Draft Environmental and Social Impact Assessment (ESIA) Report

(Including ESMP)

Raising, Renovation & Modernization of Jhanjharpur Branch Canal (Total Length 42.06 Km)

Renovation & Modernization of Jhanjharpur Branch Canal

under

Bihar Water Security and Irrigation Modernization Project (BWSIMP)

(Funded by The World Bank)

Contents

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FIGURES

ANNEXURE

ABBREVIATIONS

BC & EBC	Backward & Extremely Backward Class
BKBDP	Bihar Kosi Basin Development Project
BKFRP	Bihar Kosi Flood Recovery Project
BSDMA	Bihar State Disaster Management Authority
BSPCB	Bihar State Pollution Control Board
BWSIMP	Bihar Water Security & Irrigation Modernization Project
CCA	Cultural Command Area
CEMP	Construction Environmental Management Plan
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
CPGRAM	Centralised Public Grievance Redress and Monitoring
CTE	Consent to Establish
CTO	Consent to Operate
Cum	Cubic Meter
DG	Diesel Generator
DPR	Detailed Project Report
EAP	Emergency Action Plan
E & S	Environmental & Social
EC	Environmental Clearance
EHS	Environmental Health & Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ERM	Environmental Risk Management
ESF	Environmental & Social Framework
ESIA	Environmental & Social Impact Assessment
ESMP	Environmental & Social Management Plan
ESS	Environmental & Social Standard
FGD	Focus Group Discussion
FMISC	Flood Management Improvement Support Centre
GBV	Gender Base Violence
GRM	Grievance Redressal Mechanism
HIRA	Hazard Identification and Risk Assessment
ICC	Internal Complaints Committee
ID	Identification
IFC	International Finance Corporation
IRC	Indian Roads Congress
JBC	Jhanjharpur Branch Canal
KVA	Kilo-volt-amperes
LPG	Liquid Petroleum Gas
MCM	Million Cubic Meters
MIS	Management Information System
MoEF&CC	Ministry of Environment, Forest and Climate Change

MPL	Maximum Permissible Limit
MT	Metric Ton
NDWI	Normalized Difference Water Index
OBC	Other Backward Class
OHS	Occupational Health & Safety
PAF	Project Affected Family
PAP	Project Affected People
PCB	Pollution Control Board
PCC	Plain Cement Concrete
PIU	Project Implementation Unit
PMTC	Project Management & Technical Coordinator
PMU	Project Monitoring Unit
PRI	Panchayati Raj Institutions
PUC	Pollution under control Certificate
R&R	Rehabilitation and Resettlement
RAP	Resettlement Action Plan
SC	Scheduled Caste
SEA	Sexual Exploitation & Abuse
SH	Sexual Harassment
SPM	Suspended Particulate Matter
Sq Ft	Square Feet
ST	Scheduled Tribe
STP	Sexually Transmitted Diseases
TPP	Thermal Power Plant
WHO	World Health Organisation
WKMC	Western Kosi Main Canal
WRD	Water Resource Department
WUA	Water User's Association

EXECUTIVE SUMMARY

The Bihar Water Security and Irrigation Modernization Project (BWSIMP), partly funded by The World Bank as loan, aims to enhance water security and modernize irrigation systems in Bihar, India. One of the sub-projects under this project focuses on the "Rennovation and Modernization of Jhanjharpur Branch Canal (Km 0.00 to Km 42.06)" focuses on the renovation and modernization of Jhanjharpur Branch Canal from km 0.00 to km 42.06, as this branch canal is crucial for improving irrigation efficiency and effectiveness in the region. The whole stretch of Jhanjharpur Branch Canal i.e. from Km 0.00 to Km 42.06 falls under two (2) work divisions of Water Resources Department i.e. 1. Jhanjharpur Work Division and 2. Andhrathari Work Division.

The Jhanjharpur Branch Canal (JBC), part of the Western Kosi Canal system, serves the Madhubani district in North Bihar. This area frequently experiences flooding and drought conditions, making efficient water management essential. The canal is currently unlined, leading to significant water losses due to seepage. The project proposes lining the canal from its origin to its tail end to reduce water loss, prevent waterlogging and improve irrigation efficiency.

The sub-project proposes mainly renovation and modernization of the JBC (Km 0.00 to Km 42.06) to address seepage and other water losses, aiming to increase CCA from 24623.23 hectare to 26621.61 hectare and maximize the irrigation intensity during both Kharif and Rabi seasons by upgrading the canal system by concrete lining.

The Environmental and Social Impact Assessment (ESIA) report outlines the sub-project's objectives, methodology and expected outcomes. It includes a detailed analysis of the environmental and social impacts including inputs obtained during public consultations and proposed Environmental and Social Management Plan (ESMP). The ESMP aims to mitigate any likely adverse impacts during execution as well as completion of the sub-project and ensure sustainable development.

The sub-project is expected to bring significant benefits, including improved agricultural productivity, better water management, and enhanced resilience to weather vagaries due to climate change. It will also contribute to the overall economic development of the region by providing reliable irrigation and supporting sustainable agricultural practices.

1. Project Description

The Western Kosi main canal is 91.82 km long, with the first 35.13 km located in Nepal and the remaining 56.69 km located in India with the design discharge of 6,475 cusecs in India portion. The present reported CCA of complete Western Kosi Canal Project is 2,03,300 Ha. The irrigation potential envisaged was 2,65,265 Ha with an irrigation intensity of 130%.

Jhanjharpur Branch Canal Off-takes at Km 21.03 (India Portion) of Western Kosi Main Canal with a designed discharge of 686 cusecs. The command area of Jhanjharpur Branch Canal covers mainly Madhubani district in North Bihar. The area experiences frequent flooding and drought conditions, with flooding and inundation being common annual phenomena. At present, culturable command area for Jhanjharpur Branch Canal system is 24,623.23 Ha along with 23,237.34 Ha irrigation potential created. The Canal Alignment passes through Babubarhi, Andhratharhi and Jhanjharpur Blocks of Madhubani District. The canal is completely unlined for its entire length. The proposed work of Renovation and Modernization of JBC with concrete lining for its complete stretch of 42.06 Km will reduce seepage loss of irrigation water. Seepage can result in loss of 30 to 50 percent of irrigation water from the canal.

2. Project Risk

The sub-project's **Environmental risk is classified as "Substantial"** because of the nature of construction/intervention proposals will result in large volume of waste/silt and other significant OHS and CHS issues. Though the present sub-project components are confined to modernization of existing structures (on government land, owned by WRD), the **social risk rating is also "Substantial"** as field surveys indicate encroachments for habitation, livelihood, farming and grazing by non-title holders on the embankments.

However, it is to be noted that none of the encroachers is likely to be impacted by the renovation/modernization work of the canal.
The tools for E&S risk management have been developed and detailed in the ESMF.

Process in the Project Cycle	Tools for E&S management and monitoring
1. FEASIBILITY • Irrigation Potential (IPC & IPU) • Life of Canal System • Flood Proneness Area • Drought Prone Area	E&S Screening Checklist - will be filled and submitted by Environmental and Social Specialist of PMU BWSIMP *ESMF, RPF, SEP, LMP* will be prepared for overall project guidance.
2. PREPARATION OF SCHEME BY FIELD ENGINEERS • Identification of Vulnerable reaches for prioritization • Damages to canal structure • Selection of schemes	An Environmental and Social Impact Assessment (ESIA) of these activities proportional to risk of the activity defined will be caried out during that time. Prepare ESIAs (including ESMP) under the project. ESIA (including ESMP) to be included in the DPR. Specialized Mitigation Measures to be prepared: RAP, OHS plan, GBV plan, Dolphin program.
3. REVIEW and APPROVAL • Technical Review and approval of Scheme by SE, CE and recommendation of the scheme to PMU • Approval of Scheme by Project Co-Ordinator	
4. DETAILED DESIGN • Surveys and Preparation of DPRs • Review of DPR • Approval of DPR	
5. **TENDERING** • Preparation of Bid documents by PMTC • Tender Evaluation and Award	Contractor ESMP (C-ESMP) to be included in Bid Documents which covers E&S responsibilities of Contractor including monitoring and reporting and Contractual Remedies.
6. IMPLEMENTATION	Reporting against Contractor-ESMP Reporting against RAP Reporting against agreed specific mitigation measures Reporting against Contractor-ESMP
7. REPORTING AND MONITORING	

3. Environmental and Social Impact Assessment (ESIA)

The ESIA report provides a comprehensive analysis of the environmental and social impacts of the project. It includes the following key components: -

- **Resource Requirements**

Land Requirement

The intervention is mainly in the form of lining work in the branch canal of Jhanjharpur, which implies work will be limited to inside the canal. Hence no Land acquisition is required. On both sides of the canal sufficient land, owned by WRD is available as "Chat Land" and agricultural land (private) is about 10 m away from either side of the canal. Sufficient Govt. land is available for movement of machineries during the work and even temporary acquisition of private land is not required for that purpose. The assessment/survey conducted in the sub-project

locations observed that the proposed sub project is not going to affect any households residing in the nearby area of present location of JBC.

Construction Materials Requirement

The construction materials to be used in lining and modernization of proposed sub-project of JBC are shown in a tabular form below:-

Quantity of construction materials required for lining and modernization of JBC

Sl. No.	Construction Material	Quantity	Unit	Main Carriage station
1	Cement	25312.51	MT	Darbhanga
2	Coarse Sand	54009.34	Cum	Kiul
3	Stone Chips	68850.01	Cum	Mirzachauki
4	Bitumen	23.54	MT	Barauni
5	5-15 mm Gravel	30241.61	Cum	Mirzachauki
6	20-63 mm Gravel	34653.50	Cum	Mirzachauki
7	Local sand	2937.65	Cum	Kamla River
8	Steel	7.41	MT	Darbhanga

Labor Requirement

The lining work will take 14 months to complete for the proposed sub project. The requirement of skilled and unskilled labor is briefed in the following Table.

Particulars	Skilled Lab	Semi skilled Lab.	Unskilled Lab.	Total Lab.
No.	89	117	565	771
Man-days	37496	49158	237283	323937

4. Applicable Policy and WB Environmental and Social Standard

The legal and regulatory requirements for the sub-project's proposed interventions, under applicable acts / rules and policies for social and environment safeguards, have been identified. This includes the environmental legislations related to protection of biodiversity, pollution control, resource management, waste management, safety of workers and general public, while the identified social legislations cover socio-economic inclusion, labour welfare, gender equality, land management, resettlement of squatters, citizen engagement, citizen rights, good governance etc. There is requirement of permits / licenses under different rules /regulations for various aspects of interventions proposed in the sub-project. All agencies involved in implementing the sub-project activities, including contractors, shall have to follow applicable state and central government laws and regulations. These include, prior permission (if required) for tree felling from the Department of Forest; NoC for establishment and operation of hot mixing plant, batching plant, etc., from the Bihar Pollution Control Board, approval of local government authority / concerned work division of WRD for sites identified for camp establishment, temporary storage and disposal of waste materials, etc.

An outline of the applicable environmental and social safeguards standards of the World Bank are as follows: -

ESS 1 - Assessment and Management of Environmental and Social Risks and Impacts

ESS 2 - Labor-and-Working-Conditions

ESS 3 - Resource-Efficiency-and-Pollution-Prevention-and-Management

ESS 4 - Community-Health-and-Safety

ESS 5 - Land-Acquisition-Restrictions-on-Land-Use-and-Involuntary-Resettlement

ESS 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources and

ESS 10 - Stakeholder-Engagement-and-Information-Disclosure

The Environment Management Framework of the sub- project is based on the above elaborated policies and standards.

5. Environmental Baselines: This section covers the physical and biological environment of the project area, including temperature, rainfall, land use, topography, soil, hydrogeology, air quality, noise quality, groundwater quality, surface water quality, natural disasters, and climate change variability

6. Social Baselines: This section covers the administrative boundaries, demography, socio-economic profile, population growth rate, non-title holders occupying land required under the project, and the status of Water User Association

7. Public Consultations and Disclosure: This section outlines the identification of stakeholders, the method and process of consultation, the outcome of the consultation, the disclosure of project information, the grievance redressal mechanism, and the provision for further consultation at the implementation.

8.Environmental Impact Assessment (EIA): This section covers the pre-construction impacts, construction phase impacts and operation phase impacts of the sub-project on the environment. It includes the impact on land use and topography, air quality, drainage, surface water quality, groundwater quality, construction wastes, noise, accessibility, occupational health and safety, community health and safety, construction camps, local ecology and chance finds during execution of the sub-project.

- **Pre-construction impacts**
  - The likely works during the pre-construction phase are i) Shifting of electricity poles ii) setting up of Contractor's Camp and Construction yard iii) Planning for sourcing of construction materials etc.
  - Finalization of Work Methodology which would define the activities to be undertaken. These would also determine the risk to the workmen and the communities. Based on the work Methodology and the plan, the various legal permits need to be obtained.
  - Site Selection for Construction Work Camps, Stockpile Areas, Storage Areas near the project location. However, if it is deemed necessary to locate these elsewhere, sites to be considered should not lead to unwarranted impacts on air, noise and lead to tensions or conflicts with the local community. The chosen location should also not cause any inconvenience to the local community. Further the planning and layout of the Construction camp and the whole area / use of the equipment should be planned / done in a manner that it should not impact the environment adversely.
  - The sub-project would result in an estimated 288151.97 Cum of silt and if it is not properly disposed it can adversely impact the nearby waterbody / land of construction site. Hapazard dumping will also result in unpleasant sighting and also would be a potential health and safety risk for the residents. However, the sub-project has identified that the generated quantity of silt will be used for restoring section of the canal and construction of embankment road which is proposed under different scheme of state government. The filling quantity of earth/silt required to bring the canal in design section and filling material in embankment road construction is much more than the quantity expected to be obtained during bed clearance.
  - The Ministry of Environment, Forests and Climate Change (MoEF&CC) has issued notifications related to sediment management, particularly focusing on dredging and desilting of water bodies and sand/soil mining. These notifications outline the need for Environment Clearance (EC) for such activities, with some exemptions for maintenance dredging and desilting, subject to environmental safeguards as per the National Framework for Sediment Management (NFSM) of MoJS. During construction phase sediment management will be done in line with the said framework.

- For Sourcing of Construction Materials, only those mine & quarries will be used in the project, which have valid mining licenses and Environmental Clearances as permitted by Mines and Geology department, Govt. of Bihar.
- The Plant Machinery and Vehicle to be used in the sub-project must meet the existing emission requirement.

- **Construction Phase Impact**

Air pollution

- Deterioration of air quality due to various construction activities along the project site is primarily due to dust generated. The summer season experiences high wind velocity causing accelerated wind erosion resulting heavy suspension of dust. This results in high SPM in the air.
- Large quantity of dust is likely to be generated during modernization of JBC.
- Fugitive emissions are from vehicles used for the transportation of construction materials and other heavy mechinaries used during construction. Transportation routes are also likely to face pollution due to spills of debris and construction materials during transportation. Air pollution is also likely due to emission from vehicles and other heavy machineries (batching plant, mixing plant and DG sets to meet the power requirement) during construction period.
- The construction camp will also be a source of air pollution due to cooking, operation of DG sets for domestic uses etc.

Since there are habitation adjoining the existing canal these incremental air pollutants can cause inconvenience to the residents and sensitive group of people (elderly, sick, new born etc). The haphazard disposal may lead to loss of productive land. Additionally, during disposal the movement of trucks carrying the debris and silt outside the designated route can cause compaction.

- Mitigation measures:
  - The movement of the truck carrying debris or construction material should be limited to the designated tracks
  - The construction waste and debris should be disposed only at site "Fit for Disposal"

However, significant impact on health is not expected as construction period is short and the above emitted emission and dust will disappear as construction gets completed.

Surface Water pollution

- Impact on surface water quality during the construction phase is anticipated due to surface runoff from construction site containing substantial quantities of suspended impurities, mixing of oil / fuels /lubricants and other hazardous chemical etc.
- Discharge of sewage etc from labour camp/site offices.
- Run-off from stockpiled materials, wastewater during construction.

These pollutants could contaminate downstream surface water quality of the streams/water bodies. However, these potential impacts are temporary and of short-term only. The wash water from the concrete mixer/ batching plant/ miller may degrade the surface water quality therefore it should only be disposed at a pit developed in construction camp.

Ground Water pollution

- During vehicle/heavy machinery and equipment operation, spillage of fuels and lubricants.
- Discharge of sewage etc from labour camp/site offices.
- Run-off from stockpiled materials, wastewater during construction.

These pollutants could contaminate ground water quality of the region. To mitigate this, only fuel pumps will be used for fueling / re-fueling. Oil interceptors will be provided at vehicle parking, wash down and refueling areas as per the design provided. For sewage generated from camp/office site, proper sockpits will be provided at the required places.

Noise pollution

- Operation of heavy machineries; movement of heavy vehicles, concrete mixing activities, operation of DG Set, demolition of existing structure etc generate high level of noise resulting in increase of ambient noise level of the surrounding.

However, most of the construction activities will be confined to the sub-project area (inside the canal systems, embankment site) away from habitation area and mostly would be executed during day time only therefore these risks would be minimum.

- **Operation Phase Impact**
  - The proposed Canal modernization, which involve creating an impermeable layer along the canal section will result in decreasing water losses due to seepage
  - Canal lining targets enhancing water transport efficiency in the canal resulting in decreasing loss, due to evaporation.
  - Reduction in seepage and evaporation loss will result in significant increase in availability of water for irrigation.
  - Modernization of existing water regulatory structures alongwith canal lining will allow the adoption of modern irrigation strategies i.e. drip and sprinkler systems. This will further minimize water wastage and soil degradation.
  - Canal lining will reduce water logging and resultant salinity to a large and significant extent preserving agricultural land and environment. Increase irrigation water availability will allow increase in culturable command area of the system, which will lead to improve agriculture productivity.
  - Increased agricultural productivity will ensure food security and improvement in economic condition of farmers.
  - Canal lining may affect the microbial ecology of the irrigation water, existence of aquatic organisms etc doubtlessly downgrading quality of irrigation water.
  - To offset the ecological impacts of canal lining, if required, development of artificial wetlands, fish passages and riparian buffer zones could be thought off after consultation and involvement of nearby communities.
  - The usage of eco-friendly and locally sourced materials for canal lining whenever feasible will be explored.

9. Social Impact Assessment (SIA): This section covers the findings of the social impact assessment with respect to scope of land acquisition, socio-economic and demographic profile of affected persons, labor profile for the works, and the mitigation measures for social impact.

- The Project Area falls in 5 blocks of Madhubani district, namely, Andhrathari, Babubarhi, Jhanjharpur, Lakhnaur and Madhepur covering 37 villages. A total of 1,38,870 families reside in the project block area and the average family size is 6. The project blocks have a total population of 10,49,978 (Census 2011) out of which 51.86% are male while 48.14% are female. The religious composition of population of the project blocks shows that 83% of the population are Hindus, while 17% are Muslims. The Scheduled Caste population in the project blocks is 14%, while the Scheduled Tribe population is significantly lower at 0.13%. The labor force in the project blocks comprises 2,52,735 workers, with majority (64.09%) engaged as main worker and 35.91% are involved in marginal activity according to census, 2011.
- The economy is primarily agrarian.
- The intervention being mainly lining work limited within the canal area, no Land acquisition is required. WRD owns sufficient land along the bank of JBC of the work zone in the form of Chat land, to execute the

renovation and modernization of the canal. The social assessment survey at the project area found that there does not exist any structure, temporary or permanent at the work zone. Hence, displacement of any form, permanent or temporary does not arise.

- The project will have civil works contracts and employ both direct, contracted workers. The contractor will employ local labor and depending upon the scale and skill requirement, may source migrant labor. Total 3,23,937 no. of labor-day will be required during construction work; of them 37,496 labor-day will be for skilled labor. Labor influx increases risks of SEA/SH and also pose infection risk from the community as well as to the community. All workers under the project will be governed by Codes and laws regulating labor in India to cover workers work/service conditions, remuneration, occupational health and safety.
- Labour camps will be established following World Bank's related accommodation process and standards.
- Grievance redressal mechanism (GRM) including issues of SEA/SH for workers is based on ESMF provisions which will be accessible to all.
- The Occupational Safety, Health and Working Conditions Code, 2020, along with the Draft Occupational Safety, Health and Working Conditions (Bihar) Rules, 2021, provides guidelines for ensuring worker safety during these activities which has to be followed by the Employers. Contractors will prepare and implement a Site-Specific Occupational Health and Safety Plan, including measures like community liaison, compliance with the Worker's Code of Conduct, and provision of Personal Protective Equipment (PPE) kits. Additionally, contractors are responsible for training workers in safety procedures, maintaining first aid kits, and minimizing potential hazards.

10. Alternatives

The modernization and lining of the Jhanjharpur Branch canal (JBC) has limited interventions proposed aimed at the improvement of the performance of the system. Since this is an existing canal without any new construction/extension (within the scope of the World bank Funded Project) the analysis of alternatives is limited.

11. Environmental and Social Management Plan (ESMP): This section outlines the objectives of the ESMP, the institutional arrangement for ESMP implementation, the environmental monitoring plan, documentation and record-keeping, environment and social monitoring reports, the review mechanism of the ESMP implementation, capacity building and training, and the indicative budget allocation for the ESMP.

12. Conclusion

The BWSIMP is a significant initiative that aims to improve water security and irrigation efficiency in Bihar. The project is expected to bring substantial benefits to the region, including enhanced agricultural productivity, better water management, improved irrigation efficiency and increased resilience to climate change.

The ESIA report provides a comprehensive analysis of the project's environmental and social impacts and outlines the measures to mitigate adverse effects and ensure sustainable development.

This sub-project namely "Renovation and Modernization of Jhanjharpur Branch Canal" is designed to minimize irrigation water loss in the form of seepage and evaporation resulting in increase in availability of additional irrigation water, which could be used for increased agricultural productivity and resultant economic growth of the community residing in the project area.

This sub-project has been designed in a way that any environmental impact is minimized. Since the work is restricted to the canal's existing footprint, there is no risk of harming forests, trees, historical monuments or any other sensitive areas. The materials required for the construction, including sand, aggregate, and other resources, will be sourced from approved quarries in Bihar, Jharkhand and Uttar Pradesh, adhering to all environmental regulations.

Water User Association along with the concerned division of WRD are to be jointly responsible for the up keeping of the irrigation system so that the community continues to get the benefit in sustainable manner.

CHAPTER 1: INTRODUCTION

1.1 Introduction

Bihar is one of India's leading agricultural states, employing over 60% of its workforce, with sixty percent of its land area under cultivation significantly higher than India's national average of 42%. Bihar is primarily a plain area with high agricultural potential. Second, much of the woodland was cleared for agriculture over the past two millennia.

Agriculture (primary sector) is contributing to 20% of the State's Gross Domestic Product (GDP). In the state, the Gross Cultivated Area (GCA) is 7.30 million hectares and the Net Sown Area (NSA) is 5.08 million hectares, of which major and medium irrigation systems irrigate 2.93 million hectares and minor irrigation systems (Surface and Groundwater) irrigated 2.15 million hectares. Currently, the total Irrigation Potential of constructed Major and Medium Irrigation Schemes is 4.20 million hectares, of which 3.722 million hectares are Irrigation Potential Created (IPC) and 2.82 million hectares are Irrigation Potential Utilized (IPU). The state has set a target of 5.35 million hectares for the Ultimate Irrigation Potential (UIP) for Major and Medium Irrigation Schemes.

The State also suffers from recurring natural calamities like floods, drought, and other extreme weather events like cyclones, hailstorms, and heatwaves. About 74% of the geographical area of North Bihar is considered flood-prone. Out of the 38 districts of the state, 28 are flood- prone, with 15 being most affected, resulting in colossal loss of property, human lives, farmlands and infrastructures apart from the loss of human lives. Rivers originating in Nepal, such as Kosi, carry high sediment loads deposited on Bihar Plains. The 2008 Kosi floods affected over 1,40,000 hectares of rice, 7,200 hectares of corn, and 96,000 hectares of other crops, affecting nearly 5,00,000 farmers.

In contrast, the southern districts in Bihar viz., Munger, Nawada, Rohtas, Bhojpur, Aurangabad and Gaya, are drought prone. To combat these situations, people, machines, and financial resources have to be deployed, on a regular basis, which ultimately slows down the pace of development.

Bihar depends on agriculture and must quickly switch to a modern water- conserving irrigation system. The Water Resources Department (WRD) has created a good number of well-distributed storage reservoirs, most of them in drought-prone sub-plateau areas of the South Bihar Plains. However, the irrigation sector in Bihar needs a re-assessment considering climate challenges and improving farm income and rural employment. Under this vision the proposed **"Bihar Water Security and Irrigation Modernization Project (BWSIMP)"** has been framed in close cosultation with the World Bank. The project will cover the whole state of Bihar, focusing more on districts impacted by flood and drought. As the project title suggests, the GoB has embarked upon a new pathway of water resources management. This is a comprehensive initiative covers efficient irrigation and flood risk management and drought proofing through multi-stakeholder participation in planning and management, after needed institutional strengthening and capacity building. The project will ensure positive economic and environmental outcomes for the state. It would enable completion of the Kosi Canal Project, restore age-old canal systems and protect canal embankments. Furthermore, advanced measures will be implemented in vulnerable areas along rthe canal to safeguard them for long-term erosion.

The Project Development Objective (PDO) of the proposed "Bihar Water Security and Irrigation Modernization Project (BWSIMP)" is to "To improve irrigation and flood risk management services, and institutional capacity for water resources management in Bihar".

The BWSIMP project is proposed to be implemented over seven (7) years at a total estimated cost of USD$ 551.88 million, of which 70 percent (US$ 386.316 million) will be loan assistance from the World Bank whereas 30 percent (US$ 165.564 million) will be borne by the Government of Bihar.

The proposed BWSIMP has 5 project components i.e. (i) Climate resilient irrigation (ii) Flood risk reduction (iii) Water governance (iv) Project management and (v) Contingency Emergency Response Component.

The effective management of water resources is crucial for agricultural sustainability and environmental conservation. Canal lining plays a significant role in minimizing water losses due to seepage, ensuring equitable water distribution, and enhancing irrigation efficiency. Considering these facts under Component - I of the proposed BWSIMP there is a plan for **Rehabilitation and modernization of Jhanjharpur Branch canal scheme**.

1.2 Brief Description of the project (DPR)

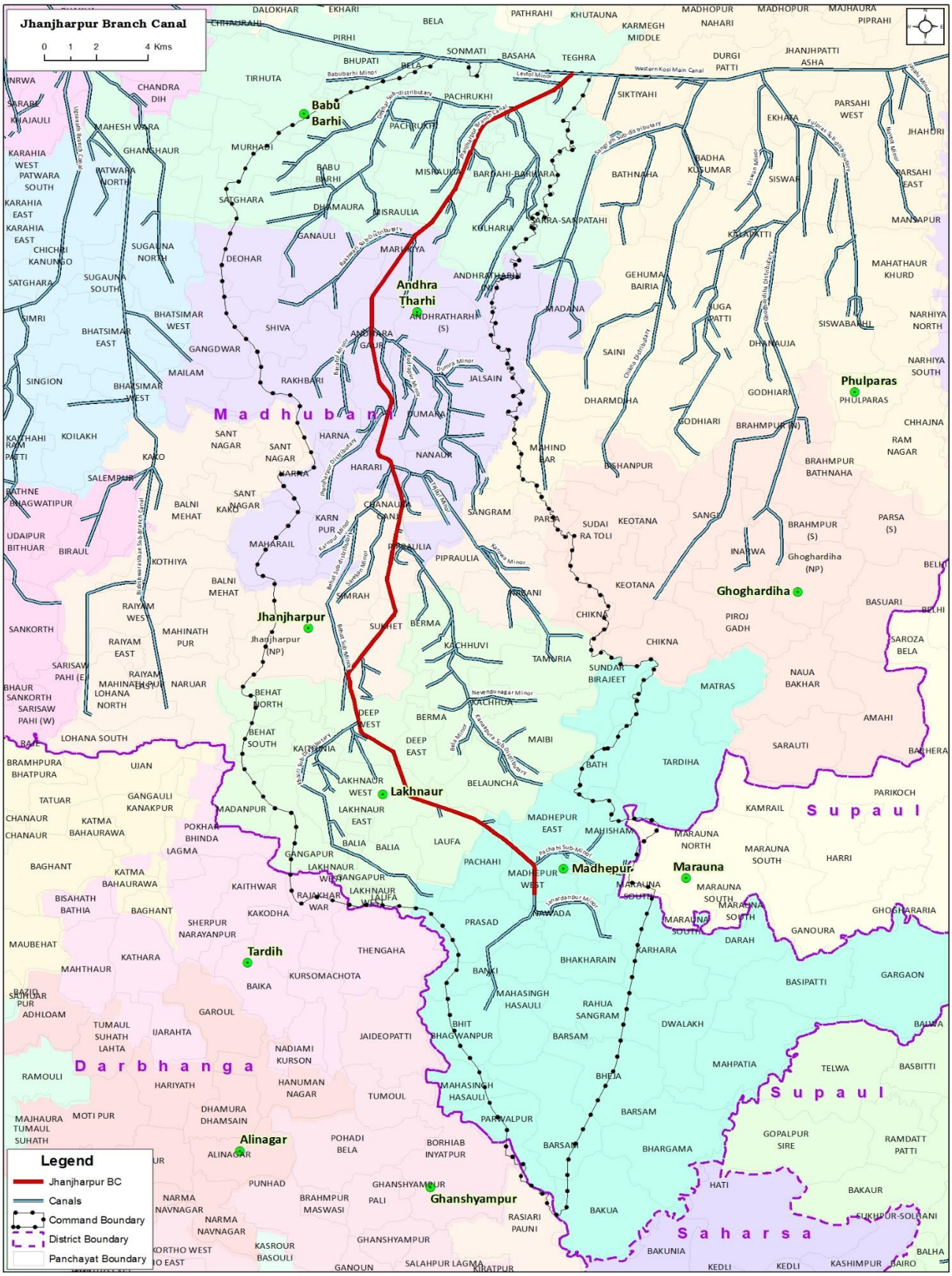
The Western Kosi main canal is 91.82 km long, with the first 35.13 km located in Nepal and the remaining 56.69 km located in India with the design discharge of 6475 cusecs for India portion. The present reported CCA of complete Western Kosi Canal Project is 2,03,300 Ha. The irrigation potential envisaged was 2,65,265 Ha with an irrigation intensity of 130%.

Jhanjharpur Branch Canal Off-takes at Km 21.03 (India Portion) of Western Kosi Main Canal with a designed discharge of 686 cusecs. The command area of Jhanjharpur Branch Canal sub-project covers mainly Madhubani district in North Bihar. The area experiences frequent flooding and drought conditions, with flooding and inundation being common annual phenomena. The districts are bounded by the Kosi River to the east, the Noon River to the west, Samastipur district to the south, and Western Kosi main to the north. The Kamla and Bagmati rivers, along with several smaller rivers, flow through the region. These rivers originate from Nepal and join the Ganga River near Kursela. During the monsoon, the region experiences flooding and inundation. Between these major rivers, numerous small rivulets, old river courses (Dhar), low-lying areas, water bodies, wetlands, and upland areas (chaurs) are present. These water bodies become submerged during the monsoon due to riverine flood spillover (fluvial flooding) as well as pluvial flooding (from direct rainfall) and remain underwater long after the monsoon ends. The area even faces drought-like conditions in the event of of low rain fall.

At present, culturable command area for Jhanjharpur Branch Canal system is 24,623.23 Ha. The Canal Alignment passes through Babubarhi, Andhratharhi and Jhanjharpur Blocks of Madhubani District. The canal is completely unlined for its entire length. Canal lining is the process of reducing seepage loss of irrigation water by adding an impermeable layer to the edge of the trench. Seepage can result in loss of 30 to 50 percent of irrigation water from canal, so adding lining in canal under BWSIMP can make irrigation system more efficient. Lining of Jhanjharpur Branch Canal could also prevent water logging around low-lying areas of the canal. By making a canal less permeable, the water velocity increases. Increased velocity also reduces the amount of Evaporation and silting that occurs, making the canal more efficient.

This sub-project deals with lining of Jhanjharpur Branch canal from km 0.00 (its origination) to km 42.06 (Tail end). District and Block wise command area of Jhanjharpur Branch Canal is shown in following Figure 1.1:-

Figure 1.1 : Command Area of Jhanjharpur Branch canal



1.3 Objective of the ESIA Study

The main objectives for ESIA & ESMP of the "Bihar Water Security and Irrigation Modernization Project (BWSIMP) includes the following: -

- To ensure that the project is implemented in an environmentally sustainable manner.
- To identify the environmental and social sensitivities in the project areas and assessing the level of environmental and social impacts.
- To mitigate potential negative environmental and social impacts that may arise during the construction and operation of the project.
- Ensuring appropriate compensation for the Project Affected Persons (PAP) / Project Affected Families (if any) irrespective of legal status with a view to provide suitable options that enable the affected people to improve or at least restore their standard of living in the post impact
- To establish systems and procedures for ensure that the mitigation planned, process suggested for preventing environment and social impacts during various stages of the project – pre-construction, construction and operation phase are implemented.

1.4 Approach and Methodology

The EIA Notification 2006 and the subsequent amendments list categories of infrastructure investment/ industries which would require prior environmental clearance. As the sub-project involved renovation or modernization of the existing irrigation canal system including desilting, rehabilitation etc without increase in the command area the project does not fall under the purview of the EIA notification. However, for the study has been conducted in the spirit of the standard Terms of Reference proposed by MoEF&CC the World Bank ESF. The ESIA has further been refined based on the discussion held with Divisional unit of WRD and World Bank in accordance with the ESF requirements.

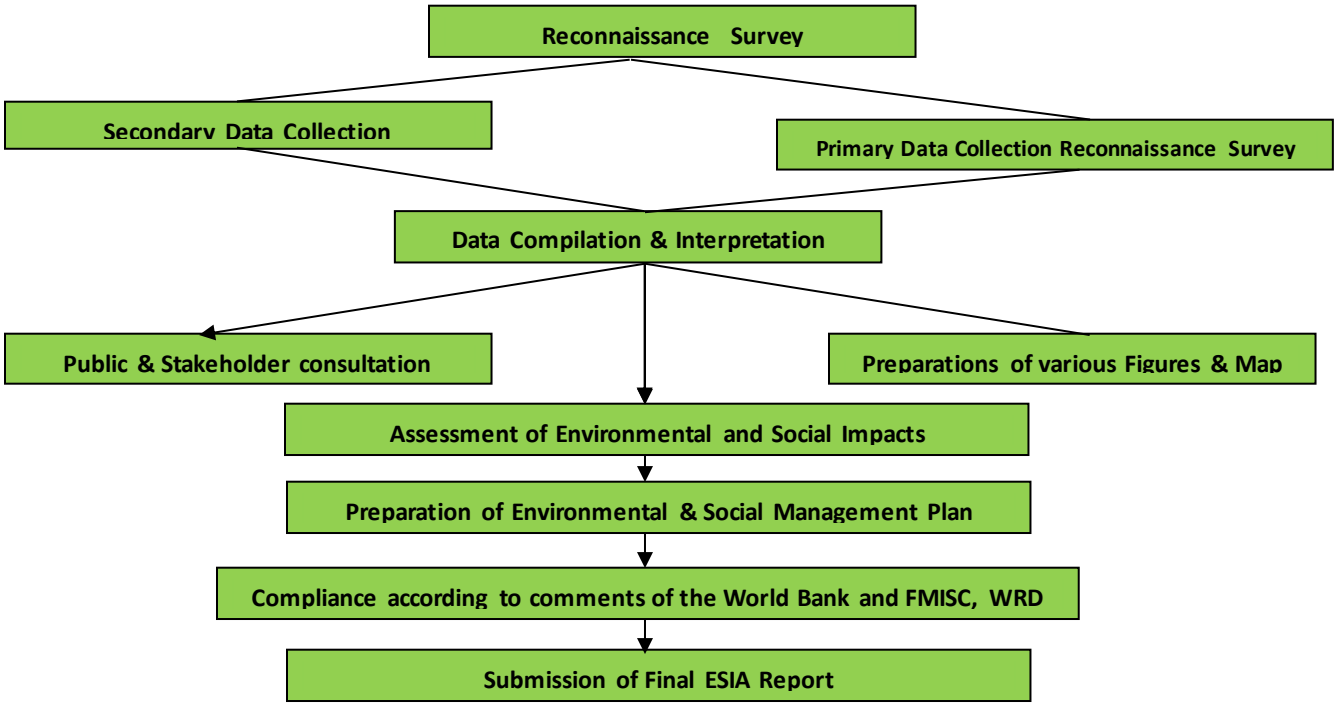
The approach and the methodology for the preparation of this report is: -

- Site Reconnaissance: Inspection of the site to assess the availability of land, type of assets to be impacted, etc.
- Desktop scoping conducted within the area of 5 km on either side of the stretch.
- Review of project documents and other relevant literature related to the water resource and irrigation sector in Bihar.
- Assessment of secondary data related to the socio-economic profile of the proposed project areas and collection of primary data required for establishing the project E&S baseline i.e. physio-chemical, biological and socio-economic aspects.
- Focused Group Discussions & Public Consultations were conducted during study to understand the views and perceptions of villagers within project area.

- Mapping of the national and state legal policy framework relevant to the project to assess gaps and additional requirements.
- Identification of potential impacts on various environmental and social attributes due to activities envisaged during the construction.
- Drafting the Environmental and Social Management Plan (ESMP), outlining measures to minimize adverse impacts anticipated during the pre-construction, construction and operation phase.
- Formulation of Environmental & Social Monitoring Programs.
- Estimation of cost for implementation of Environmental and Social Management Plan including both Environmental & Social Monitoring.

The proposed methodology for the Study is mentioned in the following Figure 1.1.

