Environmental and Social Impact Assessment (ESIA) Report (Including ESMP)

RAISING, STRENGTHENING & PUKKIKARAN OF ESML (TOTAL LENGTH – 31.985 KM) WITH RESTORATION OF 7 NOS. STUD AND CONSTRUCTION OF 13 NOS. STUD FROM KM 14.00 TO KM 26.275 OF ESML

under

Bihar Water Security and Irrigation Modernization Project (BWSIMP)

(Funded by The World Bank)

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ABBREVIATIONS

BC & EBC	Backward & Extremely Backward Class
BKBDP	Bihar Kosi Basin Development 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
ESL	Extended Sikarhatta Low
ESML	Extende Sikarhatta Majhari Low Bund
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
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, aims to enhance water security including flood protection / management and modernize irrigation systems in Bihar, India. One of the sub-projects under this project focuses on the “Raising, Strengthening & Pukkikaran of Extended Sikarhatta Majhari Low (ESML) Bundh with Restoration of 7 nos. of studs and construction of 13 nos. of new studs (Km 14.00 to Km 26.275 stretch of ESML).

The "Extended Sikarhatta Majhari low bundh (ESML)" refers to a specific section of the Sikarhatta-Majhari bund, an embankment along the western side of Kosi River in Bihar, India. This bundh is part of a larger flood control system designed to protect villages from Kosi river flooding. This bundh was constructed near Rasuwar village under Nirmali and ends at Nakta, inside of existing “Western Kosi Embankment” to confine / regulate the flow of Kosi Rriver so that larger section of land could be used for agriculture and habitation by the local people. The "low bund" designation refers to once lower height in comparison to original Western Kosi Embankment. Now this “bundh” actually functions as Western Kosi Embankment from Rasuwar to Nakta thereafter Original Western Kosi Embankment becomes functional.

In order to prevent further occurrence of disaster like “Kusaha” breach in Eastern Kosi Embankment and to minimize resultant social & environmental losses, Protection & Restoration works of vulnerable reaches of Eastern / Western Kosi embankments have taken up with the support of World Bank. Protection and Restoration works have been executed on Eastern Kosi Embankment and Extended Sikarhatta Majhari Low Bund (ESML) under BKFRP and BKBDP, based on recommendations of Central Water and Power Research Station (CWPRS), Pune. For this, CWPRS, Pune had conducted extensive Model Studies. During execution of the work periodical supervision and suggestions of World Bank’s various specialists was of great help. Due to above mentioned completed works, deeper channel of the Kosi River shifted away from then in danger Eastern Kosi Embankment. But as a result, Kosi started threatening of Extended Sikarhatta Majhari Low (ESML) especially in reach of Km 5.00 to Km 14.00. Under BKBDP this stretch has already been strengthen following the protocol established and tested earlier. However, main current of river Kosi has focused its fury on Km 14.00 to Km 26.275 stretch of ESML. So, to fortify this stretch this has been taken as a sub-project under BWSIMP. This work is crucial for managing flood risk in the Kosi region.

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 the 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.

Several benefits are expected from the proposed sub-project including protection of agricultural land and habitation near the riverbank. After completion of the sub-project, as has been experienced in past Kosi main current will move away from this stretch of ESML too enabling farmers to reclaim their land engulfed in the river and begin cultivation. This will naturally enhance their income. The proposed construction work will generate temporary employment opportunity to the local community as well. With the protection of embankment public safety from flood will improve. The black topping of the road on the embankment will improve the connectivity of the area which will result in enormous benefit to the local community both socially and economically as they will get better linkages to market places.

1. Project Description

The proposed works for the protection of ESML from Km 14.00 to Km 26.275 is divided into the following categories of activities: -

I. Protection & Restoration of 7 Nos. Existing studs

- Protection Works for the Studs –Studs protruding into the river bed were constructed in this reach to repel the flood waters and the deeper channels away from the ESML. Unfortunately, inspite of best efforts over the years, the noses of many of these spurs have been severely damaged, and some of these spur lengths have also been significantly shortened due to erosion and effects of large floods. As a consequence, the effectiveness of many of these spurs has significantly reduced, and the river banks at those locations have been significantly eroded. As such total 7 nos. of studs are proposed to be restored and protected under the sub-project.
- In all, 7 Nos. of worst affected studs have been selected for repair and strengthening under the proposed Project. The proposed measures include re-creation of the appropriate shape of the stud nose by placing and consolidating adequate number of sand-filled geo-bags and locally available salvaged materials to develop a stable slope of 3:1 from the river-bed to the top of the spur. Then the prepared slope would be covered with geo-textile filter of adequate strength and thickness. PVC coated machine made stone filled gabions (0.5m thick) will be laid over the prepared surface along the slope, up to the river-bed level. In addition, gabions will be placed at the bed level to act as launching apron, and the length of the same computed according to the provision of relevant IS Codes and by recommendation of CWPRS, Pune. Cavity under the launching apron will be filled with Mega Geobag and Geobag.
- The placing of gabions will be carried out by barge mounted cranes except in areas above water level where it can be done in-situ or launched from a crane on the ground. Well-equipped divers will work under water to place the gabions at appropriate locations, and also to tie them up with each other so that the gabions are not easily disturbed or displaced due to the actions of flood flows. Underwater photography will be carried out to keep record of the works done below the water surface.
- GSB in thickness of 150mm will be laid in 6m width on top of studs.

II. Construction of 13 Nos. new studs

- Earthwork – For construction of new studs, earthwork from up to 1.50 Km lead has been provided. Earthwork would be mechanically laid in specified layers which would be consolidated by vibratory rollers to achieve specified compaction test result. Specified top level and slopes of the stud would be obtained. Since there are a large number of Kutcha houses and hutments close to the embankment so there is a risk of damage to these structures during compaction by using vibratory rollers. To avoid such damages precautionary measures will be taken so that structures could not be impacted during compaction. Construction work for new stud work will be undertaken inside the river bank, accordingly Impact mitigation measures has been described in ESMP of construction phase.
- In all, 13 Nos. of studs have been designed to develop a stable slope of 3:1 from the riverbed to the top of the spur i.e. base of slope will be in riverbed. The prepared slope would be covered with geo-textile filter of adequate strength and thickness. PVC coated machine made stone filled gabions (0.5m thick) will be laid over the prepared surface along the slope, up to the river bed level. In addition, gabions will be placed at the bed level to act as launching apron, and the length of the same computed according to the provision of relevant IS Codes and by recommendation of CWPRS, Pune. Cavity under the launching apron will be filled with Mega Geobag and Geobag.

- The placing of gabions will be carried out by barge mounted cranes except in areas above water level where it can be done in-situ or launched from a crane on the ground. Well-equipped divers will work under-water to place the gabions at appropriate locations, and also to tie them up with each other so that the gabions are not easily disturbed or displaced due to the actions of flood flows. Underwater photography will be carried out to keep record of the works done below the water surface.
- GSB in thickness of 150mm will be laid in 6m width on top of studs.
- Revetment/ Slope Protection from Km 15.07 to Km 15.17 and from Km 17.10 to Km 17.40 will be done by PVC coated machine made stone filled gabions (0.5m thick in toe and 0.30m thick in slope) will be laid over prepared surface covered by Geo-textile filter of adequate strength and thickness. A key of size 0.3m x 0.3m filled with loose stone boulder will be made along the edge on top of embankment up to the length of slope protection/ revetment work.

III. Raising, Strengthening & Pukkikaran of ESML (Total Length- 31.985 Km)

- Earthwork – For raising & strengthening, earthwork up to 1.50 Km lead has been provided. Earthwork would be mechanically laid in specified layers which would be consolidated by vibratory rollers to achieve specified compaction test result. Specified top level and slopes of the embankment would be obtained.
- Pukkikaran (black topping) – In total, 6.50 m wide inspection road (5.00 m carriageway and 0.75 m earthen shoulder on either side) would be constructed/ repaired. Pavement design for the road of traffic 5 msa and effective CBR- 5%, as stipulated in Plate-1 of IRC 37: 2018, has been adopted. Hence, provision for 30mm thick BC over 65mm thick DBM over 250mm thick WMM over 150mm thick GSB, including prime coat and tack coat, has been made in the DPR. Road signs and Kilometer Stones would be fixed at specified intervals along the road

2. Project Risk

The project **Environmental risk is classified as "Substantial"** because the nature of construction/intervention proposed may result in significant volume of waste of construction materials, OHS and CHS issues. Though the present sub-project components are confined to restoration and strengthening of existing / new structures (on government land i.e. in river bed). The **Social risk rating is also "Substantial"** as field surveys indicate encroachments for habitation, livelihood, farming by squatters along some patches of the embankment chosen for renovation/strengthening.

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	An Environmental and Social Impact Assessment (ESIA) of these activities

Process in the Project Cycle	Tools for E&S management and monitoring
• Identification of Vulnerable reaches for prioritization • Damages to canal structure • Selection of schemes	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
7. REPORTING AND MONITORING	Reporting against agreed specific mitigation measures Reporting against Contractor-ESMP

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

Proposed new studs will be constructed on identified Govt. land i.e. in the river bed. Besides, all the protection and restoration activities will be carried out on government land i.e. existing embankment. Water Resource Department has the ownership of RoW up to 12.5 meters on either side from the centerline of the embankment, i.e. total 25 meters. Permanent acquisition of private land is not required. However, temporary displacement of few structures is envisaged under this sub-project during construction work.

Any temporary land requirements of the contractor for meeting their construction related needs, including for setting up labor hutments and storage yards will be part of the Contractors obligation subject to the E&S requirements spelt by this ESIA and the ESMF.

Construction Materials Requirement

The construction materials that will be used is given in the table below:

Sl. No.	Construction Material	Quantity	Unit	Main Carriage station
1	Good earth	9,39,151.82	Cum	Locally
2	Boulder	57231.12	Cum	Mirzachauki
3	Stone chips	17542.399	Cum	Pakur
4	GSB & WMM	71855.931	Cum	Mirzachauki
5	Bitumen	1324.799	MT	Baruani (IOCL)

Labor Requirement

The embankment and roadwork will take 24 months to complete. The requirement of skilled and unskilled labor is given in tabular form below.

Skilled Lab days	Semi skilled Lab. days	Unskilled Lab. days	Total Lab. days.
8236	265	161353	169854

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 social inclusion, labor 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, would be required.

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
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 pollution, groundwater quality, surface water quality, natural disasters, biodiversity and climate change variability.

6. **Social Baselines**: This section covers the administrative boundaries, demography, socio-economic profile, population growth rate, squatters occupying government land required under the sub-project.
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, aquatic life 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. In addition to permits some of the impacts are very site specific as for example ecological impacts - probable existence of Dolphin at work site. Site Specific Ecological Management Plan outlining how to manage and protect biodiversity and ecological resources within a specific project area, ensuring compliance with relevant regulations and promoting sustainable practices will have to be developed if Dolphins are sighted at work site.

  - 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.

  - 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**

<u>Air pollution</u>

  - 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 in heavy suspension of dust. This results in high SPM in the air.

- Large quantity of dust is likely to be generated during execution of this sub-project.
- Fugitive emissions are from vehicles used for the transportation of construction materials and other heavy machineries used during construction. Transportation routes are also likely to face pollution due to spills of 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 embankment these incremental air pollutants can cause inconvenience to the residents and sensitive group of people (elderly, sick, new born etc).

The following mitigation measures are to be followed:

- Regular sprinkling of water at construction site and transportation routes through mechanical sprinkler is required.
- The movement of the truck carrying construction material should be confined 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-mentioned emissions and dust will disappear as construction gets completed.

Surface Water pollution

- Impact on surface water quality during the construction phase is anticipated due to laying of mega geo bags, gabion reno mattresses will disturb the bed of the river temporarily.
- 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 river. However, these potential impacts are temporary and of short-term only. The wash water from heavy construction machineries may degrade the surface water quality therefore it should only be disposed at a soak 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 of construction machineries. Oil interceptors will be installed at vehicle parking, wash down and refueling areas. For sewage generated from camp/office site, proper soak pits will be provided at the required places.

Noise pollution

- Operation of heavy construction machineries like Cranes, Barges etc., movement of heavy vehicles, operation of DG Set, demolition of existing structure (if any) etc generate high level of noise resulting in increase in ambient noise level of the surrounding.

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

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. However, proposed work under the sub-project is either inside the water course or on embankment of the river Kosi, which has been identified as "Critical Area" for dolphin. Though the proposed work site is in the middle reach of the river where no sighting of the Dolphins has been reported in the past i.e. the work site does not fall under "Hot Spot" for Dolphins, even though it is imperative that during execution of the work people remain very cautious and vigilant regarding sighting of Dolphins. Once Dolphins are sighted work should be immediately stop and remedial / preventive actions for safety of Dolphins must be started as per the guidance of Dolphin Expert. As a precautionary measure for Dolphin protection Gabion Reno Mattresses having opening of nominal dimension (D) of 100 mm only has been provided. This will ensure no entanglement of the dolphin in the wire mesh net cage and resultant fatalities. This will ensure "no net loss". However, some residual risks will remain until sedimentation in the infrastructure stabilizes and riparian habitats are established.

Measures during Construction Phase:

- Construction barges must be operated at safe speed to avoid collision with aquatic animals.
- Training should be provided for the construction machinery (cranes, barges etc.) operators for minimal use of horns/ sirens as it may adversely affect dolphins, if present in the surroundings. Once dolphin is sighted work should be stopped immediately and warning signs related with sighting of Dolphin must be displayed. Work should be resumed only after getting clearance from the Dolphin expert.
- Change in geology and topography should be kept at minimum.
- Construction of labour camps and construction yards near the river banks should be avoided.
- To minimize impacts, noisy operations should be avoided during breeding season of the dolphins (February-July).
- River flow should not be blocked at any time for free movement of dolphins.
- All activities that increase soil erosion and/or contribute pollutants to water need be minimized both on-site and off-site by using measures such as silt curtain.
- Before the initiation of underwater works the site must be checked for the presence of threatened turtles, migratory birds, and other threatened species and their nests. If the turtles and/or their nest are found inside or near the construction area the animals and/or the eggs must be physically moved to safer habitat areas under the guidance of the local wildlife experts.

- **Operation Phase Impact**

For conservation of dolphin, instruction should be given to all vessel operators and all employee and staff that no dolphin or any other endangered species should be harmed due to any reason. In case any accident with dolphin occurs that should be reported immediately to concerned authority. As a precaution vessel should not use sharp lights and sounds, there should be provision of propeller guards to all vessels, speed of

vessels should be regulated in dolphin or aquatic organisms' habitation area. Further sediment dispersion should be minimized during excavation and lifting of silt by adopting appropriate dredgers and dredging methods.

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 of the workers, and mitigation measures required for social impact.

- The Project Area falls in Nirmali block of Supaul district and Madhepur block of Madhubani district covering a total of 21 villages. A total of 1,80,580 families reside in the project block area and the average family size is 5. The project blocks have a total population of 8,71,375 (Census 2011) out of which 51.95% are male and 48.05% are female. The religious composition of population of the project blocks shows that 81.04% of the population are Hindus, while 18.69% are Muslims. The Scheduled Caste population in the project blocks is 13.91%, while the Scheduled Tribe population is significantly lower at 0.26%. The labor force in the project blocks comprises 370,468 workers, with 42.5% engaged as main worker and majority, 57.33% are marginal worker according to census, 2011.

- The economy is primarily agrarian.

- The project does not need permanent acquisition of private land. WRD owns sufficient land along the embankment of the work zone to execute the construction and restoration work. However, 26 residential structures and 2 commercial structures (including 1 household having residential cum commercial structure) covering 8,750 square feet WRD/Govt. land near work zone will be affected during construction. Further, on 7,46,872 square feet (6.9 ha) land owned by WRD in the project zone, 23 encroachers grow crops. All the project affected households need to be relocated with appropriate R & R support.

- The above mentioned 51 project affected households belong to OBC community. Head of the households of most of them are illiterate. Their primary occupation is working as daily laborer within their own village, few goes outside the state for daily labour job. Open defecation is still a practice in the area. However, most of them have LPG connection and their source of water is tube well.

- A temple on 230 square feet land area along the embankment at Rasuar village, Keota Patti Gram Panchayat under Marauna block is likely to be affected by the project. Further, one side of the boundary wall of a Govt. sponsored primary school on 830 square feet land area at Majhari village, Musahari Gram Panchayat under Nirmali block has been anticipated to be impacted due to project intervention. Necessary measures will be taken up to avoid/minimize the adverse impact on these properties during the construction phase.

- The project will have civil works contracts and employ both direct and contracted workers. The contractor will employ local labor and depending upon the scale and skill requirement, may source migrant labor. Total 1,69,854 no. of labor days will be required, spread over 24 months of construction work. A total 8,236 labor days of the total labour days are for skilled laborers. 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.

- Labor camps will be established following World Bank's accommodation process and standards.

- Grievance redressal mechanism (GRM) including SEA/SH related grievances for workers will be established based on ESMF provisions which will be accessible to all.

- The Occupational Safety, Health and Working Conditions Code, 2020 of GoI., along with the Draft Occupational Safety, Health and Working Conditions (Bihar) Rules, 2021, provides guidelines for ensuring workers' safety during sub-project implementation 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 as per Worker's Code of Conduct and provision of Personal Protective Equipment (PPE) kits. Additionally, contractors are responsible for training workers in safety procedures and drills, maintaining first aid kits and minimizing potential hazards.

10. Alternatives

The proposed ESML Bundh Protection and Restoration project is environmentally acceptable and will bring economic, social and environmental benefits to the land users and local community in the area when completed.

The "with" and "without" project scenarios are analyzed and provided as under:-

S. No.	Parameters	Without sub-project		With sub-project	
		Positive	Negative	Positive	Negative
1.	Employment Opportunity and rise in income level	-	No change in economic status and living standard of people.	Opportunity for unskilled /semi-skilled people to work in the project.	-
2.	Loss of land	No loss of land and livelihood	Continued erosion of river edge resulting into loss of cultivable land.	No acquisition of land and hence no impact	-
3.	Community Infrastructure and services	Present infrastructure will not get affected.	-	-	More stress on existing infrastructure facilities during construction phase of the project.
4.	Water logging and public health	-	Impact on health - water borne diseases due to susceptibility of the area to floods.	Less vulnerability of the area to the effect of floods (inundation)	Increased incidences of water borne diseases and transmission of diseases by immigrant labour population during construction phase.
5.	Change in environmental quality	-	Erosion of river banks will continue resulting into loss of cultivable land and threat to the embankment and spur.	Erosion of river banks will be prevented as well as main current of river will be repulsed resulting into availability of more cultivable land and no threat to the embankment and spur.	During construction phase:- - Increase in soil erosion due to stripping of land in the work zone - Pollution by construction spoils Solid waste dumping and liquid waste discharge - Increase in turbidity of river water, specially in the submerged area. - Degradation of water quality due to disposal of untreated liquid wastes and solid wastes, open squatting - Pollution due to dust re-suspension and emissions

S. No.	Parameters	Without sub-project		With sub-project	
		Positive	Negative	Positive	Negative
					- Rise in noise level
7.	Aquatic and Terrestrial Ecology	-	Erosion of river banks will continue resulting into loss of terrestrial and aquatic ecology.	Once siltation takes place one or two years after completion of the sub-project Riparian food will be restored which will feed aquatic animals and boost their growth.	During construction phase, following are likely temporary negative impact :- - Marginal reduction in productivity due to increase in turbidity levels and indiscriminate fishing by the labour population. - Impact due to fuel wood requirement by labourers. -Temporary adverse impact on flora and fauna due to increased influx of human population.
8.	Social Problems	-	-	Once sub-project gets completed and road on embankment become operational people will feel secure against flood and will have various opportunities of livelihood at the local level itself.	- Cultural conflicts and law and order related issues due to migrant of labour population.

- **Technology Alternatives**

Existence of freshwater dolphins in Kosi River being an iconic species for the river ecosystem serves as a link between people and freshwater and a symbol of a healthy ecosystem. The positive side for the conservation and increase in the population of dolphins means that river water is clean enough to be used as potable, will encourage growth of diverse assemblage of fish to support people and dolphins. Construction works should be avoided or kept minimum in vicinity of the dolphins' favourable microhabitats. Dolphins are likely to prefer water depth range between 4.1 to 6 m. Therefore, Movement of sediment and influx of soil/silt etc. should be avoided to keep range of water at dolphin's favourable depth i.e. 4.1 to 6 m. All kind of technical protective measures in use of machines, equipment will be taken up to prevent any harm, injury or death of dolphins, turtles and other aquatic fauna during construction and implementation of the project.

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. This project is expected to bring substantial benefits to the region, including flood protection, prevention of water logging, enhanced agricultural productivity, better water management, 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 "Raising, Strengthening & Pukkikaran of ESML (Total Length – 31.985 Km) with Restoration of 7 Nos. Stud and Construction of 13 Nos. new Studs (Km 14.00 To Km 26.275) of ESML" is designed to protect the area from flood, minimize water logging and reclaim cultivable land submerged in

the river and thus increase agricultural productivity and resultant comparatively better livelihood of 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 embankment of ESML, 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.

CHAPTER 1: INTRODUCTION

1.1 Introduction

Bihar is one of the most densely populated states in India with a population of 10.41 crore While Bihar is the most flood-affected state in India, recurring floods and resultant erosion are mostly confined to North Bihar. About 73 percent of Bihar's total geographic area of 93,600 km^2 has historically been affected by floods, mainly due to excessive rainfall in the catchment during the monsoon months (June-September), including major water inflow from Nepal, and flat terrain. Flooding in Bihar is associated with long inundation periods and very high sediment load in river water, which destroy crops and infrastructure and threaten dwellings as well as livelihoods of the population. The collateral damage is recurring annual socio-economic stress that leaves the rural economy reeling. As a result, about 3.09 million ha (m ha), or 55 percent of the total net cropped area of 5.65 m ha, in 28 districts are regularly put under flood hazard categories, of which 15 districts i.e. Darbhanga, Khagaria, Sitamarhi, Muzaffarpur, Patna, Bhagalpur, Samastipur, East Champaran, Madhubani, Nalanda, Saharsa, Supaul, Madhepura, Purnia and Araria are the worst affected.

Flood management works so far implemented comprise of construction and maintenance of embankments, revetment in selected portions of river banks, land spurs and other necessary flood protection works. All the rivers excluding the Burhi Gandak joining the Ganga on its left bank in Bihar flows through a considerable length in Nepal. A large part of their catchments falls in the glacial regions of great Himalayas. Thus, the remedial measures of the flood problem of Bihar acquires international dimensions. As a long term measure construction of storage reservoirs and extensive water shed treatment in upper catchments of river is essential. As a short term protective measure, construction of embankments along rivers have been taken up.

The existing embankments are under increasing pressure due to rise in the bed level of rivers due to heavy silts brought by the rivers from Nepal. Due to abnormal changes in river courses, anti-erosion works for protection of embankment and some very essential flood fighting works become essential every year.

The Kosi River is an important and historic river in the Indian state of Bihar, often referred to as the "Sorrow of Bihar" due to its frequent and devastating floods. It is one of the major tributaries of the Ganga River, with a significant role in the geography, culture, and economy of the region.

