Avijit Garai, 3. Mr. Prahlad Chandra, 4. Mr. Parimal Kumbhakar, 5. Monasa Ruidas, 7. Uday Badyakar	
22nd March, 2018	East Bardhhaman	Vill.- Tilkoria, GP.- Jarugrame, Block- Jamalpur	9	1. Atanu Mandal, 2. Somnath Ghosh, 3. Raghupati Ghosh, 4. Chinmay Ghosh, 5. Tanmay Ghosh, 6. Mahadeb Bhumik, 7. Debashis mondal, 8. Kuntal Ghosh, 9. Bimalendu Dey	
22nd March, 2018		Vill.- Kaligram, GP.- Belkash, Block- Bardhhaman- 1	11	1. Sanat Majhi, 2. Buddhadev Gorai, 3. Joydev Gorai, 4. Saif Ahammed Mirza, 5. Sahalom Mirza, 6. Sk Robiul Alam, 7. Samir Pandit, 8. Jaydeb Ghorui, 9. Naba Ghoroi, 10. Tina Ghosh, 11. Jagai Loher	
13th March, 2018	Hooghly	Vill.- Nandanpur, GP.- Jagatpur, Block- Khanakul- II	10	Female: 1. Tukun Kar 1. Sasanka Shekhar Dolui, 2. Prasanta Majhi, 3. Sishir Dolui, 4. Bhaskar Dolui, 5. Rabibdranath Mandal, 6. Ashok Bera, 7. Bibhutibhusan Kar, 8. Ashok Kumar Samanta, 9. Utpal Bera	

Date	District	Place	No. of Participant	Name of Participant	Issue Raised
13th March, 2018		Vill.- Fatepur, GP.- Chilidangi, Block- Pursura	7	1. Shyam Sundar Mandal, 2. Sushanta Sasmal, 3. Ganesh Chandra Dhank, 4. Mrinmoy Bera, 5. Gopinath Ghosh, 6. Subhendu Adhikary, 7. Raghudeb Mondal	16. Mud/ clay portion of desilted material shall be used for filling up, strengthening and raising of embankment and village road network. 17. Beatification of embankment and nearby park, picnic spot may be done. 18. Sand mining from Mundeswari and other river shall strictly be restricted. 19. Operator shall be engaged at each outlet point to control irrigation structure 20. Proper water delivery schedule and mechanism shall be developed and maintained to equally distribute water among tail as well as head users 21. Construction of Boro band shall not be permitted within river bed, it aggravates flood damage. 22. All meandering pond shall also be desilted to increase storage capacity 23. Drip/ sprinkler irrigation may be introduced for horticulture with 50- 70 % subsidy.
14th March, 2018		Vill.- Ratanpur, GP.- Singur-II, Block- Singur	8	2. Mamoni Soren, 2. Mrs. Sita Soren 1. Ganesh Nayek, 2. Sandip Jana, 3. Kartik Nayek, 4. Ashok Rui Dash, 5. Susanta Manna, 6. Mr. Srikanta Kisku,	
11th March, 2018	Howrah	Vill.- Sarpai, GP.- Banichak, Block- Amta-I	9		
11th March, 2018		Vill.- Pancharul, GP.- Pancharul, Block- Udayanarayanpur	7		
12th March, 2018		Vill.- Rajapur, GP.- Bonibon, Block- Uluberia-II	7		

District: Bankura
Block: Patrasayer
Gram Panchayat: Patrasayer
Village: Patrasayer

Figure 16: Stake-holder consultation at Bankura district

Figure 17: Stake-holder consultation at Bardhhaman district

Figure 18: Stake-holder consultation at Howrah district

Annexure- 9: Outline for preparation of minutes of stakeholder consultation meetings

Project: West Bengal Major Irrigation and Flood Management Project (WBMIFMP)

Venue:_____
date :_____

A. Brief of the consultation meeting (organizer, and participants)

B. Topics discussed during the meeting

C. Reports / Materials disclosed to the participants

D. Suggestions and feedback of participants and response of project team

Sl. No.	Name of Participant	Address of Participant	Issues Raised by Participants	Response of Project Team
1				
2				
3				
n				

Photographs with caption specifying date and location:

List of Participants: (insert scanned image of the attendance sheet)

West Bengal Major Irrigation and Flood Management Project (WBMIFMP)
Stakeholder Consultation