Figure 1.1: Flow Chart of proposed activity under ESIA Study



1.5 Layout of the Report

The layout of the ESIA Study is presented below:

- **Chapter 1**- This chapter provides a brief description of the project, the objectives of the ESIA study along with the methodology adopted for the ESIA Study.
- **Chapter 2**- This chapter discusses Resource Requirement for the proposed Project such as Land Requirement and availability, power requirement, requirement of raw material, labor requirement (local, migrant- number, accommodation), waste water disposal and Waste Generation and Disposal of Sludge etc.
- **Chapter 3**- This chapter discusses policy, legal and administrative framework applicable to this Project, World Bank Safeguard Policies etc.
- **Chapter 4**- This chapter deals with the analysis on alternatives available for the proposed project.
- **Chapter 5**- This chapter deals with the environmental baseline status of the Project area. It also described the details of the surveys/ field studies carried out during study.
- **Chapter 6**- This chapter deals with social baseline status of the Project area. It also described the details of the surveys/ field studies carried out during study.
- **Chapter 7**- This chapter deals with public consultation conducted under the project and its disclosure.
- **Chapter 8**- This chapter describes the impacts of project on the environmental components.
- **Chapter 9**- This chapter describes the impacts of project on the social components.
- **Chapter 10**- ESMP is presented in this chapter which includes proposed measures needed to prevent, minimize & mitigate the adverse impacts and improve environmental and social performance, along with the proposed Implementation Mechanism for the ESMP and financial estimates for the implementation of environmental and social measures proposed in the ESMP.

CHAPTER 2: PROJECT DESCRIPTION

2.1 General

The Kosi is one of the largest tributaries of the Ganges and drains including the parts of Tibet, Nepal, and India. Some of the tributaries of the Kosi system, such as the Arun, and the Bhote Kosi, originate in Tibet. The Sun Kosi and Tamor and their tributaries originate in the Higher Himalaya but majorly flow through the Lesser Himalayan region. The combined flow of the Sun Kosi, Arun, and Tamor (called Sapt Kosi hereafter) flows through the Barahkshetra gorge for about 15 km before emerging at Chatara in Nepal and then entering the plains of north Bihar in India.

The Canal lining of Jhanjharpur Branch Canal sub-project is part of the Kosi Multipurpose Project which was originally constructed between the period May 2003 to March 2005[1]. The command area of Jhanjharpur Branch Canal sub-project covers mainly Madhubani district in North Bihar. The Jhanjharpur Branch Canal was intended to irrigate areas west of the Kosi River in the Madhubani District of Bihar. Initially, irrigation facilities from this system could only be extended to flood-free areas.

Jhanjharpur Branch Canal Offtakes at Km 21.03 (India Portion) of Western Kosi Main Canal with a designed discharge of 19.423 cumecs, canal Alignment passes through Babubarhi, Andhratharhi and Jhanjharpur blocks of Madhubani district. The canal is completely unlined for its entire length. The following Table 2.1 shows the details of existing canals that off-take from Jhanjharpur Branch Canal: -

Table 2.1 Canal offtaking from Jhanjharpur Brach Canal

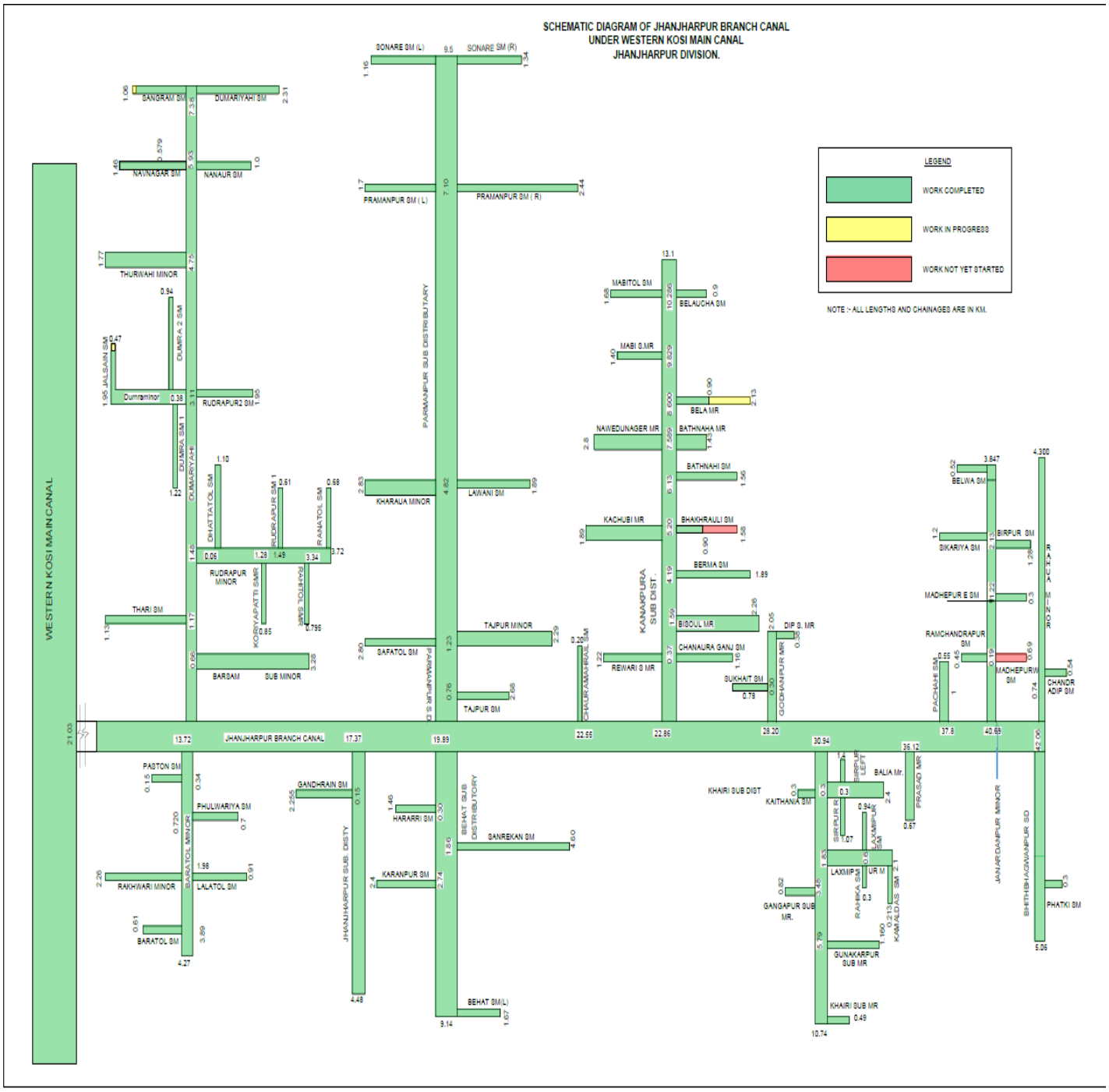
S. No.	Type of Canal	Name of Canal	Off take Chainage (Km)	Discharge in Cumecs
I.	**Branch Canal**	**Jhanjharpur Branch Canal**	**21.03**	**19.423**
1.	Minor	Basaha Minor	0.67	0.198
2.	Minor	Navtol Minor	0.67	0.000
3.	Minor	Kamladitya Minor	2.74	0.708
4.	Sub Distributary	Deohar sub -distributary	2.74	3.051
5.	Sub Minor	Barhara sub-minor	3.05	0.115
6.	Minor	Bardahi Minor	5.03	0.219
7.	Minor	Marukiya Minor	7.38	0.171
8.	Minor	Gaur Minor	9.62	0.161

[1] Source CAG Audit Report (Civil) for the year ended 31 March 2004 (https://cag.gov.in/uploads/old_reports/state/Bihar/2005/Civil/Civil_Bihar_2005/civil_chap_4.pdf)

S. No.	Type of Canal	Name of Canal	Off take Chainage (Km)	Discharge in Cumecs
9.	Sub Distributary	Rakhwari sub - distributary	9.62	0.883
10.	Minor	Baratol Minor	13.72	0.575
11.	Sub Distributary	Dumariyahi sub - distributary	13.72	1.511
12.	Sub Distributary	Jhanjharpur sub - distributary	17.37	1.201
13.	Sub Distributary	Behat sub -distributary	19.89	0.885
14.	Sub Distributary	Parmanpur sub - distributary	19.89	1.104
15.	Sub Minor	Chaora mahnaril sub minor	22.56	0.024
16.	Sub Distributary	Kanakpura sub - distributary	22.86	2.821
17.	Minor	Godhanpur Minor	28.20	0.176
18.	Sub Distributary	Khairi Sub distributary	30.94	1.678
19.	Minor	Prasad Minor	36.12	0.655
20.	Sub Minor	Pachahi Sub Minor	37.80	0.140
21.	Minor	Janardanpur Minor	40.69	0.554
22.	Minor	Rahua Minor	42.06	0.696
23.	Sub Distributary	Bhith bhagwanpur sub -distributary	42.06	0.720

Schemetic Diagram of Jhanjharpur Branch Canal System is provided below in **Figure 2.1:-**

Figure 2.1: Schemetic Diagram of Jhanjharpur Branch Canal System



2.2 Existing condition of the scheme

The districts are bounded by the Kosi River to the east, the Noon River to the west, Samastipur district to the south, and JBC itself to the north. The Kamla and Bagmati rivers, along with several smaller rivers, flow through the region. It has been observed during field visits that the Jhanjharpur Branch Canal, which branches off from WKMC at km 21.03 (India Portion), is entirely unlined. Major issues such as water loss due to seepage and piping hinder the achievement of irrigation objectives. Additionally, siltation remains a significant problem, further decreasing the canal's discharge capacity. The problem of sedimentation in the JBC has been compounded by the lack of functionality of the silt ejector in the head reach of the channel. Its unstable nature has been attributed to the power it can build up as it passes through the steep and Narrow area. During the monsoon season, it picks up a heavy silt load, which is Redeposit at times, causing it to change its channel. This leads to flooding in India with extreme effects.

Present Condition of Jhanjharpur Branch Canal:

a) Water Flow Below Sill Level: The water flow in the parent canal is below the sill level of the off-take structures, which hinders the efficient distribution of water to branch canals.
b) Uncontrolled Flow at Off-Take Locations: The absence of control gates or regulators at off take locations results in uncontrolled water flow, making it difficult to manage and distribute water effectively.
c) Damaged or Defunct Outlet Structures: Many outlet structures are either damaged or non-functional, reducing their ability to control and direct water flow properly.
d) Blocked Pipe Culverts: Blockages in pipe culverts across the canal impede water flow and can cause localized flooding or reduced irrigation efficiency.
e) Maintenance Issues: Problems such as siltation and vegetation growth are affecting the canal's operational efficiency, leading to reduced water flow and potential obstructions.

Jhanjharpur Branch canal (JBC) is designed and constructed as unlined canal. The following Table 2.2 shows the details of existing canal particulars: -

Table 2.2 Details of existing canal particulars for Jhanjharpur Branch Canal

S. No.	Canal Particulars	Existing	Proposed
1.	Length of Canal	42.06 kms	42.06 kms
2.	CCA	24623.23 Ha	26621.61 Ha
3.	Discharge of Canal	19.423 Cumecs	27.653 Cumecs
4.	No. of sub-distributaries off taking from JBC	9	9
5.	No. of Minors off taking from JBC	11	11
6.	No. of sub-minors off taking from JBC	3	3

Modernisation of Jhanjharpur Canal sub-project would alleviate the economic condition of the farmers in the command area utilising the abundantly available water resources of Kosi River. The modernisation would be part of a larger framework that integrates both surface water from the Kosi River and ground water for irrigation, ensuring water security during dry seasons. The description of the environment presents the Baseline Environmental Status of the project area in terms of its

physical, micro-meteorological, chemical, biological, Social and cultural description. The baseline data would help to establish the pre-project environmental status in the project study area. The possible impacts due to proposed activity will be predicted over existing baseline conditions, based on the quantification of project activities. Based on the secondary data collected, the proposed Jhanjharpur Branch Canal project site and its environs with respect to Environment and Ecology aspects.

2.3 Need of the Project

The Jhanjharpur Branch Canal (JBC) is heavily silted. The problem of sedimentation in the JBC has been compounded by the lack of functionality of the silt ejector in the head reach of the channel. Moreover, the Kosi River, which serves as the source, carries a significant amount of silt and detritus every monsoon season due to flood flow from the upper catchment.

Canal lining is also used to prevent weed growth, which can spread throughout an irrigation system and reduce water flow. Lining a canal can also prevent water logging around low-Lying areas of the canal. By making a canal less permeable, the water velocity increases resulting in a greater overall Discharge.

Need of the Project:

a) The system was originally designed to provide protective irrigation for paddy crops during droughts. As a result, it is water supply-oriented, offering a low level of irrigation service to farmers who experience a wild flooding irrigation method. Consequently, there is inefficient use of irrigation water through the supply-oriented canal network.

b) Irrigation potential of up to 67% of the CCA, as envisioned in the scheme design, has not yet been realized in the command area.

c) The system was originally designed to meet the maximum irrigation requirements of the Kharif paddy crop, covering 75% of the CCA during the month of October. Hence, there is still scoped to extend irrigation to the remaining 25% of the CCA, allowing for full irrigation of high-yielding variety crops in the right amounts and at the right times.

d) The development of Water User Groups in the distribution system and the upper hydraulic layers of the canal, including the establishment of sub-minor (watercourse) canals linking to the fields, has yet to be completely realized in the system for the efficient use of irrigation water.

e) Vandalism and theft of the existing regulator gates in the distributary and sub-distributary canals are evident due to a lack of ownership in the JBC system and the disownment of common assets among the irrigating farmers.

f) Heavy silt deposition in the main and branch canals has resulted in a reduced carrying capacity of the channel.

g) The portion of Jhanjharpur Branch Canal, has deteriorated over the long course of its operation, resulting in significant water loss through the channel reaches. Therefore, the need to line the Jhanjharpur Branch Canal is required to conserve water for irrigating the command area in the ERM.

h) Silt management in the main canal, either through the existing silt ejector or by other suitable means, is essential to reduce the maintenance costs of the canal and to maintain the agreed level of service for the irrigating farmers through the Water User Associations (WUAs) of the JBC system.

i) Off-farm water management through the conveyance system must be systematically examined for designed or desired flow conditions in the canal network, considering a crop-based demand and supply-oriented irrigation system management for sustainable development.

2.4 Description of the Proposed Scheme

The objective of developing, modernizing and lining of the JBC system, like that of other major irrigation systems, was to provide protective irrigation to a larger crop area in the field so that the Kharif (Aghani) paddy crop can receive adequate water during it in contras critical growth stage in October (Hathiya constellation period). Consequently, crop production loss due to drought can be effectively managed. In this context, the JBC system was developed solely as a supply-based system, where water would be allocated to the outlets covering a larger command area using a wild flooding irrigation method in the fields, with less attention given to the optimal management of discharge by the irrigating farmers. In contrast, a crop-based, supply-oriented productive irrigation scheme with an increased level of service for righting farmers is needed. The branch canal has been designed as a unlined canal. Due to lack of lining along the JBC, its performance has deteriorated over its long period of operation. Canal particulars proposed under ERM for JBC is shown in **Table 2.3**.

Table 2.3 Canal particulars as proposed under ERM for Jhanjharpur Branch Canal

Sl. No.	Description	Details
1	Length of branch canal	42.06 km
2	Discharge	27.65 Cumec
3	Bed width	11.35 m
4	FSL	1.90
5	Bed fall	1:5000
6	CCA	26,622 Ha

Canal lining is an important feature of irrigation projects as it improves the flow characteristics and minimizes the loss of water due to seepage and maximize the irrigation intensity during both Kharif and Rabi seasons. This project deals with lining of Jhanjharpur Branch Canal from Km 0.00 to k.m 42.06 under 2 canal divisions of Water Resources Department i.e. 1. Western Kosi Canal Division, Jhanjharpur and 2. Western Kosi Canal Division, Andhrathari.

Under CC Lining following work to be performed as per site condition:

1. Preparation of subgrade
2. Ploughing of Existing Canal
3. Lip cutting for Earthwork Excavation
4. Laying of Sand Layer under Bed
5. Laying of LDPE Film above the sand layer
6. Under Drainage work
7. Concreting

2.5 Demand Projection

The Kosi Irrigation system comprises of i) the Kosi Barrage ii) the Eastern Kosi Canal (design capacity 15,000 cusecs) iii) the Western Kosi Canal (design capacity 6,475 cusecs in India portion). The irrigation water requirements are also during the two cropping seasons: i) the Kharif Season, June – September, primarily for rice and ii) the Rabi season, January – March, primarily crop is wheat. The water requirement during the Kharif season is approximately 4000 – 7000 cusecs, with a maximum discharge of 12000 cusecs in the last three years in the Eastern Kosi Canal during the Kharif season. During the rabi season, the average flow varies between 2000 - 2800 cusecs, with a maximum flow of 3500 cusecs in the last three years.

In the Western Kosi system, the average flow during the Kharif season is 2600-4700 cusec with a maximum flow of 6100 cusec in Kharif, and the maximum flow during the rabi season is 0 cusec with a maximum recorded flow of 1000 cusec. The modernisation of the canal system is not going to result in any increase in the design capacity.

The following Table 2.4 shows the details of canal perticulars after CC lining of Jhanjharpur Branch Canal:-

Table 2.4

Comparison of canal particulars existing vs proposed for Jhanjharpur Branch Canal

S. No.	Canal Particulars	Existing	Proposed
1.	Length of Canal	42.06 kms	42.06 kms
2.	CCA	24623.23 Ha	26621.61 Ha
3.	Discharge of Canal	19.423 Cumecs	27.653 Cumecs
4.	No. of sub-distributaries off taking from JBC	9	9
5.	No. of Minors off taking from JBC	11	11
6.	No. of sub-minors off taking from JBC	3	3

2.6 Design Basis and Period

Lining of canals is an important feature of irrigation projects as it improves the flow characteristics and minimises the loss of water due to seepage. The water thus saved can be utilised for the extension and improvement of irrigation. Lining of water courses in the areas irrigated by tube-wells assumes special significance as the pumped water supply is relatively costlier. The reduced seepage also prevents rise of the sub-soil water table and thus reduces the possibility of damage to the adjoining areas by water logging. Further, due to adoption of higher velocities in a lined canal there is a saving in the cross-sectional area of the canal and land width required, with corresponding saving in the cost of excavation and masonry works. It helps in retention of shape of the canal.

The Jhanjharpur branch canal is based on Lacey's regime approach for an alluvial channel with a non-rigid boundary.

Function of lining:

1. Seepage control, 2. Prevention of water logging, 3. Increased hydraulic efficiency, 4. Increased resistance to erosion\abrasion 5. Low operational and maintenance cost.

The present reported CCA of Western Kosi Canal Project is 2,03,300 Ha. The irrigation potential envisaged was 2,65,265 Ha with an irrigation intensity of 130%. At present, irrigation potential has been created for 1,02,444 Ha for the entire Western Kosi Canal Project (India Portion) and 23237.34 Ha for Jhanjharpur Branch Canal system. In order to maximize the irrigation intensity during both Kharif and Rabi seasons CC lining is proposed in whole section of JCB i.e. from Km 0.00 to Km 42.06. For the purpose of economic analysis, the life expectancy of concrete, brick/tile and stone pitched lining is taken as 60 years as per IS 10430:2000.

2.7 Sustainability of the Project

Lining and modernization of Jhanjharpur Branch Canal sub-project will be considered sustainable when it effectively conserves water by minimizing seepage and evaporation, leading to increased irrigation efficiency in the adjoining areas, reduced maintenance needs, and improved agricultural productivity, while also minimizing environmental impacts through the choice of materials and construction practices, ultimately contributing to long-term water resource management and ecological health.

Key aspects of sustainable JBC modernization sub-project: -

Water Conservation: The primary benefit of JBC lining is significantly reducing water loss through seepage, allowing more water to reach the intended irrigation areas, thus promoting water conservation and sustainable agricultural practices.

Improved Irrigation Efficiency: By minimizing water losses, JBC lining will enable better water distribution and allows for the adoption of modern irrigation techniques like drip and sprinkler systems, further enhancing water use efficiency.

Reduced Maintenance Costs: Proper lining and modernization of JBC will require less frequent cleaning and repairs due to reduced sediment deposition and vegetation growth, leading to long-term cost savings.

Environmental Considerations:

Material Selection: Choosing eco-friendly lining materials like geomembranes made from recycled materials can minimize the environmental footprint of the project.

Habitat Preservation: Incorporating vegetation along canal banks can provide wildlife habitats while stabilizing soil and improving water quality.

Minimizing Disruption: Careful construction techniques can minimize disturbance to existing ecosystems.

2.8 Resource Requirement for the Project

- Land Requirement and availability

  The intervention is mainly lining work on the branch canal of Jhanjharpur, which implies work will be limited inside the canal, hence, no Land acquisition is required. On both sides of the

canal sufficient land, owned by WRD is available, details of which is given in **Table 2.5.** Further, necessary land is available for movement of machineries during the works, hence acquisition of private land is not required for that. Agricultural land is about 5 to 10 m far from either side of the canal along the entire alignment.

The assessment conducted in the project locations observed that the proposed sub project is not going to cause resettlement of any households located in the area near the existing JBC. Details of WRD Land available on each side of embankment of JBC is depicted in the following Table 2.5.

Table 2.5: Details of WRD Land available on each side of embankment of JBC

Division	Name of Sub project	Block	Village	Private Land requirement	Impacted Common property	Availability of Govt. land on both side of central line (M) Avg
1. Jhanjharpur	Lining Work km: 12.50 to km 42.06	Andhrathari Jhanjharpur, Lakhnaur, Madhepur	**28 Vill:** Gaur, Andhrathari, Phulwariya, Basua, Barsam, Hararri, Dhattatol, Rahitol, Chauramahrail, Alpura, Tajpur, Rewari, Chanauraganj, Machhadi, Berma, Sukhet, Deep, Behat, Godhanpur, Jorla, Laufa, Bela, Koriyapatti, Parmeshara, Pachahi, Prasad, Laxmipur, Madhepur	0	0	Left: 27.50, Right: 27.50
2. Andhrathari	Lining of Jhanjharpur branch canal from km 0.00 to km 12.50	Babubarhi, Andhrathari	**9 Vill:** Barail, Navtol, Khoriyatol, Basha, Barahara, Baluhaha tol, Rahikpur, Marukiya, Dakhjari	0	0	Left: 27.4, Right: 29.0

- Requirement of Raw Materials

This section deals with construction materials to be used in Lining of Jhanjharpur Branch Canal from k.m 0.00 to k.m 42.06. Jhanjharpur Branch Canal has been divided into 2 divisions i.e. Andhrathari and Jhanjharpur Canal Divsion. The construction materials used in lining of proposed JBC is tabulated in Table 2.6.

Table 2.6 Amount of construction Materials required for lining of JBC

Jhanjharpur Branch Canal (k.m 0.00 to k.m 42.06)				
Sl. No.	**Construction Material**	**Quantity**	**Unit**	**Main Carriage station**
1	Cement	25312.51	MT	Darbhanga
2	Coarse Sand	54009.34	Cum	Kiul
3	Stone Chips	68850.01	Cum	Mirzachauki
4	Bitumen	23.54	MT	Barauni
5	5-15 mm Gravel	30241.61	Cum	Mirzachauki
6	20-63 mm Gravel	34653.50	Cum	Mirzachauki
7	Local sand	2937.65	Cum	Kamla River

Jhanjharpur Branch Canal (k.m 0.00 to k.m 42.06)				
Sl. No.	**Construction Material**	**Quantity**	**Unit**	**Main Carriage station**
8	Steel	7.41	MT	Darbhanga

- Labor Requirement

The lining work will take an estimated 14 months to complete the proposed sub project. The estimated requirement of skilled and unskilled labour assessed for lining of JBC is given in the following Table 2.7: -

Table 2.7: Requirement of labour by type

Division	Particulars	Skilled Lab.	Semi-skilled Lab.	Unskilled Lab.	Total Lab.
Andhratarhi	No.	27	36	171	234
	Man-days	11,437	15,286	71617	98,340
Jhanjharpur	No.	62	81	394	537
	Man-days	26,059	33872	165666	225,597
Total	**No.**	**89**	**117**	**565**	**771**
	Man-days	**37,496**	**49,158**	**237,283**	**323,937**

The construction workers will be provided by the contractor. As per WB's guidance (ESS2) for such workers, the contractor will need to prepare a detailed profile of the deployed Workforce and ensure that the requirements under ESS2 related to fair working conditions and labor safety-protection are met. The unskilled workers will be primarily sourced from the local areas, while the skilled workers would be part of the Contractors own workforce and would need to be housed in construction camps or rented accommodation by the Contractor based on *IFC Guidance note on Workers Accommodation: Process and Standards.*

- Waste Water Disposal

Waste water from the construction area charged with cement slurry, Grease and oils etc. are likely to flow to the nearest water body causing contamination of water. The water contamination may be caused due to waste discharge from construction camps and labour camps. These short-term impacts will be mitigated with the adoption of precautionary measures as detailed in Chapter 10.

- Waste Generation and Disposal of Sludge

The Jhanjharpur Branch Canal has unlined at present so there there is no need of dismantling in the bed and slopes, while lining is proposed on the bed and side slopes. In areas where the slopes have collapsed, resectioning of the canal is proposed.

In addition, estimated quantity of excavated materials to be generated due to desilting of JBC under the project is estimated to be 288151.97 Cum (285151.97 for Andhrathari and 3000 cum for Jhajharpur division). As per the disposal plan of desilted material will be further utilized for road construction works, building construction and filling of the low-lying areas. Desilted material will temporarily be stored in alongside available chat land belonging to Water

Resources Department (WRD). There are approx. 20-30-meter-wide chat land is available alongside of Jhanjharpur Branch Canal (JBC). As per discussions held with official of concerned division of WRD, the construction/debris waste and desilted material generated during the construction will temporarily be stored in alongside available chat land area of WRD.

CHAPTER 3: LAWS, POLICIES AND PERMITS

This chapter deals with the laws, regulations and policies, of Government of India, Government of Bihar and the World Bank, related to environmental and social issues. Only the laws, regulations and policies which are in vogue and relevant to the project are discussed here. This section needs to be updated as and when new laws, regulations and policies are made and enforced or the existing ones are revised.

3.1 National and State Laws- Environment and Social

Table 3.1: Applicable Laws and Policies

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
1.	Constitution of India (Article 15, 16, 46)	The Indian Constitution prohibits any discrimination based on religion, race, caste, sex, and place of birth and contains a clause allowing the union and state governments to make special provision for the advancement of socially and educationally vulnerable classes of citizens or for the Scheduled Castes and Scheduled Tribes. Article 16 refers to the equality of opportunity in matters of public employment and directs the state to protect them from social injustice and all forms of exploitation	The provisions under the Constitution ensure the access, equity, and inclusiveness of the vulnerable groups in the Program
2.	The Bihar Irrigation Act, 1997	The Act consolidates the law relating to irrigation embankment, drainage, levy and assessment of water rates. It provides the State government all rights in the water of any river, natural stream or natural drainage, channel, natural lake or other natural collection of water.	The Act guides the project activity for carrying out repair work related to irrigation. It gives direction in remedial measures in ESIA and ESMP.
3.	Bihar Irrigation and Drainage Rules, 2003	The rules include some of the relevant laws and regulations that govern Water Users Associations (WUA)s in Bihar. It implements the provisions of the Bihar Irrigation Act, 19.97. The rules also outline an action plan for the state in the event of floods	It gives direction in strengthening of Water Users Association (WUA) w.r.t. Standard operation procedure of WUA, Irrigation work forms, in ESIA and ESMP.
4.	The Right to Information Act, 2005	Empowers citizens to demand information on functioning of public systems if it impacts their lives or is of	Ensures transparency and accountability in the govt operations and citizen's

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
		public interest. Designates a Public Information Officer in all public offices to provide info; creates State /Central Information Commissions (statutory) to look into appeals regarding unsatisfactory information provided to citizens or unclear interest in demanding information.	access to public information.
5.	Bihar Right to Public Services Act, 2011	To provide for the delivery of notified public services to the people of the State within the stipulated time limit	Timely, transparent, and easy-to-access public services.
6.	Panchayati Raj Act, 73rd constitutional amendment act, 1992	The act strengthens the decentralized governance system and promotes bottom-up planning. The most critical part is that it strengthens the structure of representative democracy and political representation at the local level.	The Act empowers the local self-government to prepare GP level plans at Gram sabha, to execute and monitor the same. In ESIA and ESMP it gives direction for managing and monitoring irrigation work, flood protection work.
7.	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCT in LARR), 2013 and Bihar Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2014	To ensure, in consultation with institutions of local self-government and Gram Sabhas established under the constitution of India, a humane, participative, informed and transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization with the least disturbance to the owners of the land and other affected families; provide just and fair compensation to the affected families whose land has been acquired or proposed to be acquired or are affected by such acquisition.	NA for the present sub-project. However, during implementation if such case arises then appropriate measures will be taken up as per the Act. Make adequate provisions for such affected persons for their rehabilitation and resettlement; (iv) ensure that the affected persons become partners in development leading to an improvement in their post-acquisition social and economic status and for matters connected therewith.

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
8.	The Equal Remuneration Act, 1976; Employee Compensation Act, 1923; and Personal Injuries (Compensation Insurance) Act, 1963; The Minimum Wages Act, 1948, Payment of Wages Act, Maternity Benefit Act, 1961	Provide equal remuneration to men & women workers, prevent discrimination against women in matters of employment, employers to compensate workman's spouse / dependent sons, daughter in case of injury at workplace and mandatory worker insurance by employers against such liability.	Prevents gender discrimination in employment and provides for employee welfare, including social assistance against any incident/ accident.
9.	The Child Labour (Prohibition and Regulation) Act 1986, and Rules 1988; Children (Pledging of Labour) Act, 1933 (as amended in 2002); Contract Labour Act 1970; The Bonded Labour System (Abolition) Act, 1976	These Acts mandate the employers of any establishment employing construction workers to provide basic amenities and welfare facilities. The laws also prohibit employment of child and bonded labour.	Ensures safety, welfare, and other conditions of service to construction workers employed
10.	Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	To regulate the employment and conditions of service of building and other construction workers.	Safe and healthy working environment. Responsiveness in case of mishaps and accidents.

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
11.	Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979	To regulate the employment of inter-State migrant workmen and to provide for their conditions of service	Protects migrant and seasonal agricultural workers by establishing employment standards related to wages, housing, transportation, disclosures and record keeping
12.	EIA Notification 2006 and its amendement vide Ministry of Enironment, Forest and Climate Change, New Delhi Notification dated 17th March, 2025	Supreme Court vide its judgment dated the 21st March 2024 in Civil Appeal Nos. 1628-1629 of 2021 titled Noble M. Paikada Vs Union of India has struck down item 6 of the Appendix-IX to the said notification, on the grounds that the term "linear projects" is not defined and is very vague and the process to be adopted for excavation has not been set out, thus, item 6 is a case of completely unguided and blanket exemption which is, per se, arbitrary and violative of article 14 of the Constitution of India; In order to address all the issues and concerns raised by the Supreme Court MoEFCC issued notification dated 17.03.2025 and amended the said notification of 2006. As per amendment "Extraction or sourcing or borrowing of ordinary earth for the linear projects subject to the compliance of the conditions set out in Appendix XIV2 of MoEFCC notification dated 17.03.2025	The Expert Appraisal Committee shall, while granting prior environment clearance for the projects requiring extraction or sourcing or borrowing of ordinary earth, include the environmental safeguards prescribed in this Appendix as part of the prior environmental clearance granted to them.
13.	National Policy on Safety, Health, and Environment	The policy provides an action program that includes enforcement, national standards, compliance, awareness,	It emphasizes that awareness generation on occupational safety needs to be done by suitably

[2] https://parivesh.nic.in/publicdocument/UPLOAD_OM_NOTIFICATION/IA_DOCS/1001_19032025024958.pdf

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
	at Workplace 2009:	occupational safety, and health development.	incorporating teaching inputs on safety, health, and environment at workplace in schools, technical and vocational courses.
14.	Code on Occupational Safety, Health, and Working Conditions Bill, 2019	This code on occupational safety, health and working conditions applies to all establishments with 10 or more workers and includes building and construction workers.	
15.	Public Liability and Insurance Act, 1991	Enacted for the purpose of providing immediate relief to persons affected by accidents while handling hazardous substances and other incidents.	The project is being carried out in mainly urban areas where there are already existing vessel movements as well as several other human activities at the jetty locations (vendors, locals moving around, etc.). Protection to general public from the accidents due to hazardous material (especially if any used at the vessel yards, gangway/pontoon manufacturing units) is essential.
16.	The Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act 2013	Protects women workers from sexual harassment and abuse of power at their workplace and provides for constituting an Internal Complaints Committee in every organization employing 10 or more workers, including women, to look into complaints of sexual harassment. Provides guidance on redressal against such complaints, including its internal investigation in a time bound manner.	Recognizes the need for legal protection of women workers against abuse, exploitation in all government institutions.
17.	National Policy for Women, 2016	The policy articulates various mandates for the holistic empowerment of women	Guides inclusion and accessibility provisions

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
		in the country. It includes various areas such as health, education, livelihoods, access to social protection, and protection from violence and discrimination at the core of its provisions. The policy's mandate seeks to guide governance and policy making practices across departments at the national and state level.	and overall women's empowerment and SEA relevant to the program.
18.	Plastic Waste Management 2016	The plastic waste like polythene, plastic bags, plastic bottles etc. during project construction and operation phases.	Applicable, during operation phase, project proponent will implement the provision of this Act for disposal of Plastic waste.
19.	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.	Applicable for equipment and machinery's potential to emit air pollution (including hot mix/ batching plants/ stone crushers/ diesel generators and vehicles etc.). The project involves digging, spoil dumping, etc., which will generate fugitive dust.
20.	Water Prevention and Control of Pollution) Act, 1974, Amendment there of.	To prevent and control water pollution.	Applicable. Effluents are expected to be generated during construction of the project. The effluents should meet the discharge standards specified in the Rules.
21.	Environmental (Protection) Act, 1986 amended 1991 and associated rules / notifications	▪ To protect and improve overall environment, this is a umbrella legislation for protecting the environment ▪ It seeks to supplement existing laws on pollution control and also lays down standards for air quality and noise.	▪ Relevant to sub-projects to be taken up, viz., Canal lining, dredging of silt, embankments, etc. activities. ▪ Preservation of air and water quality.

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
		▪ Many rules/ notifications are formed under this act.	▪ Control of pesticides & insecticide runoff ▪ Control dust pollution due to quarrying, which might harm the vegetation.
22.	Construction and Demolition Waste Management Rules, 2016	The rules shall apply to everyone who generates construction and demolition waste such as building materials, debris, rubble waste resulting from construction, re-modeling, repair and demolition of any civil structure of individual or organisation or authority.	Construction and demolition waste generated from the project works shall be managed and disposed as per the rules.
23.	Hazardous Waste Management Rules, 2016	Rules defines and classifies hazardous waste, and procedures for handling and storage.	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 tested for toxicity (presence of heavy metals, pesticide residues, etc.) and disposed as per the provisions of the applicable Rules.
24.	Solid Waste Management Rules, 2016	The provisions of the Act prevent littering and mandate proper segregation, collection, storage and disposal of municipal solid waste.	Applicable. The project will have provisions to manage and dispose solid wastes generated during project construction and operation phases.
25.	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. In case of any violation in silence zone area, complaints to be made to authority and power to prohibit	Noise will be generated during project implementation stage due to different activities like construction, operation and movement of vehicle,

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
		continuance of music sound or noise also falls under within these rules.	heavy equipment and machinery.
26.	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. ▪ The 2016 amendment requires the mandatory use of fly ash in the construction of roads and flyover embankments within a 300 km radius of a thermal power plant. ▪ Fly ash shall mandatorily be utilized in asset creation programmes of the Govt. involving construction of building, road, dams and embankment. ▪ Fly ash shall be used in soil conditioner. ▪ Fly ash-based bricks or product shall be used in construction under all Govt. scheme or programme.	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. Possibility of using fly ash in different construction related activities will be planned as part of the EMPs of the project works.
27.	Insecticides Act, 1968, Rule 1971	Use of registered and recommended insecticides and non-use of banned insecticides.	No insecticides will be procured under the project
28.	Central Motor Vehicle Act, 1988 and Central Motor Vehicle Rules, 1989	To check vehicular air and noise pollution. Empowers State Transport Authority to enforce standards for vehicular pollution. From August 1997 the "Pollution Under Control Certificate is issued to reduce vehicular emissions.	Applicable, as the proposed development activities will engage several vehicles (transport of materials, worker movements, etc.).
29.	The Gas Cylinder Rules 2004	To regulate the storage of gas / possession of gas cylinder more than the exempted quantity	Applicable if contractor store more than the exempted quantity of gas cylinder.
30	National Framework for Sediment Management issued by the MoJS[3]	To adhere with the environmental safeguards during dredging and desilting of canal as outlined in the National Framework for Sediment Management (SOP)	The Ministry of Environment, Forests and Climate Change (MoEF&CC) has issued notifications related to sediment management (S. O. 1224 (E), dated 28th March 2020), particularly focusing on dredging and desilting of

[3] https://nmcg.nic.in/writereaddata/fileupload/52_National%20Framework%20for%20Sediment%20Management%20-%20English%20(1).pdf

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
			dams, reservoirs, weirs, barrages, rivers, and canals. Said notification exempts these activities from requiring environmental clearance, provided they adhere to the environmental safeguards outlined in the National Framework for Sediment Management (NFSM).
31.	The Mines and Minerals (Development and Regulation) Act, 1957 as amended	Legal framework for regulating mines and developing minerals.	The contractors will procure aggregates and other building materials from quarries and borrow areas approved under such Acts. In the event the contractors open any new quarry and/or borrow areas, appropriate prior permission from the State Departments of Minerals and Geology will need to be obtained. Contractors will also need to ensure full compliance with these rules and any conditions imposed in the permit.