Unlike many rivers in India, the river does not have any defined flood plains. It is rather extensive and changing along with the shift in course of the river. The flood problem gets aggravated when the Ganga is also in high spate simultaneously and the outfall of the river is choked resulting in back flow of Ganga into the River. Any breach in the embankment in such a situation, therefore, results in a catastrophe in the area. Such a catastrophic situation was already witnessed in 2008 as aftermath of Kusaha Breach in Eastern Kosi Embankment.

In order to prevent further occurrence of such disaster and to alleviate further social & environmental losses, Protection & Restoration works have been taken-up with the intervention of World Bank. Investing in flood protection offers numerous benefits, including safeguarding communities, infrastructure, and livelihoods from devastating impacts of floods. Specifically for the agricultural sector, implementing robust grey and green flood protection measures, apart from strengthening existing flood control structure (embankments), in and around irrigation command areas can significantly lower flood-related losses for farmers. In addition, the enhancement of the On-Farm Development (OFD) activities, coupled with the support for the implementation of DoA's Climate Resilient Agriculture (CRA) program, the project activities will contribute to the improvement of agricultural productivity and farming systems resilience, improved food security, and sustainability.

Protection and Restoration works have been executed on Eastern Kosi Embankment under BKFRP and BKBDP, based on Technical Report No- 5266 of CWPRS Pune, month March 2015 and sub-sequential comments/

suggestions of the water resources specialists of the World Bank. As an impact of the completed work under BKFRP and BKBDP, deeper channel of the river shifted away from Eastern Kosi Embankment. This also imposed a threat on Western Kosi Embankment at downstream of Kosi Mahasetu especially in reach of Km 6.00 to Km 14.00 of Extended Sikarhatta Majhari Low (ESML) Bundh.

1.2 Brief Description of the Project (DPR)

The sub-project estimate amount Rs. 288.24 Crore is framed for the whole project. Under the sub-project the works that has been proposed are Raising, Strengthening & Pukkikaran work of ESML (total length – 31.985 Km) with Restoration of 7 Nos. stud of ESML from Km 14.00 to Km 26.275 (tentative cost - Rs. 161.89 Crore) and Construction of 13 Nos. new studs from Km 14.00 to Km 26.275 of ESML (tentative cost - Rs. 125.42 Crore).

The current proposal has been prepared based on the "Protection & Restoration of Km 6.00 to Km 14.00 of ESML under Bihar Kosi Basin Development Project (BKBDP) as Package-4 and Technical Report No. – 5266/ CWPRS, Pune month March 2015 keeping in view the suggestions of the Water Resources Specialists of the World Bank including comments/suggestions by the World Bank/CWPRS - Pune teams during and after site visits. Location, size, shape, etc. for construction/restoration of 20 nos. new studs as well as revetment work at two locations have been recommended as per mathematical modelling conducted for the reach from Km 14.00 to Km 26.275 of ESML.

The list of spurs proposed for Restoration are as per table below: -

Sl	**Locations of Spurs on ESML**	**Existing Length of Spurs (m)**
1	Km 16.00 spur	110
2	Km 18.87 spur	207
3	Km 19.02 spur	115
4	Km 19.245 spur	97
5	Km 19.56 spur	47
6	km 20.05 spur	31
7	km 20.35 spur	68
	Total	**675**

The list of spurs proposed for construction are as per table below: -

Sl	**Locations of Spurs on ESML**	**Proposed Length of Spurs (m)**
1	Km 15.35 spur	100
2	Km 16.45 spur	70
3	Km 16.71 spur	165
4	Km 20.70 spur	115
5	Km 21.00 spur	90
6	km 22.66 spur	45
7	km 22.83 spur	50
8	km 23.01 spur	55
9	km 23.30 spur	58
10	km 23.54 spur	42
11	km 24.00 spur	120
12	km 26.13 spur	90
13	km 26.275 spur	30
	Total	**1030**

The list of Revetment is as per table below:-

SI	Locations of Revetment on ESML	Proposed Length of Revetment (m)
1	Km 15.49 to Km 15.59	100
2	Km 17.10 to Km 17.40	300
	Total	**400**

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 and socially sustainable manner.
- To identify the environmental and social sensitivities and impacts in the project areas and assessing the level of environmental and social impacts.
- To mitigate specific negative environmental and social impacts that may arise during the construction and operation of the project through an E&S management plan.
- To assess and mitigate resettlement impacts on the local communities due to the project activities, , irrespective of their legal status with respect to that land
- 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.
- Define the roles and responsibilities with respect to the measures outlined in the assessment

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. The EIA especially in the limited studies, such as the ESML Bundh Protection and Restoration Project, is subjective and the degree of the impacts cannot be quantified. However, based upon the available information about the project, wherever possible, the impacts were quantified and qualitative assessment has been carried out for those aspects where the information is wanting. Probable positive and negative impacts due to implementation of the proposed protection and restoration of ESML Bundh are discussed in this Chapter. After studying the existing baseline environmental scenario, field surveys, reviewing the methods of construction and related statutory norms, the impacts were identified and assessed for the planning/pre- construction phase, construction phase and post construction phase.The proposed restoration of the ESML Bundh generally would not have serious negative impacts on the environment and ecology of the area where the proposed works are to be carried out and a few negative impacts, which will be temporary, shall be limited to only to the construction phase of the project. These impacts could be mitigated through a precautionary engineering design, planning and management.

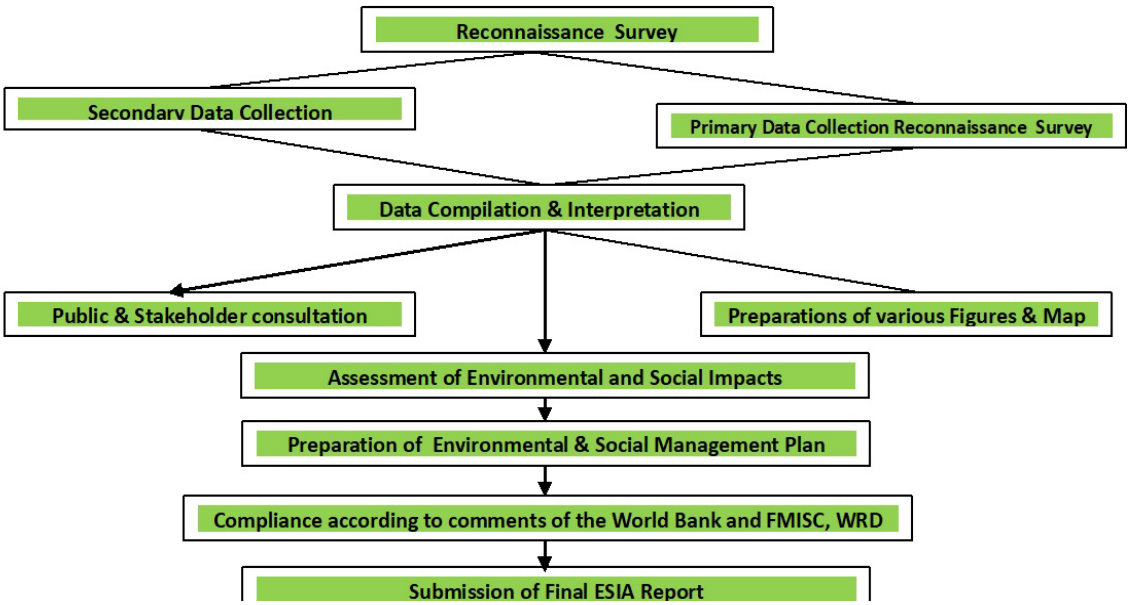
The approach and the methodology for the preparation of this report is: -

- 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
- Assessment of the existing status of the project area's 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
- 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 construction and operation phase.

- Defining the roles and responsibilities of project stakeholders for implementing the management plan, and identifying their E&S related capacity building needs.
- 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 and 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

As an impact of the completed work in Eastern Kosi Embankment under World Bank funded Bihar Kosi Flood Recovery Project (BKFRP) and Bihar Kosi Basin Development Project (BKBDP), deeper channel of the river shifted away from Eastern Kosi Embankment. This also imposed a threat on Western Kosi Embankment at down stream of Kosi Mahasetu especially in reach of Km 6.00 to Km 14.00 of Extended Sikarhatta Majhari Low (ESML) Bundh.

To encounter the impact of change in river flow pattern and enhanced pressure on Western Side- ESML Bundh in down stream of Kosi Mahasetu, Protections and Restoration works of 18 nos. studs, Slope Protection in two Critical Reaches with Construction of 3 new studs have been executed under BKBDP (Package-4). During the execution of the work, Km 5.00 to Km 6.00 of ESML was observed critical and needed to be protected. As per the suggestions of the WB Mission, mathematical modelling was done to determine the number, location, length, alignment and shape & Size of new studs supposed to be constructed between Km 5.00 and Km 6.00 of ESML. Based on the result of mathematical modelling and commendations of WB Mission, three (3) additional studs in that reach were constructed as additional work under BKBDP (Package-4). During flood 2023 and 2024, this work has been very effective in terms of protection of embankments/ studs as well as safeguarding nearby inhabitations. Benefits of this work observed so far are as follows:

- ESML embankment from KM 5.00 to KM 14.00 remained intact during flood 2024, even in case of flow of the unprecedented discharge through the river.
- Restored and newly constructed studs, in between, have functioned well in keeping the main river course away from the embankment thereby keeping it protected from erosion/ breach.
- Approximately, more than 500 ha. cultivable land has been reclaimed as a result of effectiveness of the work.
- People along the embankment and nearby have been living free from social vulnerability of flood & psychological implications like post-traumatic stress disorder, depression and anxiety.
- Because of the reclaimed cultivable land, protection provided by the work from submergence of additional area and improved crop pattern & crop production, livelihood of the people has comparatively been better.

By the time of inception of Protection & Restoration works under BKBDP (Package-4), the reach from Km 6.00 to Km 14.00 of ESML Bundh had been found critical. Till that time, main course near the embankment of Kosi River was getting deflected from Km 14.00 of ESML towards the center of the river. Thus, downstream reach from Km 14.00 to Km 26.275 of ESML was not considered as critical as required to be taken up for Protection and Restoration Works. Hence, the reach was left out in BKBDP (package-4).

In total, 11 nos. studs are previously constructed between Km 14.00 and Km 26.275 of ESML, which have been protecting the embankment since then. However, as protection & restoration works under BKBDP (package-4) was started, the river course gradually started getting inclined towards the embankment in downstream of Km 14.00 of ESML. Consequently, rigorous flood fighting works have been done on these studs every year though. Over last 2-3 years, nose, shank, top and side slope of most of these studs have been eroded/ damaged by the river. 7 nos. studs out of 11 nos. studs have been identified for which Protection and Restoration work need to be done so that these studs would perform better to keep the embankment safe and protected. Hence, Protection & Restoration Works of 7 Nos. studs with slope protection work between Km 17.10 and Km 17.40 of ESML Bundh have been proposed in the DPR. Nonetheless, some new studs need to be constructed between Km 14.00 & Km 26.275 of ESML Bundh for which mathematical modelling has been carried out as recommended by the World Bank team. After mathematical modelling, the same has been included under the sub-project. Depending on the nature and scale of the investment, it is

recommended that a higher-level assessment may be carried out on Kosi to examine the combined environmental effects of a project along with other existing and planned developments in a region.

It is noteworthy that a Peak discharge of 18720 cumecs (6.61 lakh cusecs) was recorded in the morning of 29th of September 2024. Resultantly, a new H.F.L. has been recorded which requires raising and strengthening of almost all embankments, specially situated in India-Nepal border area, accordingly. In this reference, Raising and Strengthening of the embankments has also been included under the proposed scheme. During execution of the proposed project, the Climate Resilience of Flood Protection will be ensured based on the projected HFL.

Embankment Road

It has been observed that Inspection Road on top of the embankment is the only means of communication, especially in monsoon period, for inhabitants along the embankment and nearby areas. Bituminous roads have already been constructed to the specification of a village road on most of these embankments, which have got damaged over the years. As a result of that, movement of traffic on the roads has become very difficult that has affected normal lives of inhabitants. In addition, easy and on-time access to the whole stretch of embankments & river edges has also become difficult for departmental officers/ administrative officials, in case of emergency or from regular inspection/ supervision standpoint. Daily life of inhabitants is comparatively difficult. In light of these, repairing/ construction of flexible pavements has been proposed that will directly benefit more than 14,243 families, in total, population of 73,277 inhabited along the embankment and it will benefit directly and indirectly total population of 4,05,000 across Supaul, Madhubani and Saharsa district.

2.2 Regional Setting

The physical footprint of the ESML is limited to the Supaul district but the benefits also be felt in the Saharsa and Madhubani districts. The project area is spread from NH-57 at Majhari Chowk in Nirmali block under Supaul district in the north, and to the Nakta village in Supaul block under Supaul district in the south along ESML on west side of Kosi river. The entire project area is flood prone and is distributed under Supaul, Madhubani & Saharsa districts.

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.

2.3 Existing Condition of the Scheme

Reconnaissance survey of the entire project (Km 14.00 to Km 26.275 of ESML) has been done in detail which includes inspection on present status of Embankment on their studs , inventory of village, road connectivity to the Embankment, socio economic condition of the area, general topography, extent of drainage condition of the area, hydrological observation present flow of river Kosi nearest working site, availability of construction materials in the vicinity, possibility of best possible of local available materials and labours etc near the work site.

All required data have been gathered by detailed survey for conducting mathematical modelling in order to finalize locations, length, size, etc. for construction of new studs between Km 14.00 & Km 26.275 of ESML.

Present Condition of Extended Sikarhatta Majhari Low (ESML) Embankment

The present condition of the ESML is described below:

- SML (Sikarhatta Majhari Low) embankment ends at 59.00 RD, which is situated at 3.00 Km south of Majhari Chowk in downstream of Kosi Mahasetu, from where it extends as ESML in a length of 26.275 Km. The whole length of ESML is situated in Supaul district (Block- Nirmali, Marauna & Supaul), Madubani district (Block- Ghoghardiha & Madhepur) and Saharsa district (Block- Nauhatta).
- Kosi river is flowing very close to the ESML embankment between this reach. In some stretches, the distance between river edge and main embankment is even less than 50 (fifty) metres.
- Total 11 Nos. of studs are constructed previously between km 14.00 to 26.275 of ESML. In present time nose and shanks of 7 Nos. of studs are fully/ partially damaged due to erosion of Kosi River.
- All the stud nose and shanks are fully/ partially damaged, so restorations of stud nose are more necessary to restore the design section. Some new studs are required to be constructed for protecting the embankment from Km 14.00 to Km 26.275 of ESML.

Embankment Road Condition

- Inspection Road on top of the embankment, which is the only shortest communication route connected to NH-57 for people living along and nearby the embankment, has got damaged over years.
- It has not only made daily life of the nearby inhabitants difficult but also has negatively affected easy and on-time access to the whole stretch of embankments for departmental officers/ administrative officials, in case of emergency or from regular inspection/ supervision standpoint.

A map of the entire project areas has been provided in **Annexure I.**

2.4 Need of The Project

It is noteworthy that a Peak discharge of 18720 cumecs (6.61 lakh cusecs) was recorded in the morning of 29th of September 2024. Resultantly, a new H.F.L. has been recorded which requires raising and strengthening of almost all embankments, specially situated in India-Nepal border area, accordingly.

Further there are other factors which need consideration: -

a) As protection & restoration works under BKBDP (package-4) was started, the river course gradually started getting inclined towards the embankment in downstream of Km 14.00 of ESML. Consequently, rigorous flood fighting works have been done on these studs every year though. Over last 2-3 years, nose, shank, top and side slope of most of these studs have been eroded/ damaged by the river.
b) 7 nos. studs out of 11 nos. of existing studs have been identified for which Protection and Restoration work need to be done so that these studs would perform better to keep the embankment safe and protected. In addition to this some new studs need to be constructed between Km 14.00 & Km 26.275 of ESML Bundh for which mathematical modelling has been carried out as recommended by the World Bank team.
c) It has been observed that Inspection Road on top of the embankment is the only means of communication, especially in monsoon period, for inhabitants along the embankment and nearby areas. Bituminous roads which have been constructed to the specification of a village road on most of these embankments, which have got damaged over the years. As a result of that, movement of traffic on the roads has become very difficult that has affected normal lives of inhabitants. Considering the same, repairing work as to black-topping on the embankment has been including

under the proposed sub-project that will directly benefit more than 14243 families, in total, population of 73277 inhabited along the embankment and it will benefit directly and indirectly total population of 4,05,000 across Supaul, Madhubani and Saharsa district.

2.5 Description of the Proposed Scheme

The proposed works for the protection of ESML from Km 14.00 to Km 26.275 can be divided into the following categories of activities: -

I. Protection & Restoration of 7 Nos. Existing studs

- Protection Works for the Studs –Studs protruding into the riverbed were constructed in this reach to repel the flood waters and the deeper channels away from the ESML. Unfortunately, inspite of best efforts over the years, the noses of many of these spurs have been severely damaged, and some of these spur lengths have also been significantly shortened due to erosion and effects of large floods. As a consequence, the effectiveness of many of these spurs has significantly reduced, and the river banks at those locations have been significantly eroded. As such total 7 nos. of studs are proposed to be restored and protected under the sub-project.
- In all, 7 Nos. of worst affected studs have been selected for repair and strengthening under the proposed Project. The proposed measures include re-creation of the appropriate shape of the stud nose by placing and consolidating adequate number of sand-filled geo-bags and locally available salvaged materials to develop a stable slope of 3:1 from the river-bed to the top of the spur. Then the prepared slope would be covered with geo-textile filter of adequate strength and thickness. PVC coated machine made stone filled gabions (0.5m thick) will be laid over the prepared surface along the slope, up to the river-bed level. In addition, gabions will be placed at the bed level to act as launching apron, and the length of the same computed according to the provision of relevant IS Codes and by recommendation of CWPRS, Pune. Cavity under the launching apron will be filled with Mega Geobag and Geobag.
- The placing of gabions will be carried out by barge mounted cranes except in areas above water level where it can be done in-situ or launched from a crane on the ground. Well-equipped divers will work under water to place the gabions at appropriate locations, and also to tie them up with each other so that the gabions are not easily disturbed or displaced due to the actions of flood flows. Underwater photography will be carried out to keep record of the works done below the water surface.
- GSB in thickness of 150mm will be laid in 6m width on top of studs.

II. Construction of 13 Nos. new studs

- Earthwork – For construction of new studs, earthwork from up to 1.50 Km lead has been provided. Earthwork would be mechanically laid in specified layers which would be consolidated by vibratory rollers to achieve specified compaction test result. Specified top level and slopes of the stud would be obtained. Since there are a large number of Kutcha houses and hutments close to the embankment so there is a risk of damage to these structures during compaction by using vibratory rollers. To avoid such damages precautionary measures will be taken so that structures could not be impacted during compaction. Construction work for new stud work will be undertaken inside the riverbank, accordingly Impact mitigation measures has been described in ESMP of construction phase.
- In all, 13 Nos. of studs have been designed to develop a stable slope of 3:1 from the riverbed to the top of the spur i.e. base of slope will be in riverbed. The prepared slope would be covered with geo-textile filter of adequate strength and thickness. PVC coated machine made stone filled

gabions (0.5m thick) will be laid over the prepared surface along the slope, up to the river bed level. In addition, gabions will be placed at the bed level to act as launching apron, and the length of the same computed according to the provision of relevant IS Codes and by recommendation of CWPRS, Pune. Cavity under the launching apron will be filled with Mega Geobag and Geobag.

- The placing of gabions will be carried out by barge mounted cranes except in areas above water level where it can be done in-situ or launched from a crane on the ground. Well-equipped divers will work under-water to place the gabions at appropriate locations, and also to tie them up with each other so that the gabions are not easily disturbed or displaced due to the actions of flood flows. Underwater photography will be carried out to keep record of the works done below the water surface.
- GSB in thickness of 150mm will be laid in 6m width on top of studs.
- Revetment/ Slope Protection from Km 15.07 to Km 15.17 and from Km 17.10 to Km 17.40 will be done by PVC coated machine made stone filled gabions (0.5m thick in toe and 0.30m thick in slope) will be laid over prepared surface covered by Geo-textile filter of adequate strength and thickness. A key of size 0.3m x 0.3m filled with loose stone boulder will be made along the edge on top of embankment up to the length of slope protection/ revetment work.

III. Raising, Strengthening & Pukkikaran of ESML (Total Length- 31.985 Km)

- Earthwork – For raising & strengthening, earthwork from up to 1.50 Km lead has been provided. Earthwork would be mechanically laid in specified layers which would be consolidated by vibratory rollers to achieve specified compaction test result. Specified top level and slopes of the embankment would be obtained.
- Pukkikaran (black topping) – In total, 6.50 m wide inspection road (5.00 m carriageway and 0.75 m earthen shoulder on either side) would be constructed/ repaired. Pavement design for the road of traffic 5 msa and effective CBR- 5%, as stipulated in Plate-1 of IRC 37: 2018, has been adopted. Hence, provision for 30mm thick BC over 65mm thick DBM over 250mm thick WMM over 150mm thick GSB, including prime coat and tack coat, has been made in the DPR. Road signs and Kilometer Stones would be fixed at specified intervals along the road

The proposed work under DPR has two parts.

Part	Work
1	Raising, Strengthening & Pukkikaran of ESML (total length – 31.985 Km) with Restoration of 7 Nos. stud of ESML from Km 14.00 to Km 26.275.
2	Construction of 13 Nos. new studs from Km 14.00 to Km 26.275 of ESML.