Date:_____Venue:_____
Organized by_____

Sl. No.	Name	Designation/ Agency	Contact No.	Signature
1				
2				
3				
4				
5				
6				
n				

Annexure- 10: Guidance to Ensure the Participation of all Eligible Farmers in Project Activities

a) Special attention will be paid to ensure that the vulnerable water users have a full access to all project-related information. For this purpose, the project will engage a third-party service provider to disseminate project information to all stakeholders.

b) Scheme/ Site Specific Participatory Social Assessment (SA): will be carried out under FS for each irrigation scheme and pilot land improvement site. The SA will (i) identify vulnerable farmers; (ii) conduct free, prior and informed consultations with them including, if relevant, ethnic minority farmers; (iii) identify measures to enhance their participation in the management of farmer owned systems and the implementation of land improvement pilots; and (iv) assess local sociopolitical dynamics and the risk that they may be excluded from local decision processes[17].

c) Vulnerable water users should be allowed to meaningfully particulate in the processes in which Water User Groups (WUGs) are formed and develop mechanisms for an equitable allocation of project benefits, minimize negative impacts on fellow water users and identify measures to mitigate residual impacts. The third-party service provider will be hired and provide necessary support and guidance to beneficiary farmers so that they will form, gradually and over time, WUGs in an inclusive and equitable manner.

d) Vulnerable water users should be allowed to receive training and other capacity development supports as do fellow water users.

e) Grievances from people affected by the project and vulnerable water users will be addressed primarily through the WUG under the participatory mechanisms as per procedures described in this ESMF.

f) Vulnerable water users will participate in the monitoring of project implementation and be given opportunities to provide feedbacks. In particular, they will be allowed to participate in participatory Monitoring and Evaluation (M&E) to assess outstanding issues and identify measures to address them. Participatory M&E will seek to verify that farmer owned systems are rehabilitated and land improvement pilots are implemented in an incisive and equitable manner, and that negative impacts are addressed based on the consensus built among beneficiaries without causing significant impact on any member. The third-party service provider hired under the project will regularly participate in the meeting of WUGs and monitor project implementation.

g) Members of the project oversight and implementation entities at all levels will be made fully aware of the challenges and constraints of the vulnerable water users, and of the needs for specific actions for their inclusion and informed participation. The project implementation agencies and oversight bodies at all levels will be made aware of the project principles and procedures with regard to farmer participation in project activities. Field extension workers will also be trained and sensitized so they will respond to the needs of smallholders and vulnerable farmers including female and ethnic farmers

h) All farmers should be allowed to select crops they grow.

i) Detailed grievance procedure will be developed based on the procedures described in this ESMF so all complains made by anyone locally or regionally to the displacement that may occur under the project will be properly processed. Such a procedure can set a good precedent and contribute towards resolving this difficult issue that require a nation-wide dialogue and consensus building.

j) The project will be implemented in sites that are free of land disputes brought to the consideration of the Land Loss Enquiry Commission of the Parliament.

k) Farmers should be allowed to participate in the decision on the investments/activities.

[17] Where tribal communities are present in project areas of influence, SIA will address requirements provided in the Tribal Peoples Planning Framework attached to this ESMF.

Annexure-11: Complaint Form

<table>
<tr><td colspan="4">Action taken</td></tr>
<tr><td colspan="2">Inform to concerned authority</td><td colspan="2">Check & verify by responsible person (Name)</td></tr>
<tr><td colspan="2">……..…….. ……..</td><td colspan="2"></td></tr>
<tr><td colspan="2">Pending (no response further</td><td>Satisfactorily solved</td><td></td></tr>
<tr><td>Name of person complain</td><td></td><td colspan="2">Village</td></tr>
<tr><td>Name of Household Head</td><td></td><td colspan="2">Village Tract</td></tr>
<tr><td>National Identity</td><td></td><td colspan="2">Township</td></tr>
<tr><td>Date of complain</td><td></td><td colspan="2">Name of village administration</td></tr>
<tr><td>Major complain (losses, damage, dissatisfaction)</td><td colspan="3"></td></tr>
<tr><td>Analysis of the complaint (To be written by verifier/responsible person)</td><td colspan="3"></td></tr>
</table>