Other Acts and Regulations that may be applicable:

- Untouchability Offences Act, 1955
- The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act, 1989 and The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Rules, 1995
- Bihar Public Land Encroachment Act, 1956
- Kosi Calamity Rehabilitation and Reconstruction Policy, 2008
- Panchayats Extension to Scheduled Areas (PESA) Act, 1996
- The Rights of Persons with Disabilities Act, 2016
- Mahatma Gandhi National Rural Employment Guarantee Act, 2005 (MGNREGA)
- Forest Rights Act, 2006

- Bihar Reservation of Vacancies in Posts and Services Act, 1991 (Bihar Act 03, 1992)
- Bihar Reservation of Vacancies in Posts and Services (for Scheduled Castes, Scheduled Tribes and other Backward Classes) (Amendment) Act, 2023

Earlier Approval (if any)

Ministry of Environment and Forest, Govt. of India vide its letter no. J-12011/14/09-IA. dated 26.03.2009 informed Central Water Commission, New Delhi that *"the construction of Western Kosi Canal has started in 1971. The main canal has been constructed completely and branch canals are almost complete. Balance work involves plugging of some gaps in branch canals and construction of distribution system. The Environmental Clearance became a statutory requirement since 27.01.1994 for major irrigation projects. Under the provisions of EIA Notification, 1994 & 2006 environmental clearance can be issued only for new projects. The above-mentioned project is an ongoing project and was started before 27.01.1994. As such does not attract the provisions of EIA Notification, 1994/2006".* The said letter of *Ministry* of Environment and Forest, Govt. of India is annexed as ***Annexure I.***

Ministry of Environment and Forest

3.2 World Bank Environmental and Social Standards

The project will be governed by the Environment and Social Framework of the World Bank. The World Bank's Environmental and Social Framework (ESF) promotes sustainable solutions in its operations and in the work environment. The focus is to prevent and mitigate undue harm to people and their environment during the development process. They strive for positive impact on the environment and on Indigenous Peoples and local communities — whose perspectives we seek through meaningful consultation, by prioritizing projects that tackle issues of climate change, environmental and social sustainability, fragility, and gender-based violence. All World Bank Projects should adhere to these standards. The Environmental and Social Framework (ESMF) prepared for the project, which would guide the E&S actions in the project has identified the following policies as relevant: -

- **ESS 1 -** Assessment and Management of Environmental and Social Risks and Impacts: ESS1 is relevant to ensure that such investments are planned and designed to be sound and sustainable by integrating environmental dimension into the overall decision-making process. The ESIA is prepared in compliance to the requirements

- **ESS 2 -** Labor-and-Working-Conditions: The labour to be employed under Jhanjharpur Branch Canal will be governed by the national and state regulations and shall also comply with the requirement of the ESS2.

- **ESS 3 -** Resource-Efficiency-and-Pollution-Prevention-and-Management: It improves resource efficiency. The project is aiming to use the excavated material. There are also measures being planned to control pollution during construction

- **ESS 4 -** Community-Health-and-Safety: Community Health Safety and Occupational Health and Safety concerns are being taken care of during the design, construction and operations

- **ESS 5 -** Land-Acquisition-Restrictions-on-Land-Use-and-Involuntary-Resettlement: Proposed sub project involves resettlement of non-title holders/ encroachers/ squatters along the existing canal's RoWs. Site specific RAPs will be prepared and implemented in line with ESS5 guidance to address the impacts of of permanent and temporary resettlement

- **ESS 6 -** Biodiversity Conservation and Sustainable Management of Living Natural Resources: It recognizes protection and conservation of biodiversity and habitats. Jhanjhapur Branch Canal does not have as such important habitats. If any such habitats are identified specific mitigation measures proportional to the risk will be taken up as per ESS 6 guidance

- **ESS 7** - Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities: Not relevant as the project does not have footprint in tribal areas

- **ESS 8** - Cultural Heritage: The project will not encroach into any archeological site but may be in proximity and the ESMF lays down the guidance for handling these situations.

- **ESS 9** - Financial-Intermediaries: Not relevant as there are no financial intermediaries involved.

- **ESS 10** - Stakeholder-Engagement-and-Information-Disclosure: Stakeholder remains at the center of the development process and a Stakeholder Engagement Plan has been put in place for effective communication and handling grievance if any

The Environment Management Framework is based on the policies and standards elaborated on the above. The ESMF has been prepared and approved by the Bank and disclosed. The ESIA and ESMP have been prepared in compliance with this framework.

3.3 IFC EHS Guideline

The International Finance Corporation (IFC) Environmental, Health, and Safety (EHS) Guidelines are technical references with general and Good International Industry Practice (GIIP). The EHS Guidelines contain the performance levels and measures that are normally acceptable to the World Bank Group, and that are generally considered to be achievable at reasonable costs by existing technology. The Contractors are expected to apply the relevant levels or measures of the EHS Guidelines. The guidelines which are relevant are:

- ***IFC General EHS Guidelines***: The (EHS) guidelines contain performance level and measures on environmental, occupational health and safety for construction, community health and safety to be followed during the construction, operation and decommissioning phases. Since the project contains construction activities the Contractor will adhere to the performance level and measures provided in the IFC general EHS guidelines.
- **World Bank's Guideline note on Labour Influx, 2016**: The influx of workers can lead to adverse social and environmental impacts on local communities, especially if the communities are rural, remote or small. The objective of the guideline note is to identify risks and impacts on

local communities associated with the temporary influx of labourers that typically results from construction works, and to advising Borrowers accordingly on how to best manage such risks. The Project will engage maximum local labours as far as possible; Labour camps will be established by the contractor as per the guidelines given in Annexure-II. Toilet facilities and other recreational activities will be provided at the camp. Adequate supply of potable drinking water will be ensured in the labour camp and site.

3.4 E & S permits required

Relevant permissions, clearances and authorizations need to be obtained from competent authorities during the design, planning and implementation of the project as indicated in the following Table:

Table 3.2: Clearances required

S. No.	Clearance/ Authorization	Relevant Act	Competent Authority	Responsibility
1	Tree Cutting Permission	Forest Conservation Act, 1980	State Forest Department, MoEF & CC, Govt. of India	PMU & Concerned division of WRD
2	Hot mix plants, Wet Mix Macadam plants, Crushers, Batching Plants	Air (Prevention and Control of Pollution) Act, 1981 and Noise Pollution (Regulation and Control) Rules, *2000*	Bihar State Pollution Control Board	Concerned Contractor
3	Storage, handling and transport of hazardous materials and waste	Hazardous Waste (Management and Handling) Rules, 1989 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	Bihar State Pollution Control Board	Concerned Contractor
4	Location/ layout of workers camp, equipment and storage yards	Environment Protection Act, 1986 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	Bihar State Pollution Control Board	Concerned Contractor
5	Discharges from Labor Camp	Water (Prevention and Control of Pollution) Act, 1974	Bihar State Pollution Control Board	Concerned Contractor

6	Permission for sand mining from river bed	Environment Protection Act, 1986	Bihar State PCB, Mining Department, GoB	Concerned Contractor
7	Obtaining Labour license and other related permissions	Contract Labour (Regulation and Abolition) Act. 1970, BOCW-1996, Inter-state migrant workmen's Act 1979	State Labour Department	Concerned Contractor
8	Permission/ Intimation for Silt Management	Environmental Safeguards as proposed in the National Framework for Sediment Management (SoP)[4] issued by the MoJS, Department of Water Resources. There is a requirement to intimate SPCB as per the MoEF&CC Notification 21st August 2023. State pollution control board shall independently monitor the compliance status of the above mentioned SOP. Further in case of noncompliance SPCB shall initiate legal action against the project proponent under the relevant provisions of Environment	Bihar State PCB and Department of Water Resources	Concerned Contractor

[4] https://nmcg.nic.in/writereaddata/fileupload/52_National%20Framework%20for%20Sediment%20Management%20-%20English%20(1).pdf

		(Protection) Act, 1986.		
9.	Borrow Area	EIA Notification 2006 and its amendement vide Ministry of Enironment, Forest and Climate Change, New Delhi Notification dated 17th March, 2025	Bihar State PCB	Concerned contractor shall ensure that extraction or sourcing or borrowing of ordinary earth for the sub-project is in line with the compliance of the conditions set out in Appendix XIV[5] of MoEFCC notification dated 17.03.2025

The Contractor will also be responsible for meeting the requirement specified under these permits and also filing reports/ returns as is applicable under the respective regulations.

[5] https://parivesh.nic.in/publicdocument/UPLOAD_OM_NOTIFICATION/IA_DOCS/1001_19032025024958.pdf

CHAPTER 4: ANALYSIS OF ALTERNATIVES

The modernization and lining of the Jhanjharpur Branch canal (JBC) has limited interventions aimed at the improvement of the performance of the existing canal system. Since this is an existing canal without any new construction/extension (within the scope of the World bank Funded Project) the analysis of alternatives is limited to the options described below.

4.1 Project or No Project scenario

As is evident from the description provided in previous sections, the JBC is not performing as expected. The primary reasons for this poor performance are reduction in the carrying capacity of the canal due to the siltation, water losses due to lack of lining of existing JBC, etc. If this "Business-as-Usual scenario continues, water losses will continue, high maintenance costs will be incurred and the potential for increasing the irrigated area and its efficiency will not be achieved.

The implementation of the project would improve the irrigation networks and coverage, reduce water losses, better distribution among farmers in the command and thus improve overall resource efficiency.

4.2 Alternative Material

There are road adjoining the canals. These roads are essential for the movement of the machinery during the construction as well as the maintenance of the canal. Since there are some settlements along the canals the canal road also acts as an access road for the population in the area. The renovation of the canal will result in excavation of silt. The estimated quantity is 288,151.97 Cum. As per the disposal plan of the Division, the desilted material will be further utilized for embankment road construction works and filling of the low-lying areas. Based on the divisional engineer of JBC, Construction of embankment road is proposed and at tendering stage under different scheme of state government. The filling quantity required for construction of embankment road is much more than the quantity obtained during bed clearance of the Jhanjharpur Branch canal. This excavated material will be used during filling of the damaged embankment of canal to bring the canal in section. This reuse of material will have dual benefits it would a) reduce the quantity of borrow area and b) reduce the amount of land required for the dumping of the excavated material.

The Ministry of Environment, Forests and Climate Change (MoEF&CC) has issued notifications related to sediment management, particularly focusing on dredging and desilting of water bodies and sand/soil mining. These notifications outline the need for Environment Clearance (EC) for such activities, with some exemptions for maintenance dredging and desilting, subject to environmental safeguards as per the National Framework for Sediment Management (NFSM) of MoJS. During construction phase sediment managment will be done in line with the said framework. There is a requirement to intimate SPCB as per the MoEF&CC Notification 21st August 2023. State pollution control board shall independently monitor the compliance status of the above-mentioned SOP.

CHAPTER 5: ENVIRONMENTAL BASELINES

The objective of conducting baseline survey of the existing environmental and social status in the study area is to provide a data base for assessing the likely changes that are expected in implementation of the project. This chapter deals with the approach for data collection, environmental scoping / identification of social and environmental attributes and baseline survey details. As the project activities are limited to the river and canal systems of Madhubani district, surrounding environments of project activity zones were also considered for baseline study.

5.1 Project Location and Delineation of study area

The Rehabilitation and modernization of Jhanjharpur Branch Canal Scheme is part of the World Bank funded "Bihar Water Security and Irrigation Modernization Project (BWSIMP)". The Western Kosi main canal off-takes from the right side of the canal head regulator of the Kosi barrage, constructed on the Kosi River at Bhimnagar (Birpur) in Nepal. The main canal is 91.63 km long, with the first 35.13 km located in Nepal. After traversing through the Sagarmatha District in Nepal, the canal enters India near Nari village in the Laukahi Block of Madhubani District, Bihar, with the remaining 56.69 km located in India. Jhanjharpur Branch Canal Off-takes at Km 56.16 of Western Kosi Main Canal (including Nepal portion) near Barail village with a designed discharge of 686 cusecs i.e. for India portion its off-take at Km 21.56 from WKMC. Total length of Jharjharpur Branch Canal is 42.06 Km and for entire length of branch canal re-modernization and lining of canal is proposed under BWSIMP. The command area of Jhanjharpur Branch Canal sub-project covers Madhubani district in North Bihar.

Division wise coverage of Jhanjharpur Canal cover under the project is given in the following Table 5.1 and stretch wise coverage of JBC is shown in Figure 5.1 & Figure 5.2:-

Table 5.1 Division wise Jhanjharpur Branch Canal Stretch Under BWSIMP

Name of Division	Stretch	Length	Villages Covered
Andhrathadi Division of Western Kosi Main Canal	Km 0.00 to Km 12.50 (Branch Canal)	12.50	Barail, Navtol, Khoriyatol, Basha, Barahara, Baluhaha tol, Rahikpur, Marukiya, Dakhjari
Jhanjharpur Branch Canal Division	Km 12.50 to Km 42.06	29.56	Gaur, Andhrathari, Phulwariya, Basua, Barsam, Hararri, Dhattatol, Rahitol, Chauramahrail, Alpura, Tajpur, Rewari, Chanauraganj, Machhadi, Berma, Sukhet, Deep, Behat, Godhanpur, Jorla, Laufa, Bela, Koriyapatti, Parmeshara, Pachahi, Prasad, Laxmipur, Madhepur
TOTAL		42.06	

Figure 5.1 : Project Location Map under Jhanjharpur Branch Canal under BWSIM Project

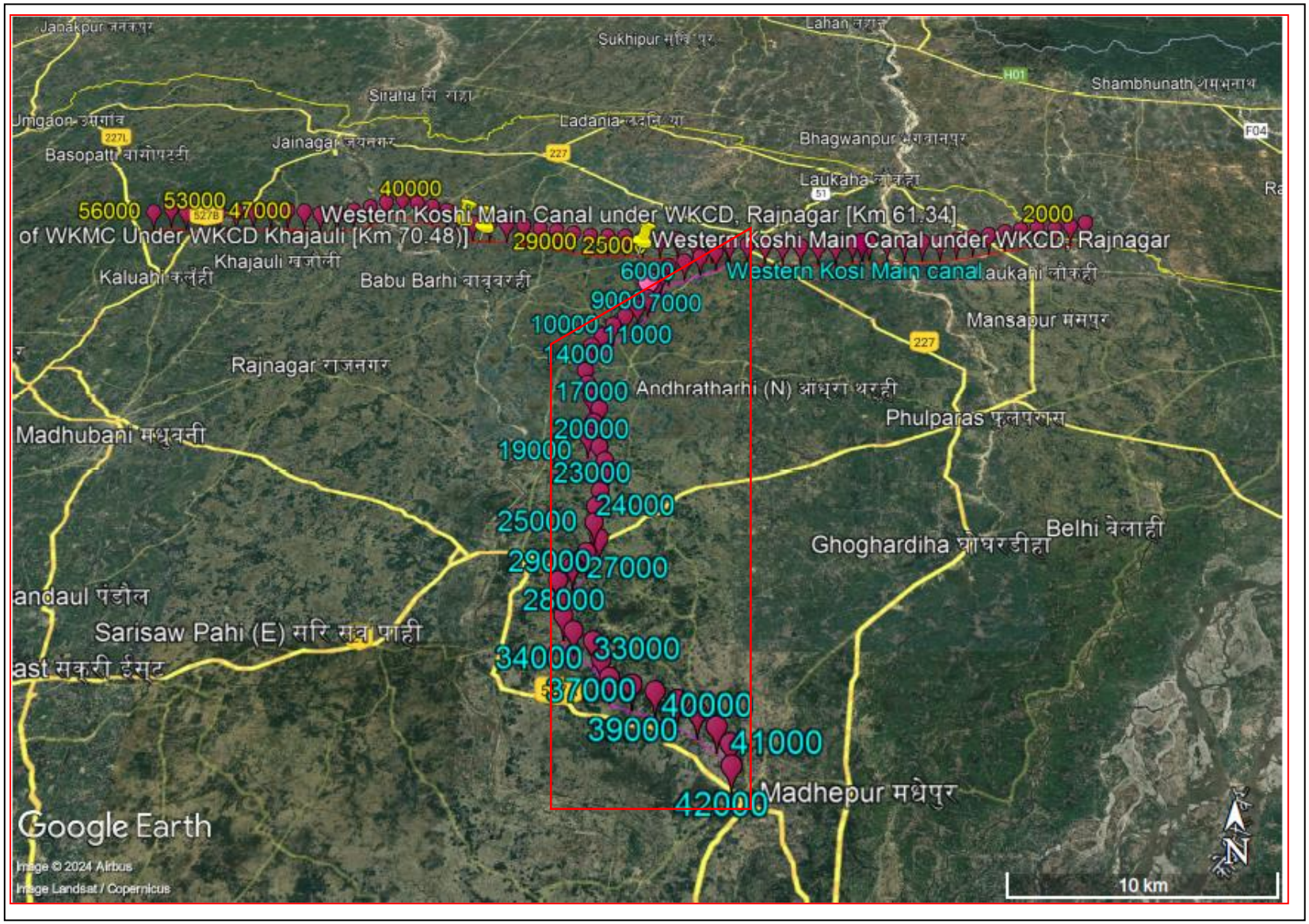
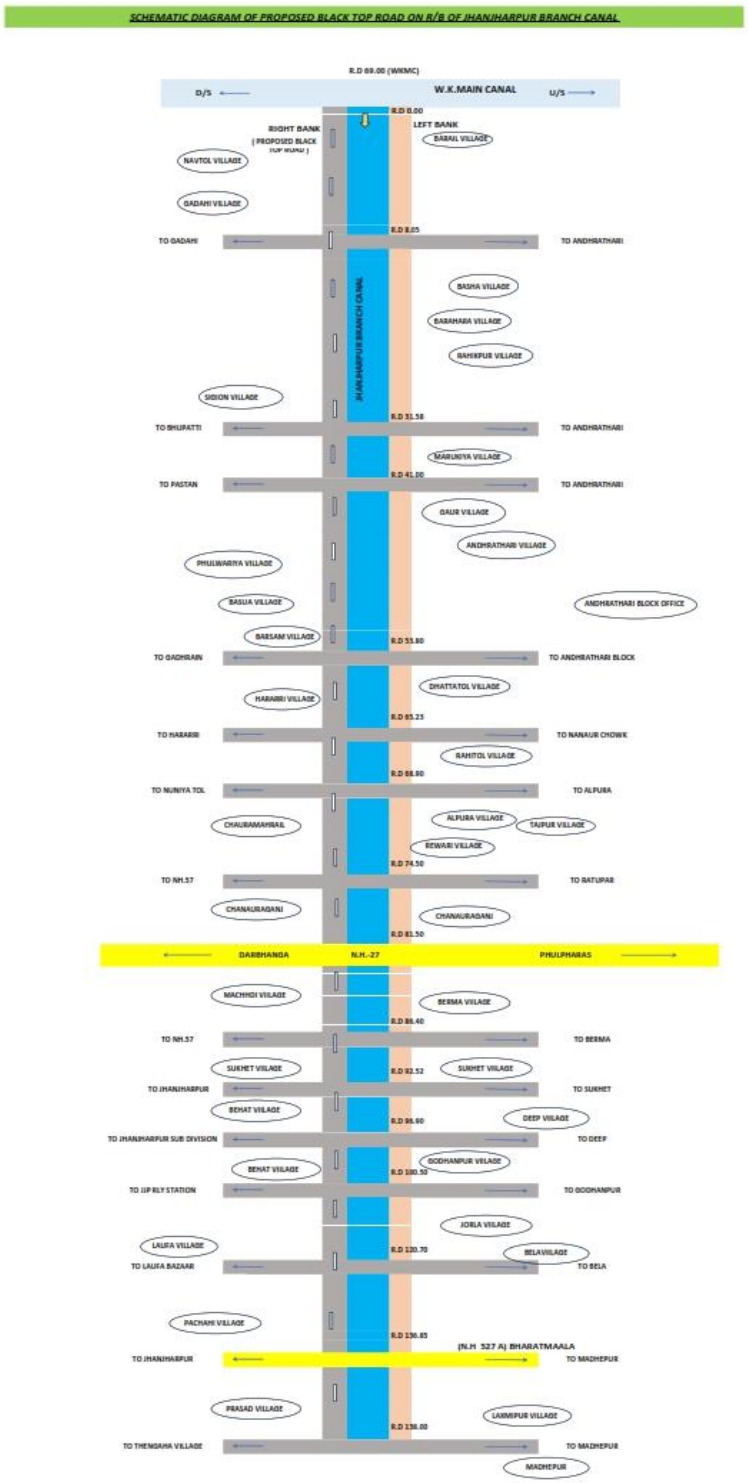


Figure: 5.2: Schematic Diagram of Proposed Canal Lining in existing Jhanjharpur Branch Canal (from Km 0.00 to Km 42.06)



5.2 Physical Environment

Madhubani district where proposed project is located, is in the northern part of Bihar and is characterized by its rich cultural heritage, dynamic environmental conditions, and diverse socio-economic structures. An environmental study encompasses physical, biological, and social components. The physical environment includes vital elements such as, land use, air quality, water quality, and soil conditions each affected by both natural and anthropogenic factor.

5.2.1 Temperature and Relative Humidity

Proposed sub-project area fall under the Agro-climatic Zone-1. Agro climatic zone-1 is North West Alluvial Zone. Dr. Rajendra Prasad Central Agriculture University, Pusa, Samastipur in Bihar is the nearest station where Agro- climatic data is available. Hence, the same data is considered for determination of Reference Evapotranspiration (ETo). The available climatic information at daily interval of PUSA was downloaded from official website of the University for the years 2014 to 2023. Data from this source is considered, as the command area of Jhanjharpur Branch Canal as RPCA University fall under same Agro-climatic zone-1 of Bihar. On considering terrain and climatic variations, the command area with respect to irrigation planning has been grouped into one zone.

Temperature

The project area has warm & humid climate with high temperatures and medium to high rainfall. The temperatures are lowest during December-January with an average minimum of 8°C to 10°C and maximum of 24°C to 25°C. The temperatures in the hottest months of April to June are minimum 23°C to 25°C and maximum 35°C to 38°C. In rare cases, the summer maximum temperature reaches 43°C[6].

Relative Humidity

Humidity levels remain high during the monsoon months, ranging from 60% to 85%, while winter months experience lower humidity levels of around 40%-50%. Overall, the district's climate is shaped by distinct seasonal variations, with the monsoon being a dominant influence on both agriculture and water resources.

The mean daily maximum Relative Humidity (Rhmax) was high during most of the months except during summer and it was lowest in April.

5.2.2 Rainfall

In continuation to the hydrological analysis during DPR preparation by M/s Aarvee Associates, the weighted average of the sixteen rainfall stations has been worked out to obtain complete observed 10-daily rainfall series for Western Kosi command area (India portion) including Jhanjharpur Canal command. The monthly rainfall and 10-daily Rainfall of Jhanjharpur Branch Canal project command area is given in the following ***Table 5.2*** and ***Table 5.3***:-

[6] Ground Water Information Booklet Madhubani District, Bihar State.

Table 5.2: Monthly Rainfall (mm) of JBC Project Command Area (India Portion)

Water Year	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May
1993-94	201.8	272.1	394.8	273.1	14.4	2.6	0.0	23.2	27.0	0.9	13.4	39.6
1994-95	84.2	212.7	289.1	309.3	5.1	0.0	0.0	1.3	10.0	1.2	0.0	2.4
1995-96	184.3	214.0	337.2	150.1	16.0	26.1	11.5	21.3	4.0	0.0	0.7	15.2
1996-97	202.4	365.7	298.0	95.4	112.7	0.0	0.0	8.3	0.0	2.0	50.3	47.1
1997-98	256.6	441.3	247.2	194.4	4.9	0.1	11.9	7.2	10.5	17.6	50.4	34.0
1998-99	91.5	455.2	371.0	173.0	57.7	2.0	0.0	0.0	0.0	0.0	7.1	62.0
1999-00	286.7	326.3	313.9	121.6	85.9	0.3	0.3	0.4	12.9	2.9	32.0	94.1
2000-01	223.0	199.9	195.3	246.5	14.0	0.0	0.0	0.7	0.1	0.1	9.8	139.1
2001-02	121.7	163.9	184.9	178.9	214.0	0.2	0.0	6.2	1.3	0.5	23.7	70.3
2002-03	98.9	421.3	131.2	108.9	4.1	0.0	0.0	5.9	22.6	17.3	27.0	38.2
2003-04	185.2	212.0	242.9	85.7	71.2	0.0	1.7	11.1	0.2	1.5	36.1	76.9
2004-05	247.9	490.0	148.4	111.7	32.5	0.1	0.6	8.4	9.4	7.5	20.4	39.0
2005-06	89.6	220.5	362.5	82.1	15.3	0.0	0.0	0.0	0.0	0.1	25.9	45.4
2006-07	72.8	202.9	123.2	268.4	11.7	2.0	0.0	0.0	10.9	4.2	12.3	53.5
2007-08	192.3	485.1	444.2	370.8	43.2	0.0	0.0	1.3	0.4	1.9	7.4	40.0
2008-09	124.7	352.3	213.9	115.3	38.8	0.0	0.0	0.0	0.0	0.6	0.3	83.1
2009-10	58.9	349.3	360.8	90.0	39.5	0.2	0.0	0.0	0.3	0.0	2.5	34.6
2010-11	89.6	229.5	133.2	82.1	5.2	0.0	0.0	0.7	13.2	2.5	4.9	81.9
2011-12	163.2	325.4	197.8	258.4	4.9	0.4	0.0	9.4	0.3	2.3	22.0	23.2
2012-13	77.1	273.8	163.7	129.4	14.1	0.0	0.0	11.9	12.3	1.3	29.9	86.5
2013-14	243.6	66.2	41.8	138.1	193.9	0.0	0.0	0.7	25.6	1.3	0.5	72.4
2014-15	173.8	248.3	358.8	105.5	75.8	0.0	0.2	8.2	0.0	28.3	47.8	22.3
2015-16	71.7	96.7	327.3	135.8	1.7	0.0	0.0	1.7	0.0	1.4	4.0	84.7
2016-17	211.6	298.6	89.5	372.8	40.3	0.0	0.0	12.2	0.0	33.5	46.4	130.5
2017-18	108.4	467.7	463.0	124.0	12.3	0.0	0.0	0.0	0.0	2.8	31.9	37.6
2018-19	113.5	324.8	222.4	97.0	5.6	0.0	1.6	1.8	18.9	1.5	68.1	25.7
2019-20	99.1	406.1	123.9	388.8	7.7	0.0	10.9	4.6	10.1	28.8	60.7	79.0
2020-21	335.0	499.1	201.0	264.3	8.1	0.0	0.0	0.0	0.0	0.0	5.3	326.1
2021-22	284.4	343.0	292.3	51.4	222.4	0.0	3.5	2.0	25.4	0.0	19.9	131.8
2022-23	194.5	168.7	164.8	143.3	66.4	0.0	0.0	0.0	1.6	12.5	14.4	52.5
Mean Monthly Rainfall	**162.93**	**304.41**	**247.93**	**175.54**	**47.98**	**1.13**	**1.41**	**4.95**	**7.23**	**5.82**	**22.50**	**68.96**

The average monthly and 10-daily rainfall are given in the table below. The annual rainfall of command area is 1050.80 mm. It is to observed that more than 80% of the rainfall occurs during the South-West monsoon from mid-June to mid-October. The late September October rains

(locally known as 'Hathia' Nakshatra) are very crucial to agriculture in the region and their timing and distribution make all the difference between plenty and scarcity.

Table 5.3: Monthly & 10-daily Rainfall of JBC area

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean Monthly	4.95	7.23	5.82	22.50	68.97	162.93	304.41	247.93	175.54	47.98	1.13	1.41	1050.80

The majority of rainfall occurs during the monsoon season, spanning from June to September, with July and August typically receiving the highest rainfall. There is also noticeable variability within the monsoon season, with years like 1992, 2010, and 2013 showing higher rainfall, while years such as 2007, 2012 and 2022 experience relatively lower amounts.

The trends in monsoon rainfall from 1993 to 2022, revealing a slight overall decline over this period. Noteworthy peaks in rainfall were observed in 2007 and 2020, while significant drops occurred in 2010, 2013, and 2015. The rainfall distribution indicates a median value of approximately 900 mm, with an interquartile range between 750 mm and 1000 mm. While overall monsoon rainfall has exhibited variability, there has been a slight declining trend in rainfall over the past three decades. This trend may reflect changing monsoon dynamics influenced by factors such as climate change, regional weather patterns, and human activities.

Analysis of Monthly Variation of Rainfall during monsoon

The analysis of monthly rainfall trends from 1993 to 2022 across June, July, August, and September reveals distinct seasonal patterns and shifts. June exhibits relatively stable rainfall with minor fluctuations, although recent years, particularly 2020, show higher values, suggested a consistent early monsoon. In contrast, August show concerning declines, with a pronounced downward trend, particularly after the early 2000s.

Conclusion:

The analysis indicates that the Jhanjharpur Branch Canal command area receives a significant portion of its annual rainfall during the monsoon season. The significant variability is observed in certain years suggests that the monsoon system is becoming increasingly unpredictable, characterized by both extreme dry and wet years. Such fluctuation could have critical implications for water availability, agriculture, and flood management, particularly in regions that rely heavily on the monsoon. Although there has been a slight decrease in average monsoon rainfall compared to earlier historical records, this highlights the necessity for improvements in the irrigation systems within the Jhanjharpur Branch Canal command area.

5.2.3 Land Use

The project district Madhubani has an area of 3501 square km. The soil of the district is highly calcareous. It is a mixture of clay and sand in varying proportions. It is suitable for paddy cultivation. This district has cropping intensity around 134.23%.

The land use pattern of Madhubani district, Bihar is predominantly agrarian, with over 65% (2251 sq.km) of the geographical area under cultivation and the rest constitute non-culturable wasteland and land put to non-agricultural uses. There are mainly two harvesting seasons in the district in a year known as Rabi and Kharif. The area under paddy cultivation stands at 36.85 % of the total agricultural land in the district. During the Rabi season (October to April), the crops like wheat, barley and pulses etc are sown, while the main crops during Kharif season (June to October) are paddy, maize, Jawar and pulses. Sugarcane is sown during both the seasons. The main sources of irrigation in the district are shallow tube wells, tanks and canals. Tanks and canals are basically rain-fed and dry up during the Rabi season[7].

Cropping Pattern

To demarcate the agricultural regions of project area i.e. Madhubani district, the nature of the seasonal harvest and their relative significance have been graded in hierarchical order. By using this yardstick, rice constitutes 66.36 per cent of the total net sown area of the district. In all eighteen anchals of the district, it ranges from 52 to 88 per cent of the total cropped area. The aghani rabi-bhadai-grama region comprises of the acnhals of Rajnagar, Jhanjharpur, Andhratharhi, Phulparas, Bisfi, Madhwapur, Khajauli, jainagar, Basopatti, Babu Barhi, whereas Madhubani, Pandaul, Laukah, Laukahi, Benipatti, Harlakhi and Ladania comprise aghani-bhadairabi-garma, and Madhepur anchal is associated as aghanigrama-rabi-bhadai region.

An analysis of the cropping pattern reveals that there is a great diversity in cropping in the study area. Except a few, crops have no fixed growing time and can be grown in any season of the year. Rice, mung and maize can be included in this rank. The relative importance as regards their area coverage fluctuates from one season to another, i.e. maize is the main crop on bhadai season but in garma season it ranks to low.

Land use and land cover is given in below table which retails that predominant land use is agriculture followed by built-up areas and water bodies:-

Table 5.4: Land use /land cover classes of Project district (Madhubani)

Land Use classes	Area (Ha)	Area (%)
Agriculture (RF/Single Crop)	286201	81.7
Plantation	56641	16.16
Habitation	3425	0.98
River and Water body	4045	1.16

5.2.4 Topography

Project district Madhubani is in the Terai region, south of Nepal. It's bordered by the Darbhanga district to the south, Sitamarhi to the west, and Supaul to the east. Madhubani and its adjoining district Darbhanga are part of the northern Bihar plains and exhibits typical Gangetic alluvial plains topography. The land is generally flat, with an average elevation of 60-85 meters above sea level. The terrain is crisscrossed by numerous rivers and streams, notably the Kamla Balan and Bagmati rivers, contributing to the district's fertile soil. The geology of this region is primarily characterized by quaternary alluvial deposits, consisting of of fine silt, sand, and clay. The soil is generally fertile and suitable for agriculture. Alluvial fans formed by river systems dominate the district, providing ideal conditions for crop cultivation.

[7] *Source: Aquifer mapping and management of ground water resources, Madhubani district*

5.2.5 Soil

The entire proposed canal lining project is a plain tract situated just to the south of Nepal. The area in Madhubani district can be sub-divided three geomorphological units namely (i) Newer Flood Plain, (ii) Older flood plain and (iii) Older alluvial plain. The flood plains are mainly occurring all along the river courses and consist of sand, silt and clay having largely low-lying water logged areas. The old flood plains consist of sand, silt and clay and are mostly under paddy cultivation. The older alluvial plains are generally uplands and consist of clayey silt, clay, and occasional kankars.

The soils found in project may be classified into the following three categories:-

i) Newer Aluvium (Khadar)
ii) Sandy Alluvium soil having alkaline reaction
iii) Calcareous soil

Newer Alluvium soil is generally found along either side of the river namely Kamla, Bhutahi Balan and Dhaus Nadi. The soils in Madhubani fall in the class of largely entisols with several variations brought about due to vagaries of fluvial sedimentation. These soils have not got sufficient time for pedogenic changes due to highly dynamic fluvial regimes in the area

The proposed project area is covered by predominantly alluvial sediments, which are made up of varying proportions of unconsolidated sand, silt, and clay. The percentage of clay and silt is usually higher than sand within the first 100 meters. Soil degradation due to overuse of chemical fertilizers and improper irrigation practices has been a growing concern. Soil pH levels vary between 6.2 - 7.5, with some areas showing signs of acidification due to excessive urea usage. The soil nutrients status in the project area is tabulated below:-

Table 5.5: Soil Nutrients Status (Average Value)

Parameters	Value (ppm)	Optimum Range (ppm)
Nitrogen (N)	245	250-400
Phosphorus (P)	18	20-40
Potassium (K)	220	200-300
Organic Carbon	0.75	0.8% - 1.5%
pH	6.8	6.5 - 7.5

(Source: Agricultural Research Institute, 2021)

5.2.6 Physiography and Drainage Pattern

The region, part of the northern Gangetic alluvial plains, has gentle slopes and no hills. It is drained by the Kosi River and its tributaries, originating from the Himalayas, and characterized by fertile alluvial deposits. Key rivers, such as Kamla Balan, contribute to both irrigation and frequent flooding. The Kosi River is known for carrying significant sediment, leading to frequent floods and fertile soil deposits. Major rivers are embanked to control flooding, but seasonal monsoon rains still cause significant flooding, particularly in low-lying areas.

5.2.7 Hydrogeology

Project district Madhubani and its adjoining area are part of the northern Bihar plains and exhibits typical Gangetic alluvial plains topography. The land is generally flat, with an average elevation of 60-85 meters above sea level. The terrain is crisscrossed by numerous rivers and streams, notably the Kamla Balan and Bagmati rivers, contributing to the district's fertile soil. The geology of this region is primarily characterized by quaternary alluvial deposits, consisting of fine silt, sand, and clay. The soil is generally fertile and suitable for agriculture. Alluvial fans formed by river systems dominate the district, providing ideal conditions for crop cultivation.

The hydrology of this region is predominantly influenced by its location within the Kosi River basin and its proximity to several other rivers such as the Kamla Balan and Bagmati. These rivers, fed by the Himalayan watershed, play a crucial role in both the water availability and flood dynamics of the region. The district's extensive river network contributes to its rich alluvial aquifer system, providing substantial groundwater resources. However, this same network also makes Madhubani highly vulnerable to seasonal flooding, especially during the monsoon, when the rivers often breach their banks, causing widespread water logging and disruption of agricultural activities.

The groundwater table in the area is relatively shallow, depending on the season. Irrigation in the district is primarily groundwater-dependent, though surface water from the river systems is also harnessed through a network of canals and irrigation schemes. The Kamla Balan River, in particular, serves as a vital source for irrigation, though it also contributes to frequent flooding during the monsoon. Flood control measures, such as embankments, have been constructed along these rivers, though they provide limited mitigation against the frequent and intense flooding experienced in the region (*Source: BSDMA, 2020; CGWB 2013; GSI 2022*).

5.2.8 Air Environment

Air quality in the project area varies significantly among different seasons, at present the sources of air pollution are the vehicles plying on the existing roads, burning of crop residue and domestic fuel burning. In some places small factory and brick kilns are also the sources of air pollution. In general, project area ambient air quality is good and within maximum permissible limit for NOx, SOx and SPM, however in some places in urban areas Average PM2.5 levels is upto 82 µg/m³, with levels exceeding the national permissible limit of 60 µg/m³ during winter months (CPCB 2020).

It is expected that, during construction of lining of canal and desiltation work, the air quality may be deteriorated temporarily due to increase in pollutant in the ambient air, but very limited within the local areas. Monitoring of air quality during construction period will be carried out against the ambient air quality standards set by CPCB. The table below shows Air Quality Index (Annual Average) of the project area: -

Table 5.6 Air Quality Index (Annual Average) of the project area

(Station: Madhubani town, Jhanjharpur, Khutauna)

Pollutants	Rural Area	Urban Area	National Permissible Limit
PM2.5	54 µg/m³	82 µg/m³	60 µg/m³
PM10	78 µg/m³	104 µg/m³	100 µg/m³
NO_X	25 µg/m³	32 µg/m³	40 µg/m³
SO_X	18 µg/m³	23 µg/m³	30 µg/m³

(Source: CPCB 2020)

5.2.9 Noise Quality

The existing noise sources are mainly from crowds, machineries used in agricultural field, pumps, two wheeler, three-wheeler, motor vehicles plying on the roads. Ambient noise level at different project location site is found in the range of 47-55 dB(A) in day time - within the Maximum Permissible Limit (MPL) at residential area. Moreover, the noise level during construction period of canal ling may be increased and to be monitored near sensitive receptors against the Ambient Noise Quality Standards set by CPCB.

5.2.10 Ground Water Quality Monitoring

The total annual ground water available in the command area in Madhubani district covering the 21 blocks is 1126 MCM.

Ground water Quality is paramount important for its utilization for different purposes. Normally, Chemical properties are geogenic in nature. CGWB has determined chemical properties as per standard methods and analyzed results of of 98 water samples collected by them during pre monsoon of 2022. Out of these 98 samples, 44 samples are from shallow aquifer, 39 samples from deeper aquifer and 15 samples are from surface and ponds.

The groundwater status in Project district Madhubani and its adjoining district Darbhanga is classified as "safe" for extraction by the Central Ground Water Board (CGWB), although signs of over-extraction are becoming evident in urban areas (**Table 5.7**).:

Water Table Depth: The depth of the water table ranges between 5 to 15 meters in both aforesaid districts, depending on the season and geographical location. Rural areas typically experience shallower water tables due to the proximity to rivers and ponds.