Typical layout plan of proposed stud is shown in Figure 2.1 and Typical cross section of protection work near spur is shown in Figure 2.2

Figure 2.1: Typical Layout Plan of Stud

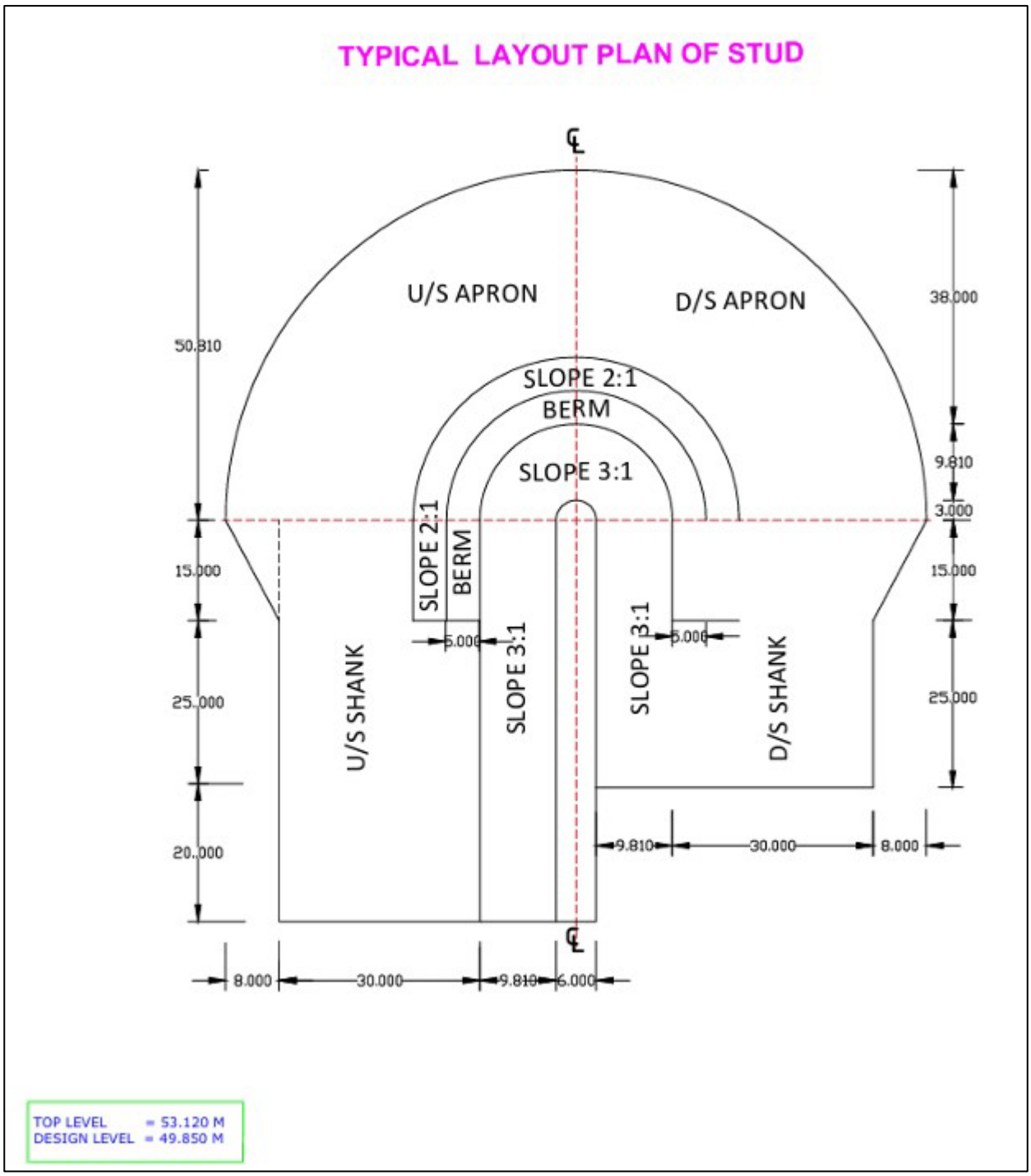
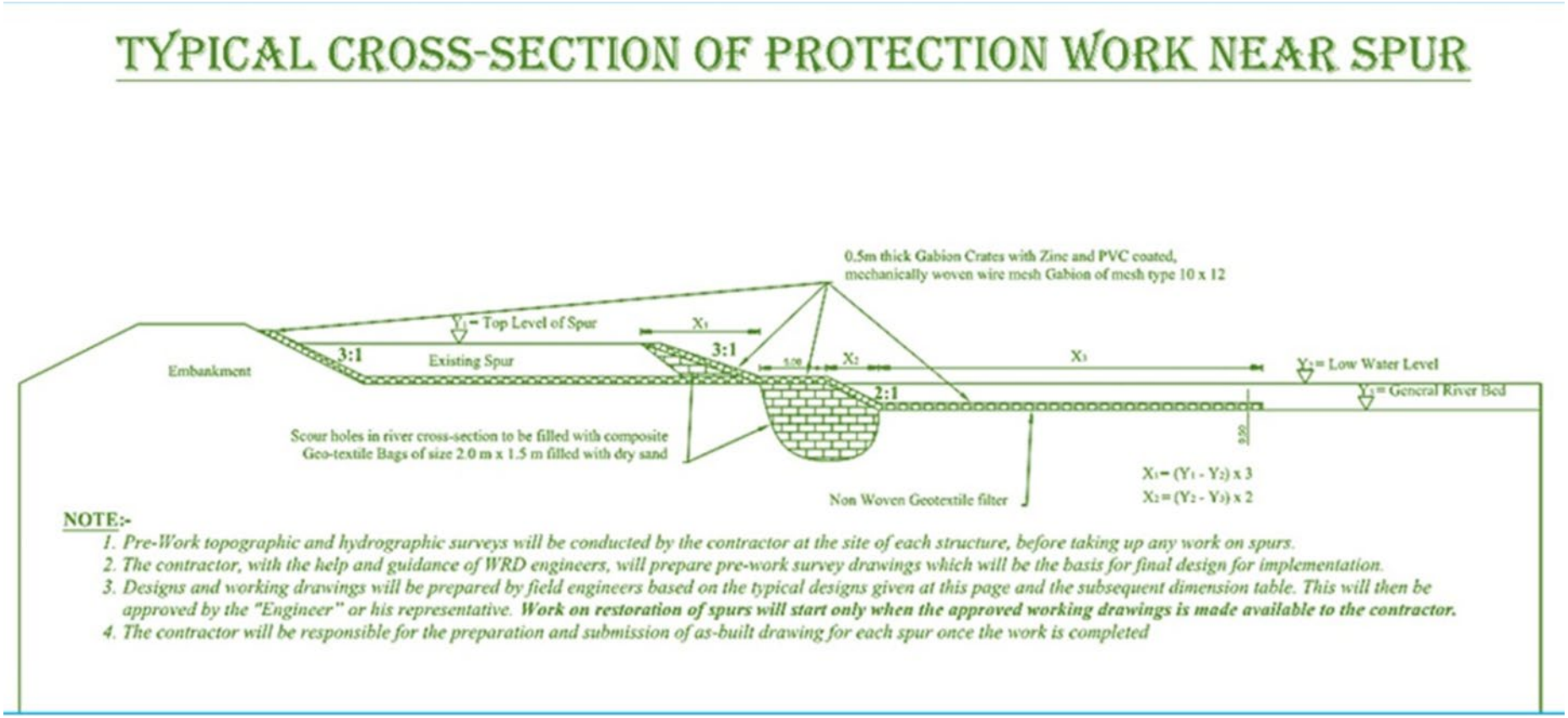


Figure 2.3: Typical Cross Section of Protection Work near Spur



2.6 Demand Projection

There are 11 existing spurs for erosion and flood management at Extended Sikrahata-Majhari Low Bundh erosion affected reach, identified from Chainage (Ch.) 14.00 km to Ch.26.275 km on the west bank of the Kosi River. The reach is located downstream of Kosi Mahasetu.

One-dimensional (1D) and two-dimensional (2D) hydraulic models have been developed to provide hydraulic design of seven newly proposed spurs in a DPR by WRD, Bihar and to evaluate hydraulic functions on the effectiveness of other 11 existing spurs and also propose if any additional spur is needed. Seven new spurs have been proposed in the DPR at Ch. 15.35 km, 16.45 km, 20.70 km, 21.00 km, 23.00 km, 23.50 km and 24.00 km.

Objectives are:

1. Assess future risk of erosion vulnerability in Extended Sikrahata-Majhari Low Bundh reach.
2. Evaluate whether the proposed seven new spurs in DPR are able to eliminate/minimize bank erosion and if required propose alternative options.
3. Evaluate hydraulic performance of existing spurs in reaches where no new spur has been proposed; function of 11 existing spurs has been evaluated.
4. Investigate whether the existing spurs are adequate, and if there is any need for extending length of existing spurs or there is need of any additional spur, in addition to the seven proposed in the DPR.

Key findings on options for proposed new spurs in DPR, six additional spurs and two additional revetments:
Seven new spurs were proposed in DPR. But the location and length of the spurs have been modified through experimenting different options. Further, six additional spurs and two additional revetments, other than the provision of the seven in the DPR, have also been proposed.

i) DPR proposed seven new spurs chainage at 15.35 KM to 24.00 KM.
ii) Six new spurs in addition to DPR provision chainage at 16.71 KM to 26.275 KM.
iii) Two new revetments in addition to DPR provision Revetment at 15.49 KM (approximate) and at 17.17 KM (approximate).

Key findings for existing spur & revetments: High velocity was found at the tip of spur at 19.91 KM (2.31 m/s), 20.05 KM (2.26 m/s) and 20.35 KM (3.59 m/s). During high flow conditions, high velocity was also observed between the spur at 16.00 KM and revetment at 17.20 KM, in between the spur at 19.56 KM and revetment at 19.76 KM and in between the spur at 20.05 KM and 20.35 KM. Hence monitoring during monsoon at these reaches are recommended.

Future risk of erosion vulnerability:
Based on the Mathematical Modelling Report, the large 2D Model for the Full width of the kosi River predicted the future risk of erosion vulnearability.

Therefore, the proposed new spurs and existing spurs at Extended Sikrahata-Majhari Low Bundh will require continuous monitoring work for bed erosion and bank migration in the coming monsoons and if required strengthening of existing spurs may be required or new spurs are built to arrest erosion attack on flood embankment. After implementation, it is recommended to monitor the stretch between the spurs at 20.35 KM to 20.70 KM, upstream of 22.66 KM and in between 23.54 KM to 24.00 KM where future channel migration might put this stretch under erosion threat.

2.7 Design Basis and Period

The scour depth for studs and river edges has been calculated for the discharge of 950000 cusecs or 26885 cum/sec. The embankments have already been designed for this discharge which is estimated equivalent to a 25-year return period flood. The maximum scour depth around nose of spur has been taken as 2.5 times the regime (Lacey's) scour depth, and in other areas like Shank, it has been adopted as only 2.0 times the

Lacey's scour depth and at embankment it is taken as 1.5 following the recommendation by CWPRS, Pune as per provisions of BIS 14262-1995.

2.8 Sustainability of the Project

Environmental and Social Impact Assessment (ESIA) study needs to integrate outcome of public participation and community consultation to ensure project sustainability. The participation of the public in the project is expected to enhance the sustainability of the project by installing a feeling of belongingness. That is why consultations need to be conducted with local community to educate them about the positive and negative impacts as well as the project benefits. This has been outlined in detail in the Stakeholder Engagement Plan (SEP) of the project and relevant details provided in Chapter 9 of this report.

2.9 Resource Requirement for the Project

Land Requirement and availability

Proposed new studs will be constructed on identified Govt. land. All the protection and restoration activities will be carried out on Govt. land. Water Resource Dept. (Govt.) has the ownership of RoW up to 12.5 meters on either side from the centerline of the embankment, i.e. total 25 meters. There is no requirement for acquisition of private land for the interventions proposed in this package. Any temporary land requirements of the contractor for meeting their construction related needs, including for setting up labor hutments and storage yards will be part of the Contractors obligation subject to the E&S requirements spelt by this ESIA and the ESMF. Overall, such referred land shall not be very close to the water body, water logged areas or the wetlands to avoid any impact on the water sources and the associated fauna.

Following table details the availability of government land on both sides of centre line of the embankment (at every 100 m interval) for the entire embankment and certified by the concerned Superintending Engineer. As can be seen, no additional land is required for the proposed works along the entire chainage:

Table 2.1: Details of WRD Land available on each side of embankment

S.No.	Chainage, km	Government Land from Centre line of Embankment		Proposed Embankment Base Width		Additional Land Requirement - permanently	
		Left	Right	Left	Right	Left	Right
1	0.000	15.00	15.00	14.20	14.20	Nil	Nil
2	1.00	15.00	15.00	14.40	14.40	Nil	Nil
3	2.00	15.00	15.00	14.30	14.30	Nil	Nil
4	3.00	15.00	15.00	13.90	13.90	Nil	Nil
5	4.00	15.00	15.00	14.00	14.00	Nil	Nil
6	5.00	15.00	15.00	13.80	13.80	Nil	Nil
7	6.00	15.00	15.00	13.90	13.90	Nil	Nil
8	7.00	15.00	15.00	14.10	14.10	Nil	Nil
9	8.00	15.00	15.00	14.00	14.00	Nil	Nil
10	9.00	15.00	15.00	13.70	13.70	Nil	Nil
11	10.00	15.00	15.00	13.50	13.50	Nil	Nil
12	11.00	15.00	15.00	13.80	13.80	Nil	Nil
13	12.00	15.00	15.00	13.60	13.60	Nil	Nil
14	13.00	15.00	15.00	13.90	13.90	Nil	Nil
15	14.00	15.00	15.00	13.90	13.90	Nil	Nil
16	15.00	15.00	15.00	14.00	14.00	Nil	Nil
17	16.00	15.00	15.00	14.00	14.00	Nil	Nil
18	17.00	15.00	15.00	14.00	14.00	Nil	Nil
19	18.00	15.00	15.00	14.10	14.10	Nil	Nil

S.No.	Chainage, km	Government Land from Centre line of Embankment		Proposed Embankment Base Width		Additional Land Requirement - permanently	
20	19.00	15.00	15.00	14.00	14.00	Nil	Nil
21	20.00	15.00	15.00	13.90	13.90	Nil	Nil
22	21.00	15.00	15.00	13.80	13.80	Nil	Nil
23	22.00	15.00	15.00	13.90	13.90	Nil	Nil
24	23.00	15.00	15.00	13.70	13.70	Nil	Nil
25	24.00	15.00	15.00	13.60	13.60	Nil	Nil
26	25.00	15.00	15.00	13.70	13.70	Nil	Nil
27	26.00	15.00	15.00	13.90	13.90	Nil	Nil
28	27.00	15.00	15.00	14.00	14.00	Nil	Nil
29	28.00	15.00	15.00	13.90	13.90	Nil	Nil
30	29.00	15.00	15.00	13.90	13.90	Nil	Nil
31	29.705	15.00	15.00	14.00	14.00	Nil	Nil
32	29.705	15.00	15.00	14.00	14.00	Nil	Nil
33	30.00	7.00	7.00	6.50	6.50	Nil	Nil
34	31.00	7.00	7.00	6.50	6.50	Nil	Nil
35	31.985	7.00	7.00	6.50	6.50	Nil	Nil

Source: Concerned divisions of WRD

Requirement of Raw material

The construction materials that will use in Raising, Strengthening & Pukkikaran of ESML and construction of new studs is tabulated in Table 2.2.

Table 2.2: Amount of construction Materials required for proposed sub-projet

Sl. No.	Construction Material	Quantity	Unit	Main Carriage station
1	Good earth	9,39,151.82	Cum	Locally
2	Boulder	57231.12	Cum	Mirzachauki
3	Stone chips	17542.399	Cum	Pakur
4	GSB & WMM	71855.931	Cum	Mirzachauki
5	Bitumen	1324.799	MT	Baruani (IOCL)

Source: Concerned Divisions of WRD

Sourcing of boulers, agregrates and other building materials will be sources with safe mining procedures in line with the Mines Act, 1952 (as amended); the Minor Mineral and concession Rules (as amended) and the State Mineral (Rights and Taxation) Acts as may be in force. These provide for safe mining activity. The contractors will procure aggregates and other building materials from quarries and borrow areas approved under such Acts. Contractors will also need to ensure full compliance with these rules and any conditions imposed in the permit.

Labor Requirement (local, migrant- number, accommodation)

The embankment repair, strengthening and the roadworks will take an estimated 24 months to complete. The requirement of skilled and unskilled labour is given in Table 2.3.

Table 2.3: Requirement of labour by type

Skilled Lab days	Semi skilled Lab. days	Unskilled Lab. days	Total Lab. days.
8236	265	161353	169854
140 per day x 12 months	165 per day for 24 months		

Source: Concerned Divisions of WRD

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 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.*

Occupational Health & Safety of Workers

The contractor during the progress of work will provide, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labour to standard and scales approved by the Engineer and subject to the above-mentioned guidelines.

Associated risks from accidents and incidents could affect health and safety of the workers and others on construction/project sites. Since the location of most of the construction sites would be away from medical centers, improper first aid facilities on the sites could affect health and safety of workers and others. The following major mitigation measures should be in place: -

- Adequate drainage, sanitation and waste disposal will be provided at workplaces.
- Provision of distinguishing clothing or reflective devices or otherwise conspicuously visible material when there is regular exposure of workers to danger from moving vehicles must be made.
- All workers and staff should be provided with Personal Protective Equipment (PPE) appropriate to their job on-site.
- Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.
- Helmet shall be provided to all workers, or visitors visiting the site, for protection of the head against impact or penetration of falling or flying objects.
- The placing of gabions will be carried out by barge mounted cranes which will be a risky operation, so OHS risk and worksite safety risks will assess by the contractor and accordingly based on their likelihood and severity mitigation and precutionary measures will be put in place.
- Earplugs will be provided for workers working in high noise zones.
- Respiratory protection devices shall be provided to all workers at the sites of occurrence of fumes, dust, or toxic gas/vapor.
- Relevant labour laws should be strictly complied with pertaining to the health and safety of workers, employees and others.
- All construction sites should be surrounded with secure tamper-proof fence, with security lighting and regular security patrols.
- All materials and components should be stored and stacked safely in dedicated secure areas.
- Use of any paint containing lead or its products or material containing asbestos should be prohibited.
- Smoking should be prohibited near areas of fire or explosion risk.
- Sufficient supply of potable water should be ensured for all workers and employees on-site.
- Ensure that first aid kits are available and accessible in all work areas and camps, supplied with adequate material to treat common workplace injuries and ailments.
- Dedicated transport should be provided at all work sites to take injured persons to hospitals if needed.
- A regular medical facility at each construction camp should be provided with suitable qualified staff and equipment to treat minor ailments and injuries and organise health camps.
- Protect all electric sub-stations, high tension towers and other areas from electrocution risk by providing security fencing and lights, warning signs and security patrols.
- All the construction equipment and vehicles will conform to the emission standards stipulated by the CPCB.

- Safe working techniques will be followed up and all the workers will be trained and mandate to undergo periodic mock-drills and OHS trainings.
- Contractor to be engaged should to experienced contractor with requisite licenses and well-trained workers for the construction works.
- Contractor having well established Occupational Health & Safety (OHS) Policy to guide the construction activities.
- The Contractor will ensure at all-time safe access to the worksite and safe working platform for workers and other supervisory staff.
- An Emergency Response system in case of any incidence will be developed and implemented.
- The Contractor will conduct awareness programmes on HIV/AIDS and other sexually transmitted diseases for workers at least once in a quarter and the record of such training programme must be recorded.
- Conduct regular safety audits on safety measures adopted during construction. The audit will cover manpower and their safety, machinery, temporary works, equipment and vehicles, materials, storage and handling, construction procedures, environment, site safety guidelines, and miscellaneous services.

Contractor will appoint a full-time Environment, Health and Safety (EHS) Officer with B.E in civil or Environmental Engineer and additional qualification in occupational health & Safety with 5 years relevant experience specialization. EHS Officers will be available full time for the project and primarily be responsible for compliance of workers OHS aspects at camp site as well as work site. They are responsible for implementation of EHS measures for different kind of allied project activities like material transport, vehicular transportation etc.

Wastewater Disposal

The wastewater from the camps should not be allowed to be discharged into existing surface water bodies, wetlands, water logged areas or river.

Waste Generation and Disposal

There is no major construction work proposed under this project, which can cause siltation. Moreover, all other proposed activities will generate a small quantity of construction debris / other waste that could be managed immediately after completion of construction and dispose off as per C & D waste rules 2016. The rules shall apply to every one 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. Soil erosion has direct bearing onsiltation. The siltation is likely to be caused due to bank erosion. Construction and demolition waste may use for manufacture of aggregates towards effective management & utilization of this waste (as per IS 383:2016). This however requires necessary care while producing aggregates to ensure their efficcacy in their use as part of concrete.

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

Sl. 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) wrt 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 public interest. Designates a Public Information	Ensures transparency and accountability in the govt operations and citizen's access to public information.

Sl. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
		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.	
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 are 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.	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.
8	The Equal Remuneration Act, 1976; Employee Compensation Act, 1923; and Personal Injuries (Compensation	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	Prevents gender discrimination in employment and provides for employee welfare, including social assistance against any incident/ accident.

Sl. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
	Insurance) Act, 1963; The Minimum Wages Act, 1948, Payment of Wages Act, Maternity Benefit Act, 1961	mandatory worker insurance by employers against such liability.	
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 and	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.
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 recordkeeping.
12	National Policy on Safety, Health, and Environment at Workplace 2009:	The policy provides an action program that includes enforcement, national standards, compliance, awareness, occupational safety, and health development.	It emphasizes that awareness generation on occupational safety needs to be done by suitably incorporating teaching inputs on safety, health, and environment at workplace in schools, technical and vocational courses.
13	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.	
14	Public Liability and Insurance Act, 1991	Enacted for the purpose of providing immediate relief to persons affected by accidents while	The project is being carried out in mainly urban areas where there are already existing vessel movements as well as several

Sl. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
		handling hazardous substances and other incidents.	other human activities at the jetty locations (vendors, locals moving around, etc.). Protection to general public from accidents due to hazardous material (especially if any used at the vessel yards, gangway/pontoon manufacturing units) is essential.
15	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.
16	National Policy for Women, 2016	The policy articulates various mandates for the holistic empowerment of women 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.	Guides inclusion and accessibility provisions and overall women's empowerment and SEA relevant to the program.
17	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.

Sl. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
18	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.
19	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.
20	Environmental (Protection) Act, 1986 amended 1991 and associated rules / notifications	▪ To protect and improve overall environment, this is an 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. ▪ Many rules/ notifications are formed under this act.	▪ Relevant to sub-projects to be taken up, viz., embankments, Canal lining, dredging of silt etc. activities. ▪ Preservation of air and water quality. ▪ Control of pesticides & insecticide runoff ▪ Control dust pollution due to quarrying, which might harm the vegetation.
21	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.
22	Hazardous Waste Management Rules, 2016	Rules define and classifyhazardous 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.)

Sl. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
			and disposed as per the provisions of the applicable Rules.
23	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 waste generated during project construction and operation phases.
24	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 continuance of music sound or noise also falls under within these rules.	Noise will be generated during project implementation stage due to different activities like construction, operation and movement of vehicle, heavy equipment and machinery.
25	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.
26	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
27	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.).

Sl. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
28	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.
29	E-Waste (Management) Rules, 2016	Ministry of Environment, Forests and Climate Change	This Rule identifies the responsibility of e-waste generators, including its handling, storage, labelling and disposal. The disposal of e-waste identified in schedule 1 of the rules is to be done through authorized collection centers and dismantlers or recyclers. E-waste cannot be stored for more than 180 days.

Other Acts and Regulations that may be applicable:

- Untouchability Offences Act, 1955
- Ancient Monuments and Archaeological Sites and Remains Act, 1958
- 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

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 a prepared in compliance to the requirements

- **ESS-2:** Labor-and-Working-Conditions –The labour to be employed under ESML will be governed by the national 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 concerns and Occupational Health and Safety are being taken care of during the design, construction and operations.
- **ESS-5**: Land-Acquisition-Restrictions-on-Land-Use-and-Involuntary-Resettlement
- **ESS-6**: Biodiversity Conservation and Sustainable Management of Living Natural Resources: The Bagmati, Kosi are important habitats for dolphins and turtles. The ESMF has provided guidance on dolphins.
- **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 remain 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 elaborates 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 identifying risks to 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

Sl. 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, DG sets	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	SOP for Borrow Area Identification; its operation, safety and redevelopment issued by MoEFCC on 8th August 2022. SoP link is provied below[1].	Bihar State PCB	Concerned Contractor
7	Sourcing of Boulders and aggregates[2]	For Boulders the Sourcing has to be from a mine which has Environmental Clearence.	Concerned State PCB	Concerned Contractor
8	Obtaining Labour license and related permissions	Contract Labour (Regulation and Abolition) Act. 1970	State Labour Department	Concerned Contractor

[1] https://environmentclearance.nic.in/writereaddata/OMs-2004-2021/305_OM_08_08_2022.pdf

[2] *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*

Sl. No.	Clearance/ Authorization	Relevant Act	Competent Authority	Responsibility
9	Dispose of Construction and Demolition (C&D) waste	Construction and Demolition Waste Management Rules, 2016.	Bihar State Pollution Control Board (SPCB)	Concerned Contractor

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.