Signature of person complain

Signature of Village Administration

Annexure-12: Block wise ST population percentage in project district

Table 101: Block wise ST population percentage in project district

Bankura		**Bardhhaman East**		**Bardhhaman West**		**Howrah**		**Hooghly**	
Block	**% of ST Population**	**Block**	**% of ST Population**	**Block**	**% of ST Population**	**Block**	**% of ST Population**	**Block**	**% of ST Population**
Barjora	1.64	Katwa - II	1.44	Faridpur Durgapur	6.96	Uluberia - II	0.04	Khanakul - II	0.02
Indus	1.85	Katwa - I	1.45	Kanksa	10.24	Shyampur - II	0.06	Chanditala - I	0.16
Patrasayer	3.01	Khandaghosh	2.29			Uluberia - I	0.07	Khanakul - I	0.30
Sonamukhi	3.50	Mangolkote	2.83			Bagnan - I	0.12	Pursura	0.48
		Manteswar	2.93			Amta - II	0.14	Chanditala - II	1.00
		Raina - II	4.00			Amta - I	0.15	Arambag	1.46
		Galsi - I	4.08			Shyampur - I	0.16	Singur	1.47
		Bardhhaman - I	5.62			Udaynarayanpur	0.19	Chinsurah - Magra	3.64
		Raina - I	5.80			Domjur	0.42	Jangipara	4.61
		Galsi - II	6.83			Bagnan - II	0.48	Tarakeswar	5.04
		Bhatar	9.74			Jagatballavpur	1.04	Haripal	6.70
		Kalna - I	10.13					Balagarh	9.23
		Bardhhaman - II	11.93					Polba - Dadpur	11.47
		Ausgram - I	13.05					Dhaniakhali	14.26
		Ausgram - II	14.42					Pandua	15.36
		Jamalpur	15.18						
		Memari - I	15.78						
		Kalna - II	17.29						
		Memari - II	18.42						
Average	*2.50*		*8.59*		*8.60*		*0.26*		*5.01*

Annexure-13: MoM on ESMF Consultation Workshop

Minutes of meeting on "Consultation and Sharing Workshop on Environmental and Social Management Framework (ESMF) of West Bengal Major Irrigation and Flood Management Project (WBMIFMP)

This meeting was held on Friday 12th October 2018 at NIC Conference Hall of Jalasampad Bhawan, Saltlake, with the Welcomes Addressed by Sri Subir kumar Laha, Chief Engineer and Project Director, SPMU-WBMIFMP, I & D, Government of West Bengal. He welcomed the delegates from Local Self-governance personnel, NGOs representatives, Government Official, Line department personnel. He delivered his key welcome address by mentioned the project perspective and ESMF assignment and relevance of the workshop.

Mr. Debashis Sengupta, Joint Secretary (Works), I & WD, government of the west Bengal addressed the key notes about the project and todays objectives of the workshop. He also welcomes again the delegates for their kind presence and attendance of the meeting as well. The perspective of this consultation workshop elaborated. He requested to the delegates for their suggestion and clarification in context with the draft finding of ESMF need to validated. In his short note Mr. Debashis addressed the project components 1. Modernization of Irrigation infrastructure. 2. Irrigation Management. 3. Flood Management 4. Project Management.

Mr. Kader Mirdha on behalf of CTRAN Consulting was presented the ESMF findings. Mr. Saroj Nayak of the CTRAN also supplemented the findings through Power Point Presentation. The house was silently observed the key findings. Each and every section of the findings and recommendation narrated by Mr. Kader Mirdha, CTRAN in Bengali dialects.

Soon after the Presentation, there was an questionaries' session, out of the total participants, the following are