Groundwater Quality: Groundwater quality varies between rural and urban areas, with agricultural activities affecting nitrate concentrations, particularly near farming zones. Some wells in both districts show nitrate levels exceeding the WHO permissible limit of 50 mg/L, particularly in rural agricultural areas.

Table 5.7: Groundwater Quality in Madhubani and Darbhanga Districts (Average Values)

Parameters	Rural Areas	Urban Areas	WHO Permissible Limit
pH	6.8	7.2	6.5-23.5
Nitrate (NO_3^-)	58 mg/l	44 mg/l	50 mg/l
Total Hardness	180 mg/l	210 mg/l	300 mg/l
Total Dissolved Solids	520 mg/l	670 mg/l	1000 mg/l

5.2.11 Surface Water Quality Monitoring

Surface water sources are essential for sustaining the agrarian economy and maintaining the ecological balance of both Madhubani and adjoing district Darbhanga. These districts are rich in surface water resources, predominantly fed by rivers, lakes, ponds, and canals, all of which play a crucial role in agriculture and local livelihoods.

Major Rivers: The Kosi, Kamalabalan, and Bhutahi Balan rivers are the primary water sources in Madhubani, while Darbhanga relies heavily on the Bagmati, Adhwara Group, and Kamala rivers. These rivers not only provide irrigation but also support fisheries and contribute to groundwater recharge.

Canal Systems: Both districts are served by extensive canal systems that help in distributing surface water for irrigation. The Kamalabalan Canal System in Madhubani and the Bagmati Irrigation Project in Darbhanga ensure the efficient management of water resources, significantly supporting the agricultural activities of these regions.

Ponds and Chaur Lands: In addition to rivers, both districts have numerous ponds and chaur lands - low-lying areas that act as natural reservoirs during the monsoon. These water bodies, known locally as pokhars in Madhubani and chaurs in Darbhanga, are integral to local water storage, especially for non-monsoon agricultural use and flood management.

5.3 Natural Disaster

The Project Area falls in the North-Eastern Alluvial plains of Bihar state. The area is full of streams with abandoned channels of the Kosi River for its frequent and sudden change of courses and forming shallow marshes[8]. The Kosi catchment is in the Himalayan Region and so rich in acidic minerals. As a result, the soils of this zone are non-calcareous. There is a rich accumulation of sodium salts and sodium adsorption ratio is on the higher side in the areas where the drainage is poor.

The Kosi River presents a challenge in terms of recurring flood hazards. A major flood in 1953-54 led to the development of 'Kosi Project' that was aimed at flood control and irrigation. Despite this intervention and a long history of flood control management in the basin for more than 5 decades, the river continues to cause extensive flooding due to breaches. The history of Kosi floods mentioned below[9]:

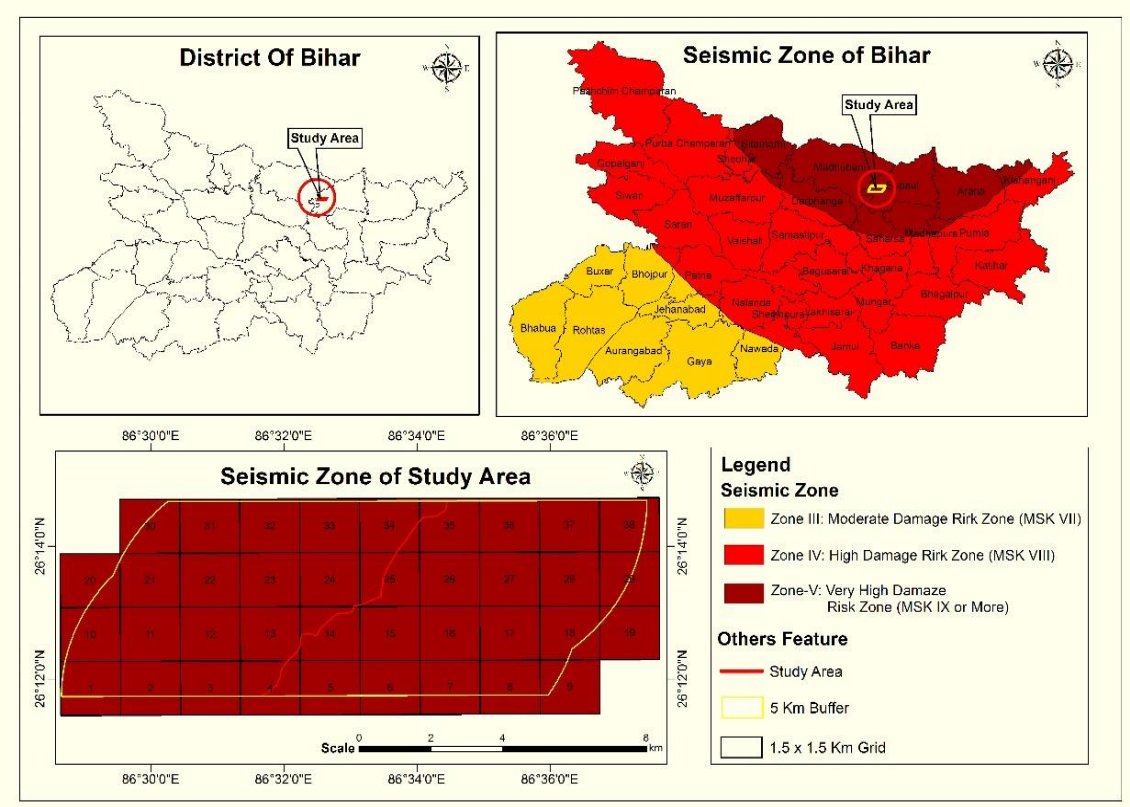
- 1963: The first breach on the Western embankment in Nepal

[8] http://krishi.bih.nic.in/Introduction.htm
[9] Bihar Kosi Flood Needs Assessment Report 2008.

- 1968: Five breaches in North Bihar
- 1971: Collapse of the 1969-built Bhatania Approach Bund
- 1980: Eastern embankment breach
- 1984: Eastern embankment breach
- 1991: Breach in the Western embankment near Joginia in Nepal
- 2008: Breach in Eastern afflux that was the most devastating floods in the Kosi flood history.

In addition to floods, the project area is also vulnerable to windstorms. The flood-prone districts are also exposed to risks from earthquakes. "Madhubani District" lies in Seismic Hazard ZoneV[10] shown in **Figure 5.3.** High hazard risk; compounded by low human and economic development in the Project area; with relatively insufficient capacity and resource base available for proper planning and execution of disaster reduction programs, significantly increases the vulnerability in the project area[11].

Figure5.3: Seismic Map of the Project area



[10] EIA Report of Kosi River August 2014
[11] Bihar Kosi Flood Needs Assessment Report 2008.

5.4 Climate Change Variability

To identify and assess spatial-temporal transformation of wetlands and future implications caused by their degradation in floodplain areas of Madhubani district, a study was conducted by University Department of Geography, L N Mithila University, Darbhanga in the year 2022[12]. The long-term hydrological investigations conducted in this study aimed to analyze various aspects of wetlands in Madhubani district, including catchment characteristics, effect of rainfall trends and variability, and urbanisation. Resulting morphological changes in the analysis included delineating catchment areas within river basins using the Arc Hydro tool. The study identified seven major rivers and their catchment areas: Kosi, Tiljuga, Balan, Kamla, and Dhauns. With Kamla-Balan having the biggest catchment area, these rivers are significant to the hydrology of the area. The study also employed the Topographic Wetness Index (TWI) to assess the wetness conditions of the landscape and explained about the distribution of water on land surface. The values of TWI ranged between -2.7 to 14.98, indicating varying wetness levels across the district. High values of TWI were found in the middle part of doab Bhuthi-Balan and Kamla-Balan and west of river Kamla while lower values of TWI were recorded in northern part of Madhubani district.

Using unsupervised classification techniques, the study identified wetlands in Madhubani district and examined their distribution during pre-monsoon and post-monsoon periods for the period 1975 to 2022. The study finds significant changes in the extent and density of wetlands, with factors such as anthropogenic activities, land use changes, and declining rainfall contributing to these transformations. The study found that during 1975-2022 wetland areas have decreased from 3.6 % to 2.1% of total geographic area in pre-monsoon season, while in post monsoon it decreased from 8.0% to 6.4% respectively. There is a decrease in annual total rainfall, especially during monsoons and post-monsoons, which has negative implications for wetland area, depth, and water quality. NDWI was used to track hydrological changes in wetlands, that highlighted reductions in the net area of water bodies and rise in area of dry regions. These changes were particularly prominent in the lower doab of Kamla and Kosi rivers, and the western and northern parts of Madhubani district. Seasonal and Annual change in Wetlands in Madhubani district is shown in the following Table 5.8.

Table 5.8: Seasonal and Annual change in Wetlands

Years	Pre-monsoon		Post-monsoon	
	Area of Wetlands (sq. km)	Percent of Total area (%)	Area of Wetlands (sq. km)	Percent of Total area (%)
1975	126	3.6	281	8.0
2000	109	3.1	253	7.2
2022	75	2.1	224	6.4
Total Change	**51**	**1.5%**	**57**	**1.6%**

[12] http://dx.doi.org/10.12944/CWE.19.1.22

In conclusion, said comprehensive study provided valuable insights into the hydrological characteristics and changes in wetlands within Madhubani district. It highlighted the importance of factors such as catchment areas, wetness indices, and hydrological changes which govern the state and dynamics of wetland ecosystems and shows climate variability in the area. The report suggests that appropriate action be taken by the state and local governments to stop further loss of the wetland area and work toward restoring it to its former level of health.

5.5 Biological Environment

The biological environment studies the natural landscape, forest cover, and profile of flora and fauna including agricultural and riverine ecosystems. Biological environment of the proposed project area can mainly be defined into agroforestry systems, riverine ecosystems, and patches of deciduous forests.

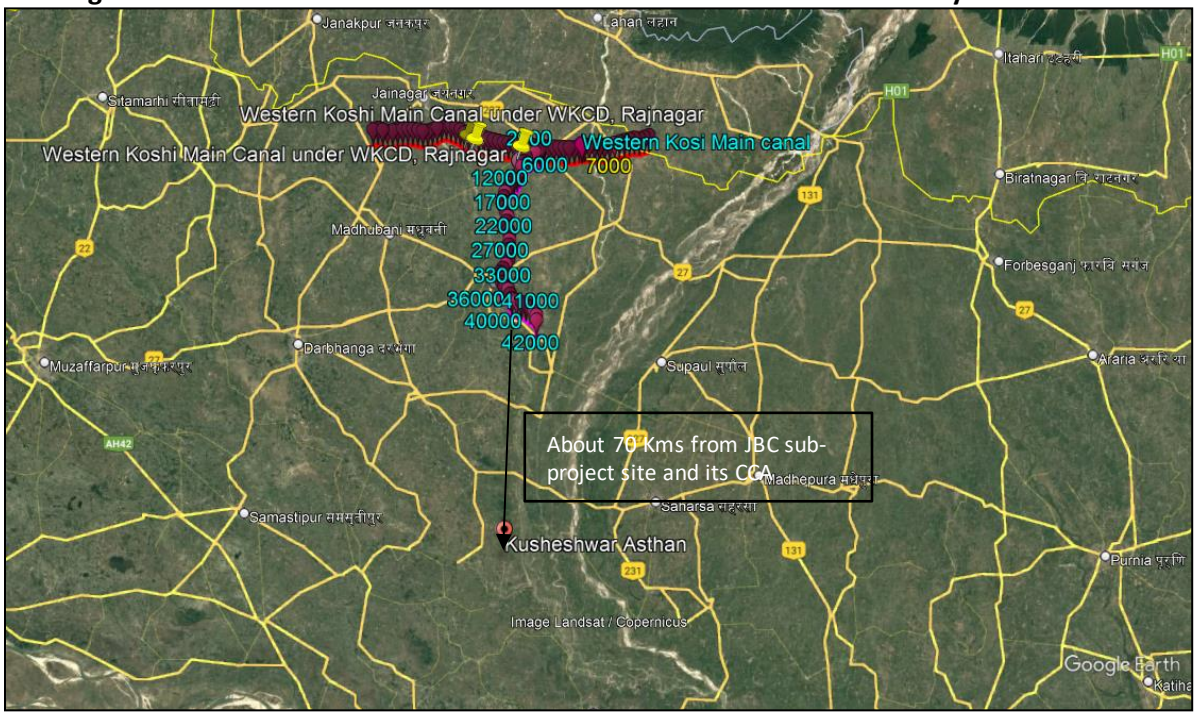
Forest Types, Forest Area, Agriculture and Ecological Sensitivity

The landscape of Madhubani and Darbhanga districts is characterized as river plains, or the **Tarai** region, shaped primarily by the **Kamalabalan** and Bagmati rivers, along with their floodplains. Flooding during the monsoon season leads to a dynamic landscape, however recurring floods also lead to soil erosion and loss of vegetation. Sediment deposition is a common phenomenon in this area along and across the stream waters.

Without any forest reported, the area not support the presence of large or special concern wildlife, but common profile of small mammals and bird species is found.

Ecological Sensitivity: The proposed irrigation channel restoration work area is not falling in the ecological protected area or WLS. The nearest ESZ boundry of Kusheshwar Asthan Bird Sanctuary (*Source: MoEFCC Notification on Final ESZ Boundary of Kusheshwar Asthan Bird WLS, 22 Aug 2017)* which is located about 70 Km from the project site as indicated in the following map.

Figure 5.8: Location of nearest ESZ i.e. Kusheshwar Asthan Bird Sanctuary from JBC site



In the project district Madhubani and its adjoining area, agriculture and horticulture play a central role in the local economy, with a variety of crops cultivated due to favourable climatic and soil conditions. The main **agricultural crops** include paddy (*Oryza sativa*), wheat (Triticum aestivum), maize (*Zea mays*), and pulses such as lentils (*Lens culinaris*) and gram (*Cicer arietinum*). Additionally, oilseeds like mustard (*Brassica juncea*) and linseed (*Linum usitatissimum*) are prominent in the region.

In horticulture, project districts are known for fruits such as mango (Mangifera indica), banana (Musa spp.), guava (Psidium guajava), and papaya (Carica papaya). Key vegetables grown include tomato (Solanum lycopersicum), onion (Allium cepa), cauliflower (Brassica oleracea), and potato (Solanum tuberosum). Spices like chili (Capsicum annuum) and ginger (Zingiber officinale) are also cultivated.

Flora

The Project area is devoid of forests, grassland or climax vegetation. Wild herbs, bushy shrubs and scattered trees dominate the area.

The dominant tree species in the project area and on the both side of Jhanjharpur Branch Canal are Sheesham (Dalbergia Sissoo), Gamhar (Gmelina Arborea), Babul (Acacia Arabica), Arjun (Terminalia Arjuna), Bael (Aegle Marmelos) and Guava (Psidium Guajava).

The dominant shrubs are Aak (Calotropis Procera), Sage (Lantana Camara), Jangal Jalebi (Pithecolobium Dulce), Jhau (Tamarix Dioica Roxb), Doob (Cynodondactylon), Nut Grass (Cyperus rotundus), Dhatura (Datura alba), Madar (Calotropis Procera Lantana Camara), Bara dudhi (Euphorbia Hirta), etc.

The vegetation reported in the project area is wild and common as in other sub-tropical regions. The area was dominated by wild herbs, bushy shrubs and scattered trees.

Most of the herbs are of common type and have economical and medicinal value for the villagers. No rare or endangered species were reported from the project area. Trees reported in the area are also common and used for flowers, fruits and vegetables. No forest area is reported in the project area or its vicinity. Following **Table No. 5.9** presents the recorded Floral Species in the Project area:-

Table No. 5.9: Floral Species in Project Area

Botanical Name	Local Name	IUCN Category
Aquatic Macrophytes		
Alternanthera philoxeroides Mart	Danta	Not Evaluated (NE)
Eichhornia crassipes (Mart) Solmns	Jalkumbhi	Not Evaluated (NE)
Ipomoea Aquatica Forsk	Karmi	Least Concern (LC)
Ipomoea fistulosa Mart (now classified as Ipomoea carnea subsp. fistulosa)	*Behaya*	Not Evaluated (NE)
Nelumbo nucifera Gaertn	Kamal	Least Concern (LC)
Nymphaea stellataWilld	Bhent	Least Concern (LC)

Botanical Name	Local Name	IUCN Category
Shrubs		
AdhatodaVasicaNees	Basak	Least Concern (LC)
Calotropis Procera (Ait) R. Br	Akwan	Not Evaluated (NE)
Cannabis Sativa	Bhang	Not Evaluated (NE)
Hiptage Benghalensis Linn	Gulphrosh	Least Concern (LC)
Lantana Camera Linn	Putus	Not Evaluated (NE)
Solanum Torvum Siu	Bab baigan	Least Concern (LC)
Tamarix DioicaRoxb	Jhau	Least Concern (LC)
Vitex Negundo	Shiwali	Least Concern (LC)
Ziziphus oenoplia (Linn) Mill	Banber	Ziziphus oenoplia (Linn) Mill
Herbs		
Acalypha Indica Linn	Copper leaf	Least Concern (LC)
Aloe Vera	Dhrit Kumari	Least Concern (LC)
Amaranthus Spinosus Linn	Ktaiyasag	Least Concern (LC)
Argemone Mexicana	Kataiya	Not Evaluated (NE)
Cyperus Rotundus	Motha	Least Concern (LC)
EcliptaAlba Linn	Bhangaiya	Not Evaluated (NE)
Euphorbia Hirta Linn	Dudhi	Not Evaluated (NE)
Evolvulus Alsinoides Linn	Shankhpushpi	Least Concern (LC)
HeliotropiumIndicum Linn	Hathisur	Least Concern (LC)
Mirabilis Jalpa	4 'O clock	Not Evaluated (NE)
Oxalis Corniculata Linn	Khattimithi	Not Evaluated (NE)
Physalis Minima Linn	Makoi	Not Evaluated (NE)
Ranunculus Sceleratus Linn	Jaldhania	Least Concern (LC)
Solanum Nigrum Linn	Bhatkoi	Least Concern (LC)
Vernonia Cinerea Linn	Sahajai	Not Evaluated (NE)
Vigna Radiata Linn	Moong	Least Concern (LC)
Zea Mays	Maize	Least Concern (LC)
Cereals, Pulses & Vegetables		
Amaranthus Tricolor	Lal saag	Data Deficient (DD)
Amaranthus Virdis Linn	Genhari saag	Least Concern (LC)
Momordica charantia	Karela	Not Evaluated (NE)
Oryza sativa	Rice	Not Evaluated (NE)
Spinacia oleracea	Palak	Not Evaluated (NE)
Vigna mungo	Urd	Not Evaluated (NE)

Botanical Name	Local Name	IUCN Category
Vigna radiata Linn	Moong	Least Concern (LC)
Climbers		
Cayratia trifolia	Amalbel	Not Evaluated (NE)
Basella alba	Poi	Not Evaluated (NE)
Cuscutareflexa	Amarbell	Not Evaluated (NE)
Atylosia scarabaeoides	Ban kulatha	Least Concern (LC)
Coccinia indica	Kundari	Not Evaluated (NE)
Dolichos lablab	Bean	Not Evaluated (NE)
Luffa cylindrical	Nenua	Not Evaluated (NE)
Grassess		
Commelina benghalensis	Kanchara	Least Concern (LC)
Cynodon dactylon	Dub	Not Evaluated (NE)
Cyperus rotundus	Motha	Least Concern (LC)
Imperata cylindrica	Khans	Not Evaluated (NE)
Setaria viridis Interrupta	Latpatwa	Least Concern (LC)
Trees		
Acacia Arabica	Babool	Least Concern (LC)
Aegle marmelos	Bel	Near Threatened (NT)
Annona squamosa Linn.	Kathal	Least Concern (LC)
Azadirachta indica A.Zuss.	Neem	Least Concern (LC)
Bombax malbaricum	Shimal	Least Concern (LC)
Citrus × Limon	Lemon	Least Concern (LC)
Cocos nucifera	Coconut	Not Evaluated (NE)
Derris pinnata	Karuini	Least Concern (LC)
Dalbergia sissoo	Shisham	Least Concern (LC)
Ficus benghalensis	Gamhaar	Least Concern (LC)
Ficus religiosa	Peepal	Least Concern (LC)
Litchi chinensis	Litchi	IUCN Red List of Litchi chinensis (Litchi) has not been assessed for the species as a whole
Mangifera indica	Mango	Data Deficient (DD)
Neolamarckia cadamba	Kadam	Least Concern (LC)
Odina wodier	Jihal	Least Concern (LC)
Pithecellobium dulce Roxb	Jalebi	Least Concern (LC)
Phyllanthus Emblica	Amala	Least Concern (LC)

Botanical Name	Local Name	IUCN Category
Psidium guajava	Amrood	Least Concern (LC)
Syzygiumcuminii	Jamun	Least Concern (LC)
Terminalia arjuna	Arjun	Least Concern (LC)
Thevetia peruviana	Yellow Kaner	Not Evaluated (NE)
Ziziphus jujube	Ber	Least Concern (LC)
Tamarindus indica	Tamarind	Least Concern (LC)
Syzygiumsalicifolium	Kath Jamun	Least Concern (LC)
Ficus glomerata	Gular	Not Evaluated (NE)

Fauna

The faunal species reported from the area within 5 km envelope on both the sides of embankment of existing canal of JBC are presented in **Table 5.10**.

Table 5.10: Faunal Species in Project Area

Zoological Name of Species	*English Name*	*IUCN Category*
MAMMALS		
Canis aureus	Jackal	Least Concern (LC)
Canis familiaris	Dog	Least Concern (LC)
Felis domesticus	Cat	Least Concern (LC)
FunambulusBalmarum	Squirrel	Least Concern (LC)
HerpestesEdwardsii	Indian Mongoose, Indian grey Mongoose	Least Concern (LC)
Mus Booduga	Indian Fieldmouse	Least Concern (LC)
Mus musculus	House Mouse	Least Concern (LC)
REPTILES		

Zoological Name of Species	*English Name*	*IUCN Category*
Agama tuberculate	Common lizard	Least Concern (LC)
Bungarus caeruleus	Common Krait	Least Concern (LC)
Chamaleonzeylanicus	Chameleon	Least Concern (LC)
Naga naja	Indian cobra	Least Concern (LC)
Viperarusselli	Russel's viper	
BIRDS		
Ardea cinereal	Grey Heron	Least Concern (LC)
Bulbulcus ibis	Cattle Egret	Least Concern (LC)
Casmerodius albus	Great Egret	Least Concern (LC)
Columba livia	Blue rock pigeon	Least Concern (LC)
Corvus splendens	House crow	Least Concern (LC)
Gyps indicus	*Grey Vultures/ Indian long-billed vulture*	Critically Endangered
Leptoptilosjavanicus	Lesser Adjutant (Garud)	Near Threatened
Milvus migrans	Cheel	Least Concern (LC)
Mycteria leucocephala	Painted storks and grey storks	Near Threatened
Pavo cristatus	Common peacock	Least Concern (LC)
Phalacrocorax fuscicolis	Cormorant or Indian Shag	Least Concern (LC)
Pyenonotusjacosus	Bulbul	Least Concern (LC)

Aquatic Ecology

The phytoplankton and macrophytes represent the primary producers in the Kosi River. Zooplankton, benthos and fish represent the secondary producers.

Fish Species: The information collected from the State Fisheries Department, suggests that 20 major fish species are found in the Kosi River and its tributaries. Catla (CatlaCatla) and Rohu (Labeorohita) are the dominant species. During field visits, the commonly observed fish species were Catla (Catla Catla), Rohu (Labeorohita), Magur (Clariasbatrachus), Garai (Channa punctatus) and Tengra (Mystusseenghala). There are no commercial fisheries in the Project Area and local fishermen catch fish in the Kosi River and its canal. Fishing activity is being done in the waterlogged areas on both sides of the canal by using local nets and fishing gear either to sell the fish in the local market or for household consumption. The list of fish species observed during field visits is presented in **Table 5.11.**

Table 5.11: Fish Species in Project Area

Zoological Name of Species	***Local Name***		***Zoological Name of Species***	***Local Name***
Catla	Catla		*Heteropreustasfossilis*	Singhi
Channa punctatus	Garai		*Labeorohita*	Rohu
Clariasbatrachus	Mangur		*Mystusseenghala*	Tengra
Cirrhinusmrigala	Naini		*Notopteruschilata*	Moy

Gangetic Dolphins: The presence of genetic dolphin, as per the Sinha et al. 2010a; Sinha 2013, is noted in the stretch of 500-525km of the Ganges River in the middle segment of the river in the state of Bihar. It is also declared as a National Aquatic Animal. Based on the discussion with the Officers of National Dolphin Research Centre, Patna, there is existence of Gangetic dolphins (colloquially named as the Sos in Bihar) in some stretches of the Kosi River. These dolphins show habitat preferences for depths of more than 5 m, meandering channels and deep pools where they cluster. During baseline survey and FGDs, the study team did not notice any Schedule-I species or endangered or threatened species of fauna within the 5 km radius of project area. During the reconnaissance of the project area and discussion with the local people on the Kosi embankment, canal as well as on the shoals, no dolphins were reported in the study area. However, the proposed works are not in the river, but along and lateral to the canal where regular farming activities are taking place.

Dredging and the removal of stones, sand, and woody debris also compromise the ecological integrity of the riverine environment, especially in small tributaries. Increasing pollution in the river may adversely affect dolphin health and their bioaccumulation may have serious consequences.

CHAPTER 6: SOCIAL BASELINE

6.1 Administrative boundaries of the project area and downstream impacted areas

The Project Area lies in Madhubani district located in the North-Eastern part of Bihar. The area is full of streams with abandoned channels of the Kosi River. The Kosi River presents a challenge in terms of recurring flood hazards. In addition, the area is also vulnerable to windstorms.

Madhubani district has 21 blocks, out of which the project area falls in the following 5 blocks covering 37 villages: -

i. Andhrathari
ii. Babubarhi
iii. Jhanjharpur
iv. Lakhnaur
v. Madhepur

Project area coverage

Sl. No.	Name of Sub-Project	Block	Village
1.	Lining of Jhanjharpur branch canal from Km 0.00 to Km 12.50	Babubarhi, Andhrathari	Barail, Navtol, Khoriyatol, Basha, Barahara, Baluhaha tol, Rahikpur, Marukiya, Dakhjari
2	Lining of Jhanjharpur Branch Canal from Km 12.5 to Km 42.06	Andhrathari, Jhanjharpur, Lakhnaur, Madhepur	Gaur, Andhrathari, Phulwariya, Basua, Barsam, Hararri, Dhattatol, Rahitol, Chauramahrail, Alpura, Tajpur, Rewari, Chanauraganj, Machhadi, Berma, Sukhet, Deep, Behat, Godhanpur, Jorla, Laufa, Bela, Koriyapatti, Parmeshara, Pachahi, Prasad, Laxmipur, Madhepur

6.2 Demography of areas directly and indirectly impacted

As per Census 2011, a total of 2,20,056 families reside in the project area and the average family size is 5. Block-wise population of above-mentioned five blocks is mentioned in the following Table 6.1.

Table 6.1: Block wise Population Distribution

Block	Population			Sex Ratio
	Total	Male	Female	
Andhrathari	191,680	100,056	91,624	916
Jhanjharpur	205,520	106,180	99,340	936
Babubarhi	217,331	111,970	105,361	941
Lakhnaur	167,841	86,959	80,882	930
Madhepur	267,606	139,319	128,287	921
Total	**10,49,978**	**5,44,484 (51.86%)**	**5,05,494 (48.14%)**	

The project blocks have a total population of 10,49,978 as per the Census 2011. Out of which 544,484 (51.86%) are male while 5,05,494 (48.14%) are female. The block wise average Sex Ratio

given in the above table shows Babubarhi has the highest 941 which is significantly higher than the state ratio (918) and Andhrathari has the lowest 916 among the project blocks.

6.3 Socio Economic Profile

The project blocks are predominated by Hindu population, 82.75% and followed by Muslim population is 16.95%. Lakhnaur block has highest Hindu population among the project districts – 87.7%.

Schedule Caste (SC) constitutes 14% while Schedule Tribe (ST) are 0.13 % of total population in the project blocks. Following Table 6.2 shows block-wise SC & ST population distribution.

Table 6.2: SC & ST population distribution

Block	SC & ST Population		
	Total	Male	Female
Andhrathali SC	25,892	13,436	12,456
Andhrathali ST	65	37	28
Jhanjharpur SC	28,394	14,599	13,795
Jhanjharpur ST	221	111	110
Babubarhi SC	27,346	14,142	13,204
Babubarhi ST	180	84	96
Lakhnaur SC	25,926	13,275	12,651
Lakhnaur ST	138	72	66
Madhepur SC	43,006	22,406	20,600
Madhepur ST	742	376	366
Total SC	**150564 (14.34%)**	**77,858**	**72,706**
Total ST	**1346 (0.13%)**	**680**	**666**

Average literacy rate of the referred blocks, as per census 2011 is very low at 49.26% of which, male and female literacy are 59.23% and 38.54% respectively. Around 21% gender gap exists in literacy rate in the project blocks. Gender-wise distribution of literacy rate is depicted in the following Table 6.3 and gender-wise distribution of workforce is shown in Table 6.4.

Table 6.3: Distribution of Literacy rate by gender

Block	Literacy		
	Total	Male	Female
Khajauli	49%	58.77%	38.31%
Laukahi	44.6%	56.92%	31.56%
Ladania	46.9%	57.72%	35.2%
Babubarhi	48.3%	59.19%	36.77%
Laukaha (Khutauna)	46.7%	58.24%	34.62%
Average	**47%**	**58.17%**	**35.29%**

Table 6.4: Distribution of Workforce by gender

Name of Block	Main Workers			Cultivators			Agriculture Labourer			Household Industries			Other Workers			Marginal Workers			Non Working		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Andhrathali	42,406	33,357	9,049	12,455	10,807	1,648	22,216	16,420	5,796	1,051	592	459	6,684	5,538	1,146	32,864	14,594	18,270	116,410	52,105	64,305
Jhanjharpur	45,055	35,081	9,974	9,901	8,324	1,577	25,203	18,978	6,225	1,387	749	638	8,564	7,030	1,534	28,114	15,391	12,723	132,351	55,708	76,643
Babubarhi	56,340	41,916	14,424	17,114	14,657	2,457	31,580	22,177	9,403	1,282	603	679	6,364	4,479	1,885	25,869	12,388	13,481	135,122	57,666	77,456
Lakhnaur	41,535	30,645	10,890	10,514	8,321	2,193	23,023	16,489	6,534	965	581	384	7,033	5,254	1,779	23,279	10,986	12,293	103,027	45,328	57,699
Madhepur	67,399	50,123	17,276	18,381	15,010	3,371	38,690	27,789	10,901	1,855	798	1,057	8,473	6,526	1,947	31,456	16,089	15,367	168,751	73,107	95,644
Total	**252,735**	**191,122**	**61,613**	**68,365**	**57,119**	**11,246**	**140,712**	**101,853**	**38,859**	**6,540**	**3,323**	**3,217**	**37,118**	**28,827**	**8,291**	**141,582**	**69,448**	**72,134**	**655,661**	**283,914**	**371,747**
Percentage on pop	24.07	18.20	5.87	6.51	5.44	1.07	13.40	9.70	3.70	0.62	0.32	0.31	3.54	2.75	0.79	13.48	6.61	6.87	62.45	27.04	35.41
Percentage on Working Pop	64.09	48.47	15.63	17.34	14.49	2.85	35.68	25.83	9.85	1.66	0.84	0.82	9.41	7.31	2.10	35.91	17.61	18.29			

In the referred project blocks out of total population, 2,52,735 (24%) are workers. 64.09% of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 35.91% are involved in Marginal activity (engaged in livelihood activities for less than 6 months). Of 252,735 workers engaged as Main Workers, 68,365 (27%) are cultivators (owner or co-owner) while 140,712 (56%) are Agricultural labourers.

6.4 Population Growth Rate

The population growth rate of Madhubani district from 2001 to 2011 is 25.51 as per census 2011, while growth rate among male is 26.52 and that for female is comparatively less, 24.44.

6.5 Land related adverse impacts under the project

The survey in the project locations found that the execution of the proposed sub project will not affect any residential or commercial structure or common utility structure or heritage property or livelihood of any household. It is not causing any displacement due to acquisition of private land, even temporarily. Sufficient land, owned by WRD is available on both sides of the canal for the movement of machineries and storage of materials during the construction work.

6.6 Status of Water User Association (WUA)

The survey observed that in the project area no WUA is active or in operation.

CHAPTER 7: PUBLIC CONSULTATIONS AND DISCLOSURE

7.1 Identification of Stakeholders

Based on the current set of proposed interventions, the following potential stakeholders were identified and categorized as Affected Stakeholders, Other Interested Stakeholders, and Disadvantaged & Vulnerable Stakeholder.

i. **Affected Persons:** None of the person directly or indirectly adversely affected by the proposed interventions. Residents of about 37 villages are expected to be positively impacted by the project due to improved water management system and climate change resilience.

ii. **Other Interested persons**: In relation to structural interventions, these are contractors, project management consultants, regulatory bodies/institutional stakeholders such as Pollution Control Board, Gram Panchayat, Electricity Department and WUA. In relation to non-structural interventions, communities living downstream who are key stakeholders to be involved in the implementation of Emergency Action Plan (EAP).

iii. **Disadvantaged and Vulnerable Stakeholders**: Illiterate persons, physically challenged, landless and marginal farmers, women and elderly who are living adjacent to the intervention sites are the key stakeholders. Public meetings were organized and during the project cycle more interaction with them through meeting will be organized to ensure that they are well informed about the provisions of the EAP.

7.2 Method and Process of Consultation

Stakeholder consultation is an integral part of the environmental and social assessment which provides inputs for the preparation of Social and Environment Management Plan (ESMP). 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, interventions, (3) enable them to give their views and opinions with respect to the project, and (4) provide them a means for effective and inclusive engagement throughout the project life cycle. During the field assessment, community consultations were taken up as an integral part of social and environmental assessment process of the project. Public participation has been viewed as a continuous two-way process, i.e., developing people's understanding on the project, activities and process of ESIA and capturing their opinion on expected environmental and social concerns / issues.

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 the stakeholders. The field visit and stakeholder consultations were conducted in Jhanjharpur branch canal project site of Madhubani district. The interaction with different stakeholders covered farmers of different social and economic categories, elcted leaders of the related project villages, leaders of the concerned communities, people / households expected to be affected due to the project, local service providers etc. in project

districts to understand their concerns.

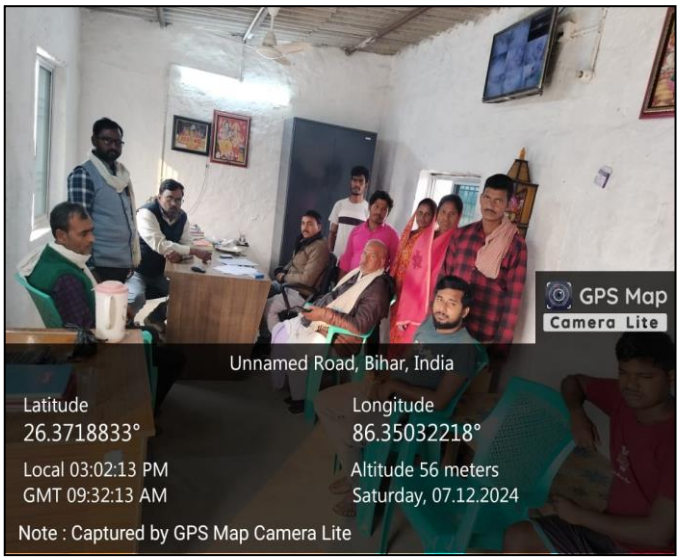
Focus Group Discussion:

Focused Group Discussions (FGD) were conducted with the villagers residing adjacent to Jhanjharpur branch area to understand their opinion on the project dimensions. The discussions were primarily related to the project and its activities, people's current livelihood engagement and expected environmental and social implications of the project. Project activity wise generic environmental and social issues were discussed with different people and at locations where activity specific environmental concerns were captured. However, people/ community were much more interested about project activities without enough environmental and social concern. They expect employment opportunity during the sub-project implementation which may stop them migrating outside the village in search of work. Villagers also expressed their concern that the project will provide safeguard to them from the hazards of flood and draught. The details of community consultations/ FGD held are given in the following Table 7.1 & Figure 7.1:

Table 7.1: Focus Group Discussion with stakeholder community

Sl. no.	Subproject name	Date	Place	No. of Participant
1	Lining of Jhanjharpur branch canal from km 0.00 to km 12.50	07/12/2024	Barail, Potehara	Total –11 Male – 10 Female – 1 Pradhan - 1
2	Lining of Jhanjharpur Branch Canal from Km 12.5 to Km 42.06	07/12/2024	Barua, Barsan	Total – 12 Male – 10 Female – 2

Figure 7.1: Community consultation in the Project Area by different divisions of WRD



Community Consultation in Jhanjharpur division

Community Consultation in Andhrathari division

Attendance Sheets for the above mentioned Public Cosultations

प्रस्तावित लाईनिंग कार्य के संबंध में स्थल निरीक्षण/बैठक

विश्व बैंक के सहयोग से पश्चिमी कोशी मुख्य नहर एवं झंझारपुर शाखा नहर में प्रस्तावित लाईनिंग कार्य के संबंध में स्थल निरीक्षण दिनांक–04.12.2024 से दिनांक–07.12.2024 तक किया गया। उक्त यात्रा के दौरान ग्रामीणों को प्रस्तावित परियोजना से अवगत कराया गया, साथ ही साथ परियोजना के साकारात्मक प्रभाव यथा स्थानीय रोजगार के सृजन, सिंचाई क्षमता में वृद्धि के फलस्वरूप उत्पादन में बढ़ोत्तरी जैसे बिन्दुओ पर चर्चा की गई। स्थानीय प्रतिनिधियों द्वारा पूरे वर्ष रब्बी, खरीफ एवं गरमा सहित आवश्यकता अनुसार जल श्राव की मांग की गई जिसका निदान लाईनिंग के उपरांत संभव होने का आश्वासन अभियंतायों द्वारा दिया गया, उक्त बैठक में स्थानीय मुखिया, सरपंच, वार्ड सदस्य एवं ग्रामीण मौजुद रहे एवं परियोजना के संबंध में साकारात्मक विचार व्यक्त किया।

	नाम	पता	हस्ताक्षर	अभियुक्ति
①	रामदेव साह	ग्रा-बरैल पो-तेघरा, थाना-बाबूबरही	रामदेव साह	ग्रामीण
②	रामपति साह	ग्रा-बरैल पो-तेघरा, थाना बाबूबरही		"
③	केलाश ठाकुर	" "	केलाश ठाकुर	"
④	मिसरी राम	" "		"
⑤	कुशेश्वर दास	" "	कुशेश्वर दास	"
⑥	संजय शर्मा	" "	संजय शर्मा	"
⑦	अनिल कु यादव	" "	Anil kumar yadav	"
⑧	राजकुमार राम	" "	राजकुमार राम	"
⑨	भवर दास	" "		"
⑩	मो० हसिन	" "	मो० हसिन	"
⑪	शीमा देवी		शीमा देवी	उपस्थिति

Signed attendance sheet during public consultantion

सार्वजनिक परामर्श / मुद्दा समूह चर्चा

1.	दिनांक - 07/12/2024	2.	गाँव का नाम - Basua, Barsam.
3.	ग्राम पंचायत का नाम - Gaur Andhra	4.	ब्लाक का नाम - Andhrathadhi
5.	तहसील का नाम - Andhrathadhi	6.	जिला का नाम- Madhubani

क्र0 सं0	व्यक्ति का नाम	आजीविका	लिंग	आयु	सामाजिक श्रेणी	हस्ताक्षर
1.	शिवदेव यादव	कृषि	M	48	OBC	शिवदेव यादव मुखिया
2.	सुपेन्द्र राम	कृषि	M	35	SC	Sapendra Ram पं० स० सदस्य
3.	मो० मुमताज रायन	कृषि	M	30	SC	मो० मुमताज
4.	मो० हलिम	कृषि	M	36	SC	
5.	सीता देवी	कृषि	F	35	OBC	सीतादेवी
6.	रौल्या देवी	कृषि	F	39	OBC	
7.	अशर्फि ठाकुर	कृषि		45	OBC	अशर्फि ठाकुर
8.	देवनारायण यादव	कृषि		70	OBC	देवनारायण यादव
9.	मुन्नानन्द झा	कृषि		60	GEN	मुनानन्द झा
10.	रामकुमार यादव	कृषि		65	OBC	रामकुमार यादव
11.	रामलगन यादव	कृषि		35	OBC	~~अशा देवी~~ रामलगन यादव
12.	भोला झा	कृषि		55	GEN	भोला झा
13.						