CHAPTER 4. ANALYSES OF ALTERNATIVES

ESML Bundh Protection and Restoration Project, is subjective with limited interventions and the degree of the impacts cannot be quantified. It is clear from the objectives of the sub-project that it will have significant positive impacts since it will:

- Provide protection of the ESML Bundh slope and protect river edge, thus preventing risks of floods in future.
- The proposed Project once implemented will prevent risks to the environment, loss of human-animal lives and properties.
- Create water availability for irrigation contribute to improved incomes of the local farming communities.

Thus, it can be concluded that the proposed project is environmentally acceptable and will bring economic, social and environmental benefits to the land users and local community in the area.

4.1 Project or No Project scenario

The "with" and "without" project scenarios were analysed with respect to necessity of the proposed restoration of the ESML Bundh. A comparison of both the scenarios is presented in Table 4.1.

Table 4.1 With & without project Scenario

S. No.	Parameters	Without sub-project		With sub-project	
1.	Loss of land	No loss of land and livelihood	Continued erosion of river edge resulting into loss of cultivable land.	No acquisition of land and hence no adverse impact	Prevention of flood and erosion related losses and retention of the cultivable areas
2.	Community Infrastructure and services	Present infrastructure will not get affected.	-	The repair of the inspection road will improve access both for asset maintenance as well as for local commutation by the local community	Temporary stress on existing infrastructure facilities such as roads and drainage system due to increased vehicular movement during construction phase of the project.
3.	Water logging and public health	-	Impact on health due to susceptibility of area of floods, which in turn cause mosquito breeding / water borne diseases.	Less vulnerability of the area to the effect of floods (inundation)	Increased incidences of water borne diseases and transmission of diseases by immigrant labour population during construction phase.
4.	Change in environmental quality	-	Erosion of river banks will continue resulting into loss of cultivable land and threat to the	-	Following negative impacts may be envisaged during construction phase of the project:- **Land Environment :**

S. No.	Parameters	Without sub-project		With sub-project	
			embankment and spur.		Increase in soil erosion due to stripping of land in the areas near to the river bank and spurs where proposed works will be undertaken. Pollution by construction spoils Solid waste dumping and liquid waste discharge from labour camps. **<u>Water quality:</u>** Increase in turbidity of river water, specially due to work in the submerged area. Degradation of water quality due to disposal of untreated liquid wastes and solid wastes from construction sites and labour colonies. Open squatting in the areas near the river bank and river water contamination due to fecal pollution. **<u>Air Quality</u>:** Pollution due to dust re-suspension and emissions from increased vehicular movement, use of construction equipment and labour colonies. **<u>Noise Level:</u>** Rise in noise level due to increased vehicular movement and use of construction equipment.
5.	Aquatic and Terrestrial Ecology	-	Erosion of river banks will continue resulting into loss of terrestrial and aquatic ecology.	-	Following negative impacts may be envisaged during construction phase of the project, which will

S. No.	Parameters	Without sub-project		With sub-project	
					be temporary in nature: - **Aquatic Ecology:** Marginal reduction in productivity due to increase in turbidity levels and indiscriminate fishing by the labour population. **Terrestrial Ecology:** Impact due to fuel wood requirement by labourers. Temporary adverse impact on flora and fauna due to increased influx of human population.
6.	Social Problems	-	Potential Social conflicts due to resource degradation, impoverishment due to reduced cultivable area and incomes	Improved community resilience to climate change impacts, better water, and livelihood security	Temporary access restrictions during the construction phase

4.2 Alternative Material

Technology Alternatives

Existence of freshwater dolphins in Kosi river being an iconic species for the river ecosystem serve as a link between people and freshwater and a symbol of a healthy ecosystem. The positive side for the conservation by the presence and increase in the population of dolphins will mean that rivers are clean enough to draw water supplies, there is more and diverse assemblage of fish to support people and dolphins.

Construction activities under the sub-project should be carried out in close supervision of the dolphin ecologist. For conservation of dolphin instruction should be given to all vssels operators and all employee and staff that no dolphin or any other endangered species should be harmed due to any reason. Construction works should be avoided or kept minimum in vicinity of the dolphins' favourable microhabitats (downstream of shallow areas/sandbars, tributary junctions). Dolphins are likely to prefer water depth range between 4.1 to 6 m. Therefore, movement of sediment and influx of soil/silt etc. should be avoided to keep the favourable depth range. All boats or ferries transporting construction material and workers will have propeller guards installed to prevent injury and death of dolphins, turtles and other aquatic fauna. Preventative maintenance of equipment should be made to mitigate negative environmental impacts such as leakages and spillages which is harmful for dolphin. The gabion mess size to be used to fix the boulders below the steps at studs close to the water line should be four inches instead of eight inches. To protect any harm to aquatic species

including dolphin, there should be minimum or no noise under the water during construction and implementation of the project.

It is estimated that the in ESML of the 1,06,280.00 cum of earth excavated 38,051.00 cum would be reused for the embankment construction.

Thus, as the analysis of alternatives shows, the project benefits far outweight the potential adverse impacts, and the site and design alternatives being proposed are the most optimal given the project context.

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 embankment systems of ESML in Supaul, Madhubani and Saharsa district mainly, surrounding environments of project activity zones were also considered for baseline study.

5.1 Project Location and Delineation of study area

Raising, strengthening & pukkikaran of ESML (total length – 31.985 km) with restoration of 7 nos. Stud and construction of 13 nos. Stud from km 14.00 to km 26.275 of ESMLScheme is part of the World Bank funded "Bihar Water Security and Irrigation Modernization Project (BWSIMP)". ESML embankment is 26.275 km long. However, the survey has been carried out for total length of 31.985 Km, which includes the stretch from 49.00 RD of Sikarhatta Majhari Low (SML) embankment to 59.00 RD of SML (Km 0.00 of ESML), from Km 0.00 to Km 26.275 of ESML embankment and Km 0.00 to Km 2.82 of Nirmali Mahua Approach Road which is connected with SML at 57.00 RD.

Delineation of study area

a) The Embankment originates from 59.00 RD of SML and terminates at Km 26.275 near Nakta village in Supaul block under Supaul district.
b) The embankment is connected to NH-57 at Majhari chowk in west side of Kosi Mahasetu. The Embankment is also connected to Barrage/King Mahendra Rajmarg through the service road of the Western Main Canal via SML crossing NH-57 & Western Kosi Embankment. For providing dependable connectivity with the king Mahendra Rajmarg for the vehicles coming through the 123.772 Km long embankment, this reach of the canal service road will have to be suitably improved.
c) To assess the present status of the embankment, spurs and river edge, a condition survey was conducted from Km 14.00 to Km 26.275 of the embankment. The various deficiencies as well as performance of earlier protection measures were identified and noted/rectified. It was that some stretches of the Embankment needed special attention as the deeper channel in this stretch was hugging the bank and eroding the same severely.
d) In particular, many studs in the reach between Km 14.00 and Km 26.275 were severally damaged, thereby allowing the river course to come very near to the toe of the embankment. Condition surveys thus helped to pin point the areas and locations which would need immediate protection measures, and accordingly, necessary surveys, investigations and designs were carried out.

Proposed work site for restoration of 7 nos. stud and construction of 13 nos. of stud in Figure 5.1 and Figure 5.2 below:-

Figure 5.1: Site for Restoration of 7 nos. Stud and construction of 13 nos. of Stud

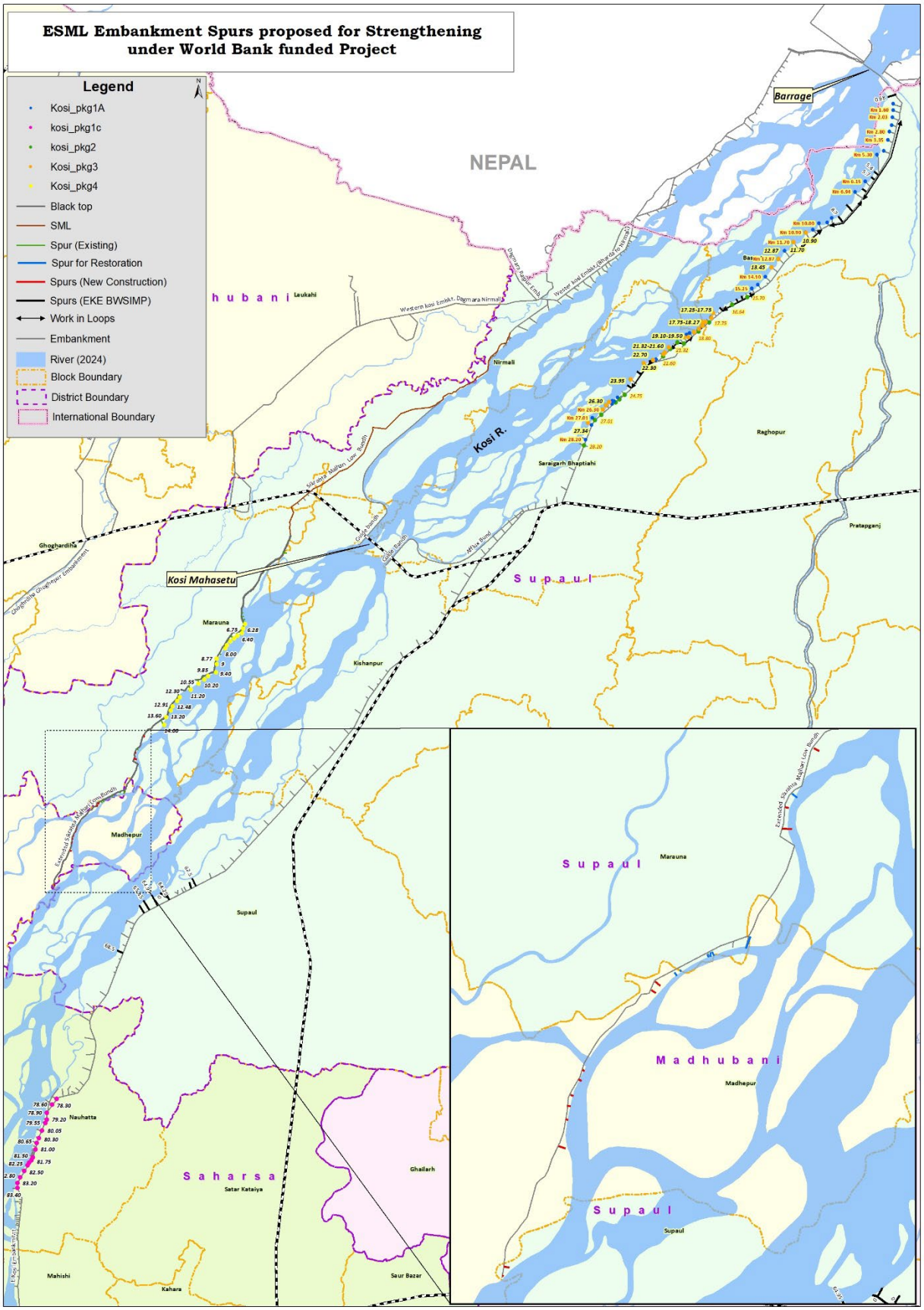
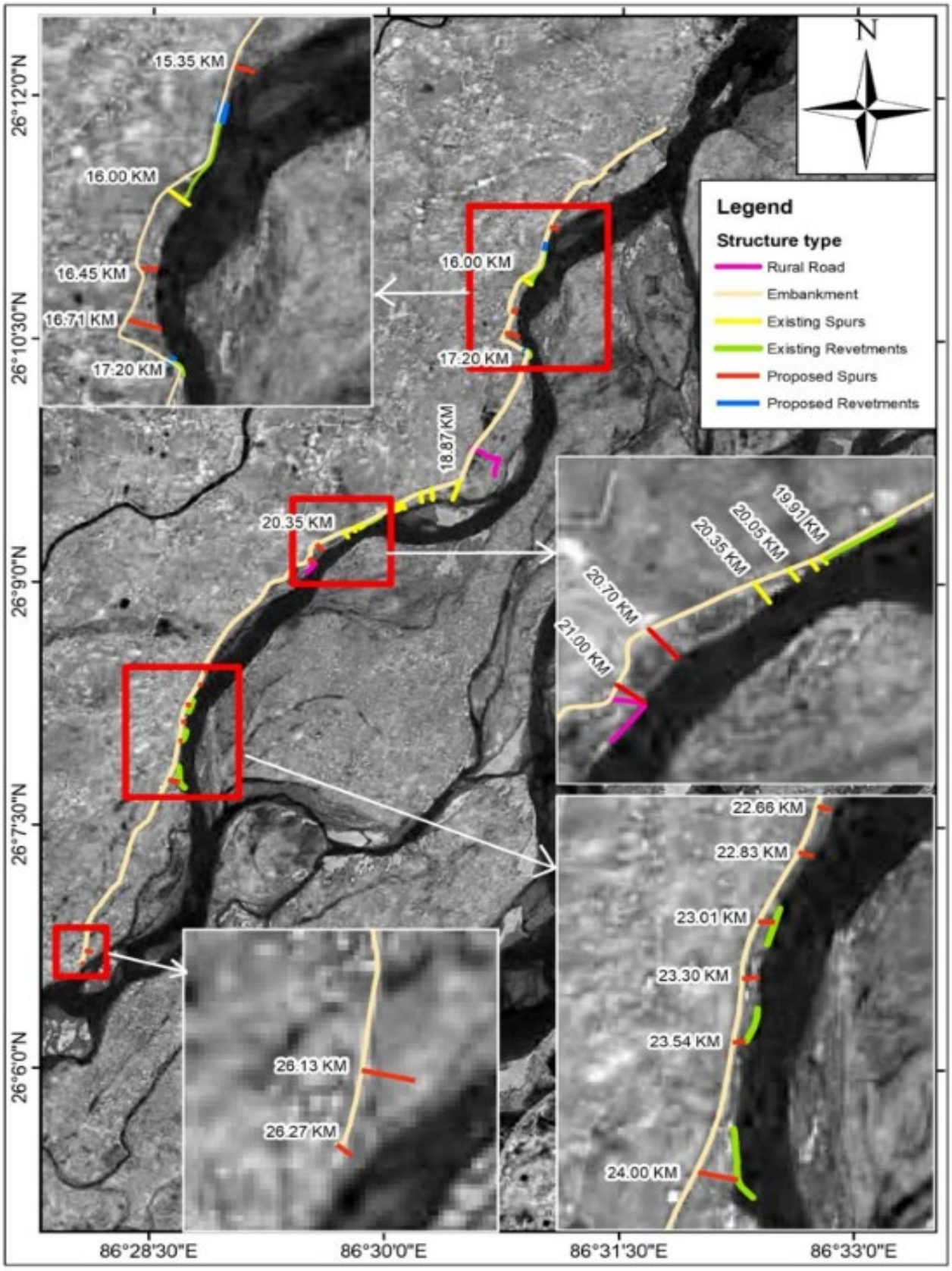


Figure 5.2: Site for Proposed Works for construction of 13 nos. Stud



5.2 Physical Environment

Kosi River flows through Nepal for 50 km below Chatra to Hanuman Nagar, before it enters the Indian Territory. From Chatra to Galpaharia, the river flows in a southwest direction in this reach, the westward swing of the river is restricted by the Mahabharata range. In the portion below Chatra, the river divides itself into several channels spread over a width of 6 to 16 km. Below Hanuman Nagar, the river Kosi runs about 100 km in a sandy track and finds its way southward through several channels. After that, the river takes an eastward direction and has a single defined channel. The main channel joins the river Ganga near Kursela in Katihar district. In plains of Bihar, the river has two important right bank tributaries; these are the Bagmati and the Kamla Balan. The other tributaries worth mentioning on the right bank are the Trijuga and the Bhutahi Balan.

Suapaul, Madhubani and Saharsa districts 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.

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 inundation area of ESML 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^{o}C. (Source: Ground Water Information Booklet Supaul & Madhubani District, Bihar State.)

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.

Rainfall

The area has warm and humid climate with high temperatures and medium tohigh rainfall. The normal rainfall for the project districts stands at 1404mm. Most of the rainfall (80% to 90%) is received from mid-June to mid-October.The late September October rains (locally known as "Hathia" Nakshatra) are

verycrucial to agriculture in the region and their timing and distribution make all thedifference between plenty and scarcity[3].

Land Use

The project area exhibits 45.51% of land as agriculture, 26.80% as sand, 6.38% as vegetation, 4.96% as village settlement, 7.70% as river, 3.69% as open land, 4.89% as fallow land and 0.07% area exhibits Inland water bodies. (Obtained from land-use study of the area from satellite imagery acquired on 18th March 2020; Source Google Earth Image through Geographic Information System (GIS) mapping).

Cropping Pattern

Agriculture is the main occupation of the people in Kosi basin. In general, there are four agricultural seasons in one year; (i) Bhadai (ii) Aghani (iii) Rabi & (iv) Garma. During Rabi the important crops, which are grown in the project districts include wheat, rice, corn, mustard, jawar etc. Paddy is mainly grown during June to November. The climate allows round the year vegetable cultivation of cabbage, cauliflower, carrot, radish, chili, capsicum, beans and long beans, gourd, potato, onion, coriander, turmeric, ginger, Garlic etc. The staple cereal of this district is rice.

The dominant cropping pattern in the Kosi Basin primarily consists of rice as the staple crop, alongside maize and wheat, with variations depending on the topography and season; in the summer months, farmers typically cultivate rice, maize, and millet, while winter sees the planting of wheat and barley, often accompanied by vegetables and cash crops depending on the region.

During field study farmers told that Water of Kosi River contain high amount of silt, making soil fertile and allow farmers to do multi-cropping. However, it becomes the worst nightmare during floods and destroys standing crops, spreading a thick sand layer on the agricultural field. Apart from this, the river engulfs agricultural land every monsoon in random way. Local residents express their apprehension that, during restoration and strengthening work, their agricultural land and cultivated crops might be affected by dust. Adequate mitigation measures like sprinkling of water and provision of dust screens around material storage areas will do away with such problem.

Topography

The topography of the sub-project area i.e. Indian part of Kosi basin is characterized by a drastic elevation change, ranging from the high Himalayan peaks in the north, including Mount Everest, to the flat plains of the Gangetic delta in the south, encompassing diverse features like the Tibetan Plateau, the Himalayan mid-hill belt, the Mahabharat Range, the Siwalik Hills, and the Terai region, resulting in a varied landscape with steep slopes, river gorges, and alluvial plains in the lower reaches; most of the basin lies within the state of Bihar, India, with the majority of the mountainous terrain situated in Nepal within the Himalayas.

[3]Ground Water Information Booklet Supaul & Madhubani District, Bihar State

Soil

Soil is the most important medium for supporting agricultural development. Itsproperties influence fertility, water retention capacity, gas exchangeability and physicalsupport capacity of plant roots, determination of various other chemical constituentparameters in the project area. Supaul in general possesses alluvial soil. Theareas close to the Kosi channels possess soil types of sandy loam, loamy sand and sandcharacter, whereas, the areas away from the river channels consist of silty sand to sandysilt in nature. The soils, in general, are fine-textured away from the river course and
rivulets and coarse-textured along with their courses. The soil profile of the project area isnot properly developed as each year huge amount of silt is deposited year covering theprevious one.

For studying the soil properties of the region six soil sampling stations wereselected from the project area at the time of ESIA study of ESML (Package - 4) in the year 2020 under BKBDP. Soil samples were collected during the study periodand their physical and chemical properties were analyzed.