SN	Name of Person	Question
1	Tapan Hazar- Farmer Block-Udyanpur District-Howrah	The Flood situation of Udaynpur Block of Howrah district extremely bad. The East Side of Mundeswari River are silted. The over flow and excessive water leeching out the Ponds. We the Fish Farmers are badly affected. During the proposed plan of action can make us space to restore our Fish Farmers and Agriculture Land.
2	Ramesh Chandra Paul Krishi Karmadhyakha Howra Jela Parishad	He extended his gratitude to the Department for such initiatives. He mentioned, Howrah Jila Parishad has taken many initatives to stop flood of Udaynpur Block and Amta Block. We are not able to control the flood. He also mentioned that, the rubber dam for the Mundeswari would be beneficial for us. He also told the silted soil are fertile hence it needs to be taken care. All the silted soil should be use for agriculture crops. The Brick clin industries should be avoided to use the silt during the de-siltation. He also recommended that there is some illegal habitation on the embankments. So, the district will take care of the habitation amicably settled during the project operation.
3	Mrs. Dalia Chatterjee Self-Help Group Nabajarga Block Hooghly	She put her concerned. In the 2007, the devastating flood in block. We have seen the run-off of Damodar River how the animal and human are brought by the water. So this intervention and remedial measure would help us.
4	Banibrata Hayat Fisherman Block-Khanakul-I Hooghly	We are the fish Farmer, due to devastating flood and over flow of the water, every year we are suffering and losses. We harvested in early due to flood. Hence the de-siltation of Mudeswari would be beneficial for us. We can have better opertunities to get more income. He also narrates, this process would help us for natural breeding of Fish.
5	Seikh Nur Islam FPO-Director Block- Galsi District- Purba Burdwan	Be a Producer Organization, we are suffering the flood situation and irrigation during the cropping season. This de-siltation and irrigation development programme would help for better production of our member farmers. The de-silted soil contains with sand. This should be kept separately.
6	Rekha Mondal ADM- LR Hoogly District	She concerned that de-silted earth contains with sand. So it is not helpful for the brick clin industries' hence this could be use for road filling and other many purposes. During carrying of the sand, it need to taken care that it should not be open truck.
7	Prasanta Majhi Farmer Block-Khanakul-II District: Hooghly	He raised a question about the situation of Khanakul-II block of Hooghly district for the sitatuion of Rupnarayan. How the Rupnarayan river are destroying the our lives. Mr. Debasish Sen, replied that this is not our jurisdiction. Hence this may be avoided.
8	Manoj Kole NGO- Representative	During execution of the plan of action, damp weather with frequent movement of trucks and dirt there will be several health hazards. The people of the such area will badly

SN	Name of Person	Question
	ASHA DEEP FOUNDATION Udaynarayanpur Block Howrah	affect by the workers, dirt and invisible particle. The wind of those area will be polluted. Hence the remedial measures of the intervention kindly be addressed.

All the concerned and question related to project were addressed by team of ESIA experts and SPMU- WBMIFMP. Joint Secretary Mr. Debashis Sengupta expressed his thanks for the present in this workshop and the meeting was concluded.

The List of Participants is given below.