Consultation Meeting with Govt. Departments:

Consultation meetings were organized with local officials of different departments to make them aware about nature of BWSIMP intervention, thereon anticipated positive as well as negative impacts, the cooperation required from them to mitigate negative impact, also to understand their views on different aspects of the project. Stake-holder departments who have specific interest / stake in proposed project from environmental and social dimensions are listed below.

Stateholder Department	**Issues**	**Issues addressed in ESMP**
District/Local Administration	Nature of work to be executed, expected duration of work, area of work, impact anticipated during implementation, future scope, maintenance of law and order	Creating awareness about the project, needs active involvement of district/ local administration in case of involuntary resettlement, although social assessment survey does not find i.any case of squatter/ encroacher at the project work zone likely to be affected due to this project and also ii.any need of acquisition of private land
Dept. of Agriculture	Nature of work to be executed, impact anticipated during implementation, scope of increase of production in future due to land reclamation Many agri-labours are migrating to other districts, other industry	Creating awareness about the project Modernization of canal will reduce seepage from canal and improve irrigation efficiency in the adjoining area. This may attract agri-labour to work in local region.
Department of Electricity	Nature of work to be executed, impact anticipated during implementation, Public utilities like lamp post, electric pole located on either side of canal may be affected. These should either be shifted before construction activity or re-established after construction activity. Electric supply will be discontinued during shifting of electric pole.	Creating awareness about the project Lamp/ electric post will be shifted by concerned electric department before or during construction work, if required. Impact will be temporary in nature.
Pollution Control Board	Nature of work to be executed, impact on environment	Creating awareness about the project.

	anticipated during implementation, obtain required permission for borrow area, storage and handling of any hazardous material, management of construction and demolition waste etc.	Adverse environmental impact will be mitigated.

7.3 Outcome of the Consultation

The ESMP addresses all such issues that are identified to have potential for adverse impact. It was found through assessment study that the proposed subproject will not require resettlement of any households located near JBC. However, during implementation if any habitant or occupant is subject to displacement, based on RAP compensation will be provided to that person as per entitlements matrix. Involvement of small and marginal holders is ensured through inclusion and equity norms in different project activities. Further, women participation in construction activities and their safety and security are addressed in the camp (labour camp) establishment and management plan. Pollution and environment related issues are taken care of in the ESMP under environment management plan.

Local communities are much more concerned about project activities and infrastructure facilities to be provided under this project. It was conveyed to them that the proposed intervention will not require displacement of any households. The discussion further focused on agricultural land pollution due to stocking of construction material on agricultural land. Majority of local peoples are expecting improvement of irrigation modernization. Very negligible percentage of people is concerned about environmental pollution during project implementation. Stakeholder wise environmental and social issues and are tabulated below in Table 7.2.

Table 7.2: Environmental and social concern by different stakeholders

Stakeholders	Issues	Issue Addressed in ESMP Stakeholders
Community	Re-use of desilted material generated due to desiltation may be a problem. People suggested reusing the same.	The desilted material will be further utilized in raising and widening of canal banks with dowels upto designed section with allowance for shrinkage, secondly it will be used in widening of canal service roads (or say width of banks) over designed section, in filling existing harmful borrow pits in country sides i.e. near outer toes of canal banks, upto N.S.L. and in raising and widening of both canal banks over designed section as spoil bank. In all cases, earth or silt so obtained will be disposed as per approved disposal plan or as per direction of Engineer-In-Charge.
	Embankment road which is proposed to be constructed under another scheme of State government may be elevated by	Desilted material will be used in filling of lowlying area, if need arises it may be sold directly to different end users.

Stakeholders	Issues	Issue Addressed in ESMP Stakeholders
	using excavated earth which comes from river/ canal bed.	
	Disposed silt may be used to raise the elevation of a selected area of village so that villagers can be re-located at the time of flood.	Majority of the silt will be deposited in the chat land area of WRD on both side of canal embankment. In addition, raising low land area using desilted material will not be a problem. This reuse of material will have dual benefits it would a) reduce the quantity of borrow area and b) reduce the amount of land required for the dumping of the excavated material.
	Farmers may not object to dump river/ canal silt in their land since the silt from the river /canal will make their land more fertile.	Possibility shall be explored during desiltation operation and dumped on agricultural land only after quality testing on interest of farmer.
	Farm land located across the chat land of WRD may be affected due to deposition of excavated material.	Desilted material will temporarily be stored on Chat land of WRD available on both side of canal embankment and sold directly from there. However proper lining arrangement will be provided in case of temporary stocking in agricultural land. Crop compensation will be provided for any crop damage.
	Contractor shall not store construction material and demolition waste in nearby agricultural field.	Construction material will be stored on side of embankment keeping enough space for local commuters. Haul road will be provided for material transfer. Contractor shall obtain consent of land owner before stocking construction or demolition material for temporary period on agricultural land. Crop compensation will be provided in case of crop damage.
	Construction labour shall not throw away any plastic bag/ materials to nearby agricultural field.	Waste bin will be provided in each work site for collection of plastic waste. These bins will be emptied and waste materials will be dumped to nearby sanitary landfill side on regular basis.
	There are planted tree on left side embankment in chat land Area. Compensation shall be paid against any such tree felling.	Only canal lining and desiltation activity is proposed for Jhanjharpur Branch Canal. Canal lining and desiltation activity will not affect tree located on embankment of canal.
	No private land shall be acquired	Project is not intended to acquire any private land.
	Contractor shall employ local labour during construction and operation	Contractor will be appropriately oriented to engage local labour force in the work to the possible extent based on the required skill base. It will be a part of the contractor's obligation.

Stakeholders	Issues	Issue Addressed in ESMP Stakeholders
	Utility relocation and Common Property Resources	
	Temporary Traffic diversion	Temporary diversion will be considered with approval of the Engineer in Charge. Detailed Traffic Control Plans will be prepared by the contractor and will be submitted to the Engineer-in-charge for approval, 5 days prior to commencement of works on any section of canal. The contractor will ensure that the diversion/ detour is always maintained in running conditions, particularly during the monsoon to avoid disruption to traffic flow. He shall priorinform local community/ Engineer-in-charge/ local Authorities about diversion of any traffic routes or other traffic arrangements. The temporary traffic detours will be kept free of dust by frequent applications of water.
Women	Contractor shall engage woman workers from nearby community.	Inclusion principles are incorporated in the ESMP.
	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 plan.
	Separate toilet shall be provided for women at camp as well as work site.	Included in ESMP as a part of labour camp and work site management plan.
	There may be social issues like women trafficking, sexual harassment in the work place during project implementation. Management planned to consider this, such activities in advance.	Workers camp site is proposed at least 500 meters away from nearby habitation. if there are women workers, the Contractor will provide separate toilet facility for women workers, orient workers on their Code of Conduct. An SEA/ SH abuse mitigation plan will also be in place. Security guard will be posted at each camp site to restrict movement of local people within campsite.
National Dolphin Research Institute, Patna	Possibility of dolphin's existence in Kosi river shall be examined properly. In general, dredging and the removal of stones, sand, and woody debris also compromise the ecological integrity of the riverine environment, especially in small	If the need arises and existence of Dolphin in project area will be found, separate study will be carried out in Kosi region and Action Plan for the Conservation of the Gangetic Dolphin for Kosi area will be prepared and implemented.

Stakeholders	Issues	Issue Addressed in ESMP Stakeholders
	tributaries. Increasing pollution in the river may adversely affect dolphin health and their bioaccumulation may have serious consequences.	
Overall Opinion	**General agreement was observed among the participants when benefit of this project was explained to them.**	

7.4 Disclosure of project Information

State Level

WRD shall disclose the entire ESMF/ESMP at their website. The summary of the ESMF need to be translated into local language (Hindi) and placed on the website. The Resettlement Action Plan (RAP) (if required to be prepared) will be disclosed along with the entitlement framework. These two documents shall also be translated into Hindi and made available at the WRD's website.

District Level

WRD has to arrange to disclose the final versions of the ESIA and RAP and its Entitlement Matrix in all the District Collectors Offices and the local offices of WRD. These would be in place once the final versions are ready. When this document is updated, then the copies in the different locations would also be updated.

The World Bank will disclose the ESMF and ESIA along with ESMP/ RAP for downloading and reference by interested parties. Following information shall be displayed / disclosed / disseminated, wherever applicable: -
Disclosure by The World Bank: The World Bank will disclose the ESMF and ESIA along with ESMP/ RAP for downloading and reference by interested parties. Following information shall be displayed / disclosed / disseminated, wherever applicable: -

- Project specific information needs to be made available at each project site(hard/soft/display);
- Project information brochures shall be made available at all the construction sites as well as the office of PMU and the office of Engineer in charge.
- 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, ESMP and RAP in local language.
- 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, as a part of pro-active and Suo-motto disclosure, transparency and accountability.
- All information will be translated into local language and will be disclosed

Table 7.3 below lists the different types of information, relevant target audience depending on the nature of information, modes and frequency of engagement with these stakeholders.

Table 7.3: Stakeholder consultation details

Information to be disclosed	Target stakeholders	Tools of engagement & mode of disclosure	Frequency	Responsibility
Provisions related to Canal	✓ Contractor ✓ PMU staff ✓ Pollution control Board ✓ Farmers, Communities (affected/ other interested) at downstream of the Canal	✓ Consultation meetings related ESIA and ESMP ✓ Minutes of the Consultation Meetings ✓ Web disclosure of related ESIAs and ESMP	✓ Multiple ✓ Must before work starts During implementation ✓ ESMP, ESIA to remain on the WRD & WB websites and other disclosure locations throughout the project period.	PMU
Work opportunities for Structural works	✓ Contractors ✓ Consultants	✓ Website notifications ✓ Tender advertisements in newspaper	✓ Multiple ✓ Continuous	PMU
Work opportunities for • Petty contracts • Labor	✓ Communities (including disadvantaged persons) ✓ Petty contractor	✓ Website notifications ✓ Meetings to inform Village heads or community representatives	✓ Multiple ✓ Continuous	PMU and Contractor
GBV related provisions	✓ WRD officials ✓ Contractor personnel ✓ Consultant personnel	✓ Office circular and training events ✓ Website notifications ✓ Bid documents and ✓ Contract provisions	✓ Multiple ✓ Continuous	PMU
Labor Management Procedure	✓ WRD officials ✓ Contractor personnel ✓ Consultant personnel	✓ Website notifications ✓ Bid documents and Contract provisions	✓ Multiple ✓ Continuous	PMU
Grievance mechanisms	✓ Communities (affected/ other interested) ✓ Contractors (for procurement	✓ Phone number or Toll free Helpline ✓ Display boards at site with GRM information	✓ Continuous ✓ Multipl ✓ To be disclosed at WRD & WB websites.	PMU

Information to be disclosed	Target stakeholders	Tools of engagement & mode of disclosure	Frequency	Responsibility
	related)	✓ Consultative meetings ✓ Website notifications ✓ Meetings to inform Village heads or community ✓ Representatives	✓ Hard copies in local language at WRD district office, DM's office	

7.5 Provision of further consultation at Implementation Stage

Consultations with stakeholders across the spectrum are needed early and continuously in the project. Project should be geared up to carry out consultations from the Identification stage, through project planning and design, as well as during implementation to nurture trust among the stakeholders. The purpose of consultations is to give 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.

Through periodic consultations with the local community, including the WUA, PMU will engage them in project 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 PMU will ensure that the consultations are free of coercion and intimidation, are gender-inclusive, and tailored to the needs of vulnerable groups. All relevant stakeholders will be informed in advance about the timing and format of the consultations.

During project implementation, safeguard 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.

A variety of approaches can be adopted, for stakeholder consultation. At minimum, the following consultation activities as mentioned in Table 7.4 should be conducted. This is indicative and PIU can also adopt more effective methods and approaches, which are locally appropriate.

Table 7.4: Consultations required for Implementation

Consultation activity during implementation	Remarks
1. Focus group discussions with the concerned WUA/people residing/working near the project sites	During the EMP monitoring at work sites
2. Informal discussions with the construction workers and construction supervision staff (contractor, consultants and PIU)	During the EMP monitoring at work sites
3. Informal discussions with commuters and general public along the JBC where works are implemented	During the EMP monitoring at work sites

7.6 Grievance Redressal 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.

Current System

The existing GRM for Government services are summarized in the table below. These can be accessed by the project stakeholders, in addition to the project specific GRM detailed in the next section.

Table 7.5: Existing GRM for Government services

Level	Name	How to access	Link to the project Implementing Agency
1	National	CPGRAMs	Accessible to all citizens. Citizens can register their grievances online and through Mobile App. Complainants track the status of the complaints with the unique registration ID generated at the time of complaint registration.
2	State	CM Portal/Helpline	Anyone can fill online form at any time by giving their personal details/contacts and feedback. Thus Project beneficiaries can access the portal to register their grievances.
3	Department	Departmental Grievance cell	At present WRD has public information officer and Grievance Redressal officer at state level to him complainants can register their complaints.
4	Department	Internal Complaint committee	At present WRD has an ICC but its role and functionality needs improvement.

GRM under BWSIMP

For the BWSMIP, a unique system will be developed for general stakeholders, individual beneficiary, PAPs, laborers and complainants of GBV/SEASH. Though they may access all the existing grievance redressal platforms mentioned above to express their grievances and seek solutions too.

The grievance redress mechanism would be in place since the inception of the project till its life. It is proposed to establish a dedicated Grievance Redress Mechanism (GRM) for receiving and handling grievances related to the project including for labor complaints, resettlement (if required) and SEA/SH. PMU at the state level will be responsible for tracking, managing and analyzing complaints received on a periodic basis and to make their status available for internal reporting as well as select information in public domain. In addition, systems will also be developed for communication on existing mechanisms as well as periodic training on grievance handling.

Emphasis in the GRM under the current program will be on enhancing transparency and accountability through wide-spread awareness creation and complementing it by creating multiple access points for registering grievance, for ensuring easy access to these mechanisms.

These access points could be telephone-based helpline, drop-boxes as well as web-based grievance filing systems.

Citizen/groups would be able to submit through various mediums - **i) Web-based, ii) Telephonic, iii) Mail Post iv) in person to concerned official/s**. At the PMU level, all grievances will be recorded and tracked through the project MIS. One Operator will be hired, and trained to receive, record, categorize and forward all the grievances daily. He/She will do that based on a charter which contains a list of designated Officials who will be alerted, and their responsibility. In case of grievances received through web- based system or in person, too screening and resolution of the same or communicating with the divisions/ department for resolution of the same will be done. There will be an internal escalation mechanism, alert generation, response and closure protocol developed for the same. A receipt or a unique number will be generated for all such complaints and communicated to the complainant within 24 hours. The complainant will follow up based on that unique number. If response is not received within 5 working days, the complaint will be escalated to the concerned superior officials. The project MIS dashboard will display this information for follow up and analysis. The number of grievances received and resolved will be disclosed.

Some key features will include:

- Investments on creating public awareness about the available GRM systems
- Easy system for filing complaints
- Charter of responsibilities and response protocols
- Availability of multiple options for filing grievance (including ICC based protocol)
- Provision for registering offline grievances either in-house or through an independent /third-party
- Generation of unique complaint ID for individuals to help them track their grievances
- Development of redress protocols (including timelines) based on nature and complexity of grievances
- Hierarchical system of escalation of unresolved complaints from sub-district upto the state
- Accessibility of GRM data to program managers at all levels for periodic monitoring and review
- Random back-checks after closure of complaints to ensure quality of grievance handling.

For SEA/ SH Related Grievances: An Internal Complaints Committee (ICC) for addressing any SEA/SH-related complaints at the workplace will be set up by the WRD under BWSMIP. The committee will be constituted as per the requirements of the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013. The PMU will put in place necessary mechanisms and procedures for confidential reporting with safe and ethical documentation of SEA/SH issues at the project level. All employers including contractors as per the Act must ensure that the contact information of ICC is displayed in their respective offices and that regular trainings/orientation programs are organised for project staff and the workers of contractors. SEA/SH related processes will be overseen by the Social Development & Management Specialist within the PMU and monitored on the ground by the Environmental and Social experts within the PIU.

Building Awareness about the Grievance Redress Mechanism: The PMU Social Development& Management Specialist will initially brief all staff, PMU, consultants, and contractors on the grievance mechanism and GBV/SEA/SH complaints mechanism of the project and explain to them the procedures for filing, reporting and documentation of public grievances. Awareness campaigns will be conducted targeting project stakeholders to inform them of the availability of the mechanism through various mediums. The GRM will also be published on the WRD website. Construction sites under the project will also display the phone number, email, and address for filing public grievances.

There will be a State level GR Committee to review the functioning of the above on a six-monthly basis. ESS10 requires the development and implementation of a GRM that allows project-affected parties and others to raise concerns and provide feedback related to the environmental and social performance of the project and to have those concerns addressed in a timely manner. The SRC will be established under the chairmanship of Secretary, Department of Water Resources. Project Director will be convener of this committee. The composition of the committee will be with the following members:

Chief Engineer
Heads of Participating Departments
A senior representative, one each from BC & EBC Welfare and SC & ST Welfare
A senior representative of the Revenue Department
A representative of the PRIs
State level Environmental Officer of project
State level Social Officer of project

District level Grievance Management

At the district, nodal department will be responsible for collecting off-line grievances, undertaking a preliminary assessment on the relevance of grievances, digitization offline grievances, their categorization according to nature of complaint, updating complainants about status of their grievance and routing them to concerned duty- bearers. The district level focal point will also be responsible for generating and submitting state monthly or quarterly reports on status of grievance management.

Legal Options: If the aggrieved person is not satisfied with the verdict given by district level grievance cell, he or she will have the right to approach the Judiciary. Project will help the aggrieved person in all respect if person wants to approach the judiciary. These options will be disclosed to the public during the public consultation process.

CHAPTER 8: ENVIRONMENTAL IMPACT ASSESSMENT

At present the Jharjharpur Branch Canal (JBC) is heavily silted. The discharge carrying capacity of the channel has been considerably reduced. The heavy siltation in the canal may be attributed to the fact that the reaches of the JBC were designed for Lacey's silt factor, which is smaller than what is currently realized due to sediment-laden water flow in the channel during the monsoon period.

The problem of sedimentation in the JBC has been compounded by the lack of functionality of the silt ejector in the head reach of the channel. Moreover, the Kosi River, which serves as the source, carries a significant amount of silt and detritus every monsoon season due to flood flows from the upper catchment.

The capacity of Jhanjharpur Branch Canal (JBC) has deteriorated over its long period of operation due to heavy siltation and lack of lining. Consequently, the discharge, and thus the water level, in the downstream reach of the main canal is below the full supply level due to increased seepage loss.

The development of the irrigation canal network, starting from the upper hydraulic layer of the Main Canal and extending down to the Branch Canal and Distributaries Canal, including the Subdistributary, was originally implemented in situ. As a result, farmers are compelled to irrigate crops through field-to-field irrigation. Consequently, the overall efficiency of the JBC system is considerably reduced compared to its design. Initially, the development of the Minor Canal was restricted to only part of the command area. However, the full development of minor channels off-taking from the distributary or sub-distributary canal within the command area is progressing rapidly and is expected to be finalized by the irrigation authority. This achievement will certainly contribute to saving water that would otherwise be lost in the JBC system.

The discharge control structure (Head Regulator) and the water level regulating structure (Cross Regulator) in the main canal and branch canal are functioning well. However, vandalism and theft of the head regulators of the minor canals have been observed, leaving no control over the discharge into the off-taking minor canals. This situation may be perceived as irrigating farmers disowning the common assets due to inadequate amounts, unreliable timing, and inequitable spatial availability of water allocation within the distribution system.

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8.1 Design Phase Impacts

The design for the JBC has been completed and the alternative which has been considered in the design are presented in Chapter 4. During the construction phase the design is not expected to change. If there are any major changes in the design the ESIA will be updated.

8.2 Pre-Construction Impacts –Location and Design

The work likely during the pre-construction period are i) Shifting of electricity poles , II) setting up of Contractor's Camp and Construction yard, iii) Planning for sourcing of material etc.

8.2.1 Finalization of Work Methodology

The work methodology would define the activities undertaken. These would also determine the risk to the workmen and the communities. Based on the work Methodology and the plan the legal permits need to be obtained. It is thus important to identify the risk and plan mitigation for both these aspects: -

Mitigation Measures;

To address the OHS issues:

- A Hazard Identification and Risk Assessment (HIRA) for all tasks presented in the Method Statement will be carried out.
- Safety standards will be applied during all phase of project activities. The personnel should be periodically undergoing medical check to identify anybody suffering from occupational health hazard.
- OHS plan for construction work site safety will be prepared
- The contractor shall effective arrangements to provide sufficient supply of wholesome drinking water with minimum quantity of 5 litres per workman per day. Quality of the drinking water shall conform to the requirements of national standards on Public Health.

To address the community Health safety issues:

- Traffic management plan for working along the Canalroad/Inspection Road and hauling of material during the construction period will be prepared by the contractor.
- Community Health Safety Plan will be prepared to ensure that the commuters are segregated from the work site.

The OHS Plan, Community Health Safety Plan and Traffic Safety Plan must be submitted along with the Work methodology. The PMU/PMTC shall review this comprehensively (within one week), address any comments, and resubmit for approval. The work methodology should not be approved without the approval of these plans.

8.2.2 Site Selection of Construction Work Camps, Stockpile Areas, Storage Areas

Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites to be considered should not lead to unwarranted impacts on air, noise and tensions or conflicts with the local community. The location should not also cause any inconvenience to the local community. Further the planning of the Construction camp and the Layout of the equipment can also adversely impact he environment.

Mitigation Measures

- The guidelines to be followed by Contractor for site selection for the Camp is presented in Annexure - II. It should conform to the World Bank Group Guidance on Labour Accommodation (Workers' accommodation: processes and standards (https://www.ifc.org/content/dam/ifc/doc/mgrt/workers-accomodation.pdf) and local laws which ever is stringent
- The layout of the Camp shall be reviewed and approved after full compliance of one round of comprehensive review by Environment Officer of PMTC. The construction of the camp should be carried out after the clearance from Environment Officer, PMTC

8.2.3 Selection of the Disposal Areas

The project has estimated 288151.97 Cum of silt will be generated and if they are not properly disposed it can adversely impact the receiving waterbody due to erosion. These excavated silts are difficult to re-vegetate. However, if no attempts to vegetate the slopes are made, the silt could slide lower down during rain It can also affect the adjoining agricultural lands and affect their productivity. Hapazard dumping can also be a source of visual pollution and also a health and safety risk for the residents. The project has identified that the generated quantity of silt Will be used for sectioning of canal and in construction of embankment road which is proposed under another scheme of Govt. of Bihar. The filling quantity required to bring the canal in section is much more than the quantity obtained during bed clearance of the Jhanjharpur Branch canal. This cutting quantity will be used during filling of the damaged embankment of canal to bring the canal in section.

Desilted material will temporarily be stored in alongside available chart land belonging to Water Resources Department (WRD). There are approximately 10 meter wide chat land is available alongside of Jhanjharpur Branch Canal (JBC). As per discussions held with official of concerned division of WRD, desilted material generated during the construction will temporarily be stored in alongside available chat land area.

Mitigation Measures

The following needs to be kept in mind during disposal:

- Clear the debris (if any) from construction and demolition sites. Unusable Debris's (if any) are to be carried by trucks/dumpers to the identified dumping yards.
- The locations of dumping sites should be selected with following considerations.
    - Unproductive/wastelands shall be selected for dumping sites.
    - These should be away from residential areas and located at least 1km downwind side of these locations,
    - These sites shall be finalized such that they do not lie within any designed forest or other eco-sensitive areas, do not affect natural drainage courses and no endangered/rare flora is impacted by such disposal.
    - The lowlands, natural depressions which are natural sinks will not be used for dumping as these are natural sinks.
    - Drainage channels should not be used for dumping
    - Local Authorities should be consulted about the location of debris disposal sites before finalizing the locations.
- Dumping sites should not contaminate water sources.
- Dumping sites should have adequate capacity for the amount of debris generated.
- The Ministry of Environment, Forests and Climate Change (MoEF&CC) has issued notifications related to sediment management, particularly focusing on dredging and desilting of water bodies and sand/soil mining. These notifications outline the need for Environment Clearance (EC) for such activities, with some exemptions for maintenance dredging and desilting, subject to environmental safeguards as per the National Framework for Sediment Management (NFSM) of MoJS. During construction phase sediment managment will be done in line with the said framework.

8.2.4 Shifting of Utilities

The baseline study has revealed the electricity distribution line is present and would get affected. No other amenities/ utilities, which are going to be affected by the project as all of them are situated at a safe distance beyond the proposed construction (protection & strengthening). These infrastructures and utilities will need to be relocated from their present position due to the proposed alignment. Unplanned shifting can lead to power disruption causing inconvenience to people.

Mitigation Measures:

- Shifting and relocating utilities like electric poles to a safe place before the commencement of the construction / strengthening/lining work. Concerned department such as electricity department will be consulted before hand for this purpose and the project.
- The scheduling of the construction works will be shared with the line department (electricity supply, Road & transport) for ensuring uninterrupted services during construction.
- The Community should be made aware by WRD about any disruption to the electricity.
- Power disruption should be planned only during daytime so that there are no safety security issues at night during the night time.

8.2.5 Selection of Plant Machinery and Vehicle

The Plant Machinery and Vehicle should be selected that they meet the existing emission requirement else they would be a source of pollution. The Ministry of Road Transport and Highways has notified that emission standards[13] for construction equipment.

Mitigation Measures:

The following process should be applied: -

- All construction machinery, equipment should comply with the emission norms. The Contractor needs to provide a Certification to that effect.
- All vehicles involved in the project should have a Pollution under control Certificate (PUC) at all times.
- The Environmental Officer (PMTC) should verify that all vehicle has PUC certification as a process of verification of the bill of the contractor

8.2.6 Sourcing of Construction Materials

Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. The existing system of environmental clearance for the quarry site for aggregate and sand has inbuilt safety mechanism to safeguard against these. To prevent similar impacts from borrow areas (for loose material other than stones) MoEF&CC has provided Standard Operating procedures (305_OM_08_08_2022 Borrow Area.pdf). To ensure that the process is instituionalised in the project the following has procedures have been developed:

- Only mine, quarries which have valid mining licenses and Environmental Clearance are permitted by Mines and Geology Department will be used in the project.

[13] https://morth.nic.in/sites/default/files/notifications_document/GSR%20598%20%28E%29%20dated%2030%20September%202020%20Seperate%20emission%20norms%20for%20agriculture%20tractors%20and%20CEV.pdf

- The Contractor will finalise the stone quarry /sand mine / borrow area for procurement of construction materials after assessment of the availability of sufficient materials and other logistic arrangements.
- The Contractor will provide a copy of the Environmental Clearance Certificate of the quarry/sand mine and the Consent to Establish and Operate along with the recent compliance report to the PMU before any such quarry is engaged.

- In case of Borrow areas
  - identified areas will be verified by the Environmental Specialist (PMU) / Env Officer (PMTC) for adherence to the SoP provided by MoEF&CC
  - The request for approval of the borrow area shall be accompanied by Borrow area Rehabilitation Plan
  - The Final Payment to the Contractor shall be released only after the redevelopment of Borrow area is completed.
- The Environmental Specialist (PMU)/ Environmental Officer (PMTC) will inspect every site and suggest measures as is required to prevent deterioration of environment or safety of the people before they are considered "Fit for dumping"

8.2.7 Sourcing of Water for construction

The construction water would be required for the concreting (incase of in-situ concrete mixing), other construction activities and for domestic purpose. Even though the groundwater resources are not deficient unscrupulous abstraction can lead to shortages in the local area.

Mitigation Measures:

- The contractor needs to obtain permission for borewell from Bihar Ground Waterboard / Central Groundwater Board. A copy of the application needs to be submitted with the Method Statement.
- In case the water is procured from third party the copy of the permit should be provided to the Env Safeguard Specialist of PMU / Env Expert of PMTC.

8.3 Construction Phase Impacts

The construction activities would primarily involve i) excavation, transport and disposal of silt, ii) lining of the canal will involve: a) transportation storage and of construction material, b) transportation, storage and laying of liner, iii) mixing and laying of concrete iv) construction activities at the gates

8.3.1 Impact on Land Use and Topography

All the suitable materials will be reused as fill materials, aggregates, embankment, etc. to minimize the disposable quantity. The unsuitable and unutilized excavated material will be disposed-off. Unless the same is done in a scientific manner it has potential to cause water pollution, affect the fertility of the adjoin land and also cause visual pollution. The guidance for the disposal is presented below:

Mitigation Measures

- During the dumping the following should be maintained:
  - The height of the dump at any location shall not exceed 3m

- The 1:2 slopes of the dump should be maintained and the slopes should be maintained
- The slopes and top should be covered with vegetation e.g. local variety of grasses to prevent erosion.
- Peripheral drains should be developed to top and bottom of dump to collect the water. Chute drains should be developed along the sides at regular intervals to collect the water.

8.3.2 Impact on Air Quality

Deterioration of air quality due to various construction activities along the project site is primarily due to dust. The summer season experiences high wind velocity causing accelerated wind erosion, resuspension of dust which contributes to the high SPM in the ambient air quality. Fugitive emissions are from vehicles used for the transportation of construction materials. Large quantity of dust is likely to be generated on the JBC and the proposed transportation routes for debris and spoils disposal and construction materials. Another source of air pollution is construction emission form movement of vehicles and machineries, running of batching plant, mixing plant and the operation of DG sets to meet the power requirements during construction period. The construction camp will have some sources of pollution from domestic sources such as cooking, DG sets for domestic uses.

Since there are habitation adjoining the canal these incremental air pollutants can cause inconvenience to the residents and sensitive group of people. Significant impact on health is not considered because the construction period is short and the emission and dust will co-terminate with the construction. However, to mitigate the temporary impacts the following should be carried out:

Mitigation Measures:

- All vehicles delivering fine materials to the site will be covered to avoid spillage of materials or being blown away during the transportation.
- Contractor will arrange for regular water sprinkling for dust suppression of all roads and surfaces. The records of sprinkling shall be maintained
- The unloading of materials at construction sites in/close to settlements will be done with proper barricade made by the contractor.
- All stockpiles will be covered/protected to prevent dust generation
- The contractor will take every precaution to reduce the level of dust construction sites involving earthwork by a sprinkling of water, encapsulation of dust source and by the erection of screens/barriers.
- The contractor will provide necessary certificates to confirm that all Plants, equipment, machinery, and vehicle used in construction conform to relevant dust emission control legislation.
- No burning of firewood is allowed in the construction camp. The Contractor must make provisions for LPG cylinders.
- The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project.

- Location of DG sets and other emission generating equipment should be decided keeping in view the predominant wind direction so that emissions do not affect nearby residential areas.
- Stack height of DG sets to be kept in accordance with CPCB norms, which prescribes the minimum height of stack to be provided with each generator set to be calculated using the following formula:

  H = h+0.2x √KVA

  H = Total height of stack in meter

  h = Height of the building in meters where the generator set is installed

  KVA = Total generator capacity of the set in KVA
- Obtain, CTE and CTO for batching plant, crushers and DG set etc. if specifically established for this project.
- If contractor procures any material (such as ready-mix concrete, asphalt/macadam, aggregates etc.), from third party agencies, contractor shall ensure that such agencies have all necessary clearances/permissions as required under the law; these include CTE/CTO from BSPCB, environmental clearance, etc.; contractor shall collect the copy of these certificates and submit to PIU; PIU will approve the source only after all the certificates are submitted; and`
- Conduct air quality monitoring according to the EMP.

8.3.3 Impact on Drainage

The area has a history of flooding and drought both, but the works will be carried out within the existing canal, thus no natural drainage is likely to be affected. The selection criteria for the dumping sites have ensured that low lying areas / depressions, natural channels are not used for dumping because they would hamper the natural flow of water, cause stagnation or water. The project areas are also vulnerable to vector-borne diseases e.g. malaria, Kala-azar and dengu. Thus, the stagnation of water can also lead to health concerns.

Mitigation Measures:

The following mitigation measures should be implemented:

- Spoils will be disposed, at site which has been identified as "Fit for Dumping" only after the completion of all mitigation measures suggested by the Environmental Specialist (PMU)/ Environmental Specialist (PMTC).
- Inspect all the drainage at construction site/construction camp/labor camp/ dumping site etc. and clear all the drainage lines so that no water stagnation/flooding may occur during heavy rainfall.

It is anticipated that there will not be major adverse impacts on the topography because of the proposed project.

8.3.4 Impact on Surface Water Quality

No permanent impact is anticipated on surface water quality due to the sub-project. Construction, desiltation of Jhanjharpur Branch Canal canal activity may temporarily deteriorate surface water quality near the alignment through increase in turbidity as well as spill of oil and grease. Run-off from stockpiled materials construction wastewater, construction camps and chemical

contamination from fuels and lubricants during construction works can contaminate downstream surface water quality of the streams. These potential impacts are temporary and short-term duration only.

Mitigation Measures

The presumptive source of surface water pollution due to construction activities and their suggested mitigation measures are discussed below:

Material storage beside the Canal

- The contractor will ensure that no construction materials shall disposed off or block the flow of water of any water course and cross drainage channels.
- The stockpiled material must be prevented from erosion and deposition in the drainage channel from sites where these are stocked for construction. Since the project site is congested, an additional construction/fabrication yard can be proposed away from the construction site.
- The runoff from the construction material storage yard must be channelized through peripheral drains connected to sedimentation tanks (holding tanks excavated in the ground) of adequate capacity
- All sedimentation tanks and peripheral drains must be cleaned before the monsoon.

Water pollution from Fuel and Lubricant

- Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelling will be carried out in such a way that spillage of fuels and lubricants does not contaminate the ground. Only fuel pumps will be used for the transfer of fuel during refuelling.
- Oil interceptors will be provided for vehicle parking, wash down and refuelling areas as per the design provided.

Pollution from sewage disposal

- The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into river or any other nearby water bodies by passing wastewater to sedimentation tank to be considered as part of the EM plan and Contractor's responsibility.
- Stagnation of water should not be allowed at any place near the camp site as a precaution against vector-borne disease.
- Provision of STP/septic tank should be provided at site/labour camp for onsite treatment of sewage. Adequate number of toilets shall be constreucted for both male and female employees.
- No Solid waste should be discharged into any waterbody

Pollution from Construction activities

- The wash water from the concrete mixer/ batching plant/ miller should only be disposed at a pit developed in construction camp.

8.3.5 Impact on Groundwater Quality

Groundwater resources are not scarce in the project area. It is anticipated that there will not be major adverse impacts on the ground water quality during construction phase of canal lining

project The potential of temporal scarcity, affecting nearby wells and ecosystems is also considered to be low.

Contamination of groundwater quality may happen during the construction phase occur due to oil spillage and other chemical contaminants from vehicle parking and washing/ servicing area, fuel/ chemical storage area etc.

Discharge of untreated sewage are potential source of groundwater contamination. Following mitigation measures are suggested to avoid any negative impact.

Mitigation Measures

- Ensure waste oil from all equipment, vehicles and other sources of fuels and lubricants will be collected and contained to avoid soil/ groundwater contamination.
- Fuel must be stored in proper bounded and covered areas.
- All spills and collected petroleum products must be disposed of in accordance with Hazardous Waste Management Rules
- Maintenance and refuelling of vehicles, machinery and other construction equipment must be carried out on an impervious surface so that spillage of fuels and lubricants does not contaminate the ground.
- The runoff from the maintenance yard must lead to a peripheral drain and pass through an oil-water separator
- In case the contractor is using groundwater for construction he needs to obtain permission from the Central Ground Water Authority as the case may be. In case he obtains/ purchases the water from a third party, the permission of the third party to supply water for construction purpose should be obtained.
- Septic tanks / STP / Modular Bio-toilets constructed / placed at Contractor Camp and work sites to treat human waste.