Table 5.1: Details of Soil Sample Monitoring Locations

Code	Location	Latitude	Longitude	Landmark References
S-1	Siswa	26° 11' 18.606" N	86° 34' 4.970" E	Agriculture Field of Pachgachhra village
S-2	Ghogharia	26° 11' 51.827" N	86° 31' 49.300" E	Agriculture field near spur at km 14.00
S-3	Manharpatti	26° 12' 57.972" N	86° 33' 12.739" E	Agriculture field near stud at km 9.00
S-4	Dhanuktola	26° 15' 16.615" N	86° 34' 53.873" E	Agriculture field near stud at km 6.00
S-5	Gajhara	26° 13' 58.255" N	86° 32' 48.327" E	Agriculture filed in the village of Tatrariahi
S-6	Banarjhula	26° 13' 56.743" N	86° 30' 51.106" E	Agricultural field at the village of Mainahi

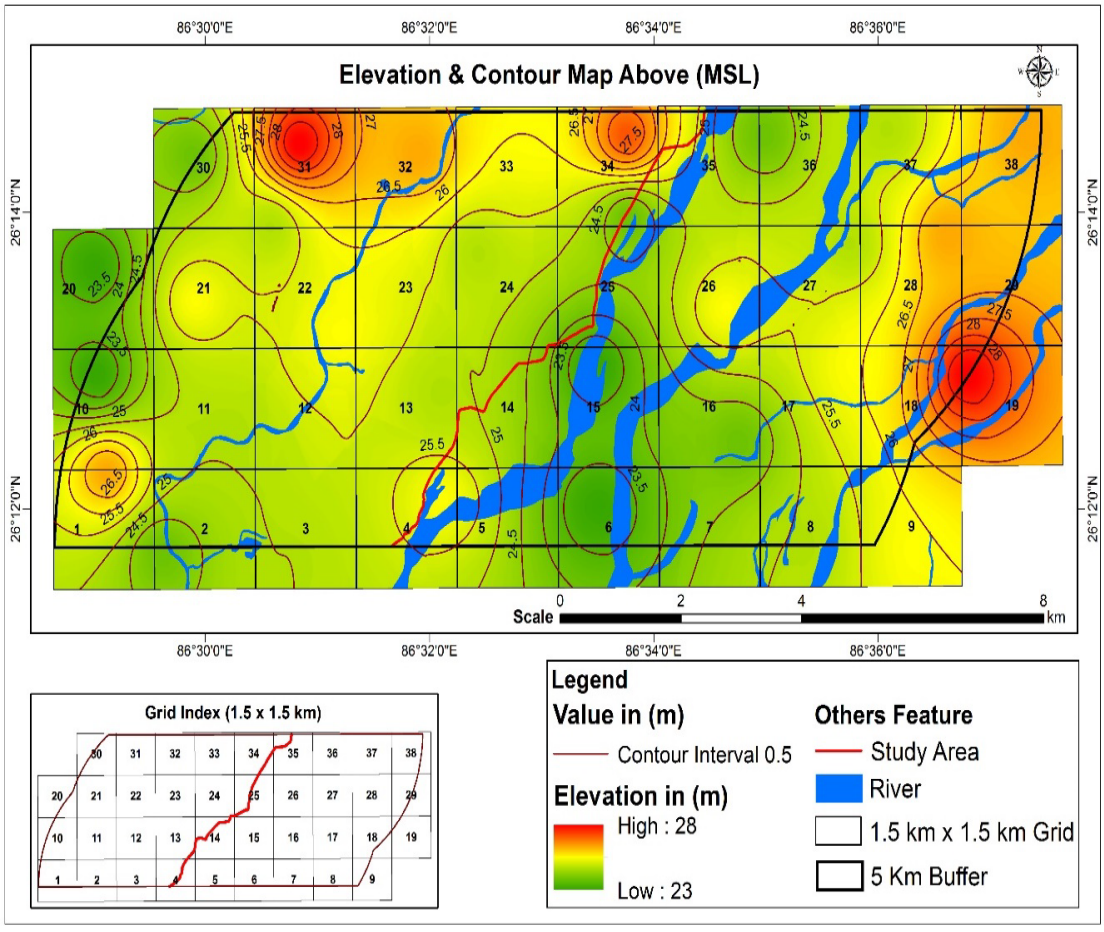
Table 5.2: Analytical results of soil quality of the project area

#	Parameter	Unit	S1	S2	S3	S4	S5	S6
	Date of Sampling		**21.02.20**	**21.02.20**	**22.02.20**	**22.02.20**	**23.02.20**	**23.02.20**
1	pH value @ 25°C (1:5)	--	6.72	6.82	6.94	6.78	6.98	7.08
2	Electrical Conductivity	µS/cm	104.2	99.8	151.6	101.6	158.5	147.2
3	Texture	--	Sandy Loam	Sandy Loam	Loamy Sand	Sandy Loam	Slit Loamy	Loamy Sand
4	Sand	%	79.46	82.34	32.12	81.23	18.96	34.82
5	Silt	%	13.4	11.82	56.28	13.82	56.42	52.94
6	Clay	%	7.14	5.84	11.6	4.95	24.62	12.24
7	Bulk Density	g/cc	1.45	1.46	1.35	1.46	1.28	1.36
8	Moisture content	%	8.8	9.2	10.4	8.7	9.6	8.5
9	Available Cl	mg/kg	148.9	124.1	198.5	148.9	223.3	198.5
10	Available Ca	mg/kg	160.3	120.2	240.5	160.3	320.6	300.6
11	Available Mg	mg/kg	48.6	48.6	97.2	72.9	97.2	85.1
12	Available Na	mg/kg	93.6	82.8	113.6	94.8	115.0	104.8
13	Available Potassium as K	mg/kg	56.4	50.8	68.4	58.0	77.0	73.0
14	Available SO4	mg/kg	150.0	145.0	230.0	160.0	245.0	217.5
15	Available Nitrogen as N	mg/kg	68.92	83.80	195.73	95.66	223.42	181.13
16	Available Phosphorus as P	mg/kg	56.54	67.45	102.16	60.01	98.69	94.47
17	Available Organic Carbon	%	0.72	0.6	1.08	0.66	1.2	0.96
18	CEC	(meq/100g)	4.8	4.6	10.8	5.1	11.2	10.2
19	SAR		9.16	9.01	8.74	8.78	7.96	7.55

Physiography and Drainage Pattern

Kosi River flows through Nepal for 50 km below Chatra to Hanuman Nagar, before it enters the Indian Territory. From Chatra to Galpaharia, the river flows in a southwest direction in this reach, the westward swing of the river is restricted by the Mahabharata range. In the portion below Chatra, the river divides itself into several channels spread over a width of 6 to 16 km. Below Hanuman Nagar, the river Kosi runs about 100 km in a sandy track and finds its way southward through several channels. After that, the river takes an eastward direction and has a single defined channel. The main channel joins the river Ganga near Kursela in Katihar district. In plains of Bihar, the river has two important right bank tributaries; these are the Bagmati and the Kamla Balan. The other tributaries worth mentioning on the right bank are the Trijuga and the Bhutahi Balan. Figure 5.3 showing contour map of project area.

Figure 5.3: Contour map of the Project area



Hydrogeology

In the project area, the hydrogeology (groundwater occurrence, movement and quality) is controlled by the lithology (host sediments) that store and transmit groundwater. The area of study is dominated by the

presence of river sand, deposited as part of the Kosi River system. The intercalations of clays in dominantly sand deposits control the behavior of groundwater. This observation also indicates the fact that the dynamics involved in deposition of sediments from the Kosi River and various combinations of fine sand, coarse sand, gravel and clay sequences are likely to be found within the Basin.

Therefore, due to the complex nature of flow regimes within such systems, there is difficulty in defining hydrological boundaries. Upper unconfined systems may receive direct contributions through vertical recharge from precipitation and lateral flows from streams.[4]

(*Source: BSDMA, 2020; CGWB 2013; GSI 2022*).

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 and strengtheing of spurs, revetment works and embankment road re-construction, 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 5.3 Air Quality Index (Annual Average) of the project area

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)

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. Ambient noise level may be increased temporarily and to be monitored near sensitive receptors against the Ambient Noise Quality Standards set by CPCB. These construction activities are expected to produce noise levels in the range of 80 – 95 dB at a distance of about 5 m from the source of operation. Although this level of noise is higher than the permissible limits for ambient noise level for residential/ commercial settlements but the noise will occur only intermittently and temporarily.

[4] Kosi Flood Report 2014.

Ground Water Quality Monitoring

The total annual ground water available in the command area in Supaul district covering the 10 blocks and Madhubani district covering the 21 blocks is 824 MCM and1126 MCM respectively.

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 Supaul and its adjoining district Madhubani is classified as "safe" for extraction by the Central Ground Water Board (CGWB), although signs of over-extraction are becoming evident in urban areas.

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 5.4: Groundwater Quality in Madhubani and Supaul 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

Surface Water Quality Monitoring

Surface water sources are essential for sustaining the agrarian economy and maintaining the ecological balance of both Supaul and adjoing district madhubani. 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 Project area, while adjoing area 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.

Ponds and Chaur Lands: In addition to rivers, both project districts have numerous ponds and chaurlands - low-lying areas that act as natural reservoirs during the monsoon. These water bodies, known locally as pokhars in Madhubani and Supaul, 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.[5] 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.

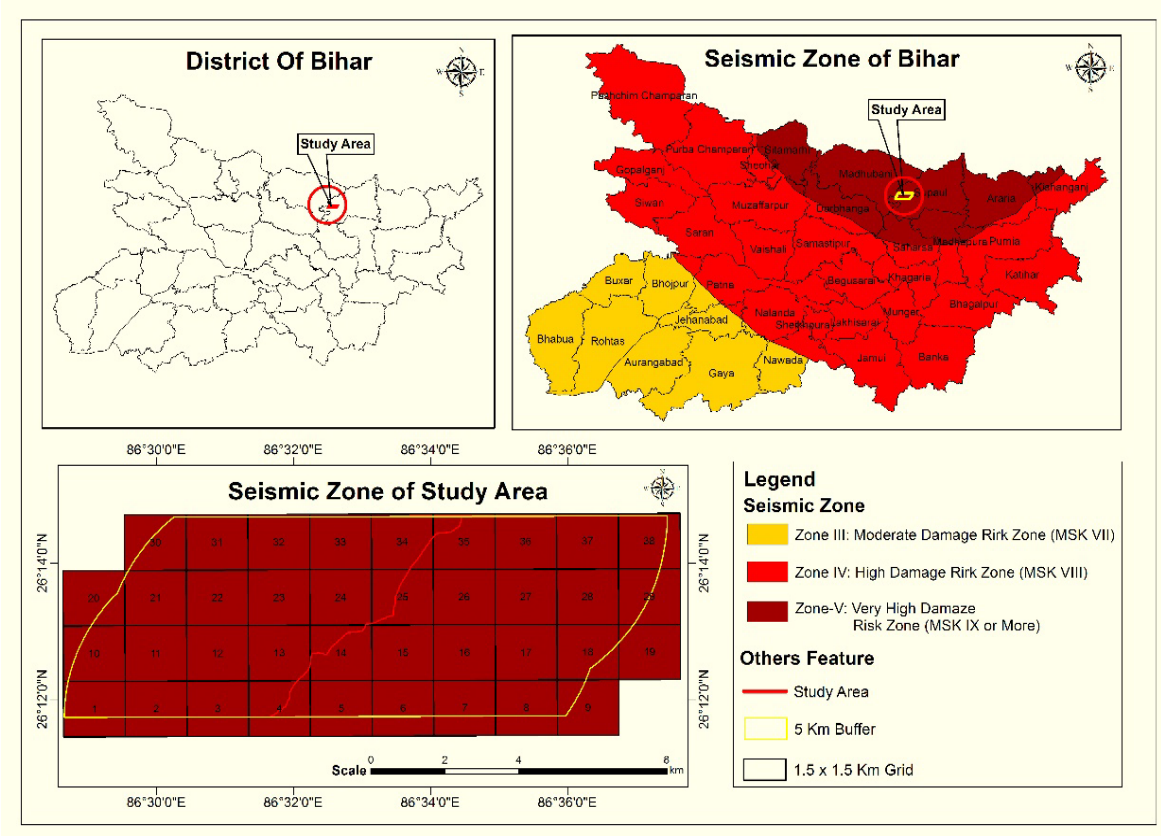
The Kosi River presents a challenge in terms of recurring flood hazards. A major flood in 1953-54 led to the development of 'Kosi Project' that was aimed at flood control and irrigation. Despite this intervention and a long history of flood control management in the basin for more than 5 decades, the river continues to cause extensive flooding due to breaches. The history of Kosi floods mentioned below:[6]

1963: The first breach on the Western embankment in Nepal
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. "Supaul and Madhubani District" lies in Seismic Hazard ZoneV[7] shown in Figure 5.4. 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[8].

[5] https://www.biharkrishi.in/
[6] Bihar Kosi Flood Needs Assessment Report 2008
[7] EIA Report of Kosi River August 2014
[8] Bihar Kosi Flood Needs Assessment Report 2008

Figure 5.4: Seismic Map of the Project area



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 Supaul & Madhubani district, a study was conducted by University Department of Geography, L N Mithila University, Darbhanga in the year 2022[9]. The long-term hydrological investigations conducted in this study aimed to analyze various aspects of wetlands in Supaul &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 Supaul & 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

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

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. Seasonal and Annual change in Wetlands in project districtsis shown in the following Table 5.5.

Table 5.5: 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%**

In conclusion, said comprehensive study provided valuable insights into the hydrological characteristics and changes in wetlands within Madhubani & Supaul 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 Supaul and Madhubani 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 studs restoration work area is not falling in the ecological protected area or WLS. The proposed project area is falling 40 Km from the nearest ESZ boundary of Kusheshwar

Asthan Bird Wildlife Sanctuary (Source: MoEFCC Notification on Final ESZ Boundary of Kusheshwar Asthan Bird WLS, 22 Aug 2017).

In the project districts 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 and Fauna

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 country side of embankment 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 5.6 presents the recorded Floral Species in the Project area:-

Table 5.6: Floral Species in Project Area

Botanical Name	**Local Name**	**Botanical Name**	**Local Name**
Aquatic Macrophytes		***Shrubs***	
Alternanthera philoxeroides Mart	Danta	*Adhatoda Vasica Nees*	Basak
Eichhornia crassipes (Mart) Solmns	Jalkumbhi	*Calotropis Procera (Ait) R. Br*	Akwan

Ipomoea Aquatica Forsk	Karmi	*Cannabis Sativa*	Bhang
Ipomoea fistulosa Mart	Behaya	*Hiptage Benghalensis Linn*	Gulphrosh
Nelumbo nucifera Gaertn	Kamal	*Lantana Camera Linn*	Putus
Nymphaea stellataWilld	Bhent	*Solanum Torvum Siu*	Bab baigan
Herbs		*Tamarix DioicaRoxb*	Jhau
Acalypha Indica Linn	Copper leaf	*Vitex Negundo*	Shiwali
Aloe Vera	Dhrit Kumari	**Cereals, Pulses & Vegetables**	
Amaranthus Spinosus Linn	Ktaiyasag	*Amaranthus Tricolor*	Lal saag
Argemone Mexicana	Kataiya	*Amaranthus Virdis Linn*	Genhari saag
CentellaAsiatica Linn	Brahmi Buti	*Momordica charantia*	Karela
Cyperus Rotundus	Motha	*Oryza sativa*	Rice
EcliptaAlba Linn	Bhangaiya	*Spinacia oleracea*	Palak
Euphorbia Hirta Linn	Dudhi	*Vigna mungo*	Urd
EvolvulusAlsinoides Linn	Shankhpushpi	*Vigna radiata Linn*	Moong
HeliotropiumIndicum Linn	Hathisur	**Grasses**	
Mirabilis Jalpa	4 'O clock	*Commelinabenghalensis*	Kanchara
Oxalis Corniculata Linn	Khattimithi	*Cynodondactylon*	Dub
Physalis Minima Linn	Makoi	*Cyperus rotundus*	Motha
Ranunculus Sceleratus Linn	Jaldhania	*Imperata cylindrical*	Khans
Solanum Nigrum Linn	Bhatkoi	*SetariaInterrupta*	Latpatwa
Vernonia Cinerea Linn	Sahajai	**Trees**	
Vigna Radiata Linn	Moong	*Acacia Arabica*	Babool
ZeaMays	Maize	*Aegle marmelos*	Bel
Climbers			*Annona squamosa Linn.*
Cayratiatrifolia	Amalbel	*Azadirachta indica A.Zuss.*	Neem
Basella alba	Poi	*Bombax malbaricum*	Shimal
Cuscutareflexa	Amarbell	*Citrus × Limon*	Lemon
Atylosiascarabaeoides	Ban kulatha	*Cocos nucifera*	Coconut
Coccinia indica	Kundari	*Derris pinnata*	Karuini
Dolichos lablab	Bean	*DulbergiadissoRoxb.*	Shisham
Luffa cylindrical	Nenua	*Ficus benghalensis*	Gamhaar
Trees		*Syzygiumcuminii*	Jamun
Ficus religiosa	Peepal	*Terminalia arjuna*	Arjun
Litchi chinensis	Litchi	*Thevetia peruviana*	Yellow Kaner

Mangifera indica	Mango	*Ziziphus jujube*	Ber
Neolamarckiacadamba	Kadam	*Tamarindus indica*	Tamarind
Odinawodier	Jihal	*Syzygiumsalicifolium*	Kath Jamun
Pithecellobium dulce Roxb	Jalebi	*Ficus glomerate*	Gular
Phyllanthus Emblica	Amala		
Psidium guajava	Amrood		

Fauna

The faunal species reported from the area within 5 km envelope on country side of embankment of existing EKE are presented in Table 5.7.

Table 5.7: Faunal Species in Project Area

Zoological Name of Species	English Name	Zoological Name of Species	English Name
MAMMALS		**BIRDS**	
Canis aureus	Jackal	*Ardea cinereal*	Grey Heron
Canis familiaris	Dog	*Bulbulcus ibis*	Cattle Egret
Felis domesticus	Cat	*Casmerodius albus*	Great Egret
FunambulusBalmarum	Squirrel	*Columba livia*	Blue rock pigeon
HerpestesEdwardsii	Indian Mongoose, Indian grey Mongoose	*Corvus splendens*	House crow
Mus Booduga	Indian Fieldmouse	*Ardea cinereal*	Grey Heron
Mus musculus	House Mouse	*Gyps indicus*	*Grey Vultures/ Indian long-billed vulture*
REPTILES		*Leptoptilosjavanicus*	Lesser Adjutant (Garud)
Agama tuberculate	Common lizard	*Milvus migrans*	Cheel
Bungarus caeruleus	Common Krait	*Mycteria leucocephala*	Painted storks and grey storks
Chamaleonzeylanicus	Chameleon	*Pavocristatus*	Common peacock
Naga naja	Indian cobra	*Phalacrocorax fuscicolis*	Cormorant or Indian Shag
Viperarusselli	Russel's viper	*Pyenonotusjacosus*	Bulbul

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 meandering nature of a river creates diverse and natural habitats for fish, providing a variety of environments with different flow velocities, depths, and substrates, which are crucial for fish survival and biodiversity. The mentioned stretch of Kosi River, Supaul, Bihar, India is rich in fish biodiversity and source of livelihoods for the residing fishing community. Besides, it a source of quality fish protein for neighbouring populations thus helpful in providing nutritional security. However, the fish populations are decreasing day by day and cause a serious threat to the ecology of riverine ecosystem. Pollutions, overexploitation and indiscriminate fishing methods have been observed throughout the study period, which has resulted in a drastic decrease of fish populations. Awareness of fishing community and enforcements of inland fishing rule and regulations is very much important for the conservation of these valuable fish recourses. Further research about reproductive biology, bionomics and genetic diversity of inhabiting fishes is essential for effective utilization and conservation of fisheries resources of this river.

The information collected from local fisherman, 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. Fishing activity is being done in the waterlogged areas inside the river 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 5.8.

Table 5.8: 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 Dolphin:

The presence of genetic dolphin, as per the Sinha et al. 2010a; Sinha 2013, is noted in the stretch of 500-525 km 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 (Reeves and Leatherwood, 1994; Smith et al., 1998, 2009, 2010; Kelkar et al., 2010).

Dolphin range in main stem Ganga of Bihar seems fairly stable with high population densities across the stretch, with an estimate of 1096 individuals (SE± 17) (Qureshi et al, 2018). Vikramshila Dolphin Sanctuary at the confluence of River Kosi and the Ganges forms an important habitat for the species and may be acting as a source population of the river stretch. The stretch between Chausa (Madhepura district) and Maniharighat (Katihar district) in Bihar seems to be the strongest hold for this species in the Ganges river

basin. While the Vikramshila Gangetic Dolphin Sanctuary in Bhagalpur Bihar itself serves as a good habitat, where dolphins thrive in the region, the stretch surrounding Katihar (near Maniharighat) seems to be another major hotspot. Similarly, other stretches which include Ghaghara and Gandak confluences also have a good population of Ganges dolphin. They are also critical links to maintain a viable dolphin population, as they connect the rivers of Nepal with Ganga. Begusarai, Barh, and Naugacchia form other critical hotspots that require regular monitoring and infrastructure, to ensure the survival of dolphins in the future. A significant reduction in population has been observed in Koshi river and river Gandak (Narayani in Nepal) upstream of the barrages (Smith et al. 1994; Sinha et al. 2000; R. K. Sinha & Kannan, 2014). In a survey in 2010, 257 dolphins were recorded in the Gandak river (Choudhary, 2012). In the Ghaghara river, an estimated 125 dolphins were recorded in the river stretch in Bihar. The stretches between Chhatei and Ghagra-Ganga confluence holds high densities of dolphins and needs special attention (WTI, 2019). In an abundance estimation study carried out for 155 km of Koshi river in India a total of 132 (SE± 6) dolphins were sighted (Qureshi et al., 2018), and around 160 dolphins by another independent estimate (Choudhary et al., 2019a, Choudhary et al., 2019b).
As per Final Report on 'Status of Ganges River dolphins in Kosi River in Supaul District, Bihar (Choudhary, S.K., Dey, S. & Nair, T. 2019b), a total of 79 dolphins (upstream count) were recorded in 72.8 Km stretch of the Kosi river in Saharsa district in the present survey. Most of the sightings were of adult (51) and sub-adult (26) individuals. Only one calf was sighted this time compared to four that sighted in April 2018 survey. The dolphins were recorded mostly in sections of river where the average depth was two meters or more (Mean recorded depth for dolphin = 2.04 ± 1.11 m). However, the average thalweg depth for Saharsa was found to be lower than the required threshold depth as suggested in the report submitted to the Forest Department for the 2016 survey. The low depth of the river is a major concern for dolphins as well as for the health of the entire Kosi river ecosystem.

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. So, if the need arises, separate study should be carried out by any Dolphin Expert in Kosi region and Action Plan for the Conservation of the Gangetic Dolphin for Kosi area will be prepared.

CHAPTER 6. SOCIAL BASELINE

6.1 Administrative boundaries of the project area and downstream impacted areas

The project area is spread from NH-57 at Majhari Chowk in Nirmali block under Supaul district in the north, and to the Nakta village in Supaul block under Supaul district in the south along ESML on west side of Kosi river. The entire project area is flood prone and is distributed under Supaul and Madhubani districts. Supaul district has 11 blocks, out of which the project area falls in Nirmali, Marauna and tiny part of Supaul blocks whereas, Madhubani district has 21 blocks, out of which the project area falls in Madhepur block. In total 21 villages are covered.

The project covers the following villages under the mentioned blocks.

Sl. No.	Name of Sub-Project	District	Block	Villages
1.	Raising, Strengthening & Pukkikaran of ESML (total length – 31.985 km) with Restoration of 7 nos. stud and Construction of 13 nos. stud from km 14.00 to km 26.275 of ESML.	Supaul	Nirmali	Mahua, Majhari
2.			Marauna	Barhara, Rasuar, Kadmaha, Sisauni, Kataiya, Ghoghraria, Panchgachhiya, Mangarihaul, Parsauni, Khokhnaha, Manohar Patti, Hadari, Dhavghat, Parsa Madho
3.			Supaul	Telwa, Nakta
4.		Madhubani	Madhepur	Basi Patti, Mehsa, Gadhgaon

6.2 Demography of areas directly and indirectly impacted

As per Census 2011, total 180,580 families reside in the project blocks and the average family size is 5. Population of the four project blocks is mentioned in the following Table 6.1.

Table 6.1: Block wise Population Distribution

Block	Population			Sex Ratio
	Total	Male	Female	
Nirmali	98,435	50,824	47,611	937
Marauna	145,136	74,701	70,435	943
Supaul	360,198	187,813	172,385	918
Madhepur	267,606	139,319	128,287	921
Total	**871,375**	**452,657 (51.95%)**	**418,718 (48.05%)**	

The project blocks have a total population of 871,375 as per the Census 2011. Out of which 139,319(51.95%) are male while 418,718 (48.05%) are female. The block wise average Sex Ratio given in the above table 6.1 shows Marauna has the highest at 943 and Supaul has the lowest 918 among the project blocks.

6.3 Socio Economic Profile

The project blocks are predominated by Hindu population, 81.04% and followed by Muslim population,18.69%. The Schedule Caste (SC) constitutes 13.91% while Schedule Tribe (ST) was only 0.26% of total population in project blocks. Following Table 6.2 shows SC & ST population distribution.