List of Participants in ESMF consultation workshop

ESMF WORKSHOP ON 12.10.2018 AT 11.30 AM, NIC HALL, JALASAMPAD BHAWAN, SALT LAKE, KOL-91

SL NO	NAME	DEPARTMENT/ UNIVERSITY	DESIGNATION	NGO/SHG/FISHERMAN/ FARMER/FPO/FPC	CONTACT NO.	SIGNATURE
01	REKHA MONDAL	L&LR DEPT; ADM(LR) OFFICE, HOOGHLY	SRO-II		7551016346	[illegible] 12.10.18
02	SK. NUR ISLAM	galsi sabuj saty Forame polum organice	galsi II B.M	galsi sabuj saty Foramer podusame org. Burdwan.	8768527797	[illegible] 12.10.18
03	[illegible] Hait	HOOGHLY/KHANAKUL-2	FISHERMAN			
04	BANIBRATA HAIT	KRISHI-PROGOTI	KHANAKUL-2	FISHERMAN	9734373358	[illegible] 12/10/18
05	BANASHREE SARKAR	Ausgram-1 - CRP	Ausgram-1	SHG-Uttaran mohila Dal	8436167676	BSarkar
06	Soma MAJUMDAR	Aushgram-1 - C.R.P	Aushgram-1	S.H.G (Paribartan Shill Sangha [illegible])	9593045843	S. majumdar
07	KANCHAN MONDAL	DRDC	Secretary	QUESTCOM	9800013547	[illegible]
08	MD SUKUR SK	ANIMATE SOCIETY (NGO)	FIELD WORKER	ANIMATE SOCIETY	7872529875	Md. Sukur Sk
09	Debabrata Mandal	CTRAN Consulting Ltd.	Consultant.	CTRAN Consulting Limited.	8013143162	[illegible]
10	Amitava Mondal	CTRAN Consulting Ltd	Coordinator	CTRAN Consulting Limited	9681273475	[illegible]
11	Pranab Kr. Ghosh	CTRAN Consulting Ltd.	Coordinator	CTRAN Consulting Limited	9932116130	[illegible]
12	BORJAHAN MALLICK	F.P.O	Galsi. II B.M	Galsi Sabujsati F.P.O. Purba Burdwan	9775767759	B. Mallick
13	Dr. Prakash Pradhan	W.B. Biodiversity Board	Research Asst.		7908106464	Pradhan
14	Dr. Kamal Adak	Prakrit Roy Environment & Education Trust	Core support scientist	Prakrit Roy Environment & Education Trust (PREET)	9434316519	[illegible] 12/10/18
15	Faiyaz Ahmed	DL&LRO Burdwan (Purba)	DY DLLRO		9339437184	[illegible] 12-10-8
16	Sajal Malik	Purba Burdwan Z.P	Karmadhyaksha [illegible]		9233331780	[illegible] 12.10.18
17	Tapan Hazra	FPO/Farmer, Howrah		Farmer, Howrah.	8345526653	[illegible]
18	Kamlesh Ch. Pal	Karmadhyaksha. H.Z.P.	K.D, Krishi		9830016285	[illegible]
19	Prasanta Kr. Maity	Agri H2P	P. Farmer		9733037113	[illegible]
20	Saroj Neyar.	CTRAN Consultin.	VP-CTRAN		9437326787	[illegible]
21	Bula Basu.		U.N.Pur.	S.H.G.	9002012983	BBasu
22	Lakshmi Kanta Pakhira		U.N.Pur	Fisher man - Howrah.	9735106499	L. Pakhira
23	Laxmikanta Chakraborty	NGO - Jtarae Asha deep	Accountant	NGO - Jtarae Asha deep	9836631096	[illegible]
24	Manoj Poree	NGO - Jtarae Asha Deep	Co-ordinator	NGO - Jtarae Asha deep.	9732986143	[illegible]
25	PINAKI MITRA. IFS	FOREST DEPARTMENT	DCF/FINANCE	Not Applicable/Govt dept.	9083451813	[illegible]
26	ASIT DATTA	I&WD	BB/RB1		9474309410	[illegible]
27	DALIA CHATTERJEE	SHG	CSP SM13	NABAJAGARAN MAHILA SANGHA	9474155266	Dalia Chatterjee
28	MITHU MALIK	SHG	President	NABAJAGARAN MAHILA SANGHA	8927006801	Mithu Malik
29	DIPALI PATRA	SHG	Vice-president	NABAJAGARAN MAHILA SANGHA	8609235007	Dipali patra

Contd.

ESMF WORKSHOP ON 12.10.2018 AT 11.30 AM, NIC HALL, JALASAMPAD BHAWAN, SALT LAKE, KOL-91

SL NO	NAME	DEPARTMENT/ UNIVERSITY	DESIGNATION	NGO/SHG/FISHERMAN/ FARMER/FPO/FPC	CONTACT NO.	SIGNATURE
30	Prasanta Maji	Not applicable		Farmer, Hooghly.	8145494554	Prasanta Maji.
31.	Amit Pakira	R&D Dte, DPMU-II	JE	Not applicable.	9433747287	
32.	Abhisek Das	Trust member	Manager.	Indira Gandhi Vocational Welfare trust	8759071951	
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Consultation and Sharing Workshop on Environmental and Social Management Framework (ESMF) of West Bengal Major Irrigation and Flood Management Project (WBMIFMP)

Irrigation & Waterways Department, Govt. of West Bengal

Date: 12th October, 2018
Venue: Ground Floor NIC Conference Hall of Jalasampad Bhawan, Salt Lake.

Registration Sheet

No.	Name, Department & Address	Mobile No. & e-mail ID	Signature
1.	Rajib Chakraborty Team Leader, EPTISA & FSDD Consultant India Pvt Ltd	9717597906 rajib.chakraborty@eptisa.com	12/10/18
2.	Diganta Maity Dy. PD - IV, SPMU, WBMIFMP	9433066850 diganta.maity@rediffmail.com	12/10/18
3.	B. Chakraborty Addl. P.D-IV DPMU-II WBMIFMP	9433013526	
4.	M. Roy Addl. Proj. Director-I & III WBMIFMP	9231624202 mrinalroy65@yahoo.co.in	
5.	D Sengupta JS(Water)	9932-16743	
6.	S. K. Laha. CE & PD.	9434416427.	
7.	S. C. Patra Consultant (Irrigation)	9433508198	
8.	Sanj Nayak. CTRan.	9437326787.	

No.	Name, Department & Address	Mobile No. & e-mail ID	Signature
9.	Kadir Moidha CTRAN Consulting Bhubaneswar	8337932884 Kadir.moidha@ctranconsulting.com	Moidha
10.			
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