8.3.6 Impacts from Construction Wastes

It is anticipated that quantity of excavated materials to be generated due to desilting of JBC under the project will be approx 2,88,151.97 Cum. In addition, the haphazard disposal may lead to loss of productive land. Additionally, during disposal the movement of trucks carrying the debris and silt outside the designated route can cause compaction. The following mitigation measures:

- The movement of the truck carrying debris or construction material should be limited to the designated tracks
- The construction waste and debris should be disposed only at site “Fit for Disposal”
- The Ministry of Environment, Forests and Climate Change (MoEF&CC) has issued notifications related to sediment management, particularly focusing on dredging and desilting of water bodies and sand/soil mining. These notifications outline the need for Environment Clearance (EC) for such activities, with some exemptions for maintenance dredging and desilting, subject to environmental safeguards as per the National Framework for Sediment Management (NFSM) of MoJS. During construction phase sediment managment will be done in line with the said framework.

8.3.7 Impact due to Noise

Operation of heavy machineries; movement of heavy vehicles, concrete mixing activities, operation of DG Set, demolition of existing structure, bullah piling generates high noise increasing the ambient noise level in the surrounding. Typical noise leaves are provided in
Table . However, most of the construction activities will be confined to the project area (inside the canal systems, embankment site) away from habitation area.

Table 8.1: Average noise levels generated by the operation of various construction equipment

Equipment	Noise level (dB (A))
Batching Plant	90
Transit mixer	75
Winch-7.5 t capacity	75
Generator	85
Hydraulic Rig	85
Compressor	80
Hydra 12/15t	80
Vibro hammer	80
Concrete mixer	75
JCB-3D	85
Trailor	85
Excavator	80
Dumper	85
EoT cranes	80
Ordinary cranes	75

Modelling studies were conducted to assess the increase in noise level due to operation of various construction equipment's, and the results of this exercise are given in Table .

Table 8.2: Predicted noise levels due to the operation of various construction equipment

Distance (m)	Ambient noise level (dB (A))	Increase in noise level due to construction activities (dB (A))	Resultant Noise Level	Increase in ambient noise level due to construction activities (dB (A))
30	45	70	70	25
50	45	66	66	21
100	45	60	60	15
200	45	54	55	10
500	45	46	49	4
1000	45	36	46	1
1500	45	36	45.5	0.5
2000	45	34	45	-

It is clear from the above table, that at a distance of 1 km from the construction site, the increase in noise levels will be only 1 dB (A). The JBC is located in a rural setting, at most place receptors are located beyond 1km. At few locations the settlement or sentitive receptors would in proximity of the worksite. Since the worksite would keep on shifting along the length of the canal at no location the works would be carried out for more than a couple of days. Hence, no adverse impacts are anticipated on ambient noise levels during construction phase of the proposed project. Attenuation will also occur due to sound waves traversing over vegetation, atmospheric absorption or any other obstacles.

However, to minimise the Impacts to the noise environment the following mitigations measures are considered:

Mitigation Measures

- Staging of construction equipment and unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible.
- All plants and equipment used in construction (including third-party plants and equipment) must conform to the MoEF&CC/ CPCB noise standards.
- All vehicles and equipment used in construction will be fitted with exhaust silencers.
- Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked, and if found defective will be replaced.
- The activities must be carried out during the daytime. Night-time activities may be carried out in an emergency, but all measures mentioned in the mitigation measures for night work must be strictly adhered to.
- Restriction on unnecessary honking at the project site
- Barricading (Temporary noise barrier) around the construction site to minimize the noise level
- Monitoring must be carried out at the construction sites as per the monitoring schedule, and results will be submitted to PMC and PMU.

The following **Noise Standards for DG sets** are recommended for the running of DG sets during the construction:

- The contractor must use silent DG sets prescribed by CPCB; if not then noise from the DG set should be controlled by providing an acoustic enclosure or by treating the enclosure acoustically.
- The Acoustic Enclosure should be made of material of appropriate thickness and structural/ sheet metal base. The walls of the enclosure should be insulated with fire retardant foam.
- The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB (A) Insertion Loss or for meeting the ambient noise standards, whichever is on the higher side.
- The DG set should also be provided with proper exhaust muffler.
- Proper efforts to be made to bring down the noise levels due to the DG set, outside its premises, within the ambient noise requirements by proper siting and control measures.
- A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

8.3.8 Impact on Local Ecology

The project activities are not located in any ecological sensitive areas e.g. wild life sanctuary, national park or interfere with any wildlife corridor. No tree felling is also envisaged. The project withdraws water from the River Kosi where aquatic life may be disturbed. As the modernization happens more land would be converted into double cropped areas requiring additional water. As described in the ESMF there will be reduction in flow in the river but that would not be substantial.

In JBCC since there are no interventions directly in the river there no standalone plans are proposed to be implemented.

8.3.9 Accessibility

The Canal inspection road/ canal bank road is presently used the local people for commuting. The same will be used during the construction. Deterioration of the conditions / damage to the structure due to construction. This will inconvenience the people. The following mitigation measures related to OHS and CHS are proposed.

8.3.10 Occupational Health and Safety

The project activities will include operation of heavy machinery, movement of heavy vehicle etc. it is also expected to have around 700 plus labours working in the project. The various OHS risk in the different activities these have been identified and presented in Annexure- III. The OHS mitigation and control point are also highlighted in the same.

8.3.11 Community Health and Safety

The work site is primarily located in rural areas with a few habitations and the villages covered under the proposed sub-project is detailed in Chapter 6. In addition, the Canal Side Road / Inspection Road is used by people for their commuting. During construction there will be chances of interaction between machinery and the local population especially near settlements. Since the canal road/inspection road would also be used for staging the machinery thus there will be chances of pedestrian or road user being struck by the machinery.

In addition, there will be movement of project vehicles along the canal road/ inspection road. Since this road is also used by local population and other commuter to access their agriculture field. There are chances of collision but the probability of occurrence of such collisions are low because of the low traffic during the non-agricultural season. Majority of the civil works will also be scheduled during the non-agricultural season when the canal will not be used. However, there are a few mitigations which are envisaged.

Mitigation Measures

- Since the worksites are mostly in rural areas with not much traffic hard barricading may not be possible. It is thus suggested that work site be demarcated with barricading tapes outside settlement areas. Inside settlement areas the barricading should done by waterfilled New Jersy Barriers.
- The Work zone safety signages shall be placed as per IRC: SP 55.
- The Project Board shall be presented at the beginning /start of the package. The Project Board should provide the critical information about the project include the grievance mechanism.
- The construction zone must be access controlled, and the workers must be provided valid identification cards to allow entry.
- Construction material must be stored in the barricaded area. If temporary storage is required (for 1-2 days) outside the demarcated construction area, the same must be discussed with the community.
- Retro reflective tapes shall be fitted on all sides of equipment

- Reverse horns must be placed on all vehicle and equipment. In case of rotating equipment rotation alarm must also be fixed on the equipment.
- If machineries are parked on / beside the canal road the area should be barricaded ater filled New Jersey barrier. Retrorefletive tape must be fixed on the barrier for easy visibility. Solar LED blinkers shall be placed on the machinery for easy visibility.
- To prevent the dust from the construction area affecting the sensitive receptor/ commuters' green screens may be used as per advice of safety officer.

8.3.12 Chance Finds

The excavation in this project would be limited to removal of sediments from within the canal. Since the excavation would be limited to the sediments only, the probability of chance find would be limited.

8.4 Operation Phase Impact

Modernization and lining of Jhanjharpur Branch Canal will be instrumental in maintaining agriculture activity in the vicinity of project area i.e. in the district of Madhubani & Darbhanga. Yet, the unchecked glide of water through these earthen channels often ends in seepage, evaporation and waterlogging, diminishing their efficiency. To address those challenges, canal lining emerges as a capability solution. However, like any intervention in a complex atmosphere, it contains its own set of implications. This exploration delves into the multifaceted environmental impacts of canal lining, inspecting both its blessings and drawbacks.

Following is the anticipated major operation phase impact of proposed renovation and modernization of Jhanjharpur Branch Canal project:-

- The proposed Canal lining, which involve creating an impermeable layer in the canal mattress and banks will itself as a viable approach by decreasing water losses through seepage and evaporation, canal lining targets enhancing water transport efficiency in agricultural fields.
- Canal lining will present water losses, notably lowering seepage and evaporation. This translates to a tremendous growth in the quantity of water reaching the fields, improving agricultural productivity and ensuring food security, particularly in regions grappling with water scarcity.
- With an extra-controlled water flow, canal lining will allow the adoption of contemporary irrigation strategies, together with drip and sprinkler systems. This will minimize water wastage and maximizes crop yields, optimizing resource utilization.
- By stopping water logging and salinity, canal lining allows for the preservation of agricultural land. This, in turn, contributes to the general fitness of the atmosphere and supports sustainable agricultural practices.
- Increased agricultural output, coupled with reduced water wastage, leads to stepped-forward economic conditions for farmers and the vicinity as a whole. The proposed project can contribute to poverty comfort and rural improvement by enhancing agricultural livelihoods.
- While canal lining offers several benefits, it's critical to remember its potential environmental impacts from a nuanced and comprehensive angle.
- After operation, the proposed canal lining project will enhance agricultural productivity. Small-scale farmers and marginalised groups may additionally face demanding situations in having access to and utilising the improved water sources. Furthermore, the initial investment and renovation charges related to canal lining can be sizeable, probably affecting the affordability and accessibility of this generation for positive groups.

- Canal lining can affect the microbial ecology of the water, doubtlessly affecting the pleasantness of the water and the fitness of aquatic organisms.
- Implement measures to offset the ecological impacts of canal lining, consisting of developing artificial wetlands, fish passages, or riparian buffer zones.
- Involve nearby communities in the choice-making method and make certain they benefit from the assignment.
- Explore the usage of eco-friendly and locally sourced materials for canal lining whenever feasible.
- Canal-lining initiatives ought to be aligned with the United Nations Sustainable Development Goals (SDGs), particularly those related to water and sanitation, food protection, and sustainable ecosystems. By integrating these dreams into undertaking planning and implementation, it is viable to gain both environmental and social benefits.

8.5 Community Benefit

Overall, canal lining of Jhanjharpur Branch Canal can have a significant positive impact on the economic growth of local community by improving water supply, reducing flood risk, and enhancing agricultural productivity. Canal lining will contribute to the economic growth of community residing in project area in several ways:-

Increased Water Supply: Canal lining will help in reduction of water losses due to seepage, ensuring a more reliable and consistent water supply for irrigation, drinking water, and industrial purposes.

Prevention from water logging: Water logging is caused due to rise in the water table by the seepage losses from the canals. Water logging affects the groundwater table and makes the land unfit for irrigation. This problem of water logging in the project area can be prevented by canal lining.

Improved Agricultural Productivity: By the process of canal lining, the seepage losses of the water for irrigation from the canals are reduced and this helps increase the extent of irrigation of a field. With a reliable water supply, farmers of local community can increase crop yields, leading to higher incomes and improved food security.

Enhanced Food Security: Increased agricultural productivity and improved water supply contribute to enhanced food security, reducing the risk of famine and malnutrition.

Job Creation: Canal lining of Jhanjharpur Branch Canal (JBC) will create employment opportunities for local communities, both during construction and in the long-term maintenance and operation of the canal.

Increased Property Values: Improved water supply and reduced flood risk will increase property values, making local community more attractive for investment and development.

Safety against floods: The bed and sides of lined canals can withstand flooding conditions while the unlined canals cannot. In the case of unlined canals, the bed and sides can easily erode away with water during flood conditions, while the bed and sides of lined canals are protected with a hard stratum, which prevents its weathering. So, canal lining will help to reduce the risk of flooding, protecting homes, businesses, and infrastructure from damage.

Improved Water Quality: By reducing seepage and preventing contamination, canal lining will improve water quality, making it safer for human consumption and other uses.

Increased Industrial Activity: A reliable water supply and reduced flood risk can attract industries that rely on water, such as manufacturing, textiles, and food processing.

Enhanced Tourism: Improved water supply and reduced flood risk can make the area more attractive for tourism, generating revenue and creating jobs.

Long-term Sustainability: Canal lining is a long-term investment in the community's infrastructure, providing benefits for generations to come.

Solid Waste Mangement: Solid waste from community including garbage, rubbish, agricultural waste, toxic Industrial discharge, construction debris, landfills in the catchment area etc. all contributes to pollution in canal which damages highly sensitive and fragile river and canal ecosystem. The disposal of solid waste needs to be controlled by the community, local municipal bodies and government bodies in line with the MoJS Sediment Management Guidelines which will be directly benefited to the community.

CHAPTER 9: SOCIAL IMPACT ASSESSMENT (SIA)

9.1 Findings of Social Impact Assessment

The assessment revealed that the sub project will have both positive as well as negative social impact on the people of the area.

Encroacher

There is no structure, temporary or permanent at the bank of the Jhanjharpur branch canal of the work zone which can be affected due to lining work on canal.

Employment

As the proposed lining work will require skilled and unskilled workers, some people will get employment opportunities in this project and there will not be necessity for them to go out of their villages for livelihood. Hence, there is a positive impact on employment and income. It will also increase the economic activities in the nearby villages.

Agriculture land

Agricultural land is about 10 m away from either side of the canal. Hence the impact on agriculture land adjacent to canal is not expected. However, during construction phase, minor impacts on agriculture field (productivity related) may occur due to the proposed project intervention, but the benefits to the farmers with the implementation of the project will be high, as it will provide necessary irrigation water and protect their agricultural lands near the riverbanks.

Amenities

There is no such amenity/ utility, except electrical poles, which are going to be affected by the project as all of them are situated at a safe distance from the canal bank.

In case of electrical poles, after consultation with the Electricity department, the poles which are located at the work zone will be shifted.

The information gathered through stakeholder consultation, public meeting and FGD with the people living near to project area found that people are in favour of the lining works of the branch canal.

Local villagers are willing to be involved and take part in project implementation.

9.2 Scope of Land Acquisition

The intervention is mainly lining work on the branch canal of Jhanjharpur, which implies work will be limited inside the canal, no Land acquisition is required. On both sides of the canal sufficient land, owned by Govt./WRD is available, details of which are given in the Annexure IV. Further, necessary land is available for movement of machineries during the construction works, acquisition of private land is not required for that.

9.3 Socio-economic and Demographic profile of affected Households

There is no structure, temporary or permanent at the bank of the Jhanjharpur branch canal of the work zone.

9.4 Labor profile for the works

The lining work will take 14 months to complete for the proposed sub project. The requirement of skilled and unskilled labour is given in the table 9.1 below:-

Table 9.1: Requirement of labour by type

Division	Particular	Skilled Lab	Semi skilled Lab	Unskilled Lab	Total
Jhanjharpur	No.	62	81	394	537
	Man-days	26059	33872	165666	225597
Andhratarhi	No.	27	36	171	234
	Man-days	11437	15286	71617	98340
Total	No.	89	117	565	771
	Man-days	37496	49158	237283	323937

The labourers will be provided by the contractor. Hence as per WB's guidance i.e. as per ESS2 for such workers, Contractor needs to prepare detailed profile of Workforce.

Influx of Labour and Conflict with Local people during Construction phase

During the construction period, labour will be required for construction work. Reportedly, the manpower requirement for the construction phase is 3,23,937 labour days (in 14 months) who will be mobilized for the construction work. These include unskilled, semi-skilled and skilled workers. Reportedly, 86,654 labour days are for skilled and semi-skilled labourer, who are expected to be sourced from outside the district and rest can be sourced locally. The intra state migration of labour may affect the project area in terms of additional burden on public infrastructure such as water supply, electricity, and other social dynamics, which may potentially have an impact on local communities. Moreover, there is a possibility of conflict with local people residing near the project footprint. Conflict can also arise with shop owners and business entities operating their businesses near the project footprint due to access disruption. Moreover, the influx of labour may potentially lead to conflict with local people residing near the project footprint due to cultural differences. As during construction phase larger number of labourers will be working on the project site there is risk of occurrence of GBV and SEA, incidence.

The contractor would need to take necessary measures to prevent GBV & SEA risks. (***Annexure - V***)

Labour Accommodation

Approximately 3,23,937 labour days (14 months) will be required during the construction phase of the project. The demand for workers will keep on changing depending on the requirement of the work to be undertaken. Around 37,496 labordays minimum (skilled labor) will be sourced

outside the locality. As a result, a labor camp will be required during the different construction periods. As observed during the site visit, the alignment of the proposed work zone passes through inhabitant areas, thus random establishment of the camp will create hindrance to the inhabitants. Improper sanitation facilities in the construction labour camps can also trigger vector borne diseases and impact the health and safety of the workers and the nearby community. (Annexure - II)

9.5 Mitigation Measures for social impact

The proposed lining work on Jhanjharpur branch canal will directly benefit people inhabiting along the Jhanjharpur branch canal, and it will benefit directly and indirectly to the dewellers of the command area of the canal of Madhubani district socio-economicaly. By improving irrigation facility, it will favour growth of cash crops and commercialization of agricultural activities also leading to enhancement of income as well as quality of life.

Resettlement

The Jhanjharpur branch sub project is not causing any displacement due to acquisition of private land. Moreover, there is no squatters who will be temporarily / permanently relocated or their economic activities will be affected during the construction period.

Labour Influx

Although the construction work will be within closed premises and the labour camp will also be situated within the site, measures such as proper orientation to workers on gender and cultural sensitivity and prior information dissemination before construction starts is necessary. The required mitigation measures as per LAP is mentioned below.

- Communication to local community, shops and vendors prior to the start of the construction;
- Labours would be provided training on local culture and traditions through daily tool box talk;
- Local community to be made aware of the grievance mechanism and provide access to the local community and labourers to the grievance redressal mechanism for the project;
- The contractor is responsible for providing adequate accommodation facilities for the labourers;
- The contractor would be required to develop labour management procedures and mitigation measures before the start of works and monitor and update the Labour Management Plan (LMP), as necessary during the course of the project.
- For preventative and mitigatory measures in case GBV & SEA issues the help of key government and non-government stakeholders have to be taken as mentioned in ESMF. Ref. Annexure V
- Contractor should introduce/get signed by 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. Time to time orientation programme on Code of conduct to be organized with the workers by the contractor.

Labour Accommodation

Measures such as mentioned below will be implemented conforming with the World Bank Group Guidance on Labour Accommodation.

- Proper collection, storage and disposal of wastes
- Proper sanitation facilities to prevent contamination of water resources from sanitary effluents generated from labour camps
- Safe drinking water facility
- Proper safety measures, such as fire safety, community health safety

Social Impact mitigation measures to be taken care of under the project is described in Table 9.2.

Table 9.2: Social Impact mitigation measures

Mitigation Measures during Planning / Pre-construction Phase	
Social issues/ Activities	**Mitigation Measures**
Compensation and R&R Assistance to the affected families	Not Applicable
Site clearance	WRD will have to give notice to the affected families to shift from the proposed site at least one month prior to start of construction work and hand it over to the contractor.
Mitigation Measures during Construction Phase	
Income Generation/ Restoration	Income restoration/ generation facilities will be provided to the affected families. Employment opportunity for the locals in the sub-project construction work, if available and if so desired by them will be provided. Subsistence allowances and shifting allowances will also be provided. Contractor will be encouraged to involve the vulnerable people in the project activity by providing employment opportunity for them. To provide long-term income restoration, different skill upgrading vocational training shall be provided of their choice at a rate of Rs. 25,000/- per family.
Labour influx and related issues	Labour Management Procedure (LMP) including OHS management plan and GBV/SEAH will be followed and monitored. Labour camp will be set up as per WB guidance (ESS 2). Workers consultation will be regular feature. Contractor should introduce Workers to their Code of Conduct and get it duly signed, as part of the employment contract. Contractor will provide training to all workers before start of

	work and thereafter quarterly. Contractor shall ensure compliance with all relevant national and state labor laws/ codes, including labor registration and insurance and periodic reporting of these measures, Monitoring by the Project E&S staff of the contractor compliance with labor related obligations WRD will ensure that contractor monitor, keep records and report on terms and conditions related to labour management.

Contractor needs to prepare and maintain detailed profile of Workforce as per Table 9.3 below:

Table 9.3: Detailed profile of Workforce

Key work activities	Schedule for such activities		Duration of contract	Rotation	Place of residence		
					Workers from community	Within local community	On site

CHAPTER 10: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

10.1 Objectives of the ESMP

The main objectives for ESMP of the "Bihar Water Security and Irrigation Modernization Project (BWSIMP) includes the following:-

- To mitigate potential negative environmental and social impacts that may arise during the construction and operation of the project.
- To establish systems and procedures for protecting environment during various stages of the project – pre-construction, construction and operation phase.
- To ensure that the project is implemented in an environmentally sustainable manner.
- To monitor that the project is implemented in accordance with the design.
- To monitor implementation of mitigation measures and their effectiveness.

10.2 The Environment and Social Management Plan

This section describes the mitigation measures of various impacts during project phases. All care has been taken to provide mitigation measures for all expected environmental degradation and social imbalance at various stages

Table 10.1: Environmental and Social Management Plan

A. Design and Pre-Construction

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
Finalization of Work Methodology	Occupational health, safety, and community health impact	• To manage Environmental & Social issues of the project prepare a **Contractor Environment Health Safety Management Plan** (C-ESMP) in line with the ESMP included in the ESIA. The CESMP should be proportionate and align with Work Methodology proposed; define Roles & Responsibilities, Resources available and monitoring & review mechanisms for E & S issues. • Prepare **Occupational Health and Safety Plan** (OHS Plan). OHS plan for construction work site safety will be prepared[14] • Conduct **Hazard Identification and Risk Assessment** (HIRA) for all tasks presented in the Method Statement[15] • **Community Health and Safety (CHS) Plan** will be prepared which includes a **Traffic management plan** for movement of equipment and materials as well as emergency and hauling of material during the construction period will be prepared by the contractor; Management of distance and safety to ensure that the community members	CESMP OHS Plan (including HIRA) along with work methodology CHS Plan (including traffic safety) along with work methodology	Contractor to submit CESMP, OHS, CHS, Traffic plan along with the construction methodology and Work Plan. The PMU/PMTC shall review this comprehensively (within one week), address any comments, and resubmit for approval.	E&S Specialist PMU and WRD Officials / Environmental Expert and Social Expert of PMTC

[14] See Occupational Safety, Health and Working Conditions Code, 2020 considering EHS General Guidelines https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-en.pdf

[15] Classify work/assessment units or work activities during construction phase (based on generic understanding of works to be carried out); Identify the hazards associated with work activities; List out the Consequence of the hazard involved in the activity; List out controls (preventive and recovery)

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		are segregated from the work site. Safety standards will be applied during all phase of project activities. The personnel should be periodically undergoing medical check to identify anybody suffering from occupational health hazard.	Method Statement only to be approved once the CESMP, OHS, CHS, Traffic plan is approved		
Resettlement	Residential and livelihood impact	If any habitants or occupants (squatters/encroachers) are to be displaced, they will be relocated with prior approval of the concerned agencies.	Entitlement matrix, Resettlement Action Plan	Local administration, District administration, District/ Divisional unit, PMU, PMTC	PMU / PMTC, Divisional Office of WRD NGO/Support organization
Setting up of Office and Construction Camp, rest places /shed/ Labour Camp	Air pollution, noise levels and vibration	In case workers accommodation (temporary/ permanent) are constructed by the Contractor it should conform to the World Bank Group Guidance on Labour Accommodation (Workers' accommodation: processes and standards (https://www.ifc.org/content/dam/ifc/doc/mgrt/workers-accomodation.pdf) and local laws which ever is stringent. The Contractor needs to obtain CTE and CTO for setting of Camp. No sites should be considered for stockpiling areas that may promote instability and result in damage of property, hindrance to access road, vegetation, nearby land (without written permission of the owner). No spoils disposals or material shall flow into agricultural land adjoining the project areas. No waste, debris/ scrap / unused machinery shall be stored outside the construction areas.	Labour Accommodation Plan / Rest Areas Plan (as Applicable) submitted and approved Site Plan submitted and approved.	Contractor to submit along with the construction methodology and Work Plan The PMU/PMTC shall review this comprehensively (within one week), address any comments, and resubmit for approval. The labor camp cannot be setup without the approval. If done on the contrary the Contractor has to carry out changes suggested by Client to bring the	E&S Specialist PMU and WRD Officials / Environmental Expert and Social Expert of PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		A labour accommodation/ rest area, a Labour accommodation / Rest Area Plan and Construction Yard Layout Plan must submitted along with the Work methodology.		accommodation to satisfactory levels before the same can be used	
Selection of Site for Disposal of excavated material, Camp, Storage of Material, Temporary parking	The works would be located in rural areas with rich agricultural land. Unplanned disposal or setting up of construction camp can impact the soil	The locations should be selected with following considerations: • Unproductive/wastelands/Chart land shall be selected. • These should be away from residential areas and located at least 500 m downwind side of these locations, • These sites shall be finalized such that they do not lie within any designed forest or other eco-sensitive areas, do not affect natural drainage courses and no endangered/rare flora is impacted by such disposal. • The lowlands, natural depressions which are natural sinks will not be used for dumping as these are natural sinks. • Drainage channels shall not be used for dumping • Local Authorities such as Gram Panchayat members, Ward member should be consulted about the location of debris disposal sites before finalizing the locations. • Dumping sites should not contaminate water sources. • Dumping sites should have adequate capacity for the amount of debris generated	Approval of the Dumping site by the E&S Specialist, PMU and E&S Officer PMTC.	Contractor before selection of site. The selected dumping site should be approved by the dedicated Focal Person for E & S at concerned divisional office of WRD, E & S Specialist of the PMU or Environmental & Social experts of PMTC.	E&S Specialist PMU and WRD Officials / Environmental Expert and Social Expert of PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
Assessment of Impacts Due to Changes/ Additions/ Final Designs/ Work Methodology in the Project	Additional Impacts or work Methodology related impacts	• In case of any event of changes/ revisions (including addition or deletion) in the project's scope of work or change in the site condition, the impacts as a result of the changes need to be assessed. Site-specific ESMP should be prepared and approved by the Bank before the commencement of construction. • The Contractor will also prepare CESMP for additional impacts. The CESMP must be submitted to the PMU for approval. A comprehensive review of the CESMP will be carried out by PMU/PMTC within one week's time and the rectified document will be submitted for approval before construction.	The Site Specific EMP/ to be submitted along with the Method Statement Construction should not be carried out unless the EMP is approved.	PMU Contractor, to be submitted along with the revised construction methodology and Work Plan	E&S Specialist PMU and WRD Officials / Environmental Expert and Social Expert of PMTC
Labour Requirements and labour influx	Increased illicit behavior and crime, increased burden on local public services and utilities, the spread of communicable diseases, and GBV/SEA/SH risks	• The contractor will use labour drawn from local communities preferably to avoid any additional stress on resources and communities. In case of non-availability of skilled labour locally, the contractor will bring them from outside the project area • All guidelines in the Labour Management Procedures for labour influx to be followed by the Contractor. • Ensure compliance with Labour laws - national and state • All labour licence, insurance, registrations and compliance with any statutory requirements to date must be complied with. • Screening of age based Aadhar Card.	• Registers – gender segregated (muster roll) • Labor returns • Approvals • Display Boards • ID Cards • Availability of Model Code of Conduct signed by supervisors and sub-contractors • Availability of Gender specific facilities at labour camp & worksite	Contractor, throughout Construction & operational phase	Divisional Office of WRD and PMTC.

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		• Display Board (Wages, labour rights etc). • Contractor to maintain recruitment records and employment process of labourer • Job description and employment condition should be clearly communicated to the labourers by the contractor.			
Disclosure and Public Display of Information	Stakeholder engagement for ensuring inclusiveness	• Copy of C-ESMP to be kept at project site and on the website of WRD. • Project information boards showing the name of work, project cost, duration, date of commencement, date of completion, executing agency and contact details (including telephone numbers) shall be displayed both sides of the road packages in both in English and Hindi. • Prior to construction activity, information dissemination will be undertaken by contractor at the project site. • Information boards containing Code of Conduct, SEA/SH plan, GBV plan in local languages, telephone numbers of GRM cell will be setup at the sites of construction camps and labour camps and stockyard site.	ESMF/ESMP available to public Project Information Board Camp Information Board Grievance Boards on Site	PMU Contractor Contractor Contractor throughout Construction & operational phase	PMU, PMTC
Site clearance and site preparation	Loss of green cover, Impact on terrestrial ecology	No trees will be felled without the permission of the Forest Department. Provision of project design / bid document to align the Restoration and rehabilitation of all such locations occupied or used for	Site inspection through visual survey Code of Conduct to be signed by all workers	Contractor	PMTC and PMU

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		construction purposes immediately after the given task(s) is over. No hunting/trapping/poaching of wildlife, migratory birds by workers shall be permitted while working or residing on-site. The Contractor should provide training to his staff with support from the PMU.	Code of Conduct explained to all workers		
Selection and Deployment of construction vehicles, equipment and machineries	Increase air pollution, noise and vibration	All Construction equipment16 and machinery to be used in the project will conform to standards adopted by the Ministry of Road Transport and Highways. The emission and discharge standards promulgated under the Environment Protection Act, 1986, will be strictly adhered to. Noise limits for construction equipment to be procured, such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws, will not exceed 75 dB(A)17, measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. The Contractor will submit a record of PUC for all vehicles and machinery to be mobilized in the project.	Certification by Manufacturer of emission and noise levels/ Pollution under Control Certificates, Insurance and Driving License of the driver to be submitted for all vehicles Contractor	Contractor Once before deployment of all vehicles	PMU and PMTC

- [16] Every agricultural tractor, construction equipment vehicle and combine harvester shall be so manufactured that it complies with the following standards of gaseous pollutants as per rule 115A, after sub-rule (8), of the Central Motor Vehicle Rules, 1989.The Plant Machinery and Vehicle should be selected that they meet the existing emission requirement else they would be a source of pollution. The Ministry of Road Transport and Highways has notified that emission standard for construction equipment: [16]https://morth.nic.in/sites/default/files/notifications_document/GSR%20598%20%28E%29%20dated%2030%20September%202020%20Seperate%20emission%20norms%20for%20agriculture%20tractors%20and%20CEV.pdf
- [17] As per Noise limits notified under EPA, 1986 and other provisions of Noise Rules, 2000: Noise rules for Domestic Appliances and Construction Equipment at the manufacturing stage.

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
Material sourcing	Unsustainable mining operation	Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials and other logistic arrangements. They will submit a copy of EC/ CTE/ CTO along with the recent compliance report to the PMU before any such quarry is engaged. All consent and permits to remain valid at all times. Borrow area permission should be in line with the MoEFCC notification dated 02.08.2024 (S.O 3099)[18]	Permission for mining/ quarrying of materials from the Mining Department, District Administration and District Level Environment Appraisal Committee	Contractor Once before the start of construction activities	PMTC and PMU
Compensation, rehabilitation & resettlement (R&R) provisions	Impact on local squatters/ encroachers	Documents will be verified and endorsed for the list of families eligible to get appropriate compensation and assistance as per entitlement matrix.	Prior to inception of construction activity.	Contractor, Divisional Office of WRD, PMU & PMTC	PMU & PMTC
Shifting of Utilities	Disruption of Services	Prior permission shall be taken from concerned department officials, for shifting of utility. Utility shifting shall be undertaken by concerned Department and the corresponding Divisional units shall coordinate the same. All Occupational Health Safety and Community Health Safety requirements shall apply to the respective department.	OHS and CHS requirement shall be included in the work Order and shall be communicated to the concerned departments	PMU before awarding the contract.	PMU
Identification of water source for construction	Impact on ground and surface water resource	Groundwater will be the most preferred option for construction. In case of abstraction of ground water, permission from CGWB to be obtained and same should be submitted to environment specialist of PMU. The permit conditions shall be implemented and always maintained.	Permission from CGWB for abstraction of water	Contractor Once before the start of construction activities	PMTC and PMU

[18] https://parivesh.nic.in/publicdocument/UPLOAD_OM_NOTIFICATION/IA_DOCS/256042.pdf

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		Incase Water is procured form Third parties the permission for borewell shall also be maintained by Contractor. Quality of surface & ground water wrt parameters such as, pH, Temperature DO, BOD, COD, Oil & Grease, Total Suspended Solid, turbidity, Total Hardness, Chlorine, Iron, TSS, TDS, Total hardness, Iron, Sulphate, Nitrate, heavy metals, etc. will be monitored on regular basis	Water quality as per IS 10500	On regular interval	
Setting up of Plant and Machinery (Batching Plants or concrete mixer location)	Potential source of pollution (air quality, water quality, soil)	Use of Ready-Mix Concrete will be encouraged by the contractor. In case the concrete is procured from a third party, a valid consent will be submitted to the PMU before the procurement of any material. In case a Batching plant is setup the necessary consents are required from BSPCB. The Wash Water from the Batching Plant shall be collected in settling tanks, and the supernatant shall be reused. No discharge including run off from the Batching Plant is allowed into the river. The waste from the Batching Plant shall be considered as part of the Waste Management Section of the CEMP. Stand-alone mixing machines are not allowed unless they meet the conform to Ministry of Road Transport and Highways stated above. Regular monitoring of air quality in line with National Ambient Air Quality Standards for	In case of Batching Plant / Ready mix Concrete the CTO of the Plant shall be submitted to the PMU as part of the CEMP. For Standalone Mixing machine the Pollution under control certificate is required.	Contractor Once before functioning/operation of plant & machinery	Divisional Office of WRD, PMU and PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		the parameters such as, PM10, PM2.5, SO2, NOX and CO.			
Restriction in access to religious properties	Impact on religious properties	There are religious properties at the project site. During construction necessary measures to be taken to extend respect to the property.	Prior to inception of construction activity.	A. Contractor PMU, PMTC & Divisional Office	Social & Envt Specialist, PMU and PMTC/ Concern division of WRD
Legal compliance	Non-compliance may attract penalty issues; court stay order etc.	Obtain all consents, clearances (CTE/CTO from BSPCB), permits NOCs etc., before start of construction works. Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction. In case of any legal noncompliance, resulting in financial penalties or specific remedial actions, the Contractor shall be responsible for getting the remedial actions executed and bear the financial burden of the same. The Half yearly Progress Report to update the information and provide assurance that the conditions are being met.	Copy of the Permit/ Consent to be submitted before the construction activities start.	Contractor Before the start of construction and to be maintained during the course of the contract/ activity, whichever is later.	Divisional Offices of WRD, PMTC and PMU
ESMP Implementation Training	Lack of awareness of ESMP can lead to irresponsible behavior resulting in an Irreversible impact to the environment, workers, and community.	Contractor's Project manager and all key workers will be required to undergo training on CESMP implementation, including pollution prevention, spoils management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH&S), core labour laws, applicable environmental laws etc. All new personnel joining the work need to undergo induction training on ESMP. All personnel joining work after a break of more than 15 days need to undergo refresher induction training.	Certificate of Completion (Safeguards Compliance Orientation) Posting of EMP at worksites. Refresher training every year Skill Based training as request by PMTC/ Client	Contractor Induction/ Orientation Once before initiating construction activities Refresher Training: As required Skill Based training: As and when required Maintaining Records of training, induction,	PMC and PMU

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		Based on the observation of the PMTC and the Client refresher training has to be carried out every year (July – August). Skill Based / Job based training to be carried out for personnel involved in special activities as per the instruction of PMTC.		refresher and skill-based training. Submission of the Training records to the PMTC every month	

B. Construction Stage

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
B. CONSTRUCTION PHASE					
Demolition of the Canal Lining	Impact on Land Use from C&D Waste	• The C&D waste (especially Broken Brick Lining) is a reusable resource. • The Excavated material should only be dumped / temporarily stored at the Site certified as "Fit for Dumping". • The contractor should adopt efficient construction methods and re-use of construction material to minimize the waste to be generated from the construction works in the strengthening of the road adjoining the canal. • In the case of the Storage / temporary storing of the C&D debris the following precautions should be maintained: ○ The height of the dump at any location shall not exceed 3m ○ The 1:2 slopes of the dump should be maintained ○ Peripheral drains should be developed to top and bottom of dump to collect the water. Chute drains should be	Reporting location of Disposal along with site photographs	Contractor	Divisional Office of WRD, PMU & PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
		developed along the sides at regular intervals to collect the water. ○ The Contractor shall have necessary insurance cover to cover for such exigencies e.g. protection against property damage, liability for injuries, and other unforeseen events.			
Excavation of the Sediment/ Silt	Impact on Land Environment due to dumping of excavated material	The Excavated silt would be disposed on land with the following precautions: ○ The height of the dump at any location shall not exceed 3m ○ The 1:2 slopes of the dump should be maintained, and the slopes should be maintained ○ The slopes and top should be covered with vegetation e.g. local variety of grasses to prevent erosion. ○ Peripheral drains should be developed to top and bottom of dump to collect the water. Chute drains should be developed along the sides at regular intervals to collect the water.	Reporting location of Disposal along with site photographs	Contractor	Divisional Office of WRD, PMU & PMTC
Transport of Excavated Material, C&D Waste and Construction Material	Impact of Air due to exhaust from vehicles and fugitive emission	• All vehicles delivering fine materials to the site will be covered to avoid spillage of materials or being blown away during the transportation. Empty Vehicle also needs to be covered to prevent dust • Contractor will arrange for regular water sprinkling for dust suppression of all roads and surfaces. The records of sprinkling shall be maintained. • The unloading of materials at construction sites in/close to	Covering of Vehicle transporting material Sprinkling records Records of the Dust pollution along the roads No. of Compliant received form the Public on dust. No. of observation by PMU/PIU / Project staff on Dust Cooking Fuel used	Contractor	Divisional Office of WRD & PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
		settlements will be done with proper barricade made by the contractor. • All stockpiles will be covered/protected to prevent dust generation • The contractor will take every precaution to reduce the level of dust construction sites involving earthwork by a sprinkling of water, encapsulation of dust source and by the erection of screens/barriers. • The contractor will provide necessary certificates to confirm that all Plants, equipment, machinery and vehicle used in construction conform to relevant dust emission control legislation. • The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project.	Maintenance of Stockpile PUC of the Vehicle, equipment and machinery as per the MoRTH Standards for On-Road and Off-Road machinery Visual observation of dust and smoke		
Lining of the Canal a. Grading of sides b. Preparation of subgrade c. Ploughing of Existing Canal d. Lip cutting for Earthwork Excavation e. Laying of Sand Layer under Bed f. Laying of LDPE Film	Impact of Air pollution from Plant and Machinery	• Location of DG sets and other emission generating equipment should be decided keeping in view the predominant wind direction so that emissions do not affect nearby residential areas. • Stack height of DG sets to be kept in accordance with CPCB norms, which prescribes the minimum height of stack to be provided with each generator set to be calculated using the following formula: $H = h+0.2x \sqrt{KVA}$ H = Total height of stack in meter	DG stack height Monitoring of DG sets Maintenance of DG sets CTO/CTE for plant and machinery Maintenance of CTO conditions	Contractor	Divisional Office of WRD & PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
above the sand layer g. Under Drainage work		h = Height of the building in meters where the generator set is installed KVA = Total generator capacity of the set in KVA Obtain, CTE and CTO for batching plant, crushers and DG set etc. if specifically established for this project. If contractor procures any material (such as ready-mix concrete, asphalt/macadam, aggregates etc.), from third party agencies, contractor shall ensure that such agencies have all necessary clearances/permissions as required under the law; these include CTE/CTO from BSPCB, environmental clearance, etc.; contractor shall collect the copy of these certificates and submit to PIU; PIU will approve the source only after all the certificates are submitted; Batching Plant /Concrete equipment should meet the emission standards of Conduct air quality monitoring according to the EMP.			
	Impact on Surface and Ground water form Wastewater/ Wash Water generated form Plant & Machinery	Pollution from Construction activities The wash water from the concrete mixer/ batching plant/ miller should only be disposed at a pit developed in construction camp.		Contractor	Divisional Office of WRD, PMU & PMTC
	Deterioration of the Noise quality and impact on sensitive receptors	• Staging of construction equipment and unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible. • All plants and equipment used in construction (including third-party	Adherence to measures suggested for: a. Plant and machinery b. Vehicle and equipment	Contractor	Divisional Office of WRD, PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
		plants and equipment) must conform to the MoEF&CC/ CPCB noise standards. • DG sets should conform to the CPCB standards • All vehicles and equipment used in construction will be fitted with exhaust silencers. • Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked, and if found defective will be replaced. • The activities must be carried out during the daytime. Night-time activities may be carried out in an emergency, but all measures mentioned in the mitigation measures for night work must be strictly adhered to. • Restriction on unnecessary honking at the project site • Barricading (Temporary noise barrier) around sensitive receptors adjacent to the construction site if construction works are carried for more than 7 days to minimize the noise level especially for sensitive receptors. Preferably no construction shall be carried out during the school hours. • The contractor needs to ensure compliance to the rules and adhere to	c. DG sets d. Sensitive Receptors Complaints from Community Results of the Noise Monitoring		

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
		the norms in "Silence Zone[19]" and "residential Zones[20]". This includes adhering to noise level standards and other regulations applicable to these areas. • Monitoring must be carried out at the construction sites as per the monitoring schedule, and results will be submitted to PMTC and PMU.			
	Community Health and Safety during the operation of machinery because of use of shared space	• It is suggested that work site be demarcated with barricading tapes outside settlement areas. Inside settlement areas the barricading should done by waterfilled New Jersy Barriers. •The Work zone safety signages shall be placed as per IRC: SP 55. •The Project Board shall be presented at the beginning /start of the package. The Project Board should provide the critical information about the project include the grievance mechanism. •The construction zone must be access controlled, and the workers must be provided valid identification cards to allow entry. •Retroreflective tapes shall be fitted on all sides of equipment •Reverse horns must be placed on all vehicle and equipment. In case of rotating	Barricading inside the settlement and outside the settlements Safety Signages Reverse Horns and Alarms on vehicle, equipment and machinery Presence of Retro-reflective tape on Vehicle, Equipment etc	Contractor During all construction or civil works stage	Divisional Office of WRD, PMU PMTC

[19] These are areas designated for peace and quiet, such as hospitals, schools, and residential areas where heightened noise levels are detrimental to public health and well-being. Contractors need to be aware of these zones and take steps to minimize noise during construction and operations within them.