Table 6.2: SC & ST population distribution

Block	SC & ST Population		
	Total	Male	Female
Nirmali SC	11,058	5,666	5,392
Nirmali ST	30	18	12
Marauna SC	15,872	8,138	7,734
Marauna ST	215	117	98
Supaul SC	51,258	26,498	24,760
Supaul ST	1,274	661	613
Madhepur SC	43,006	22,406	20,600
Madhepur ST	742	376	366
Total SC	**121,194 (13.91%)**		
Total ST	**2,261 (0.26%)**		

Average literacy rate of the referred blocks as per census 2011 is 56.79% in which, male and female literacy is 56.36% and 34.77% respectively, which are far below the state average. Around 22% 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
Nirmali	57.69%	57.80%	34.77%
Marauna	54.23%	55.21%	30.48%
Supaul	59.77%	57.50%	38.68%
Madhepur	55.46%	54.92%	33.95%
Average	**56.79%**	**56.36%**	**34.77%**

Table 6.4: Distribution of Workforce by gender																				
Bock	**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
Nirmali	20,855	15,319	5,536	5,889	4,729	1,160	9,387	6,201	3,186	954	470	484	4,625	3,919	706	16,219	8,560	7,659	61,36	26,945	34,416
Marauna	27,106	21,342	5,764	10,511	8,931	1,580	14,780	11,134	3,646	381	225	156	1,434	1,052	382	30,888	12,966	17,922	87,14	40,393	46,749
Supaul	69,874	56,438	13,436	22,367	18,531	3,836	27,018	20,485	6,533	1,749	1,044	705	18,740	16,378	2,362	59,328	31,558	27,770	230,99	99,817	131,179
Madhepura	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	168,75	73,107	95,644
Total	**185,234**	**143,222**	**42,012**	**57,148**	**47,201**	**9,947**	**89,875**	**65,609**	**24,266**	**4,939**	**2,537**	**2,402**	**33,272**	**27,875**	**5,397**	**137,891**	**69,173**	**68,718**	**548,25**	**240,262**	**307,988**
Percentage on Total workforce	**57.33**	**44.32**	**13.00**	**17.69**	**14.61**	**3.08**	**27.81**	**20.30**	**7.51**	**1.53**	**0.79**	**0.74**	**10.30**	**8.63**	**1.67**	**42.67**	**21.41**	**21.27**	**62.92**	**27.57**	**35.35**

In the referred project blocks, out of the total population, about 370,468 (42.5%) are engaged in work activities. 57.33% of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 42.67% are involved in Marginal activity providing livelihood for less than 6 months. Of 185,234 workers engaged in Main Work, 57,148 are cultivators (owner or co-owner) while 89,875 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.

On the other hand, population growth rate of Supaul district is 28.66%, where, 28.05% was growth rate of male, and that of female was little higher at 29.31%.

6.5 Status of Water User Association

The existing Water Users Associations (WUAs) in Bihar are formed and governed by the Bihar Irrigation, Flood Management and Drainage Rules, 2003 which implements the provisions of the Bihar Irrigation Act, 1997. As per the rule the operation and maintenance of the distribution systems of the completed irrigation schemes are handed over, in phases, to the canal system level WUAs formed and registered under Societies Registration Act 1860. Till now 64 canal systems have been transferred to WUAs. The WUAs besides being responsible for operation and maintenance also collect water charges and pay 30 percent of such collections to the department and spend the remaining 70 percent on the operation and maintenance works of the canal system under their jurisdiction. WR Department controls the works of Canal and water supplies as well as bears the responsibility of major repairs and providing any technical assistance required. However, over the years, due to serious resource constraints the performances of irrigation systems and distributory networks have increasingly deteriorated. Consequently, farmers' participation / contribution turned low so as the role of WUAs. It appears that significant improvements are necessary in the present form of PIM system.

In such circumstances, the survey observed that in the present project area there is no WUA in operation for ESML which implies, initiative is required to revive and strengthen the WUAs for this system.

Under the proposed project WRD agreed to establish institutional mechanisms for improving PIM services by taking up three types of WUA based delivery models. The purpose of implementing three models for the project is that out of these three the one that functions best in terms of transparency, efficiency and equitable water management practices will be selected for up-scaling. The project decides to develop the irrigation strategy to prepare an up-to-date Standard Operating Procedure (SOP) for Irrigation Service Delivery.

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.

Affected Persons: There are 51 households, who shall be directly or indirectly adversely affected by the proposed interventions. In addition, residents of about 21 villages are expected to be positively impacted by the project due to improved flood and climate change resilience as well as improved food and livelihoods security.

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, Agriculture Department, District Administration. In relation to non-structural interventions, communities living near to embankment or studs or having livelihood activity near to embankment or studs who are key stakeholders to be involved in the implementation of Emergency Action Plan (EAP).

Disadvantaged and Vulnerable Stakeholders: Illiterate persons, physically challenged, landless farmers, women and elderly who are living adjacent to the intervention sites are the key stakeholders facing vulnerability. Public meetings were organized and during the project cycle more interaction with them through meetings and consultations 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 in the area. 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, (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 i.e. in ESML project sites of Madhubani and Supaul district. 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 interaction with different stakeholders covered farmers of different social and economic categories, *Sarpanch* of the

related project villages, leaders of the concerned communities, people / households expected to be affected due to the project, local service providers etc.

Consultation with Potential PAFs / PAPs:

The consultation meetings were conducted with the encroachers on the studs and embankment of ESML and the landowners who have establishment/ livelihood activities near the project site. Discussion was primarily on planned improvement and strengthening measures through the project and its anticipated impact on their living, livelihood, accessibility to utilities and services. At each intervention point meetings were conducted. Environmental and social concerns of each project activity was thoroughly discussed to find out suitable project alternatives. Generic environmental and social concerns of each alternative were disseminated among all stakeholders to bring out baseline environmental and social concerns.

Focus Group Discussion:

A number of Focused Group Discussions (FGD) were conducted with the villagers residing along the embankment and studs of ESML to understand their opinion on the project and the proposed mitigation, including and resettlement measures. The details of community consultations/ FGD held are given in the below Table 7.1 and Figure 7.1.

Table 7.1: Focus Group Discussion with stakeholder community

Sl. no.	Date	Place	No. of Participant	Participants
1.	18/02/25	Mangasihaul	11	Villagers - 11 Male – 9 Female - 2 Pradhan - 1
2.	19/02/25	Hardri	6	Villagers - 6 Male – 4 Female – 2 Pradhan - 1
3.	20/02/25	Garhgaon	5	Villagers - 5 Male – 4 Female – 1 Pradhan - 1
4.	22/02/25	Telwa	9	Villagers - 9 Male – 7 Female – 2 Pradhan - 1
5.	23/02/25	Mehsha	7	Villagers - 7 Male – 5 Female – 2 Pradhan - 1
6.	26/02/25	Basipatti	11	Villagers - 11 Male – 7 Female – 4

Sl. no.	Date	Place	No. of Participant	Participants
				Pradhan – 1
7.	22/07/2025	Harri, Nirmali (Stud Km 18.87)	51	Villagers – 43 Officials from Deparment - 8 Male – 21 Female – 22 Pradhan - 2

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 locations as well as activity specific environmental concerns were captured. It was discussed that the intervention will not only provide relief from the devastation of flood but will also provide opportunities to increase agriculture production, as well will better the accessibility to medical, education and business opportunities due to road construction. People expressed concern about problems of dust during construction work. It was assured that area will be sprinkled with water regularly during works.

Photo of FGD/Public Consultation is attached in **Annexure III.**

Consultation Meeting with Govt. Departments:

A range of consultation meetings were also organized with relevant institutions and key officials including SDM, SDO of district administration, officials of Agriculture department, Electricity department and Sate Pollution Control Board to seek their cooperation in project implementation and understand their views on different aspects of the project. Issues discussed with the Stake-holder departments who have specific interest / stake in proposed project from environmental and social dimensions are summarised 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 for resettlement and rehabilitation of project affected people/families
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 Flood management activities will reduce the occurrence of embankment breaching and flooding. This may attract agri-labour to work in local region. Further

		construction of road will improve marketing linkage.
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 embankment 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 anticipated during implementation, obtain required permission for storage and handling of any hazardous material, management of construction and demolition waste etc.	Creating awareness about the project. 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. The plan takes care of land encroachment and temporary resettlement related issues, building upon the avoidance and off-set principles. Providing compensatory measures for loss of crops and livelihood are carefully addressed by providing appropriate security and alternatives. Involvement of small and marginal holders is ensured through inclusion and equity norms in different project activities. Further, women's participation and their safety and security are addressed in the camp (labour camp) establishment and management plan. Pollution and environment related issues are taken care in the ESMP under the environment management plan.

Local people are aware of the routine flood protection works undertaken by WRD. Participants expressed their apprehension that, during restoration and strengthening works, their agricultural land and cultivated crops might be affected. Communities also expressed their concern on encroachment related issues, loss of agricultural land and agricultural land pollution due to stocking of construction material on agricultural land. Majority of the local people are expecting improvement of flood management and irrigation modernization to benefit them.

People told flood causes enormous sufferings to them, such as river engulfed many villagesland, transportation and communication have become irregular for the people residing at river side, the high rise of water during flood causes hardship to them in everyday life.

In the discussion it was revealed that very negligible percentage of people are concerned about environmental pollution during project implementation, however they expressed concern regarding deposition dust on the agriculture field during construction work. 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 following reuse practice:	Desilted materials are mainly having sand, which can be used for backfilling of road, filling of low laying area. Silt test carried out by River Research Institute (RRI) has recommended safe use of desilted material in other similar study.
	Village roads may be elevated by using excavated earth which comes from river/ canal bed.	Desilted material will be used in filling of low lying area, if need arises it may be sold directly to different end users.
	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. It will reduce burden of desilted material disposal. Possibility will be explored before commencement of desiltation.
	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 based 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 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 be obliged to obtain consent of land-owner before stocking construction or demolition material for temporary period on

		agricultural land and will provide compensation 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 few planted tree on country side of embankment in chat land Area. Compensation shall be paid against any such tree felling.	Only studs strengthening & new stud constructions in river side is proposed for ESML. Said activity will not affect tree located on embankment of ESML. Although at the time of embankment road construction protective measures will be taken to protect the trees.
	No private land shall be acquired	Project is not intended to acquire any private land permanently. Temporary displacement may be required for 11 households during boulder pitching work. However, RAP is proposed for temporary relocation and resttlement, limited to 51 households on the sides of the embankment where raising, strengthening and restoration work will be undertaken.
	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.
	26 residential structure and 2 shops situated on the embankment.	Eviction of squatters is to be minimised. However, compensation will be provided to all squatters under the RAP. Compensation for structures and other immovable assets will be calculated at the latest prevailing Basic Schedule of Rates (BSR) without depreciation. The concerned division will identifying suitable relocation sites for the PAPs scheduled to be relocated. In cases where multiple families are residing within the same affected household, compensation and benefits for rehabilitation and resettlement will be distributed equally among all verified rightful resident families. Special assistant for vulnerable groups, such as women headed households, SC/ST households, and disabled members.
	23 Farmers who grow crops on the encroached land will vacate required land for	Eviction of squatters is minimised. However, compensation will be provided to all squatters as

	construction work. However, compensation shall be provided.	per the entitlement matrix prepared under the RAP.
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. Contractor will provide separate toilet facility for women workers, orient workers on their Code of Conduct and have in place SEA/ SH abuse mitigation plan 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 tributaries. Increasing pollution in the river may adversely affect dolphin health and their bioaccumulation may have serious consequences.	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.
Overall Opinion	**General agreement was observed among the participants when benefit of this project was explained to them.**	

All the 26 PAPs whose residential or commercial structures are going to be impacted have given their consent to vacate the land and welcomed the project. List of PAPs is attached in **Annexure IV**.

After preparing the ESIA report, the Western Embankment Division, Nirmali, WRD, conducted a stakeholder consultation at the sub-project site on 22 July 2025 to gather feedback and suggestions from relevant stakeholders on the draft ESIA. The consultation details are provided in the AnnexureVII.

7.4 Disclosure of project Information

State Level: WRD shall disclose the entire ESMF/ESMP at their website. The summary of the ESIA need to be translated into local language (Hindi) and placed on the website. The Resettlement Action P*l*an (RAP) will be disclosed along with the entitlement framework. These documents shall also be translated into Hindi and made available at the WRD's website.

District Level: WRD must arrange to disclose the final versions of the ESIA and RAP along with the Entitlement Matrix in the District Collectors Office and the local office 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.

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 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 engagement strategy

Information to be disclosed	Target stakeholders	Tools of engagement & mode of disclosure	Frequency	Responsibility
Provisions related to embankment/ studs	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 start 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 related)	Phone number or Toll free Helpline Display boards at site with GRM information Consultative meetings Website notifications Meetings to inform Village heads or community Representatives	Continuous Multiple To be disclosed at WRD & WB websites. Hard copies in local language at WRD district office, DM's office	PMU

7.5 Provision of further consultation at Implementation Stage

Consultations with stakeholders across the spectrum are needed early and continuously in the project. Project will 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 will be to give information about the project to stakeholders and to clarify misconceptions if any. This process will help in enhancing local ownership and ensure smooth project implementation in the long run.

Through periodic consultations with the local community, 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 will be adopted, for stakeholder consultation and will include the following:

Table 7.4: Consultations required during Implementation

Consultation activity during implementation	Remarks
1. Focus group discussions with the 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 ESML where works are implemented	During the EMP monitoring at work sites
4. Formal Discussion with PAPs about RAP implementation	During the RAP implementation and monitoring

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 resettlement, labor complaints 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 officials superior. 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
A representative of PAPs

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 to PAPs: 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 PAPs during the public consultation process.

In total, 11 nos. studs are previously constructed between Km 14.00 and Km 26.275 of ESML, which have been protecting the embankment since then. However, as protection & restoration works under BKBDP (package-4) was started, the river course gradually started getting inclined towards the embankment in downstream of Km 14.00 of ESML. Consequently, rigorous flood fighting works have been done on these studs every year though. Over last 2-3 years, nose, shank, top and side slope of most of these studs have been eroded/ damaged by the river. In addition, it has been observed that Inspection Road on top of the embankment is the only means of communication, especially in monsoon period, for inhabitants along the embankment and nearby areas. Bituminous roads have already been constructed to the specification of a village road on most of these embankments, which have got damaged over the years. As a result of that, movement of traffic on the roads has become very difficult that has affected normal lives of inhabitants.

Thus, under the modernization of the embankment the following activities have been envisaged:-

a) Protection and Restoration of 7 Nos. studs between Km 14.00 to Km 26.275 of ESML.
b) Laying G.S.B. on top of total 20 Nos. studs (7 nos. existing studs and 13 nos. new studs).
c) Raising, Strengthening and Pukkikaran (black-topping) of embankment from 49.00 RD of SML to 26.275 Km of ESML & 2.28 Km of Nirmali Mahua Approach Road (Total length – 31.985 Km).
d) Construction of 13 Nos. new studs between Km 14.00 to Km 26.275 of ESML.

These impacts at different times of the project cycle are as follows: -

8.1 Design Phase Impacts

The design for the ESMLstuds, embankment and road works 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) Re-construction of existing roads for easy movement of plant & machinery II) setting up of Contractor's Camp and Construction yard, iii) Planning for sourcing of material.

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. In addition to permits some of the impacts are very site specific e.g. ecological imapcts. The Dolphin Ecologist (only to be hired when required) of contractor need to go to the site identify the critical habitats which would be important for the Critically Endangered species. Site Specific Ecological Management Plan outlining how to manage and protect biodiversity and ecological resources within a specific project area, ensuring compliance with relevant regulations and promoting sustainable practices has to be develoepd based on surveys done by the Dolphin Ecologist of the Contractor. 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.

It is thus important to identify the risk and plan mitigation for both these aspects:

Mitigation Measures for ecological Impact

- Relevant information (e.g. encounter with vulnerable species during engineering work) to be recored and reported to WRD for decision making and thereafter be shared with the State Environment and Forest Department and concerned regional environmental experts.
- Anti-poaching measures during the pre-construction and construction phase should be strengthened to check for any violation of existing regulations. Awareness campaign to be made among the workers to aware them on the endangered and other important species.
- Construction vessels must be operated at safe speed to avoid collision with wildlife. Training should be provided for the vehicle operators and warning signs should be installed.
- Change of geology and topography should be kept minimum.
- Avoid constructing labour camps and construction yards near the river banks.
- To minimize impacts, noisy operations should be avoided during breeding season of the dolphins (February-July).
- River flow should not be blocked at all times for free movement of dolphins.
- Measures such as the creation and monitoring of an exclusion zone of a 500m radius for at least 30 minutes before the start of construction activities shall be followed. If dolphins are observed in the exclusion zone, construction works should be delayed until they have left the area. If dolphins enter the exclusion zone after construction has commenced, construction works should cease until they have left
- All activities that increase soil erosion or contribute to nutrients and pollutants to water need be minimized both onsite and off-site by using measures such as silt curtain.
- Construction activities should be carried out in close supervision of the dolphin ecologist.
- Construction works should be avoided or kept minimum in vicinity of the dolphins' favourable microhabitats (downstream of shallow areas/sandbars, tributary junctions)
- Dolphins are likely to prefer water depth range between 4.1 to 6 m. Therefore, movement of sediment and influx of soil/silt etc. should be avoided to keep the favourable depth range.
- In case rare birds of prey are observed near the construction area, the construction work will be avoided during their breeding season.
- All boats or ferries transporting construction material and workers will have propeller guards installed to prevent injury and death of dolphins, turtles and other aquatic fauna.
- No construction camp, borrow areas or disposal sites will be established within 100m of the shorelines at the highest water level period.
- All avoidance, mitigation and enhancement measures and monitoring plans proposed to address impacts on flora, fauna and the threatened species should be updated during the detailed design stage by conducting detailed studies such as identification.

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.
- Since there is Underwater activities only certified Class I divers will be required. Only IRS class certified barges should be used.
- The crane and the lifting tools and tackles should have the necessary licenses and the load certification. These should be inspected at all times

- 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 Embankment road/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. The approval of the Work Methodology should be contingent to the approval of the OHS and CHS plan.

Further the site-specific plan has to be developed for each site. The approval for works should only be provided if these plans are approved.

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 the 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

Selection of the Disposal Areas

Debris is expected to be generated during the installation of Gabions / Reno mattresses as the surface has to be prepared to install the said components. Some debris generation is expected if dismantling of existing structures is proposed by WRD depending on the need. Waste iron bars, old stone crates (GI wires) / nylon crates constitute debris. If they are not properly disposed it can adversely impact the receiving waterbody. However, if no attempts to vegetate the stud slopes are made, the life of studs will be decreased. Hapazard dumping can also be a source of visual pollution and also a health and safety risk for the residents.

Mitigation Measures

The following needs to be kept in mind during disposal: -

- Clear the debris from construction sites. Unusable Debris's 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 sued 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.

Shifting of Utilities

The baseline study has revealed few 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 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 nighttime

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[10] for construction equipment.

Mitigation Measures:

The following process should be applied:

[10] 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

- 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 very that all vehicle have PUC certification as a process of verification of the bill of the contractor

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.
    - The Contractor will finalise the boulders / 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”

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 Specialist of PMU / Env Officer of PMTC.

8.3 Construction Phase Impacts

The planning, implementation and management of the variousproject activities during construction phase shall be undertaken in line with the WB policies on environmental and social safeguards and the suggestions proposed in the presentEnvironmentManagement Plan, so that most of the environmental impacts, which are of temporary nature, will be minor and easilymitigated. No potentiallyadverse, irreversibleorlongtermnegativeimpacts are envisaged due to the proposed project interventions.

Impact on Land Use and Topography

There will not be major adverse impacts on the topography because of theproposed project.

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 dustwhich 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 ESML 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 embankment 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.

Impact on Drainage

The area has a history of flooding but the works will be carried out within the existing embankment area, thus no natural drainage is likely to be affected. The selection criteria for the dumping sites has 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:

- Prioritize re-use of excess spoils and materials in the construction works.
- 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.

Impact on Surface Water Quality

Impact on surface water quality during the construction phase are anticipated due to surface runoff from construction site containing substantial quantities of suspended impurities, mixing of oil and other hazardous chemical, discharge of sewage from labour camp etc. 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 river. However, these potential impacts are temporary in nature.

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 Embankment

- The contractor will ensure that no construction materials shall disposed of 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 campsite 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

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

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 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 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 standard protocols
- 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 Bihar Ground Water Board/ 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
- Septic tanks / STP / Modular Bio-toilets constructed / placed at Contractor Camp and work sites to treat human waste

Impacts from Construction Wastes

The issues related to construction waste have been discussed previously specifically water. 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”

Impact from vibratory rollers in embankment and road construction

During construction phase, earthwork would be mechanically laid in specified layers which would be consolidated by vibratory rollers to achieve specified compaction. Since there are large number of Kutcha houses and hutments close to the embankment, there is a risk of cracks, damage, and potential collapse of these huts during compaction of the emabankment by using vibratory rollers. The intensity of the impact depends on factors like the proximity of the construction activity to the house, the strength of the vibrations, and the condition of the kutcha structure.

However, to minimise the Impacts due to use of vibratory roller, the following mitigations measures are considered: -

Mitigation Measures

- During construction phase, continous vibration monitoring should be carried out which will help identify and manage the levels of vibration generated by construction activities.
- Contractor will take steps to reduce vibration levels, such as using quieter equipment or modifying construction techniques.
- While it's challenging to completely eliminate vibrations, measures like using quieter equipment, maintaining a safe distance, and employing vibration control techniques will help in minimizing the impact on nearby structures.

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 8.1. However, most of the construction activities will be confined to the project area (inside the ESML) 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 8.2.

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 ESML is located in a rural setting, at most places, 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 embankment 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.

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. However, the project work in either inside the water course or on embankment of river Kosi which has been identified as “Critical Area” for dolphin. During the high water flows these areas would be submerged in water, the cavities in the rocks/ boulders in the gabions and the edges of the spurs along the bank could serve as feeding grounds of dolphins. The project already includes embedded mitigation measures by adjusting the mesh size of the gabion wire cage to minimize harm to dolphins. This will ensure no entanglement of the dolphin in the wire mesh net cage and fatalities. This will ensure “no net loss”. However, some residual risks will remain until sedimentation in the infrastructure stabilizes and riparian habitats are established.

If Dolphin is sited and its existence confirmed in sub-project area, then it may be impacted due to the movement of vessels operation during construction period and for conservation of dolphin, detailed

strategic plan will be prepared by Dolphin expert under the project, which should be implemented by Water Resources Department, GoB.

Measures during Construction Phase:

- Construction vessels must be operated at safe speed to avoid collision with wildlife.
- Training should be provided for the vehicle operators and warning signs should be installed.
- Change of geology and topography should be kept minimum.
- Avoid constructing labour camps and construction yards near the river banks.
- To minimize impacts, noisy operations should be avoided during breeding season of the
- dolphins (February-July).
- River flow should not be blocked at all times for free movement of dolphins.
- Measures such as the creation and monitoring of an exclusion zone of a 500m radius for at least 30 minutes before the start of construction activities shall be followed. If dolphins are observed in the exclusion zone, construction works should be delayed until they have left the area. If dolphins enter the exclusion zone after construction has commenced, construction works should cease until they have left.
- All activities that increase soil erosion or contribute to nutrients and pollutants to water need be minimized both onsite and off-site by using measures such as silt curtain.
- Construction activities should be carried out in close supervision of the dolphin ecologist.
- Construction works should be avoided or kept minimum in vicinity of the dolphins' favourable microhabitats (downstream of shallow areas/sandbars, tributary junctions)
- Dolphins are likely to prefer water depth range between 4.1 to 6 m. Therefore, movement of sediment and influx of soil/silt etc. should be avoided to keep the favourable depth range.
- In case rare birds of prey are observed near the construction area, the construction work will be avoided during their breeding season.
- Before the initiation of underwater works the site must be checked for the presence of threatened turtles, migratory birds, and other threatened species and their nests. If the turtles and/or their nest are found inside or near the construction area the animals and/or the eggs must be physically moved to safer habitat areas under the guidance of the local wildlife experts.
- All boats or ferries transporting construction material and workers will have propeller guards installed to prevent injury and death of dolphins, turtles and other aquatic fauna.
- One of the threats to bird and turtle habitat is conversion of the river edges from natural soft embankments into hard concrete embankments. Therefore, the natural bank slope is preserved and location of the bridge piers will avoid such areas. No construction camp, borrow areas or disposal sites will be established within 100m of the shorelines at the highest water level period.
- All avoidance, mitigation and enhancement measures and monitoring plans proposed to address impacts on flora, fauna and the threatened species should be updated during the detailed design stage by conducting detailed studies such as identification of the migrating routes of dolphins and birds, exact locations of turtle nesting grounds, etc.