[20] These are areas where housing is the primary land use, and noise pollution can disrupt residents' daily lives and negatively impact their health and quality of life. Contractors must comply with noise level regulations and other rules applicable to residential zones to ensure minimal disruption to residents.

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
		equipment rotation alarm must also be fixed on the equipment. •If machineries are parked on / beside the canal road the area should be barricaded with water filled New Jersey barriers. Retroreflective tape must be fixed on the barrier for easy visibility. Solar LED blinkers shall be placed on the machinery for easy visibility.			
Operation of the Labour Camp/ Construction Yard	Impact on Air pollution form domestic sources Impact on water form domestic sources	**Air Pollution from domestic sources in Construction Camp** •No burning of firewood is allowed in the construction camp. The Contractor must make provisions for LPG cylinders. • No burning of solid waste or plastic at the Camp site or project site. **Pollution from sewage disposal** •The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering river or any other nearby water bodies by passing waste water to sedimentation tank to be considered as part of the EM plan and Contractor's responsibility. •Stagnation of water should not be allowed at any place near the camp site as a precaution against vector-borne disease. •Provision of STP/septic tank should be provided at site/labour camp for onsite treatment of sewage. •No Solid waste should be discharged into any waterbody	As per format provided in Bid Document.	Contractor	Divisional Office of WRD, PMU, PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
		•Municipal solid waste generated at the camp should be managed as per the provisions in the law (Municipal Solid Waste management Rules 2016). •Mobile Bio-toilets should be provided at the worksite.			
Labour management including labour influx	Increased illicit behavior and crime, increased burden on local public services and utilities, the spread of communicable diseases, and GBV/SEA/SH risks	• Ensure labor camps are away from settlement areas; • Ensure that every worker working in the project has been given an orientation on the Worker's Code of Conduct, especially on GBV and SEA, and has signed the code of conduct. • Maintain updated records of workers and their families living in the labor camps • Conduct periodic awareness programs targeted at women laborers and wives / partners / children of male laborers residing in the labor camps and women and children of communities residing close to the work sites for reporting incidents of GBV / SEA • Ensure complaints of GBV / SEA are recorded and addressed with urgency. Ensure that name(s) of complainant(s) are kept in confidence and enable anonymous reporting of complaints. • Activate GBV Grievance Redressal Committee immediately on receipt of any GBV / SEA complaint. Investigate complaint within 7 calendar days of receipt of complaint. Take action on recommendation of the GBV Grievance	Reporting against: Labour Management Procedures Labor related grievances GBV action plan	Contractor with support of PIU and PMTC	PMU

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
		Redressal Committee within 24 hours of submission of the report			
Storage of Material	Impact on Drainage due blocking of drainage channels	The following mitigation measures should be implemented: •Prioritize re-use of excess spoils and materials in the construction works. C&D waste and excavated silt/ soil can be used for the strengthening or raising of canal road / Inspection Road embankment. •The contractor will immediately collect any excess excavated soils for backfilling of borrow pits. •Spoils will be disposed, at site which has been identified as" Fit for Dumping" only after the completion of all mitigation measures suggested by the Environmental Specialist (PMU)/ Environmental Expert (PMTC). •Inspect all the drainage at construction site/construction camp/labor camp/ dumping site etc. and clear all the drainage lines so that no water stagnation/flooding may occur during heavy rainfall.	Fugitive measures Blockage of drainage Blockage of Access and encroachment to private property.	Contractor	Divisional Office of WRD, PMU, PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
Storage of Fuel and Waste Oil	Chances of Contamination of groundwater and surface water	**Water pollution from Fuel and Lubricant** •Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and re-fuelling will be carried out in such a way that spillage of fuels and lubricants does not contaminate the ground. Only fuel pumps will be used for the transfer of fuel during re-fuelling. •Oil interceptors will be provided for vehicle parking, wash down and refueling areas as per the design provided. Hazardous waste, including waste oil, must obtain necessary permits, maintain records, and adhere to the provisions of the Hazardous Wastes (Management and Handling) Rules. These rules are established under the Environment Protection Act of 1986.	Construction of the Oil storage areas Upkeep and Maintenance of the Oil Storage areas Maintain records and returns as per the provisions of the Act.	Contractor	Divisional Office of WRD, PMU, PMTC
Safety of Workmen	Occupational Health and safety of workmen during the construction period	Please Refer Occupational Health and Safety Plan (including Hazard Risk Identification and Assessment) which is elaborated after ESMP Table.			
Protection of Agriculture Land near stud and Embankment	Impact on agricultural land	The contractor makes proper adequate mitigation measures like sprinkling of water and provision of dust screen guard around cultivated crop near stud and embankment. If impacted, adequate compensation as per entitlement matrix will be provided.	Prior to inception of construction activity.	Contractor PMU, PMTC & Divisional Office	Social Specialist PMU / Social Expert PMTC/ Concern division of WRD

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervision
Chance Find	Chance Find of archeological remains[21]	- Stop the construction activities in the area of the chance find; - Notify the Project Environmental Officer and Project Engineer / and the PMU who in turn will notify the responsible Archeological Survey of India / State Department/ Directorate of Archaeology immediately (within 24 hours or less); - Delineate the discovered site or area; - Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the Archeological Survey of India or the State Department/ Directorate of Archeology take over; - Construction work could resume only after permission is given from the responsible Archeological Survey of India or the State Department/ Directorate of Archeology concerning safeguard of the heritage.	Notification of the chance Find	Contractor	- Responsible ASI or the related State Department would oversee protecting and preserving the site before deciding on subsequent appropriate procedures. - Implementation Support for the ASI or the related State Department decision concerning the management of the finding shall be communicated in writing by relevant local authorities

- [21] The Ancient Monuments and Archaeological Sites And Remains Act, 1958 and the Antiquities And Art Treasures Act, 1972 provides a basis for the development of the Chance find procedures.

C. **Operation Stage**

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Implementation and Frequency	Supervision
Maintenance of canal system	Restoration of irrigation potential / control water loss/seepage	Technical maintenance & repairing works of canal, Controlling water supplies	Bihar irrigation Act/ rule	Concerned Division of WRD, All through the year, specially before monsoon	Concerned Division of WRD, WUA
Operation and maintenance of distributory system	Minimize water loss, optimum supply of Irrigation water	Awareness generation of WUA/community, crop planning, Irrigation /water distribution planning, regular collection of water charges, follow up action by implementing agency	Bihar irrigation Act/ rule, WUA operation manual	WUA, During cultivation period, particularly in Ravi, Summer season	Concerned Division of WRD
Community Benefit	Agriculture productivity and yield will be enhanced with the sufficient and timely supply of irrigation water. Thus, the income of the farmers will be augmented. Widening of service road will provide an alternate option to main road to the community for communication. In addition. the proposed construction work will generate employment opportunity to the local people. Canal lining will prevent water logging substamtially. Subsequently with the reduction of flood risk and improvement of agriculture, the value of the land property will increase; community will be attracted for investment and development. As a result, the community will gain socio-economically. WUA along with the concerned division of WRD are jointly responsible for the upkeep of the irrigation system so that they get the benefit sustainably.				

10.3 Institutional Arrangements for ESMP Implementation

Error! Reference source not found. Governance and Overall Institutional Structure of the Project

Steering and Executive Bodies: Constitution of the State Level Steering Committee (SLSC) has been completed and notified. Constitution of District Project Steering Committees (DPSCs) in project districts will be completed and notified before project appraisal.

Implementation Arrangements: The project will be implemented by Water Resources Department (WRD), Department of Agriculture (DoA), and Rural Development Department (RDD) (including MENREGS and JEEViKA), with WRD as the nodal agency.

Project Management Unit (PMU): A functional Project Management Unit (PMU) at WRD is in force to effectively manage and coordinate project activities with the PIUs. The PMU includes experts in various fields engineering, procurement, financial management, environment, social, along with support from the fields of administration, information technology (IT) and Human Resources (HR). The PMU is led by the Chief Engineer, Monitoring and Planning, and supported by the Joint Director, Flood Management Improvement Support Centre (FMSIC) & Project Management Advisor (PMA), assisted by a team of Government Officers, deputed full time as per the Bank's recommendations. However, PMTC (discussed below) procurement will further strengthen the core team to provide technical backstopping to advance overall project preparation and implementation. WRD has appointed a full-time Public Relations Officer for communication with the public; Finance officer for financial management; and Project Implementation Specialist and team to start preparing the Project Operations Manual (POM).

Dedicated Environment Specialist (ES) and Social Specialist (SS) of PMU will be responsible for the technical guidance to all PIU, and Work Division / district level specialists in the projects so that the principle and processes, agreed in the ESMF is implemented. ES and SS would also be responsible for providing input on the environmental and social safeguards and the larger sustainability principles of the ESF.

Project Implementation Units (PIUs): The project activities will be implemented through PIUs at the district/field level within WRD, DoA, and RDD. While WRD has advanced in preparing project activities to meet DEA readiness requirements, DoA and RDD PIUs have appointed nodal officers and teams to carve out the project activities. The Bank team prepared scope papers and circulated the same for discussions during the mission both with the DoA and RDD.

Project Management Technical Consultant (PMTC): The technical support for implementation of project activities that are beyond skill-set of WRD, will be brought in by the PMTC, with a team of experts/consultants, headed by the Team Leader (TL). PMTC will provide support on verification of the achievement of PBCs to inform the results achieved. The PMTC will have one experienced Environmental specialist and one Social Safeguard specialist at PMU level. The environmental and social safeguard experts of the PMTC will assist PMU in updating/modifying ESIA (including ESMP) and preparing contract package specific ESMP and its inclusion in bid document. These safeguard experts of PMTC will assist PMU in implementing and monitoring environmental and social mitigation measures as per contract package specific ESMP and E&S Monitoring Plan. Safeguard specialist together will also assist PMU in preparing semi-annual safeguards monitoring reports as required by the World Bank.

Roles and Responsibilities

The roles and responsibilities of the different staff members are presented in the section below:

Project Director: The Project Director / Deputy Project Director is responsible for the overall implementation of the ESMF and ESMP. They would be supported by the SPMU and DPMU teams. The key responsibilities include:

- Oversight of the ESMF and ESMP process
- Ensure staffing as per the Implementation arrangement agree
- Review of the finding of the Internal and External Auditing
- Reporting to all stakeholders, including the World Bank

Project Management Advisor: The Project Management Advisor will work within the Project Director's Office and provided assistance in implementation, reporting and documentation of BWSIMP. The main tasks will include but not limited to the following:-

- To assist the Project Director in ensuring delivery of projects in line with the project objectives.
- Develop regular plans with PIUs for the project activities.
- Oversee day-to-day operations including implementation of ESMP.
- Responsible for the day-to-day coordination of activities with Project Implementation Units (PIUs) and Divisional and Districts offices.
- Act as focal point to monitor progress, identify bottle necks and report to the Project Director to take corrective actions for smooth implementation of the project activities.
- Ensure preparation of periodic (monthly, quarterly, and annual) reports and document good practices and lessons learnt for dissemination within the PIU for the WB etc.
- Ensure documentation of project progress and inform Project Director on a regular basis Environment Specialist

Environment Specialist at SPMU: The Environmental Officer at the PMU level will look after environmental issues in line with the ESMF. The Key responsibilities:

- Guide the PMU and PIU on the process of Implementation of the ESMF and ESMP
- Guide the project team on the integration of environmental aspects in the project over the project cycle
- Undertake screening of projects,
- Oversee the process and finalise the Environmental Assessment of the different sub-projects.
- Verification of the adequacy of the E&S Assessment and the EMP measures for each scheme
- Review the bidding documents and work order to ensure specific environmental measures mentioned in the EMP are integrated into the bid document and work order.
- Preparation and implementation of the specific management plans e.g. Dolphin Management Plan
- Guide the PMU and PIU to monitor the works of the Contractor and other agencies involved
- Undertake Capacity Building of the team at PMU, PIU, and district-level Environmental Officer.

- Guide the District-Level Environmental and Social officers
- Carry out the Reporting for the Implementation of the ESMF.
- Coordinate with the social specialist to collate the Environmental and Social Monitoring findings and present it to the Project Director.
- Coordinate the development of the Corrective Action Plan with the support of the Social Specialist (Social, Gender and Tribal issues)
- Disclosure of the information: ESMF (including SEP and LMP), RPF, ESCP, ESIA, Corrective action plan prepared during project implementation (English), Semi-annual Environmental Monitoring Reports (English))
- Preparation of the Report for the World Bank

Social Specialist: The Social Specialist at the PMU in addition to the roles will be responsible person to:

- Guide the overall process related to social and gender aspects.
- Provide guidance to the PMU and PIU to plan, execute and monitor the social / gender components
- Undertake screening of subprojects for social aspects
- Oversee and Finalize the Social Assessment and Resettlement Action Plan of different subprojects and ensure inclusivity with a gender perspective
- Oversee the execution of the planned activities and realization of the social / gender inclusion parameters.
- Undertake Capacity Building of the team on the Gender and implementation of the social aspects.
- Guide the PMU and PIU in ensuring the effective involvement of Women in the functioning of WUA
- Carry out the Internal Monitoring and Auditing for the Implementation of the ESMF
- Support the District Level teams for effective implementation of the plans for social inclusion.
- Coordinate with the Environment Specialist on the Disclosure of the documents
- Reporting of the Social and gender aspect to the Bank.

Project Team at PMU

The Project Team at the PMU will be responsible for:

- Coordinate with the Environmental and Social Specialist and the Divisions/ district team to upstream the finding so the finding of the E&S Screening into the design
- Authentication of the E&S Assessment and the EMP measures for each scheme
- Ensure that the environment and social safeguard measures are included in the Tender Document
- Coordinate with the Contractor and ensure the ESMP measures are implemented during the construction by the Contractor
- Coordinate with the Environment and Social expert to collate the Environmental and Social Monitoring findings and work with the Division to address tem.

Divisional Engineer at WRD

The Divisional Engineer is responsible for the overall implementation of the ESMF and ESMP through the District Project Steering Coordination. The team at the PMU would support him at

the in these aspects. They would extend all possible technical assistance in this regard. The Key responsibility would include the following:

- Oversight of the ESMF and ESMP process in the district
- Ensure adequate staffing and capacity as per the Implementation arrangement are present
- Ensure that the Contractor implements the EMP provisions
- Review of the finding of the Internal and External Auditing findings
- Coordinating the development of the Action Plan

Engineering Team at the district.

The Engineering Team at the district, would be responsible for, preparation of DPR, tendering process, and construction of the irrigation structures. Thus, they would be responsible for

- Authenticate the Screening Questionnaire being prepared at beginning of the DPR preparation
- Authenticate the Scoping questionnaire prepared by the E&S Officer
- Carry out socio-economic surveys and help the E&S officer in carrying out Social Impact Assessment
- Authentication of the E&S Assessment and the EMP measures for each scheme
- Include the environment and social safeguard measures are included in the Tender Document
- Coordinate with the Contractor and ensure the ESMP measures are implemented during the construction by the Contractor
- Help the Environment and Social Specialist to collate the Environmental and Social Monitoring findings and present them to the Divisional Engineer.
- Coordinate the development of the Corrective Action Plan with the support of the Social Specialist (Social, Gender and Tribal issues), Environment Specialist (construction related EMP).

E&S Officer at WRD

The Environmental & Social (E&S) Officer at the District level will look after the environmental and social issues, in line with the ESMF. The Key responsibilities:

- Guide the District team on the Implementation of the ESMF
- Guide the engineering teams in the integration of environmental and social aspects in the planning, designing and implementation
- With the assistance of the rest of the team, prepare the E&S Assessment and the EMP measures for each scheme
- Effectively plan the activities to include social / gender inclusion parameters.
- Support in building environmental parameters in the bidding documents.
- Guide the District team to monitor the implementation of the EMP by the Contractor
- Undertake Capacity Building of the team at the district.
- Carry out the Internal Monitoring and Auditing for the Implementation of the ESMF
- Collate the Environmental and Social Monitoring findings and present them to the Division and also E&S Cell.
- Coordinate the development of the Corrective Action Plan
- Support in the preparation of the Report for the World Bank

Contractor

The Contractor will also have a E&S Specialist at site to oversee the implementation of the ESMF. In addition, since there would be considerable occupational health safety risk in these construction

To ensure that the EMP is implemented in letter and spirit a penalty for non-conformance has been developed and provide in the ESMF. The penalty is used as a deterrent and does not reflect in anyway the cost of remediation or mitigation of the impact / damage/ loss. The penalties / levies/ compensation as may be fixed by the regulatory authorities are over and above this penalty. The penalty is irrevocable and will be forfeited once the sum is deducted from bill of the contractor. The Contractual remedies as applicable in the contract are also available to the contractor in case of penalties for non-implementation of the EMP.

Note: In case of non-compliance of ES requirements, an additional 1% will be retained from each bill and the contractor will be required to comply with the ES requirements within the next two billing cycles. However, if any identified non-compliance is not addressed in the next two billing cycles, then the retained amount will be forfeited. If such incidences of forfeiture due to ES non-compliance happen more than 5 times during the contract period, the contract will be terminated, and the ES performance security (ES – Bank Guarantee) will be encashed.

10.4 Environmental Monitoring Plan

Environmental Monitoring Programme is to ensure that the intended environmental protection goals are achieved and result in desired benefits of the project. The same will be included in tender / bid document. The broad objectives of the environment monitoring program are:

- To monitor impacts on the surrounding environment and the effectiveness of mitigation measures during the construction and operation phase.
- To ensure that the environmental control systems, installed are effective.
- Comply to the provisions of relevant environmental regulations.

The key environmental elements to be monitoried are:

- **Air quality monitoring** with respect to PM10, PM2.5, NOx, SO2 and CO at selected locations to assess the impact.
- **Water quality** with reference to DO, BOD, COD, suspended solids, turbidity, alkalinity, oil and grease at selected water bodies to ensure maintenance of BDU criteria.
- Noise level at settlements zone, Sensitive zones

The parameters to be monitor, frequency of monitoring, number of samples, locations and responsibility of monitoring is given in

Table **2**

Table 10.2: Environmental and Social monitoring during the different activities

S. No.	Aspects	Parameters to be Monitored	Frequency of Monitoring	No. of Samples	Location	Responsibility
1.	Ground water quality	Drinking water parameters specified in IS:10500-2012	*Construction stage*: Quarterly	1 location from contractor's camp	Contractor Camp	Contractor
			Operational stage: Quarterly			
2.	Soil quality	N, P, K and Heavy metals (Hg, Pb, Fe, Cu, Zn, Cd)	*Construction stage*: Quarterly	2 locations in each quarter from disposal area	Disposal areas	Contractor
3.	Ambient air quality	PM2.5, PM10, SO2, NOx, CO	*Construction stage*: Quarterly	3 locations in each quarter from settlement	1 location downwind of Contractor Camp (with all plant and machinery running) 2 Locations to be decided based on the area of work	Contractor
4.	Noise quality	Equivalent Noise Level	*Construction stage*: Quarterly	2 locations in each quarter from each jetty area	2 location to be decided based on area of work near receptors.	Contractor
5.	Monitoring of the EMP	As defined in the EMP Matrix	*Construction Stage: Daily*	Daily report to PMU	At Construction Camp , Labour Accommodation and Work areas	Contractor

10.5 Documentation and Record Keeping

The Monitoring of the ESMP Implementation will be carried out through aelectric application or MIS prepared for the purpose. The records of:

- Finding of Monitoring on site
- Corrective Action Plan
- Action Undertaken for Closure of the Observation
- Actions taken to prevent further recurrence of the observations

These will be documented in the electronic format with various levels of accessibility to the different stakeholders involved.

10.6 Environment and Social Monitoring Reports

Effective monitoring and supervision would require regular reporting of the implementation of the E&S aspects to the decision makers. While the Environmental & Social Officers at the District Level and Environmental Specialist and Social Specialists at the PMU and PIU would be operating system the Project Director at PMU and Director/ Nodal Officer at PIU should also be aware of the concerns which are being highlighted.

The Monitoring of the ESMP Implementation will be carried out through an electric application or MIS prepared for the purpose. The records of:

- Finding of Monitoring on site
- Corrective Action Plan
- Action Undertaken for Closure of the Observation
- Actions taken to prevent further recurrence of the observations

These will be documented in the electronic format with various levels of accessibility to the different stakeholders involved. The E&S measures outlined in the ESMP will be documented and reported to the PMU in the form of monthly E&S Progress Reports, that will also be shared with the World Bank for review and feedback. All corrective actions proposed by the PMU and the World Bank will be undertaken and reported in the subsequent progress reports.

10.7 Capacity Building and Training

The training programs will include an orientation on the project concept and components for all project stakeholders, trainings on participatory water governance and on improved agricultural productivity, farming system resilience and improved food security for greater climate resilience targeting the community institutions and farmers to ensure inclusive planning and their active participation in implementation, apart from overall awareness and training on the ESMF of the project to be able to fully manage the E&S risks under the project. Several capacity building approaches will be adopted by BWSIMP for improving the E&S performance, including institutional strengthening of classroom trainings, exposure visits, farmers/ WUA workshops, participatory planning exercises, village / community meetings as well as group discussions with targeted stakeholders.

The capacity building support proposed to be provided to various project stakeholders will include, but not limited to the following E&S related key areas/ topics:

- Overall Orientation on the Project objectives and activities

- Training of the key staff of PMU, PMTC and PIM Cells on the World Bank ESF, the project ESMF and the E&S requirements for the project and their role in ESMP implementation.
- Orientation trainings of officials of WRD and other participating departments in the project districts on the ESMF, ESMP, the E&S documents prepared and their implementation responsibilities
- Training of implementing agencies on Monitoring and reporting responsibilities
- Trainings of field staff and contractor personnel on fair working conditions for workers, including Occupational Health and Safety related risk management and incident reporting.

The capacity building for ESMP implementation will have the following elements:

The stakeholder-wise and phase-wise key topics and issues to be taken up as part of capacity building support under BWSIMP are presented in the table 10.3 below:

Table 10.3: E&S Capacity Development Plan

Project Phase	Topics	Duration	Type / Responsibility/ Periodicity	Participant Category
Pre-planning	• Orientation on the program & its social objectives • Roles & responsibilities • National and State Environmental Acts/ legislations • World Bank's ESF and the project ESMF • Implementation, Monitoring and Supervision Mechanism	2 days	• Sensitization training	• PMU • PIU
Planning & Implementation	• Salient Features of ESMP • Identification of Environmental and social issues • Addressing environmental and social impacts • Resettlement and rehabilitation of PAPs and the role of each agency involved • Stakeholder engagement activities to be undertaken during the planning and implementation phase • ESMP monitoring mechanism	2 days	District/ Division wise Workshop quarterly	District / Divisional PIU staff

	• Roles and Responsibilities of different Stakeholders • Reporting format / tool			
	• Statutory compliance procedure • E&S risk management responsibilities • Management of Labour camp • Safety and security of workers • Responsibility towards local Community • GRM of project • GRM for any incident of SEA/SH • Reporting / Documentation	2 days	• Training by PMI staff - Quarterly • Training by Environmental Specialist and the Social Specialist – Quarterly • Monthly review meeting with PIU	Contractors
	• Personal Safety and Security; use of PPE • Mock drill on fire fighting • Personal Responsibility in Work Area cleanliness & Hygienic Practices, sanitation • Training on first- aid facilities • Reporting of accident/ incidents • Respecting culture of local community and migrant labour • ESMP Implementation & EHS • GRM and SEA/SH incident response	Bi monthly	• On-Site Training by PIU & Contractors • Periodic Review and Orientation by PIU & Contractors	Workers
Implementation	Outcomes of Audit and corrective measures	1 day	Refresher Training District wise	PMU staff, District / Divisional PIU staff
	Good Practices and Learning on Environment and Social Management	1 day	Once in every year centrally	PMU, PIU, Contractors

10.8 Indicative Budget for ESMP

Sl. No.	Budget Head	Budget Sub Head	Subhead Description	Total Amount - INR

1	**TRAINING & CAPACITY BUILDING**			
1.2	Training of Division/ District workers	Orientation of ESMF and ESMP	2 official @1 divisions	3900
1.3	Training of Contractor Staff	Orientation of ESMF and ESMP	1 Division Officer	880
1.4	Refresher Training	Refresher Training - every year for 3 years	2 official @1 divisions 3 years	10500
1.5	Specialized Training	i. OHS Training by National Safety Council	1 Division @2 years	9067
		ii. GBV, SEA/SH Workshop	2 from division	**35583**
	Sub Total A			**35583**
2				
2.1	GRM	i. Helpline		55000
		ii. Boards/ Poster		100000
		iii. Dashboard	1board @500m i.e. 80 boards (approx.) @5000/-	325000
2.2	GBV , SEA/SH Program	i. GBV		221429
		ii. SEA/SH		221429
		iii. IEC material for WRD, DoA , RD		20000
2.3	Stakeholder Engagement			
	i. Public Consultation and Disclosure	Consultation and Disclosure of ESIA	Public Consultation meeting for the	150000
	ii. Community Health Safety	Campaign	Poster & Brochures	70000
	Sub Total B			**1162857**
	Total			**1198440**
	Contingency			59922
	Grand Total			**1258362**

Annexure

Annexure I: Ministry of Environment and Forest letter regarding Environmental Clearance

BY SPEED POST

No. J-12011/14/09-IA.I
Government of India
Ministry of Environment and Forests

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi –110 003
Telefax: 2436 2827

Dated:26.3.2009

Shri G. Thakur
Director (PA-N)
Central Water Commission
Project Appraisal (North) Dte.
407 (S), Seva Bhavan
R.K. Puram
New Delhi

Subject: Western Kosi Canal project in Darbhanga District, Bihar – Environmental Clearance regarding.

Sir,

This has reference to your Memo No.585 dated 7.3.2009 on the above mentioned subject. It has been noted that the construction of Western Kosi Canal has started in 1971. The main canal has been constructed completely and branch canals are almost complete. Balance work involve plugging of some gaps in branch canals and construction of distribution system.

2. The Environmental Clearance became a statutory requirement since 27.1.1994 for major irrigation projects. Under the provisions of EIA Notification, 1994 & 2006 environmental clearance can be issued only for new projects. The above mentioned project is an ongoing project and was started before 27.1.1994. As such does not attract the provisions of EIA Notification, 1994/ 2006.

Yours faithfully,

(Dr. S. Bhowmik)
Additional Director

Annexure- II

Guidelines to Contractor for Labour Camp

1. Introduction

The scope of this guideline pertains to the sitting, development, management and restoration of construction and labour camps to avoid or mitigate impacts on the environment. The area requirement for the construction camp shall depend upon the number of labour employed (approx. 150/per camp, where 10-30 Skilled migrant labours) and the extent of machinery deployed. Durig construction period contractor used more than 90% unskilled local labours. The following sections describe the siting, construction, maintenance, provision of facilities in the camps and finally rehabilitation of the construction and labour camps. These are described in three stages i.e., pre-construction, construction and post-construction stage.

2. Pre-construction stage

Identification of sites for construction and labour camps is the first task. The Contractor shall identify the site for construction camp in consultation with the individual owners in case of private lands and the concerned department in case of Government lands. The suitable sites shall be selected and finalized in consultation with the Engineer-in-charge. **Table B** gives the lands that could be avoided for construction camps and conversely those that could be preferred.

The contractor will work out with the landowner/concerned department on the arrangements of setting up his facilities for the construction period. These arrangements shall be in the form of written agreement between the contractor and the landowner (private/government) that would specify:

a) Photograph of the proposed campsite in original condition;
b) Agreement of land document acquired for labour camp and compensation amount for the use of specific land for mentioned timeframe.
c) Activities to be carried out on the site;
d) Environmental mitigation measures to be undertaken to prevent land, air, water and noise pollution;
e) Detailed layout plan for development of the construction and labour camp that shall indicate the various structures to be constructed in the camp including temporary drainage and other facilities; and
f) Restoration plan of campsite i.e. to bring the site to the previous campsite conditions.

The arrangements will be verified by the Engineer-in-charge to enable redressal of grievances at a later stage of the project.

Selection Criteria for Camp site

Avoid the following	**Prefer the following**
▪ Lands close to habitations ▪ Irrigated agricultural lands. ▪ Lands belonging to small farmers. ▪ Lands under village forests. Lands within 100 m of community water bodies and water sources as rivers. ▪ Lands within 100 m of watercourses. ▪ Low-lying lands. ▪ Lands supporting dense vegetation. ▪ Grazing lands and lands with tenure rights. ▪ Lands where there is no willingness of the landowner to permit its use.	▪ Wastelands. ▪ Waste Lands belonging to owners who look upon the temporary use as a source of income. ▪ Community lands or government land not used for beneficial purposes. ▪ Private non-irrigated lands where the owner is willing. ▪ Lands with an existing access road.

2.1 Setting Up of Labour Camp

The contractor shall provide free of cost in the campsite, temporary living accommodation to all the migrant workers employed by him until completion of construction/maintenance work that is in

progress. Estimated number of labours at one Labour camp is 150 persons (50 Skilled & 100 unskilled Labours) where more than 90% unskilled labours will be local labours.

- The Contractor agency will setup their camping locations at different places as would be identified.
- Each labour camp may house 20-30 skilled migrated labour.
- These camps should be located away from the existing village or semi-urban households to prevent likely social conflicts.
- Necessary permissions may be obtained from the respective revenue/municipal authorities.
- Temporary house structures should be provided by the contractor agencies to accommodate the labour and their families, with provision of minimum infrastructure facilities, like water supply, sanitation etc.
- A minimum area of 6 m^2 per person shall be provided.
- The rooms of labourers shall be well lighted and ventilated.

The facilities to provide for the labour discussed below:

a) Drinking-Water

Towards the provision and storage of drinking water at the construction camp, the contractor shall ensure the following.

- The contractor shall provide for a continuous and sufficient supply of potable water in the camps, in earthen pots or any other suitable containers.
- If any water storage tank is provided, the bottom of the tank will be kept at least 1 m above the surrounding ground level.
- The contractor shall identify suitable community water sources for drinking. Only in the event of non-availability of other sources of potable water, the Contractor shall obtain water from an unprotected source only after the testing for its portability. Where water has to be drawn from an existing open well, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with dustproof trap door.
- Every water supply or storage shall be at a distance of not less than 15 m from any wastewater/sewage drain or another source of pollution. Water sources within 15 m proximity of toilet, drain or any source of pollution will not be used as a source of drinking water in the project.
- A pump shall be fitted to cover the well used as drinking water source; the trap door shall be kept locked and opened only for cleaning or inspection, which shall be done at least once a month.
- Else, a new well can be constructed and a pump will be fitted to the well for drinking water purposes of the labour at the camp.

b) Washing and Bathing Facilities

On every site, adequate and suitable facilities for washing clothes and utensils shall be provided and maintained for the use of labourers employed therein. Separate and adequate bathing shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic conditions.

c) Toilets Facilities

Each labour camp should be provided with community toilets with septic tanks and soak pit arrangement or even bio-toilets could be better. Sanitary arrangements, latrines and urinals shall be provided in every workplace separately for male and female workers. The arrangements shall include:

- A latrine for every 25 labour or part thereof.
- Every latrine shall be undercover and partitioned so as to secure privacy and shall have a proper door and fastenings.
- Where workers of both sexes are employed, there shall be a display board of “For Men Only” or “For Women Only” outside each block of latrine and urinal in the language understood by the majority of the workers.

- The latrines and urinals shall be adequately lighted and shall be maintained in a clean sanitary condition at all times and should have a proper drainage system.
- Water shall be provided in or near the latrines and urinals in suitable containers.

d) Supply of Fuel

- These labour forces may adopt unscrupulous methods of cutting trees and bushes for meeting their fuelwood requirement, which would destroy the adjacent green cover and affect the local ecology.
- The project authorities would ensure supply of free fuel to these labours through the contract agencies to prevent such unscrupulous activities.
- Arrangement may be made with the local Civil Supply Authorities for Supply of kerosene oil at a fixed quota.
- Use of LPG gas cylinders should be provided.

The contract specification should include these fuel supplies free of cost to the labour force within the bid value of relevant contract items.

e) Waste Disposal

- Disposal of sanitary wastes and excreta shall be into septic tanks. If bio-toilets will be used the excreta could be converted to manure.
- Kitchen wastewater shall be disposed into soak pits/kitchen sump located preferably at least 15 m from any water body. Sump capacity should be at least 1.3 times the maximum volume of wastewater discharged per day. The bottom of the pit should be filled with coarse gravel and the sides shored up with board, etc. to prevent erosion and collapse of the pit. New soak pits shall be made ready as soon as the earlier one is filled.
- Solid wastes generated in the kitchen shall be reused if recyclable or disposed of in landfill sites.

- Provide segregated garbage bins in the camps and ensure that these are regularly emptied and disposed of hygienically as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of Project Authority.
- The camping area should be periodically sprayed with Bleaching powder and other disinfectants.

f) Medical and First Aid Facilities

Medical facilities shall be provided to the labour at the construction camp. Visits of doctors shall be arranged twice a month wherein routine checkups would be conducted for every person in the camp including children. A separate room for medical checkups and keeping of first aid facilities should be built. The site medical room should display awareness posters on safety facilitation hygiene and HIV/AIDS/COVID-19 awareness.

First Aid Box will be provided at every construction campsite and under the charge of a responsible person who shall always be readily available during working hours. He shall be adequately trained in administering first aid treatment. Formal arrangements shall be prescribed to carry injured persons or persons suddenly taken ill to the nearest hospital.

The first aid box shall contain the following.

- Six small-sterilized dressings.
- Three medium sizes sterilized dressings.
- Three large sizes sterilized dressings.
- Three large sterilized burns dressings.
- One (30 ml) bottle containing 2 % alcoholic solution of iodine.
- One (30 ml) bottle containing Sal volatile.
- One snakebite lancet.
- One (30g) bottle of potassium permanganate crystals.
- One pair of scissors.
- Ointment for burns.
- A bottle of suitable surgical antiseptic solution.

In case, the number of labours exceeds 50, the items in the first aid box shall be doubled. The contracting agency should arrange to carry out the following anti-malarial measures.

- Supply of mosquito nets.
- Supply of mosquito repellents to the labour.
- Periodic cleaning of the area to destroy stagnant water pockets as well as spraying of disinfectants through health workers.
- Supply of preventative medicines to all labour force-free of cost.
- Ensure imparting free treatment to the affected people through local health centers.

g) Provision of Shelter during Rest

The workplace shall provide four suitable sheds, two for meals and two for rest (separately for men and women). The height of the shelter shall not be less than 3 m from the floor level to the lowest part of the roof. These shall be kept clean.

2.2 Fire Fighting Arrangement

The following precautions need to be taken:

- Demarcation of area susceptible to fires with cautionary signage;
- Portable fire extinguishers and/or sand baskets shall be provided at easily accessible locations
- In the event of fire, Contractor shall educate the workers on usage of this equipment.

2.3 Interactions with Host Communities

To ensure that there is no conflict of the migrant labour with the host communities, the contractor shall issue identity cards to labour and residents of construction camps. A specified code of conduct to be implemented and awareness programe for the labours should also be conducted.

3. Construction stage

Construction camps shall be maintained free from litter and in hygienic conditions. It should be kept free from spillage of oil, grease or bitumen. Any spillage should be cleaned immediately to avoid pollution of soil, water stored or adjacent water bodies.

The following precautions need to be taken in construction camps.

- Measures to ensure that no leaching of oil and grease into water bodies or underground water takes place.
- Wastewater should not be disposed into water bodies.
- Regular collection of solid wastes should be undertaken and should be disposed of safely.
- All consumables as the first aid equipment, cleaning equipment for maintaining hygiene and sanitation should be recouped immediately.
- The debris/scrap generated during construction of campsite should be kept in a designated and barricaded area.

The Engineer-in-charge will monitor the cleanliness of construction campsites and ensure that the sites are properly maintained throughout the contract.

4. Post construction stage

After construction, all construction camp facilities shall be dismantled and removed from the site. The site shall be restored to a condition in no way inferior to the condition prior to commencement of the works. Various activities to be carried out for site rehabilitation include:

- Oil and fuel contaminated soil shall be removed and transported and buried in waste disposal areas.
- Soak pits, septic tanks shall be covered and effectively sealed off.
- Debris (rejected material) should be disposed of suitably.
- Ramps created should be leveled.
- Underground water tanks in a barren/non-agricultural land can be covered. However, in agricultural land, the tank shall be removed.
- If the construction campsite is on agricultural land, topsoil can be spread to aid faster rejuvenation.

- Proper documentation of rehabilitation site is necessary. This shall include the following:
- Photograph of rehabilitated site;
- Landowner consent letter for satisfaction in measures taken for rehabilitation of site;
- Confirmation regarding receipt of the entire financial lease amount for the use of land.
- Undertaking from contractor; and Certification from Engineer-in-charge.

In cases, where the construction campsite is located on a private landholding, the contractor would still have to restore the campsite as per this guideline. In addition, he would have to obtain a certificate for satisfaction from the landowner.

Annexure- III
OHS Risk in Different Activities

A generic Hazard Risk Identification and Assessment (HIRA) was carried out for the activities for BWSIMP Project for two major civil works and the sub-activities:

- Renovation and modification of the Irrigation system
- Strengthening and Raising of Embankment

The HIRA does not include the works to be carried out in dams. This would be included as part of the Dam Safety Plan being carried out separately under the program.

The steps undertaken for developing the generic HIRA is based on the typical activities which are undertaken during the construction activities. This HIRA is carried out to develop an understanding of the precautions which need to be planned during the construction. The Proposed Actions are generic in nature. During the Pre-Construction stage the Contractor would prepare a Work Methodology and OHS Plan. As part of the OHS Plan contractor will carry out the HIRA as per the Work Methodology. The Control Action in the HIRA submitted with the Work Methodology will supplement the actions proposed in this Generic HIRA. The present risk identification also does not present the roles and responsibilities for implementation, the control points for monitoring implementation. These will also be included in the HIRA submitted by the Contractor in the OHS Plan developed as part of the method statement. Steps of the generic HIRA review is summarized as follows:

- Classify work/assessment units or work activities during construction phase (based on generic understanding of works to be carried out).
- Identify the hazards associated with work activities.
- List out the Consequence of the hazard involved in the activity.
- List out controls (preventive and recovery).

SR. NO	SUB-ACTIVITY	ROUTINE ACTIVITY	POTENTIAL HAZARD	CONSEQUENCE	PROPOSED CONTROL
	A. TRANSPORTATION OF WORKERS				
1	Transportation of workers	R	1. Accidents	1. Fatality / severe injury due to accident	1. Use only vehicle authorized by RTO for transport of workers 2. Use Tractors, tractor trolley Excavator, dumpers for the transport of workers is strictly prohibited and lead to contractual consequences. 3. Passenger vehicle used for transporting workers should have seat belts as mandated by law. The driver should ensure that the all passengers use seatbelt at all times.
	B. SURVEY AND PREPARATION				
2	Surveying	R	Presence of poisonous reptiles/insects/snakes	Loss of consciousness / heart attack / fatal	1. Ensuring proper supervisor & using safety stick (wooden) 2. Ensuring use of appropriate PPE's (high ankle safety shoes) & avoiding loose clothing 3. Ensure proper housekeeping/ use of protective tools 4. Create awareness among the workforce and staff/ monitoring. 5. Ensure availability of emergency vehicle and contact details/ tie up with local hospitals 6. The Contractor shall make available the first aid kit, snake bite kits and bandages at all times and all the sites.

SR. NO	SUB-ACTIVITY	ROUTINE ACTIVITY	POTENTIAL HAZARD	CONSEQUENCE	PROPOSED CONTROL
3	Surveying	R	Improper Access / working on uneven ground surface;	Slip / trip/ fall may result injury to the personnel.	1. Ensuring general levelling of surface for vehicle movement 2. Deployment of flagman 3. Ensuring barricades to the work location at valley / steep access / ramps are existing. 4. Ensure proper access to work locations
4	Surveying	R	Working near to the moving vehicles / construction vehicles	Hit by the vehicles.	1. Ensuring competent driver. 2. Displaying sign boards / caution boards. 3. Providing training / awareness & close monitoring 4. Using high visibility clothing. 5. Provide rigid barricades for defining the vehicle movement & pedestrian walkways separately
5	Surveying	R	Presence of live electrical cables near survey work.	Cardiac arrest / burns due to electric shock.	1. Using Insulated tools and keeping minimum distance of 3 meters. 2. Using rubber gloves. 3. Tie-up with local hospitals. 4. Providing Tool Box Talks (explaining HIRA) to the workforce before start of work. 5. Use wooden / fibre levelling staffs wherever electrical lines are existing. 6. Ensure emergency vehicle availability till the completion of job
6	Surveying	R	Working in extreme climatic conditions	1. Sun stroke due to de-hydration. 2. Injuries / fell in sick due to adverse weather.	1. Ensure availability of drinking water 2. Provide temporary rest sheds 3. Avoiding the work during extreme climatic conditions e.g. Excessive cold/hot.
7	Surveying	R	Manual handling of survey instruments while shifting manually.	Hit by the survey instruments while shifting manually and may receive injury.	1. Ensuring supervision for safe execution of work. 2. Creating awareness on manual material handling by imparting training before start of work. 3. Using appropriate PPE in the form of safety shoes & hand gloves.
C. CLEARING AND GRUBBING					
8	Removal / cleaning of Surface encumbrances i.e. Electrical lines, trees, heap of soil, existing structure, existing roads and other encumberances	R	1. Work near to the moving Vehicles / equipment. 2. Manual cutting & material handling 3. Fall from height 4. Electrocution while using power tools 5. Presence of overhead services /	1. Fatality / severe injury due to hit by the moving vehicles / equipment. 2. Fall from height and may result into multiple njuries / fatality. 3. Cut injuries while doing manual material handling. 4. Shifting / pulling / pushing. 5. Electrical	1. Barricading the work area(Hard/ soft as is decided by the Safety Officer) 2. Engaging the competent operators. 3. Taking approval from relevant authorities and ensure Permit to Work. 4. Imparting the Tool Box Talks (explaining the HIRA) before start of work. Recording the messages delivered at the Tool Box Talk 5. Avoiding the manual material handling as much as possible and introducing mechanical material handling for the removal of surface encumbrances. 6. Engage competent / experienced personnel for handling /operating hand tools / power tools during tree cutting.

SR. NO	SUB-ACTIVITY	ROUTINE ACTIVITY	POTENTIAL HAZARD	CONSEQUENCE	PROPOSED CONTROL
			utilities; 6. Use of sharp hand tools.	urn/fatality	
9	Surface levelling (general Cutting /filling)	R	1. Work near to the moving Vehicles / equipment. 2. Topple of vehicle due to uneven ground surface. 3. Presence of overhead / underground utilities.	1. Fatal / severe injury due to hit by the moving vehicles / equipment.	1. Barricading the vehicle movement area and define pedestrian movement area separately. 2. Ensuring that vehicle movement area is levelled and well compacted. 3. Prior information to the concern departments of utility services and ensure de-energize / isolation of source. 4. Administrative control measures are to be developed for vehicle fitness and engagement of competent operators.
D. EXCAVATION					
10	Cutting / digging the soil mechanically (Pit Excavation up to 3.0 M)		1. Earth Collapse 2. Presence of buried electric cables 3. Presence of overhead electrical cables 4. Movement / working of equipment in steep access / egress / valley conditions.	1. Toppling of equipment due to earth collapse and personnel may receive severe injury / fatal.	1. Screening of workforce before induction training 2. Medical examination as per Legal Requirement 3. Safety Induction; Issue of ID Card 4. Imparting daily Tool Box Talks (explaining HIRA) 5. Use of PPE (Both Mandatory and work related) 6. Behavioural Safety Training 7. If any unsafe act found then - council them & if done knowingly. 8. Motivate them by suitably rewarding them. 9. Do not allow any unauthorized to person to enter the pit 10. Awareness towards safety by displaying safety postures & slogan. 11. Relocating/ removing the overhead electrical lines. 12. Deploying competent operators for equipment use / operation. 13. Maintain the slope as per the types of soil. 14. Develop Site Specific Standard Operating Procedure for "Excavation" and submit it along with Method Statement / Work Plan and implement it through out the project 15. Avoid collapse or soil provide shoring/shuttering /sheet piling.
11	Pit Excavation beyond 3.0m (*During excavation / cutting*)	R	*Same as above plus* 1. Flooding due to	Injury / fatal due to: 1. Drowning 2. Building / Structure collapse due to	1. In addition to the above mentioned in 1.10 follow 2. Preventing ingress of water by providing temporary bunds / diverting the catchment water. 3. Obtaining prior approval of excavation method from local authorities; if required / needed.

SR. NO	SUB-ACTIVITY	ROUTINE ACTIVITY	POTENTIAL HAZARD	CONSEQUENCE	PROPOSED CONTROL
			excessive rain / underground water 2. Digging in the vicinity of existing Building / Structure 3. Movement of vehicles / equipment's close to the edge of cut.	cave- in or slides. 3. Electrocution	4. Relocating / removing the surcharge loads such as buildings / structures from the edge of excavation before mechanical digging / cutting operation. 5. Impart training on Excavation to all operators. 6. Separate entry & exit path for man and machinery must be maintained
12	Working inside deep excavation (*After cutting/excavation*)	R	1. Formation of tension cracks on the edge of excavation 2. Formation of cave-in on the sides of excavation 3. Water seepage 4. Rain-cut 5. Presence of steep access / egress/ ramp 6. Manual shifting of materials / portable equipment 7. Presence of unprotected	Injury / fatal due to: 1. Soil collapse 2. slip/ trip while Manual material handling 3. Fall of person 4. Fall of material 5. Fall of equipment	1. Performing regular inspections as per checklist for tension cracks/cave-ins/dewatering / rain-cut. 2. Continuous de-watering system in case of seepage of water 3. Provide safe access/ egress by providing gentle ramps / standard ladders / modular stairways. 4. Providing Sloping / benching / shoring / sheet piling to restrict the soil collapse as per the type of soil. 5. Avoiding vehicle movement near to the excavation. 6. Providing rigid barricades, signage's & illumination to avoid fall of person inside excavation. 7. Regular Tool Box Talks (explaining HIRA) are being imparted to workforce on daily basis. 8. Checking the oxygen levels & other toxic gases with gas detector. 9. Develop Standard Operating Procedure for "Excavation" & assign duties, responsibilities & authorities to the concern execution team.
13	Heavy Vehicle movement	R	Speed, Hit, slip, trip & fall.	Collision Overturn Topple Fire	Following DOs & DON'Ts as listed below: 1. Don't leave the keys in the cabin. 2. Don't allow any other person / cleaner to drive the vehicle. 3. Don't use Mobile phone while driving the vehicle. 4. Parking of vehicles near the excavated area is strictly prohibited and also not in the access path 5. Minimum of 3 meters' distance to be maintained from the excavation with parking light and display signage. 6. Avoid unnecessary parking. 7. Bank man or helper to deploy. 8. First aid box and fire extinguisher must bekept inside the cabin. 9. Maintenance to be carried out by an experience mechanic. 10. Other than construction vehicles should not take

SR. NO	SUB-ACTIVITY	ROUTINE ACTIVITY	POTENTIAL HAZARD	CONSEQUENCE	PROPOSED CONTROL
					into the work locations. 11. Develop a daily Vehicle Inspection checklist and ensure compliance
14	Removal of Soil	R	Entanglement , & slip or trip	Hit by bucket	1. The radius where the Bucket is operated should be barricaded. 2. Signal man should be made available to guide the operator 3. Ensuring restriction of unauthorized personnel to enter in the excavation area. 4. Ensuring all the personnel must wear reflective jacket. 5. Ensuring by that JCB / excavator operator must aware of the surrounding area. 6. Operator should not use mobile phone or hear music by inserting the head phone in the ear. 7. While swinging / reversing - indication horn should be ON. 8. Develop Daily Equipment Inspection Checklist and ensure compliance 9. Ensure dynamic HIRA precautionary measures are in place
15	Loading / Unloading of soil	R	Workmen close to the moving equipment / machinery.	Physical injury/fatal due to hit by machinery.	1. Engaging trained personnel 2. Engaging a signal person wherever loading / unloading in progress. 3. No personnel should come in the approach / radius of the JCB bucket while loading sand in the truck. 4. Ensure that no personnel should stand in the vicinity of loading activity. 5. Signal man should communicate once the loading has been completed in the truck & he should simultaneously inform the truck driver & JCB operator. 6. Ensure that there must be a clear understanding 7. / communication between operator & signalmen. 8. Not overload the trucks since there is possibility of skidding while travelling on the ramp. 9. Ensuring no personnel movement on ramps whereas trucks are plying on the ramp. 10. Providing signal men, caution boards & barricading.
16	Backfilling, Grading & Dumping	R	Including plying of vehicles on the uneven ground surface/ loose soil.	Injury to personnel / fatal due to toppling of vehicle / equipment / stuck in loose soil.	1. Vehicle movement area must be demarcated. 2. Soil strengthening of vehicle movement area / road being done. 3. Impart Tool Box Talks (explaining HIRA).
E. OPERATION OF BATCHING PLANT					
17	Concreting: Manual / Mechanical Loading or unloading of : a) Raw	R	1. Vehicle Movement. 2. Stack plies of raw	1. Hit by the moving vehicles/ equipment may result fatality / severe injuries.	1. Men and vehicle movement area must be separated, and barricades shall be provided. 2. Deploy competent and trained operators. 3. Avoid manual material handling andinvolve mechanical lading / unloading. 4. Stop the movement of vehicles why manual

SR. NO	SUB-ACTIVITY	ROUTINE ACTIVITY	POTENTIAL HAZARD	CONSEQUENCE	PROPOSED CONTROL
	material at material stack yards of Batching plant/ local concrete plant. b) Mechanical Loading / feeding of cement in silo unit. c) Manual handling of cement bags at cement store		material. 3. Men movement on or near to stack piling area & Men movement near to the equipment. 4. Auto functioning of material. Grabber to feed the material on feeder unit. 5. Men movement or manual material handling near to the conveyor/ rotating parts.	2. Fall from height / hit by the grabber while working on piling area which may result fatality or severe injuries. 3. Injuries due to toppling of vehicles while moving on uneven ground surfaces / heaps. 4. Injuries due to collision of vehicles while working at congested / unsafe areas of Batching plant.	handling in progress. 5. Stack pile separators / retaining structures are designed based on considering all load to withstand the stack piles. 6. Daily HIRA Talk talks are to be imparted to bring the awareness amongst all workforce at batching plant. 7. Signage and caution boards shall be displayed at vehicle movement area. Engage flagmen's to guide the movement of vehicles. 8. Pull card / guarding / covers shall be provided to all rotating parts such as conveyor belts /covers on feeding hoppers. 9. All personnel shall be adhered with appropriate PPE. 10. Heavy /unwanted vehicle movement shall be restricted in and around batching plant. No parking shall be allowed near the vehicle movement area. 11. Ensure dynamic HIRA precautionary measures are in place 12. To ensure safety checklist compliance
			6. Emission of cement particles while feeding the cement. 7. Failure / collapse of stack pile separators / retaining walls / structure due to excessive stack of raw material.	5. Fatality / multiple injuries due to entrapment of body parts in the moving conveyor/rotating parts of batching plant.	1. Use and maintain filters bags at cement hopper to avoid the emission of cement particles. 2. Concern to establish and operate to be obtained from regulatory authorities.

Annexure- IV

Availability of WRD Land in both sides of Canal

S.No.	Chainage, km	Government Land from Centre line of Embankment/Canal	
		Left	Right
1	12.50	27.50 Mtr.	27.50 Mtr.
2	12.60	27.50 Mtr.	27.50 Mtr.
3	12.70	27.50 Mtr.	27.50 Mtr.
4	12.80	27.50 Mtr.	27.50 Mtr.
5	12.90	27.50 Mtr.	27.50 Mtr.
6	13.00	27.50 Mtr.	27.50 Mtr.
7	13.10	27.50 Mtr.	27.50 Mtr.
8	13.20	27.50 Mtr.	27.50 Mtr.
9	13.30	27.50 Mtr.	27.50 Mtr.
10	13.40	27.50 Mtr.	27.50 Mtr.
11	13.50	27.50 Mtr.	27.50 Mtr.
12	13.60	27.50 Mtr.	27.50 Mtr.
13	13.70	27.50 Mtr.	27.50 Mtr.
14	13.80	27.50 Mtr.	27.50 Mtr.
15	13.90	27.50 Mtr.	27.50 Mtr.
16	14.00	27.50 Mtr.	27.50 Mtr.
17	14.10	27.50 Mtr.	27.50 Mtr.
18	14.20	27.50 Mtr.	27.50 Mtr.
19	14.30	27.50 Mtr.	27.50 Mtr.
20	14.40	27.50 Mtr.	27.50 Mtr.
21	14.50	27.50 Mtr.	27.50 Mtr.
22	14.60	27.50 Mtr.	27.50 Mtr.
23	14.70	27.50 Mtr.	27.50 Mtr.
24	14.80	27.50 Mtr.	27.50 Mtr.
25	14.90	27.50 Mtr.	27.50 Mtr.
26	15.00	27.50 Mtr.	27.50 Mtr.
27	15.10	27.50 Mtr.	27.50 Mtr.
28	15.20	27.50 Mtr.	27.50 Mtr.
29	15.30	27.50 Mtr.	27.50 Mtr.
30	15.40	27.50 Mtr.	27.50 Mtr.
31	15.50	27.50 Mtr.	27.50 Mtr.
32	15.60	27.50 Mtr.	27.50 Mtr.
33	15.70	27.50 Mtr.	27.50 Mtr.
34	15.80	27.50 Mtr.	27.50 Mtr.
35	15.90	27.50 Mtr.	27.50 Mtr.
36	16.00	27.50 Mtr.	27.50 Mtr.
37	16.10	27.50 Mtr.	27.50 Mtr.

38	16.20	27.50 Mtr.	27.50 Mtr.
39	16.30	27.50 Mtr.	27.50 Mtr.
40	16.40	27.50 Mtr.	27.50 Mtr.
41	16.50	27.50 Mtr.	27.50 Mtr.
42	16.60	27.50 Mtr.	27.50 Mtr.
43	16.70	27.50 Mtr.	27.50 Mtr.
44	16.80	27.50 Mtr.	27.50 Mtr.
45	16.90	27.50 Mtr.	27.50 Mtr.
46	17.00	27.50 Mtr.	27.50 Mtr.
47	17.10	27.50 Mtr.	27.50 Mtr.
48	17.20	27.50 Mtr.	27.50 Mtr.
49	17.30	27.50 Mtr.	27.50 Mtr.
50	17.40	27.50 Mtr.	27.50 Mtr.
51	17.50	27.50 Mtr.	27.50 Mtr.
52	17.60	27.50 Mtr.	27.50 Mtr.
53	17.70	27.50 Mtr.	27.50 Mtr.
54	17.80	27.50 Mtr.	27.50 Mtr.
55	17.90	27.50 Mtr.	27.50 Mtr.
56	18.00	27.50 Mtr.	27.50 Mtr.
57	18.10	27.50 Mtr.	27.50 Mtr.
58	18.20	27.50 Mtr.	27.50 Mtr.
59	18.30	27.50 Mtr.	27.50 Mtr.
60	18.40	27.50 Mtr.	27.50 Mtr.
61	18.50	27.50 Mtr.	27.50 Mtr.
62	18.60	27.50 Mtr.	27.50 Mtr.
63	18.70	27.50 Mtr.	27.50 Mtr.
64	18.80	27.50 Mtr.	27.50 Mtr.
65	18.90	27.50 Mtr.	27.50 Mtr.
66	19.00	27.50 Mtr.	27.50 Mtr.
67	19.10	27.50 Mtr.	27.50 Mtr.
68	19.20	27.50 Mtr.	27.50 Mtr.
69	19.30	27.50 Mtr.	27.50 Mtr.
70	19.40	27.50 Mtr.	27.50 Mtr.
71	19.50	27.50 Mtr.	27.50 Mtr.
72	19.60	27.50 Mtr.	27.50 Mtr.
73	19.70	27.50 Mtr.	27.50 Mtr.
74	19.80	27.50 Mtr.	27.50 Mtr.
75	19.90	27.50 Mtr.	27.50 Mtr.
76	20.00	27.50 Mtr.	27.50 Mtr.
77	20.10	27.50 Mtr.	27.50 Mtr.
78	20.20	27.50 Mtr.	27.50 Mtr.
79	20.30	27.50 Mtr.	27.50 Mtr.
80	20.40	27.50 Mtr.	27.50 Mtr.
81	20.50	27.50 Mtr.	27.50 Mtr.

82	20.60	27.50 Mtr.	27.50 Mtr.
83	20.70	27.50 Mtr.	27.50 Mtr.
84	20.80	27.50 Mtr.	27.50 Mtr.
85	20.90	27.50 Mtr.	27.50 Mtr.
86	21.00	27.50 Mtr.	27.50 Mtr.
87	21.10	27.50 Mtr.	27.50 Mtr.
88	21.20	27.50 Mtr.	27.50 Mtr.
89	21.30	27.50 Mtr.	27.50 Mtr.
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91	21.50	27.50 Mtr.	27.50 Mtr.
92	21.60	27.50 Mtr.	27.50 Mtr.
93	21.70	27.50 Mtr.	27.50 Mtr.
94	21.80	27.50 Mtr.	27.50 Mtr.
95	21.90	27.50 Mtr.	27.50 Mtr.
96	22.00	27.50 Mtr.	27.50 Mtr.
97	22.10	27.50 Mtr.	27.50 Mtr.
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99	22.30	27.50 Mtr.	27.50 Mtr.
100	22.40	27.50 Mtr.	27.50 Mtr.
101	22.50	27.50 Mtr.	27.50 Mtr.
102	22.60	27.50 Mtr.	27.50 Mtr.
103	22.70	27.50 Mtr.	27.50 Mtr.
104	22.80	27.50 Mtr.	27.50 Mtr.
105	22.90	27.50 Mtr.	27.50 Mtr.
106	23.00	27.50 Mtr.	27.50 Mtr.
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126	25.00	27.50 Mtr.	27.50 Mtr.
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144	26.80	27.50 Mtr.	27.50 Mtr.
145	26.90	27.50 Mtr.	27.50 Mtr.
146	27.00	27.50 Mtr.	27.50 Mtr.
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152	27.60	27.50 Mtr.	27.50 Mtr.
153	27.70	27.50 Mtr.	27.50 Mtr.
154	27.80	27.50 Mtr.	27.50 Mtr.
155	27.90	27.50 Mtr.	27.50 Mtr.
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162	28.60	27.50 Mtr.	27.50 Mtr.
163	28.70	27.50 Mtr.	27.50 Mtr.
164	28.80	27.50 Mtr.	27.50 Mtr.
165	28.90	27.50 Mtr.	27.50 Mtr.
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170	29.40	27.50 Mtr.	27.50 Mtr.
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172	29.60	27.50 Mtr.	27.50 Mtr.
173	29.70	27.50 Mtr.	27.50 Mtr.
174	29.80	27.50 Mtr.	27.50 Mtr.
175	29.90	27.50 Mtr.	27.50 Mtr.
176	30.00	27.50 Mtr.	27.50 Mtr.
177	30.10	27.50 Mtr.	27.50 Mtr.
178	30.20	27.50 Mtr.	27.50 Mtr.
179	30.30	27.50 Mtr.	27.50 Mtr.
180	30.40	27.50 Mtr.	27.50 Mtr.
181	30.50	27.50 Mtr.	27.50 Mtr.
182	30.60	27.50 Mtr.	27.50 Mtr.
183	30.70	27.50 Mtr.	27.50 Mtr.
184	30.80	27.50 Mtr.	27.50 Mtr.
185	30.90	27.50 Mtr.	27.50 Mtr.
186	31.00	27.50 Mtr.	27.50 Mtr.
187	31.10	27.50 Mtr.	27.50 Mtr.
188	31.20	27.50 Mtr.	27.50 Mtr.
189	31.30	27.50 Mtr.	27.50 Mtr.
190	31.40	27.50 Mtr.	27.50 Mtr.
191	31.50	27.50 Mtr.	27.50 Mtr.
192	31.60	27.50 Mtr.	27.50 Mtr.
193	31.70	27.50 Mtr.	27.50 Mtr.
194	31.80	27.50 Mtr.	27.50 Mtr.
195	31.90	27.50 Mtr.	27.50 Mtr.
196	32.00	27.50 Mtr.	27.50 Mtr.
197	32.10	27.50 Mtr.	27.50 Mtr.
198	32.20	27.50 Mtr.	27.50 Mtr.
199	32.30	27.50 Mtr.	27.50 Mtr.
200	32.40	27.50 Mtr.	27.50 Mtr.
201	32.50	27.50 Mtr.	27.50 Mtr.
202	32.60	27.50 Mtr.	27.50 Mtr.
203	32.70	27.50 Mtr.	27.50 Mtr.
204	32.80	27.50 Mtr.	27.50 Mtr.
205	32.90	27.50 Mtr.	27.50 Mtr.
206	33.00	27.50 Mtr.	27.50 Mtr.
207	33.10	27.50 Mtr.	27.50 Mtr.
208	33.20	27.50 Mtr.	27.50 Mtr.
209	33.30	27.50 Mtr.	27.50 Mtr.
210	33.40	27.50 Mtr.	27.50 Mtr.
211	33.50	27.50 Mtr.	27.50 Mtr.
212	33.60	27.50 Mtr.	27.50 Mtr.
213	33.70	27.50 Mtr.	27.50 Mtr.

214	33.80	27.50 Mtr.	27.50 Mtr.
215	33.90	27.50 Mtr.	27.50 Mtr.
216	34.00	27.50 Mtr.	27.50 Mtr.
217	34.10	27.50 Mtr.	27.50 Mtr.
218	34.20	27.50 Mtr.	27.50 Mtr.
219	34.30	27.50 Mtr.	27.50 Mtr.
220	34.40	27.50 Mtr.	27.50 Mtr.
221	34.50	27.50 Mtr.	27.50 Mtr.
222	34.60	27.50 Mtr.	27.50 Mtr.
223	34.70	27.50 Mtr.	27.50 Mtr.
224	34.80	27.50 Mtr.	27.50 Mtr.
225	34.90	27.50 Mtr.	27.50 Mtr.
226	35.00	27.50 Mtr.	27.50 Mtr.
227	35.10	27.50 Mtr.	27.50 Mtr.
228	35.20	27.50 Mtr.	27.50 Mtr.
229	35.30	27.50 Mtr.	27.50 Mtr.
230	35.40	27.50 Mtr.	27.50 Mtr.
231	35.50	27.50 Mtr.	27.50 Mtr.
232	35.60	27.50 Mtr.	27.50 Mtr.
233	35.70	27.50 Mtr.	27.50 Mtr.
234	35.80	27.50 Mtr.	27.50 Mtr.
235	35.90	27.50 Mtr.	27.50 Mtr.
236	36.00	27.50 Mtr.	27.50 Mtr.
237	36.10	27.50 Mtr.	27.50 Mtr.
238	36.20	27.50 Mtr.	27.50 Mtr.
239	36.30	27.50 Mtr.	27.50 Mtr.
240	36.40	27.50 Mtr.	27.50 Mtr.
241	36.50	27.50 Mtr.	27.50 Mtr.
242	36.60	27.50 Mtr.	27.50 Mtr.
243	36.70	27.50 Mtr.	27.50 Mtr.
244	36.80	27.50 Mtr.	27.50 Mtr.
245	36.90	27.50 Mtr.	27.50 Mtr.
246	37.00	27.50 Mtr.	27.50 Mtr.
247	37.10	27.50 Mtr.	27.50 Mtr.
248	37.20	27.50 Mtr.	27.50 Mtr.
249	37.30	27.50 Mtr.	27.50 Mtr.
250	37.40	27.50 Mtr.	27.50 Mtr.
251	37.50	27.50 Mtr.	27.50 Mtr.
252	37.60	27.50 Mtr.	27.50 Mtr.
253	37.70	27.50 Mtr.	27.50 Mtr.
254	37.80	27.50 Mtr.	27.50 Mtr.
255	37.90	27.50 Mtr.	27.50 Mtr.
256	38.00	27.50 Mtr.	27.50 Mtr.
257	38.10	27.50 Mtr.	27.50 Mtr.

258	38.20	27.50 Mtr.	27.50 Mtr.
259	38.30	27.50 Mtr.	27.50 Mtr.
260	38.40	27.50 Mtr.	27.50 Mtr.
261	38.50	27.50 Mtr.	27.50 Mtr.
262	38.60	27.50 Mtr.	27.50 Mtr.
263	38.70	27.50 Mtr.	27.50 Mtr.
264	38.80	27.50 Mtr.	27.50 Mtr.
265	38.90	27.50 Mtr.	27.50 Mtr.
266	39.00	27.50 Mtr.	27.50 Mtr.
267	39.10	27.50 Mtr.	27.50 Mtr.
268	39.20	27.50 Mtr.	27.50 Mtr.
269	39.30	27.50 Mtr.	27.50 Mtr.
270	39.40	27.50 Mtr.	27.50 Mtr.
271	39.50	27.50 Mtr.	27.50 Mtr.
272	39.60	27.50 Mtr.	27.50 Mtr.
273	39.70	27.50 Mtr.	27.50 Mtr.
274	39.80	27.50 Mtr.	27.50 Mtr.
275	39.90	27.50 Mtr.	27.50 Mtr.
276	40.00	27.50 Mtr.	27.50 Mtr.
277	40.10	27.50 Mtr.	27.50 Mtr.
278	40.20	27.50 Mtr.	27.50 Mtr.
279	40.30	27.50 Mtr.	27.50 Mtr.
280	40.40	27.50 Mtr.	27.50 Mtr.
281	40.50	27.50 Mtr.	27.50 Mtr.
282	40.60	27.50 Mtr.	27.50 Mtr.
283	40.70	27.50 Mtr.	27.50 Mtr.
284	40.80	27.50 Mtr.	27.50 Mtr.
285	40.90	27.50 Mtr.	27.50 Mtr.
286	41.00	27.50 Mtr.	27.50 Mtr.
287	41.10	27.50 Mtr.	27.50 Mtr.
288	41.20	27.50 Mtr.	27.50 Mtr.
289	41.30	27.50 Mtr.	27.50 Mtr.
290	41.40	27.50 Mtr.	27.50 Mtr.
291	41.50	27.50 Mtr.	27.50 Mtr.
292	41.60	27.50 Mtr.	27.50 Mtr.
293	41.70	27.50 Mtr.	27.50 Mtr.
294	41.80	27.50 Mtr.	27.50 Mtr.
295	41.90	27.50 Mtr.	27.50 Mtr.
296	42.00	27.50 Mtr.	27.50 Mtr.
297	42.06	27.50 Mtr.	27.50 Mtr.

Annexure V

Gender –Based Violence & Sexual Exploitation Abuse Management

The WB Good Practice Note provides a comprehensive understanding of the nature and kinds of GVB. The GPN establishes an approach for identifying risks of GBV, in particularly sexual exploitation and abuse and sexual harassment, that can emerge in a major infrastructure project with civil works contracts. The GPN has been built up on World Bank experience and good international industry practise, including those of other development partners.

- **GVB in Major Infrastructure Projects**

Large infrastructure projects often involve major civil works that require labour forces and associated goods and services that cannot be fully met by local supply. In such cases, workers are often brought in from outside the project area. Construction workers are predominantly young meals, typically separated from their families on a construction job for extended periods of time. They can therefore act outside their normal spheres of social control, which can lead to spectrum of unacceptable and illicit behaviours, including sexual exploitation and abuse of woman and girls from the local community.

- Project create changes in the communities in which they operate and can cause shifts in power dynamics between community members and within households. Male jealousy, a key driver of GBV, can be triggered by labour influx on a project when workers are believed to be interaction with community women. Hence, abusive behaviour can occur not only between project-related staff and those living in and around the project site, but also within the homes of those affected by the project.
- Construction workers are predominantly younger males. Those who are away from home on the construction job are typically separated from their family and their normal sphere of social control. This can result is inappropriate behaviour, such as sexual harassment of woman girls and illicit sexual relations with minors form the local community.
- Project with a large influx of workers may increase the demand for sex work – even increase the risk for trafficking of women for the propose of sex work – or the risk of forced early marriage in a community where marriage to an employed man is seen as the best livelihood strategy for an adolescent girl. Furthermore, higher wages for workers in a community can lead to an increase in transactional sex. The risk of incidents of sex between labourers and minors, even when it is not transactional, can also increase.
- Women and girls' job opportunities are limited due to a lack of appropriate transportation options. When creating hob opportunities for woman within projects, teams should be aware that traveling to and from work in some setting can force women and girls to use unsafe, poorly lit commuter routes, or unsafe public transport. Increased risk of violence is experienced when women are confronted with traveling long distances to access work opportunities or forced to travel at night.
- Increased interactions between the incoming workforce and the local community may result in increasing rates of communicable diseases, including sexually transmitted diseases and HIV/AIDS/COVID-19.

❖ GBV Risk Assessment

➢ Area of Impact

When considering GBV risks, there are different "areas of impact" that influence both the nature of the risk, and appropriate mitigation measures that a project can implement:

- The project site is the location where the project's activities are being undertaken. This includes both the actual location where civil works are conducted, but also the associated areas such as the locations of workers' camps, quarries, etc.
- The project adjoining communities is generally the broader geographic area around the project. This extends beyond the specific location where civil works are being carried out into wider surroundings. Neighbouring communities are at risk of GBV, particularly when workers are highly mobile.

➢ **Gender Based Violence in Bihar**

- A gender risk assessment based on Indicative questions to assess potential risks linked to GBV and, a review of existing surveys and research available at the national level was carried out, which outlines the key drivers and risks of gender-based violence in Bihar. The percentage of married woman (18-49 year) who reported facing physical and sexual violence from the spouse has come down to 40% from 43.7% in the past four year while women who experienced physical violence during pregnancy has also declined from 4.5 to 2.8%. About 8.3% of young woman (aged 18-29) reported having faced sexual violence as compared to 14.2%.
- Extent of Violence Against Women: Prevalence of violence (physical and sexual) In Bihar for women between the age group of 15-49 is 9% as per the recently conducted National Family Health survey of India (2015-16). This is much lower than the National level percentage where 30% of women who have experience physical or sexual violence.

❖ **Action Plan for Gender Based Violence Prevention and response.**

The GBV action plan outlines the key measures for prevention, mitigation and response for:
The Potential GBV risks to women and adolescent girls (from adjoining communities) as a result of the influx of migrant labour. It is likely that the workers will come into contact with the community and vice-versa. With varied cultural and economic background, the likely interactions between communities and workers may lead to potential women safety issues, making it pertinent to create awareness on gender issues, gender-based violence and risk mitigation, in particular. If not carefully managed, and influx of labour in the form of rapid migration and settlement of workers or local can negatively impact a project area, especially in contests with high prevalence and social acceptability of violence against women and girls.

The action plan will include, but not be limited to;

i. Mapping of identified Hot Spot, and close monitoring of these areas throughout the project cycle.
ii. Mapping of GBV service provider including an assessment of the capabilities or the service providers to provide quality survivor cantered services. This should incorporate an assessment of the capabilities of the service providers to provide quality survivor cantered services including GBV case management, acting as a victim advocate, providing referral services to link to other services not provided by the project itself.
iii. Preparation and display of signage on GBV prevention and zero tolerance against GBV at all strategic location/hotspots; in the local language at identified Hot Spots; against sexual harassment and gender equality in the workplace; zero tolerance for SEA or SH in the project, and GRM committee/ contact persons names and numbers, including help line numbers of police and other response actors, for reporting GBV incidents;
iv. Formation of a GBV committee for GBV grievance.
v. Finalization of the accountability and Response Framework during project implementation. This will include at minimum a) GBV allegation procedures and b) a response framework.

vi. Introducing a Worker Code of Conduct as part of the employment contract, and including sanctions for non-compliance (e.g. termination); Inclusion of gender based violence in safety induction training's; continuous stakeholder consultation and citizen engagement carried out in the adjoining villages to inform the community about GBV risks and redressal mechanisms.

vii. Stakeholder guidance will be sought to identify existing and potential local GBV risks and on potential interventions and risk mitigation measures. Consultations with those working with adolescent girls, single women and other at risk groups, will be prioritized to enable understanding of GBV risks and mitigation measures.

❖ **Training on GBV risk**

Training shall include:

- Concept of GBV, particularly SEA and SH; and how the project can exacerbate GBV risks;
- Roles and responsibilities involved in the project (the standards of conduct for project-related staff captured in CoC.);
- GBV incident reporting mechanism, accountability structures, and referral procedures within agencies and for community members to report cases related to project staff;
- Services available for survivors of GBV; and,
- Follow-up activities to reinforce training content.