The Accessibility

The Emabnkment inspection road is presently used the local people for commuting but this road is in very poor condition so re-construction of road is proposed under this sub-project. The reconstructed road will be used during the construction. Deterioration of the conditions / damage to the structure due to construction. This will inconvenience the people.

To address accessibility issues during road re-construction, prioritize early planning, clear communication, and flexible design to ensure safe and convenient access for all, including people with disabilities, pedestrians, and cyclists.
The following mitigation are proposed:

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 1600 plus labours working in the project. The various OHS risk in the different activities these have been identified and presented in **Annexure V**. The OHS mitigation and control point are also highlighted in the same

Community Health and Safety

The work site is primarily located in rural areas with a few habitation detailed in Any temporary land requirements of the contractor for meeting their construction related needs, including for setting up labor hutments and storage yards will be part of the Contractors obligation subject to the E&S requirements spelt by this ESIA and the ESMF. Overall, such referred land shall not be very close to the water body, water logged areas or the wetlands to avoid any impact on the water sources and the associated fauna.
Following table details the availability of government land on both sides of centre line of the embankment (at every 100 m interval) for the entire embankment and certified by the concerned Superintending Engineer. As can be seen, no additional land is required for the proposed works along the entire chainage: Table 2. In addition, the Embankment 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 Embankment Road/inspection road would also be used for staging the machinery thus there will be chances of pedestrian, school children, livestock or road user being struck by the machinery and te vehicles operate in the road condition increases the chances of collision with vehicles pedestrians or local road users and hence, it concerns their safety.

In addition, there will be movement of project vehicles along the embankment 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 embankment will not be used. However, there are a few mitigations which are envisaged.

Further, there will be labourers from outside the district. The proposed work zone passes through inhabitant areas. The migrated labourer may affect the project area in terms of social dynamics due to cultural differences. This may potentially lead to conflict with local people residing near project site.
The dust and gaseous pollutant generation during the construction work near habitation area will also adversely affect the health of people residing in the proximity.

There is possibility that the area may experience some more unknown diseases that are brought by migrant workers and transporters. Thus, there could be negative health impacts on the local population during the construction phase. Provision of health checkups of the migrant labours and locals regularly is, therefore, necessary to understand the magnitude of health impacts due to the project activity.

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.
- Retroreflective 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 machinery is parked on / beside the embankment road the area should be barricaded water 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.
- Labour camp will be set up as per WB guidance (**Annexure II**).
- Contractor should introduce, explain and get signed by a Worker Code of Conduct as part of the employment contract. Time to time orientation programme on Code of conduct to be organized with the workers by the contractor.

Chance Finds

The project involves excavation of soil. Most of the excavation are within the embankment areas so there is a less likelihood of the excavating archeological remains and artifacts.

8.4 Operation Phase Impact

Impact on Ecology

Barge / Vessels / dredgers generate substantial broadband underwater noise from their propellers, motors, auxiliary machinery, gear boxes and shafts, plus their hull wake and turbulence. Diesel motors produce more noise than steam or gas turbines, but most long distance (low frequency) noise is generated by the hissing cavitation of spinning propellers. Noise generation from the movement is continuous type of noise generation. Noise generation from ferry vessel movement vary from 110-140 d(B). This order of noise generation may have impact on behaviour of various aquatic organisms and may lead to other injuries like tissue injury, temporary & permanent hearing loss. However physical impact on aquatic species is not anticipated as the aquatic species moves away from the source of disturbance (barge) and usually do not come close. But impacts of this level of noise can be significant on behavioural responses and audiometry of aquatic species, turtles and dolphins in particular.

Measures during operation phase

For conservation of dolphin instruction should be given to all vessels operators and all employee and staff that no dolphin or any other endangered species should be harmed due to any reason.

- Instruction should be given to vessel operator that in case any accident with dolphin occurs that should be reported immediately to terminal authority.
- Vessel should be instructed for not using sharp lights and sounds as they may disturb aquatic organisms.
- Provision for propeller guards should be provided for all the vessels to minimize the propeller inflicted injuries and scars.
- Regulation of vessel speed in Dolphin habited area
- Select the dredgers and dredging methods to minimize sediment dispersion during excavation and lifting process;
- Spoil dispersion out fall characteristics to be evaluated by collecting grab water samples during dredging operations and operations modified accordingly;

Chances of Water logging

Waterlogging, or the saturation of soil with water, can be a significant problem in areas with embankment and spur projects, particularly when natural drainage systems are disrupted or inadequate, leading to land degradation and other issues. Cause for water logging are detailed below:-

- Embankments/Spurs, designed to contain water, can inadvertently block natural drainage pathways, leading to the accumulation of water behind them.
- Embankments/studs can trap sediment, causing the riverbed to rise and the surrounding land to become waterlogged.
- Embankments/spurs can restrict the natural flow of rivers, leading to a buildup of water and increased waterlogging.
- Inadequate planning and management of embankment projects, including insufficient drainage infrastructure, can exacerbate waterlogging problems.
- Heavy machinery used during construction can compact the soil, reducing its ability to absorb water, and impervious surfaces can further contribute to waterlogging.
- Heavy or prolonged rainfall can overwhelm drainage systems and lead to waterlogging, especially in areas with poor drainage.

Community Benefit

Community will be benefited through this project. Immediate benefit will be with the intervention agricultural land near the riverbanks will be protected. Farmers even can reclaim their land engulfed in the river and begin cultivation. Thus, they can enhance their income. The proposed construction work will generate employment opportunity to the local community. With the protection of embankment public safety will be improved. The black topping of the roads along the embankment will improve the connectivity of the area. Subsequently the community will gain socio-economically with better linkages with larger community.

CHAPTER 9. SOCIAL IMPACT ASSESSMENT (SIA)

9.1 Findings of the Social Impact Assessment

There are some structures on the studs and embankment of the work zone which may be affected due to construction work. After field reconnaissance, baseline household data of the structure owner to be impacted during construction activities were collected through structured questionnaire. Household survey and group meeting/consultation had been conducted with the families likely to be affected and group information had been recorded.

The survey identified 51 households (List in **Annexure IV**) in the work zone who are likely to be affected due to the project. About 28 are having structures in the project zone for residential or livelihood purposes. The other 23 households are doing cultivation in the WRD/Govt. who all will be required to be displaced during the construction phase.

Resettlement Impacts

The resettlement impacts will be permanent as well as temporary on different category of PAPs. The 23 squatters/non-titleholders, engaged in agriculture on WRD land while 26 households have constructed temporary residential structures and 2 households have constructed commercial structure (1 household has residential cum commercial structure) along the embankments on WRD land as a total 51 project affected households. Among them 15 households encroaching 8,750 square feet WRD/Govt. land will be permanently displaced due to the restoration and construction works (studs and embankment road) while residential structures of 11 households covering 8100 square feet land will be temporarily displaced along with 2 vendors/ shops (with no legal titles to the shops) located near the embankment will also be displaced temporarily during the construction phase.

The adverse impacts will include permanent loss of livelihoods and physical displacement due to removal of structures and farm from encroached WRD lands, temporary economic displacement of shopkeepers/ vendors, loss of income and profits owing to the involuntary resettlement.

The structures anticipated to be affected can be categorized as i) residential and ii) commercial/ agri structures. These structures are expected to be fully or partially affected and temporary or permanent relocation is required for these structures.

These households belong to OBC community. Head of the households of most of them are illiterate. Their primary occupation is working as daily labourer within their own village, few goes outside the state in search of daily wage job. During the consultation, the potential affected households (all squatters) gave consent for vacating the encroached land. The assessment revealed that the sub project will have both positive as well as negative social impact on the people of the area.

Land acquisition

The project does not need permanent acquisition of private land. WRD owns sufficient land along the embankment of the work zone to execute the construction and restoration work. Those households situated at Gadhgaon and Gewa Gadhgaon village need to be temporarily relocated. The detail household level information is given in section 9.2.

Detailed status of the affected households is described below.

Residential structure of 26 will be impacted out of total 51 project affected households. Livelihood will get affected for the rest 25 households (including 1 residential cum commercial structure). Out of them 2 households have commercial structures and 23 grows crop on the land owned by WRD.

Majorly the structures are temporary in nature - kuchha structures.

Table 9.1: Distribution of Household by Village expected to be impacted

Village	HH No.	Structure type
Basipatti	5	Livelihood - Agriculture
Basipatti (Nuniyari)	3	Livelihood - Agriculture
Gadhgaon	21	Residence 1 have Residence & Shop
Gewal	5	Livelihood - Agriculture
Gewal gadhgaon	5	Residence
Gidrahi	4	Livelihood - Agriculture
Hari (Jhingwa)	1	Livelihood - Agriculture
Hadri	1	Residence
Mahua	1	Livelihood - Shop
Mana Sihaul	3	Livelihood - Agriculture
Makta	1	Livelihood - Agriculture
Makta (Mehsa)	1	Livelihood - Agriculture
Total	**51**	

Table 9.2: Type of Residential structures to be impacted

Type of structure	HH No.
Kuccha	22
Semi kuccha	3
Pucca	1
Total	26

Area of these identified residential structures covers minimum 200 sq ft to maximum 2650 sq ft. as elaborated in the Table 9.3 below.

Table 9.3: Area covered by impacted (to be) structure (residential)

Area of Residential structures	HH No.
Less than 500 sqft	16
500 -1000 sqft	6
1000-2650 sqft	4
Total	**26**

Out of 2 identified shop structures none is of concrete as detailed in Table 9.4. Area of Grocery shop is 320 sq ft and Motor cycle garage is 200 sq ft.

Table 9.4: Type of commercial structure to be impacted

Type of Commercial/shop impacted	HH No.	Type of structure
Grocery	1	Kuchha
Motor cycle garage	1	Semi Kuchha
Total	**2**	

The average monthly income from the grocery shop is Rs. 5,000/- and from the motorcycle garage is Rs. 15,000/-. Relocation of these structures may impact on their income.

Agriculture

A total of 23 households were identified whose one of the significant livelihood options is cultivation covering 6.9 ha encroached land adjacent to few studs. One farmer cultivates minimum 3,000sqft to maximum 92,536 sq ft. land.

Table 9.5: Encroached Area cultivated by Villagers

Area cultivated	HH No.
less than 5000	1
<5000 - 10000	4
<10000- 25000	6
<25000-50000	8
<50000	4
Total	**23**

Range of income of these 23 households from agriculture is Rs.5,000/- to Rs.32,000/-annually, i.e. on an average Rs.14,000.00. Earning from agriculture varies from Rs.10,000/- to 15,000/- to majority households. Table 9.6 below gives thelevel of incomefrom agriculture.

Table 9.6: Annual Income from Agriculture

Income	HH No.
5000 > 10000	5
10000>15000	10
15000<25000	5
<25000	3
Total	**23**

A Resettlement Action Plan (RAP) is under preparation for the sub-project which will assess the compensation and other entitlements to be made available to the PAPs based on the nature and duration of impacts as well as ownership status.

Sensitive receptors

A temple and a school building on the work zone of embankment are identified.

A Hindu temple is located at Rasuar village, Keota Patti GP under Marauna on 230 square feet land along the embankment which is going to be affected by the project. Efforts will be taken to provide necessary protection and minimize impact.

A Government supported primary school is situated adjacent to the proposed work zone, at Majhari village, Musahari of under Nirmali block. One side of the boundary walls of the school building is situated on 830 square feet land which will be impacted due to the intervention. Efforts will be taken to provide necessary protection and minimize impact.

Necessary measures will be included in ESMP to avoid any negative impact on these property resources during the construction phase.

9.2 Socio-economic and Demographic profile of affected persons

Household Profile

All of the 51 households anticipated to be impacted through the proposed intervention are Hindu by religion and belong to other backward caste. Their average family size is 8.

48 of the 51 households possess ration cardas mentioned in the following Table 9.7.

Table 9.7: Distribution of Household owns Ration card

Ration card holder	HH No.
Yes	48
No	3
Total	**51**

The primary occupation of all of the 26 households whose residential structure will be impacted by project intervention is daily labour, either as agriculture labourer or doing any other odd job.

Household distribution by Primary occupation whose residential structure expected to be impacted is given in the following Table 9.8.

Table 9.8: Household distribution by Primary occupation whose residential structure expected to be impacted

Primary Occupation	HH No.
Agri. Lab	4
Daily Lab	22
Total	**26**

Majority get work within their villages. However, 5 out of 26 reported to go out of their state to work. Table 9.9 shows the work location of primary occupation. The average earning from primary occupation isRs.6385/- monthly. Range of income majorly lies within Rs. 5000/- to Rs. 7000/- per month. The income of 7 persons out of 26 from primary occupation is Rs.8000/- to Rs.12000/-.

Table 9.9: Location of Work

Work location	HH No.
Within Own village	14
Outside own state	5
Within own district	6
In own state	1
Total	**26**

Amenities

All households have connectivity to electricity, excluding one.

The source of drinking water is tubewell/hand pump. For bathing and other domestic purposes also water from tube well is used across all seasons. Every household uses common source for water.

Open defecation is being practiced in majority households. However, 5 households have toilets with septic tank. Arrangement of sanitation is mentioned in the following Table 9.10.

Table 9.10: Arrangement for Sanitation

Sanitation	HH No.
Open Defecation	20
Pit Latrine	2
Toilet with Septic Tank	4
Total	**26**

18 out of 26 households have LPG connection for cooking. The rest 8 households use firewood. Details are provided in Table 9.11.

Table 9.11: Type of Fuel in use

Fuel used for cooking	HH No.
LPG	17
Firewood	9
Total	**26**

Motor cycleis the significant asset possessed by the 11 households. It is noteworthy, that 11 households do not own any type of movable asset mentioned in the list. Asset type wise household is provided in the following Table 9.12.

Table 9.12: Asset type

Movable asset	HH No.
Bicycle	4
Motor cycle	10
Three Wheeler	1
Nothing out of the list given	11
Total	26

Profile of Head of the households (HoH)

The average age of the Head of the 26 Households is 51 years as detailed below in Table 9.13.

Table 9.13: Age distribution of Head of the household

Age of HoH	HH No.
20 to 30	2
30 to 50	20
50 to 60	14
Above 60	15
Total	**51**

All of the head of the households are married. Head of 9 households are women and 2 of them are widow. It is noteworthy that 1 of the widows, around 68 years old lives alone. She has to be relocated as her residential structure will be affected for the project.

Table 9.14: Gender distribution of Head of the household

Gender of HoH	HH No.
Male	42
Female	9
Total	**51**

17 Head of the households whose families are expected to be relocated due to impact on residential structure are illiterate. 7 among 26 had attended upper primary education and 1 is graduate as mentioned in following Table 9.15.

Table 9.15: Educational status of Head of the household whose residential structure is expected to be impacted

Education of HoH	HH No.
Illiterate	17
Primary	2
Upper Primary	6

Graduate	1
Total	**26**

9.3 Labor profile for the works

The embankment strengthening work will take 24 months to complete for the proposed intervention. The requirement of skilled and unskilled labour is given in the Table 9.16 below:

Table 9.16: Requirement of labour by type

Skilled Lab days	Semi skilled Lab. days	Unskilled Lab. days	Total Lab. days.
8236	265	161353	169854
140 per day x 12 months	165 per day for 24 days		

The labourers will be provided by the contractor. All direct and contracted workers will be managed and risks related to them mitigated as per the guidance available under the Labor Management Procedures (as part of the ESMF)

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 169854 labour days (24 months) who will be mobilized for the construction work. These include unskilled, semi-skilled and skilled workers. Reportedly, 8501 labour days are for skilled and semi-skilled labour, 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 more number of labourers will be working on the project site there is risk of occurance of GBV and SEA, incidence.

The contractor would need to take necessary measures to prevent GBV & SEA risks.

Labour Accommodation

Approximate 169,854 labour days (across 24 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 8501 labour days minimum will be sourced outside the locality. As a result, a labour 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 haphazard 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.

9.4 Mitigation Measures for social impact

Proposed Protection & Restoration works and Construction/ Repairing of road pavement will directly benefit people inhabiting along the embankment, and it will benefit directly and indirectly to the population across Supaul, Madhubani and Saharsa district socio-economically. By improving transportation facility, it will not only favour growth of cash crops and commercialization of agricultural activities but accessibility to education and healthcare facilities leading to enhancement of quality of life.

Resettlement

The Extended Sikarahatti Majhari Low (ESML) sub project is causing temporary displacement to 11 households. Besides, there are squatters who will be permanently relocated or their economic activities will be affected during the construction period. The project will take steps for relocation of Project affected people/ families before the beginning of the construction work. In whichever case it is feasible the project may shift/ relocate the affected people temporarily, without compromising with the overall objective of the project.

In accordance with the principles of the resettlement policy framework, all of the 51 affected families will be entitled to compensation depending upon the nature and the ownership rights on the affected assets. The affected families/ persons will be entitled to the following types of compensation/ assistance as provided in entitlement matrix.

- Compensation for structures (residential / commercial) and other immovable assets
- Compensation for the loss of standing crops, trees and other incomes
- R & R assistance for loss of livelihood/ restoration of income
- R & R assistance to vulnerable people and non-titleholders
- R & R assistance for the landowners temporarily displaced, including for temporary housing
- Rebuilding and or restoration of community resources / facilities, in case these structures are affected due to execution of works
- Permission to take away material salvaged from the demolished assets

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 contractors are 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 VI**
- 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.

Table 9.17: Social Impact mitigation measures

Mitigation Measures during Planning / Pre-construction Phase	
Social issues/ Activities	**Mitigation Measures**
Relocation of Utility and Common Property Resources	Utility and common property resources are at safe distance from the bank of the embankment, so no impact due to the project. Measures would be taken to avoid any restriction in access to these properties. If any displacement is required, they will be relocated with prior approval of the concerned agencies. The relocation site identification will be in accordance with the choice of the community.
Compensation and R&R Assistance to the affected families	WRD will endorse the list of affected Title holders and Non-tiltle holder/ encroacher families eligible to get appropriate compensation and assistance. The assessment made by the Social expert shall be referred for exact loss of private properties and measures to compensate such losses. Income restoration measures/livelihood options for vulnerable group/resource poor sections and other affected persons as recommended by social expert shall be implemented. Encroacher/ Squatters will be notified and given one month time to remove their assets or harvest their crops. In cases where crops are standing, opportunity will be provided to harvest before land is physically taken into possession. They will be provided compensation for loss of structure at replacement cost and shifting assistance of Rs. 10,000/- For the vulnerable PAPs one time assistance of Rs. 25,000/- in addition will be provided. Support for housing for landowners temporarily displaced during boulder pitching

	The Squatters will be allowed to take away salvage material from the demolished structure and a notice will be issued to that effect intimating that PAPs can take away the materials.
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 PAPs 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 other labor issues	Labour Management Procedure (LMP) including OHS management plan and GBV/SEA/SH will be followed and monitored. Labour camp will be set up as per WB guidance (ESS 2). Contractor should introduce Workers to their Code of Conduct and get it duly signed, as part of the employment contract. Workers consultation will be regular feature. Contractor will provide training to all workers before start of work and thereafter quarterly, particularly regarding code of conduct and the OHS measures. 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 9.18 below:

Table 9.18: 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 (ESMP)

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

Activities	**Potential Impacts**	**Mitigation Measures**	**Monitoring Indicator**	**Responsibility**	
				Frequency	**Supervision**
A. **Design and Pre-Construction**					
Orientation of implementation agency and contractors	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 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. Additional modules for Dolphin Protection will be included. • 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. • 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 has to be carried out for personnel involved in special activities as per the instruction of PMTC/ Client. • Maintaining Records of training, induction, refresher and skill-based training. • Submission of the Training records to the PMTC every month	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	PMC and PMU

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
Disclosure and Public Display of Information	Stakeholder engagement for ensuring inclusiveness	• The ESMP needs 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. • 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 (Information boards containing Code of Conduct, SEA/SH plan, GBV plan in local languages, telephone numbers of Contractors)	PMU Contractor Contractor Contractor	PMU, PMTC PMU, PMTC PMU, PMTC
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[11]	CESMP OHS Plan (including HIRA) 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	E&S Specialist PMU and WRD Officials / Environmental Expert and Social Expert of PMTC

[11] 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

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		• Conduct **Hazard Identification and Risk Assessment** (HIRA) for all tasks presented in the Method Statement[12] • **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 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.	CHS Plan (including traffic safety) along with work methodology Method Statement only to be approved once the CESMP, OHS, CHS, Traffic plan is approved	comments, and resubmit for approval.	
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
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 including Common Property	Disruption of Services	• Prior permission shall be taken from concerned department officials, for shifting of utility	OHS and CHS requirement shall be included in the work Order and shall be	PMU before awarding the contract.	PMU

[12] 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
		• 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.	communicated to the concerned departments		
Setting up of Office and Construction Camp, rest places /shed/ Labour Camp	Impact air pollution, noise 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. • A labour accommodation/ rest area, a Labour accommodation / Rest Area Plan	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	E&S Specialist PMU and WRD Officials / Environmental Expert and Social Expert of PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		and Construction Yard Layout Plan must submitted along with the Work methodology. The PMU/PMTC shall review this comprehensively (within one week), address any comments, and resubmit for approval. The labour 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 accommodation to satisfactory levels before the same can be used.			
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	E&S Specialist at PMU and PMTC Concern division of WRD
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	Approval of the Dumping site by the E&S Specialist, PMU and E&S Officer PMTC.	Contractor before selection of site.	E&S Specialist PMU and WRD Officials / Environmental Expert and Social Expert of PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		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			
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	• The contractor will use labour drawn from local communities preferably to avoid any additional stress on resources and communities. In case of non-	• Registers - gender segregated (muster roll) • Labor returns	Contractor, throughout Construction & operational phase	Divisional Office of WRD and PMTC.

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
	services and utilities, the spread of communicable diseases, and GBV/SEA/SH risks	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. • 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.	• 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		
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 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.	Site inspection through visual survey Code of Conduct to be signed by all workers Code of Conduct explained to all workers	Contractor	PMTC and PMU

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
Selection and Deployment of construction vehicles, equipment and machineries	Increase air pollution, noise and vibration	All Construction equipment[13] 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)[14], measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.	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 The Contractor will submit a record of PUC for all vehicles and machinery to be mobilized in the project.	Contractor Once before deployment of all vehicles	PMU and PMTC
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.	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

- [13] 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:
[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
- [14]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
		Borrow area permission should be in line with the MoEFCC notification dated 02.08.2024 (S.O 3099)[15]			
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. 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	Permission from CGWB for abstraction of water Water quality as per IS 10500	Contractor Once before the start of construction activities On regular interval	PMTC and PMU
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 or Hot Mix 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	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	Contractor Once before functioning/operation of plant & machinery	Divisional Office of WRD, PMU and PMTC

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

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
		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 the parameters such as, PM10, PM2.5, SO2, NOX and CO.	under control certificate is required.		
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 behaviour resulting in an Irreversible	Contractor's Project manager and all key workers will be required to undergo training for CESMP implementation, including pollution prevention, spoils management, Standard operating procedures (SOP) for	Certificate of Completion (Safeguards Compliance Orientation)	Contractor Induction/ Orientation Once before initiating construction activities	PMTC and PMU

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicator	Responsibility	
				Frequency	Supervision
	impact to the environment, workers, and community.	construction works; occupational health and safety (OH&S), core labour laws, applicable environmental laws etc. Additional modules for Dolphin Protection will be included. 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. 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 has to be carried out for personnel involved in special activities as per the instruction of PMTC/ Client. Maintaining Records of training, induction, refresher and skill-based training. Submission of the Training records to the PMTC every month	Posting of EMP at worksites. Refresher training every year Skill Based training as request by PMTC/ Client	Refresher Training: As required Skill Based training: As and when required	

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervisions
B. CONSTRUCTION PHASE					
Excavation of the Sediment/ Silt from the river (if needed)	Impact on Land Environment due to dumping of excavated material	The Excavated silt would be disposed on land with the following precautions: o The height of the dump at any location shall not exceed 3m o The 1:2 slopes of the dump should be maintained, and the slopes should be maintained	Reporting location of Disposal along with site photographs	Contractor	Divisional Office of WRD, PMU & PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervisions
		○ 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.			
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 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	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 Maintenance of Stockpile PUC of the Vehicle, equipment and machinery as per the MoRTH Standards for On-Road and Off-Road machinery	Contractor	Divisional Office of WRD & PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervisions
		in construction conform to relevant dust emission control legislation. • The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. ○ 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.	Visual observation of dust and smoke		
Protection of Embankment (ESML, Bagmati etc) a. Grading of sides b. Preparation of subgrade c. Lip cutting for Earthwork Excavation d. Laying of Sand Layer under Bed e. Laying of LDPE Film above the sand layer f. Under Drainage work	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 √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	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	Supervisions
		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.			
	Impact on Surface and Ground water form Wastewater/ Wash Water generated form Plant and 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 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	Adherence to measures suggested for: a. Plant and machinery b. Vehicle and equipment c. DG sets d. Sensitive Receptors Complaints from Community	Contractor	Divisional Office of WRD, PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervisions
		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 the norms in "Silence Zone[16]" and "residential Zones[17]". 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	Results of the Noise Monitoring		

- [16] 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.
- [17] 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	Supervisions
		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 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.	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	Divisional Office of WRD, PMU, PMTC
Operation of the Labour Camp/ Construction Yard	Impact on Air pollution form domestic sources	**Air Pollution from domestic sources in Construction Camp**		Contractor	Divisional Office of WRD, PMU, PMTC

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervisions
	Impact on water form domestic sources	•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 •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 influx	GBV risks due to labor influx	• 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	LMP, GRM	Contractor, PIU, PMTC	PMU

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervisions
		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 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.	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	Supervisions
		•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.			
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 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 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	Please Refer Occupational Health and Safety Plan (including Hazard Risk Identification and Assessment) which is elaborated after ESMP Table.			

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervisions
	the construction period				
Protection of Agriculture Land near stud and Embankment	Impact on agricultural land	A. The contractor makes proper adequate mitigation measures like sprinkling of water and provision of dust screen guard around cultivated crop near stud and embankment. B. If impacted, adequate compensation as per entitlement matrix will be provided.	Prior to inception of construction activity.	A. Contractor B. PMU, PMTC & Divisional Office	Social Specialist PMU / Social Expert PMTC/ Concern division of WRD
Chance Find	Chance Find of archeological remains[18]	- 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	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

- [18] 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.

Activities	Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	
				Frequency	Supervisions
		Department/ Directorate of Archeology concerning safeguard of the heritage.			

Activities	Environment Attributes and Potential Impacts	Mitigation Measures	Monitoring Indicators	Responsibility	Activities
				Implementation and Frequency	
C. OPERATION PHASE					
Maintenance of embankment / spur protection measures	Sustainability of the protection measures initiated/ impacts	Awareness generation of community, follow up action by implementing agency	Role played by community and implementing agency for operation and maintenance of the embankment / spur protection	All through the year, specially before monsoon	Concerned Division of WRD to supervise the site, Conduct awareness meeting/ orientation with the community
Chances of Water logging	Water logging, or the saturation of soil with water, can be a significant problem in areas with embankment and spur projects, particularly when natural drainage systems are	Adequate planning and management of embankment projects, including sufficient drainage infrastructure, can improve water logging problems.	Regular monitoring	All through the year, specially before monsoon	Concerned Division of WRD

	disrupted or inadequate, leading to land degradation and other issues				
Community Benefit	Community will be benefited through this project. Immediate benefit will be with the protection from flood near the riverbanks. Farmers even can reclaim their land engulfed in the river and begin cultivation. Thus, they can enhance their income. The proposed construction work will generate employment opportunity to the local community. With the protection of embankment/spur public safety will be improved. The		Role played by local community and implementing agency for operation and maintenance of the embankment protection	All through the year	

	black topping of the roads along the embankment will improve the connectivity of the area. Subsequently the community will gain socio-economically with better linkages with larger community.				

10.3 Institutional Arrangement for ESMP Implementation

Governance 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 latest by March 21, 2025.

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.

10.3.1 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 constructions.

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.

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 10.2**

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			Divisional Office
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	$PM_{2.5}$, PM_10, SO_2, 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 locations to be decided based on area of work near receptors.	Contractor

S. No.	Aspects	Parameters to be Monitored	Frequency of Monitoring	No. of Samples	Location	Responsibility
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, Reporting 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. 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.

10.6 Capacity Building and Training

The training programs will include an orientation on the project concept and components for all the sub project stakeholders. Awareness programme and training on the ESMF of the project will be organized for the stakeholders to ensure proper and complete management of 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, village / community meetings as well as group discussions with targeted stakeholders.

The capacity building support proposed to be provided to various sub 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 concerned PIM Cell (Western Embankment Division Nirmali, Supaul) 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 participating departments in the project district - Supaul & Madhubani on the ESMF, the E&S documents prepared and their implementation responsibilities
- Training of WRD staff of Supaul & Madhubani districts on Monitoring and reporting responsibilities
- Trainings of field staff and contractor personnel for the sub project on fair working conditions for workers, including Occupational Health and Safety related risk management and incident reporting.

The capacity building strategy of the project will have the following elements:

- ***Training of District and Division***: The Supaul & Madhubani Districts and sub project related Divisional staff other than the Nodal E&S Officer would be trained on the ESMP implementation, project GRM, monitoring and reporting requirements and other mitigation measures proposed by the different

project E&S instruments. Such trainings will be carried out by the E&S Nodal Officers and the Environmental and Social Specialist at the PMU.

- ***Training of Contractor Staff***: All the Key personnel of Main Contractors will need to undergo training on the ESMP, the E&S precautions and diligence to be taken, the key actions related to E&S management under the project, the contractual obligations of the contractor related to works and labor management, including the Code of Conduct.

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	Elected Representatives	Staff of Support Organizations	Project Functionaries
Pre-planning	• Social mobilization (GP) • Orientation on the project & its objectives (ZP / Block /GP) • Roles and responsibilities related to ensuring inclusion and participation (GP level), especially of vulnerable groups, including women and marginal farmers	• Project objectives & components • Elements of Participatory Planning • Facilitating Participatory Planning Data requirements & simplifying data for use by committee for facilitating inclusive plans	• Social objectives of the Program • Elements of Participatory Planning • Facilitating Participatory Planning • Sustainability practices in Irrigation and Flood • E&S management functions as defined through various E&S instruments- ESCP, ESMF, SEP, ESIA, RPF, LMP, INM/IPM & BMP.
Planning	• Process of participatory planning • Mobilization of farmers and local communities for developing inclusive plans • Role of GPs in disseminating flood	• Supporting the framing of gender sensitive and inclusive byelaws for the user groups • Devising simple and	• Objectives & expected outcomes of participatory & inclusive planning • Devising simple and accessible mechanisms

	forecasts and other related information to the community • Encouraging farmers to adopt climate resilient practices • Features of the project GRM, GPs role in resolving grievances or escalating them to district GRC	accessible mechanisms for sharing flood forecasts, irrigation schedules and other information to local community • Handholding of CIs to develop fair rules for water sharing	for sharing flood forecasts, irrigation schedules and other information to local community • Handholding of CIs to develop fair byelaws for equitable water sharing • SEA/ SH prevention and response, steps for setting up ICCs under the POSH Act • Management of critical habitats • Process for implementing site specific RAPs and role in facilitating resettlement of PAPs
Implementation and Monitoring	• Role of GPs in ensuring equitable collection of irrigation/ water tariffs, including disincentives to be created by GP for non-payments • Role of GPs in resolving conflicts among water users/ farmers • Role of JP/ ZP in inter- GP	• Facilitating the participatory conduct of meetings Tools for community monitoring & its facilitation	• Facilitating committee's and Gram Sabha's meetings on the project • Strategies for public sharing/ dissemination of plans and decisions • Facilitating community monitoring of the project

	coordination and conflict resolution • Importance of community monitoring and communicating emerging issues to senior duty bearers		

10.7 Indicative budget allocation for Environment and Social Management Plan

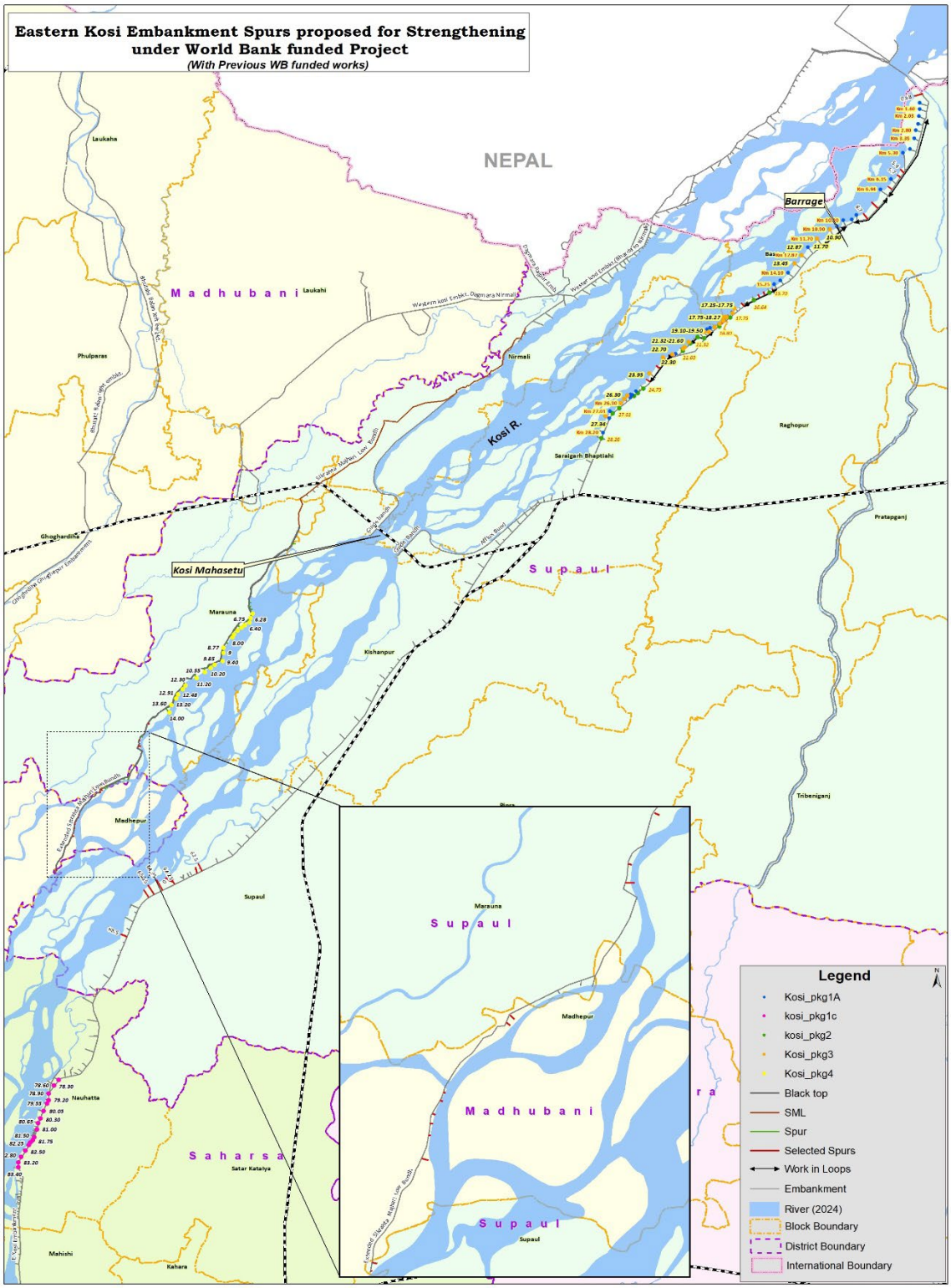
A draft indicative budget has been provided in ESMF. Based on the unit cost considered for each item in that budget, ESMP budget has been prepared and detailed below in **Table 10.4**: -

Table 10.4 Indicative Budget for WMC ESMP

Sl. No.	Budget Head	Total Amount INR
A	**Training & Capacity Building**	
1	Training of Division/ District workers on ESMF & ESMP	3900
2	Training of Contractor Staff on ESMF & ESMP	880
3	Refresher Training	10500
4	Specialised Training: i. OHS Training by National Safety Council	11333
	ii. GBV, SEA/SH Workshop	11236
Sub Total A		**37850**
B	**Information Awareness**	
1	GRM: i. Helpline	55000
	ii. Boards/ Poster	100000
	iii. Dashboard	325000
2	GBV, SEA/SH Program: i. GBV	221429
	ii. SEA/SH	221429
	iii. IEC material for WRD, DoA, RD	20000
3	Stakeholder Engagement	
	i. Public Consultation and Disclosure	450000
	ii. Community Health Safety campaign	70000
Sub Total B		**1462857**
C	**Reporting**	
1	R&R platform Development & Maintenance	250000
2	RAP Implementation Agency hiring	3168000
Sub Total C		**3418000**
Total		**4918707**
Contingency		245935
	Grand Total	**51,64,642**

Annexure I

Map of the entire project areas with Western Kosi Embankment, Eastern Kosi Embankment, Package IV (under BKBDP), ESML



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. **TableB** 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.

Table No. B: Selection Criteria for Campsite

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 labour 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. <u>Construction stage</u>

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

Public Consultation & Attendance sheets

Annexure- IV
List of Project Affected People & Consent letters of the PAPS

Sl. No.	Village Name	Name of PAP	Gender
1	Gadhgaon	Jay naryan mandal	Male
2	Gadhgaon	Sushil Kumar Mandal	Male
3	Gadhgaon	Chandrashekhar	Male
4	Gadhgaon	Ram chandra Mandal	Female
5	Gadhgaon	Lakhwinder Mandal	Female
6	Gadhgaon	Suraj Mandal	Male
7	Gadhgaon	Sonawati Devi	Female
8	Gadhgaon	Jitendra Yadav	Male
9	Gadhgaon	Nitu Devi	Female
10	Gadhgaon	Archana Kumari	Female
11	Gadhgaon	Pawan Devi	Female
12	Gadhgaon	Phulo Devi	Female
13	Gadhgaon	Mahesh Kumar Mandal	Male
14	Gadhgaon	Ram Ballav Mandal	Male
15	Gadhgaon	Laxman Mandal	Male
16	Gadhgaon	Ram Chandra Mandal	Male
17	Gadhgaon	Ram Dev Rai	Male
18	Gadhgaon	Chandra Kishore Mandal	Male
19	Gadhgaon	Sudhir Yadav	Male
20	Gewal gadhgaon	Dinesh Mandal	Male
21	Gewal Gadhgaon	Sajay Mandal	Male
22	Gewal Gadhgaon	Ranjeet Mandal	Male
23	Gewal Gadhgaon	Ramu Yadav	Male
24	Gewal Gadhgaon	Domi Mandal	Male
25	Gadhgaon	Musni Devi (widow)	Female
26	Gadhgaon	Nirmala Devi	Female
27	Nakta	Lal Mandal Bahadur	Male
28	Nakta (Mehsa)	Bihari Mandal	Male
29	Basipatti (Nuniyari)	Raj Kumar Yadav	Male
30	Basipatti (Nuniyari)	Raj Kumar Singh	Male
31	Basipatti (Nuniyari)	Mahendra Singh	Male
32	Basipatti	Lalu Singh	Male
33	Basipatti	Gaya Singh	Male
34	Basipatti	Shivam Sharma	Male
35	Basipatti	Mohan Singh	Male
36	Basipatti	Indra Badhai	Male

37	Gewal	Rajendra Yadav	Male
38	Gewal	Sri Yadav	Male
39	Gewal	Jyotish Yadav	Male
40	Gewal	Rajendra Yadav	Male
41	Gewal	Tapsi Yadav	Male
42	Manga Sihaul	Dinesh Yadav	Male
43	Manga Sihaul	Chande Yadav	Male
44	Manga Sihaul	Subhak Yadav	Male
45	Hari (Jhingwa)	Sheetal Yadav	Male
46	Gidrahi	Upendra Yadav	Male
47	Gidrahi	Vijay Yadav	Male
48	Gidrahi	Pramod Yadav	Male
49	Gidrahi	Channu Yadav	Male
50	Mahua	Ram udgar Yadav	Male
51	Hadri	Sanjay Kumar	Male

Consent letters of the PAPs whose structures will be affected

Annexure- V
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 are strictly prohibited and lead to contractual consequences. 3. Passenger vehicle used for transporting workers should have seat belts as mandated
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

Sr. No	Sub-Activity	Routine Activity	Potential Hazard	Consequence	Proposed Control
					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.
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 instrumen ts 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.

Sr. No	Sub-Activity	Routine Activity	Potential Hazard	Consequence	Proposed Control
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 / utilities; 6. Use of sharp hand tools.	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 urn/fatality	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.
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					

Sr. No	Sub-Activity	Routine Activity	Potential Hazard	Consequence	Proposed Control
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 of soil provide shoring/shuttering/sheet piling.
11	Pit Excavation beyond 3.0m (*During excavation / cutting*)	R	*Same as above plus* 1. Flooding due to excessive rain / undergroud water 2. Digging in the vicinity of existing Building / Structure 3. Movement of vehicles	Injury / fatal due to: 1. Drowning 2. Building / Structure collapse due to cave- in or slides. 3. Electrocution	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. 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

Sr. No	Sub-Activity	Routine Activity	Potential Hazard	Consequence	Proposed Control
			/ equipment's close to the edge of cut.		
12	Working inside deep excavation (*After cutting/excavati on*)	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	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
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

Sr. No	Sub-Activity	Routine Activity	Potential Hazard	Consequence	Proposed Control
					take 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
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					

Sr. No	Sub-Activity	Routine Activity	Potential Hazard	Consequence	Proposed Control
17	Concreting: Manual / Mechanical Loading or unloading of: a) Raw 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	R	1. Vehicle Movement. 2. Stack plies of raw 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.	1. Hit by the moving vehicles/ equipment may result fatality / severe injuries. 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.	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 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

Sr. No	Sub-Activity	Routine Activity	Potential Hazard	Consequence	Proposed Control
			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 VI

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.

Annexure VII

Stakeholder consultation meeting on Draft ESIA - Minutes

Subject: Stakeholder Consultation on Draft Environmental and Social Impact Assessment (ESIA) of Raising, Strengthening & Pukkikaran of ESML (Total length – 31.985 km) with restoration of 7 nos. stud and construction of 13 nos. stud from km 14.00 to km 26.275 of ESML.

Organised by: Western Embankment Division, Nirmali, Water Resource Department, Govt. of Bihar

Date: 22/07/2025 **Venue:** Harri, Nirmali (Stud Km 18.87)

Attendees: Prospective stakeholders including, project beneficiaries, project affected people, farmers, representatives of WUA, community leaders, representatives of local government, related line departments and elected representatives. Attendance sheet attached for reference.

Purpose of meeting: To present the draft Environmental and Social Impact Assessment (ESIA) of the referred sub-project and obtain final feedback and suggestions from prospective stakeholders.

Summary of discussion:

- Participants were briefed on the background, location, and specific activities of the proposed sub-project, along with the mandate of the World Bank.
- The expected outcomes of the sub project intervention were highlighted.
- The process followed for preparing the ESIA report was explained.
- Key findings of the ESIA were discussed.
- The procedure for preparing the Resettlement Action Plan (RAP) was outlined.
- The entitlements for the twenty six squatters likely to be relocated were explained.
- An overview of Grievance redressal mechanism for the project was shared.

Stakeholder Feedback/Suggestions:

- Squatters at risk of displacement due to the proposed intervention sought clarification on the methodology used to estimate compensation for rehabilitation and resettlement.
- Participants requested information on the authority responsible for identifying relocation sites.
- Queries were raised regarding the allocation of compensation and entitlements in cases where multiple families reside within the same household to be relocated.
- During the flood, the water level of Kosi River rises. Thus, people residing at riverside get affected.
- Respondents told that it becomes the worst nightmare during floods and destroys standing crops, spreading a thick sand layer on the agricultural field.
- Participants express their apprehension that, during restoration and raising strengthening work, their agricultural land and cultivated crops might be affected by dust.
- People are very much aware of the routine flood protection works undertaken by WRD. Some of them also participated in the protection works in the form of temporary labours. They also told that they did not face problems due to routine restoration activities.

- The WRD repairs the vulnerable stretch of the embankment & studs as needed. However, most the people do not have idea of the proposed project. During discussion, they have been informed.
- After discussing the objective and outcomes of the project, most of the participants have shown their positive interest in the proposed work.

Clarification provided:

- Provisions under the Entitlement Matrix were explained, noting that compensation for structures and other immovable assets will be calculated at the latest prevailing Basic Schedule of Rates (BSR) without depreciation. Affected persons will also be entitled to salvage materials from their structures and other assets without any deduction from the replacement value. Additional entitlements include assistance for shifting, income restoration measures, and special support for vulnerable groups.
- The implementing agency—the concerned division—will be responsible for identifying suitable relocation sites.
- In cases where multiple families are residing within the same affected household, compensation and benefits for rehabilitation and resettlement will be distributed equally among all verified rightful resident families.
- Adequate mitigation measures like sprinkling of water and provision of dust screens around material storage areas will do away with such problem.
- Flood risk will be mitigated after execution of the sub-project.

Conclusions:

It has been revealed from information gathered from stakeholder consultations and public consultations as well as discussions with project-affected squatters along project area that people are in favour of the proposed Raising, Strengthening & Pukkikaran of ESML and protection & restoration works of spurs. Local inhabitants belong to small farmer/ seasonal labour/ skilled or unskilled labour categories are willing to be involved as workforce during execution of the project. Stakeholders and community members voluntarily agreed to join their hands and take part during project implementation.

FEW SNAPSHOTS OF STAKEHOLDER CONSULTATION MEETING FOR ESML