



GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF ROAD TRANSPORT AND BRIDGES

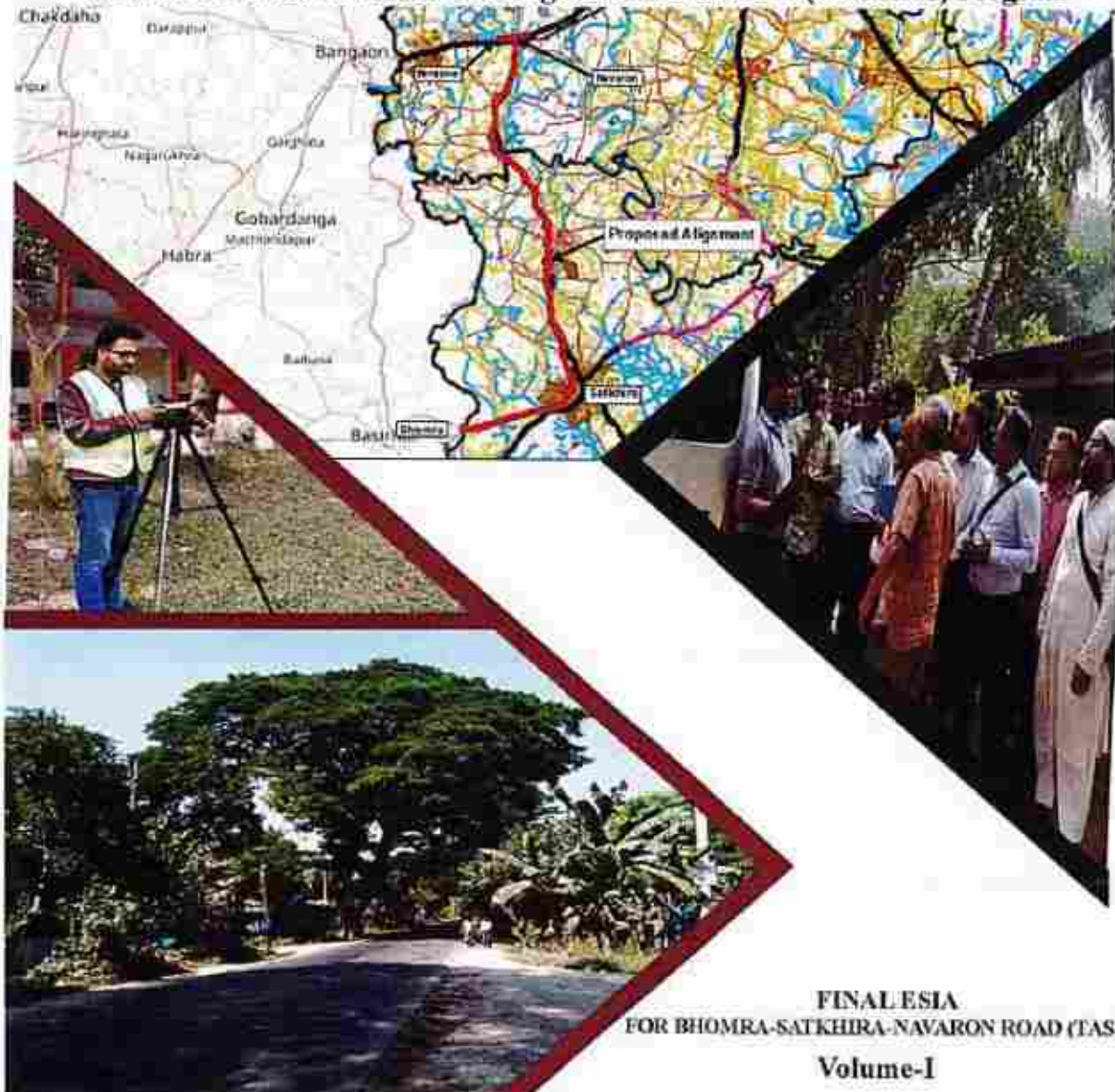


ROADS AND HIGHWAYS DEPARTMENT

**Environment and Social Assessment & Management Plans and Resettlement Actions
Plan for Bhomra-Satkhira-Navaron under Package (SP-06) (RHD)**

Phase-3

Western Economic Corridor and Regional Enhancement (WeCARE) Program



**FINAL ESIA
FOR BHOMRA-SATKHIRA-NAVARON ROAD (TASK 4)**

Volume-I

NOVEMBER 2025

JOINT VENTURE OF



STUP CONSULTANTS PVT. LIMITED (STUP), INDIA



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(Volume 2)

LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome	Km	Kilometer
AIIB	Asian Infrastructure Investment Bank	LGED	Local Government Engineering Department
AP	Affected Person	LHS	Labor Health and Safety
APD	Additional Project Director	LAPs	Land Acquisition Plans
ARIPA, 2017	Acquisition and Requisition of Immovable Property Act, 2017	MoRTB	Ministry of Road Transport and Bridges
BWDB	Bangladesh Water Development Board	NTHHs	Non-Title Holder Households
BDT	Bangladesh Taka	OPC	Optical Fibre Cable
BFD	Bangladesh Forest Department	OHS	Occupational Health and Safety
BMP	Biodiversity Management Plan	PAPs	Project Affected Persons
CCL	Cash Compensation under Law	PEA	Project Execution Agency
CoC	Code of Conduct	PD	Project Director
Col	Corridor of Impact	POPs	Pedestrian Overpasses
CPR	Community Property Resource	PRAC	Physical Relocation Assistance Committee
CSC	Construction Supervision Consultants	PSC	Project Steering Committee
DAM	Department of Agricultural Marketing	RAP	Resettlement Action Plan
DC	Deputy Commissioner	RHD	Roads and Highways Department
DF	Department of Forest	RPF	Resettlement Policy Framework
DPs	Displaced Persons	RoW	Right of Way
DoE	Department of Environment	SCMs	Stakeholder Consultation Meetings
DPM	Deputy Project Manager	SEA	Sexual Exploitation and Abuse
ESF	Environmental and Social Framework	SEID	Stakeholder Engagement and Information Disclosure
ESIA	Environmental and Social Impact Assessment	SES	Socioeconomic Survey
ESMP	Environmental and Social Management Plan	SH	Sexual Harassment
ESS	Environmental and Social Strategy	SMVT	Slow Moving Vehicle Traffic
EHSG	Environmental and Health Safety Guidelines		
EM	Entitlement Matrix		
EPs	Entitled Persons		
ESF	Environmental and Social Framework		
FGD	Focus Group Discussion		
FOB	Foot Over-bridge		
GBV	Gender Based Violence		
GIIP	Good International and Industry Practices		
GoB	Government of Bangladesh		
GRC	Grievance Redress Committee		
GRM	Grievance Redress Mechanism		
HIV	Human Immunodeficiency Virus		
HHS	Households		
IOL	Inventory of Losses		
IR	Involuntary Resettlement		
KIIs	Key Informant Interviews		

EXECUTIVE SUMMARY

INTRODUCTION

- i. The Government of Bangladesh (GoB), with funding from multilateral agencies such as the World Bank (WB) and the Asian Infrastructure Investment Bank (AIIB), has launched the Western Economic Corridor & Regional Enhancement (WeCARE) program. This initiative aims to provide efficient, safe, and resilient connectivity along a segment of a regional transport corridor in the country's western region, while also strengthening road sector management.
- ii. The Bhomra—Satkhira—Navaron road project is in the western part of the country and is proposed for development under Phase 3 of the WeCARE program financed by the World Bank. The road segment is regionally significant as it connects the Bhomra land port to the hinterland. Under this program, the existing two-lane highway will be upgraded to a safer, climate-resilient four-lane road.
- iii. The Road and Highways Department (RHD) under the Ministry of Roads, Highways, and Bridges is responsible for constructing and maintaining national and regional road networks. As the program's implementing agency for Phases 1 and 3, RHD ensures the sustainable development of the proposed road project.
- iv. The RHD has appointed Environmental and Social (E&S) Consultants—M/s Assystem STUP and BCL Associates (JV)—to conduct an Environmental and Social Impact Assessment (ESIA) and develop an Environmental and Social Management Plan (ESMP) and a Resettlement Action Plan (RAP) for the proposed road development.

POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

- v. The country's environmental legal framework includes various acts, rules, and policies. Article 18A of the Constitution, added in 2011, recognizes environmental protection as a fundamental right and mandates the state to safeguard the environment and natural resources for present and future generations.
- vi. The legislation addresses critical issues such as air, water, and noise pollution, biodiversity conservation, and resource management, alongside agriculture, fisheries, disaster risk management, and renewable energy regulations. Since the first environmental policy was endorsed in 1992, various laws have been established, with ECA 1995 being the cornerstone of environmental protection. This act aims to promote conservation, enhance quality standards, and control pollution, including setting limits on emissions, requiring environmental clearances for projects, and enforcing penalties for noncompliance.
- vii. The Acquisition and Requisition of Immovable Property Act (ARIPA), 2017, addresses risks related to land acquisition for projects, while the Environmental Conservation Rules (ECR) 2023 regulate harmful activities to ensure sustainable development. According to the ECR 2023, Item 38 under Schedule -I, the project road falls Red Category, requiring to conduct of an Environmental Impact Assessment (EIA). The Ministry of Environment, Forest, and Climate Change (MoEFCC) is the primary body responsible for environmental protection, with the Department of Environment (DOE) tasked with implementing laws. Therefore, the project road requires an Environmental Clearance Certificate (ECC) from the DOE, and approved terms of reference for the EIA have been followed in preparing this ESIA report.
- viii. The World Bank Environmental and Social Framework (ESF) sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards (ESS I through 10) that are designed to support Project Proponent (RHD) projects, intending to end extreme poverty and promote shared prosperity while ensuring environmental protection and social responsibility. The project is classified as **High Risk** under the World Bank's Environmental and Social Standards (ESSs), requiring a **full ESIA**, and compliance with ten (10) ESSs, including those on resettlement, labour, pollution, biodiversity, cultural heritage, and stakeholder engagement. In this regard, the AIIB's environmental and social policy requirements is not applicable to this project, since the project funded by the World Bank.
- ix. Chapter 2 examines the policies, laws, and frameworks relevant to the Bhomra-Satkhira-Navaron Section (Phase-3) Road project. It includes an analysis of World Bank environmental and social safeguards; and identifies any compliance gaps.

DESCRIPTION OF PROJECT

- x. The proposed development of this highway covers a total length of 61.184 km, including a portion of Jashore-Benapole Highway (3.3 Km), Navaron-Bhomra (55.304 Km), and Bhomra Loop or Service Road (2.58

Km). The length of existing road is 61.512 km and the width of Right of Way (RoW) varies at different sections as ranges 27m to 45m, whereas the RoW of the proposed road is 49.2m at Urban and 58m at Rural areas. The designed speed has been proposed 80 km/h. The project road alignment will comprise Dual 2-lane with Service Road on both sides, the carriage width 7.3 m, flyover bridges (04), culverts (118), Vehicular overpass (09), Bridges (04), Railway overpass cum flyover (01), Underpass (01), Service roads, drains, and 03 bypasses. The longitudinal gradient will be 3%. The project has been divided into four lots:

- ▶ Lot 1: from Km 0+000 to Km 7+200 and from Km 119+700 to Km 123+000 (Bhanga-Benapole Road) = 10.5 km
- ▶ Lot 2: from Km 7+201 to Km 23+093 = 15.893
- ▶ Lot 3: from Km 23+001 to Km 39+400 = 16.400
- ▶ Lot 4: from Km 39+401 to Km 55+212 = 15.811 + 2.58 Service Road only.

xi. There are three realignment at Bagachra 4.4 km in Lot-2, Kolaroa and Jhaudanga 8.25 km in Lot -3 and Satkhira Medical College 1.96 Km in Lot-4 and because of these 03 realignments the proposed road length will be 61.184 km, which is 0.328 km less than the existing road length of 61.512 km. Tentative filling materials requirement for the earthwork of Phase -3 will be 1508282 m³, 2 2262561 m³, 2715581 m³, and 4 243598 m³ for the Lot 1, Lot 2, Lot 3 and Lot 4, respectively.

xii. To implement the Bhomra-Satkhira-Navaron road section under Phase-3, about 907.60 acres of land will be required. This includes 636.64 acres of private land, 124.36 acres from the RHD land, and 147.60 acres from other government agencies' land, including 1.2721 acres of the CPRs.

xiii. The project's land acquisition and resettlement cost will be approximately 64,895.09 BDT (Sixty-four thousand eight hundred ninety-five million taka according to the Draft RAP, which is being prepared as a separate report by the Social Team.

DESCRIPTION OF ENVIRONMENTAL AND SOCIAL BASELINE

xiv. The Project area includes the Bhomra, Satkhira, and Navaron regions in southwestern Bangladesh's Jashore and Satkhira districts. It starts at Navaron (Lat: 23° 3'29.07"N, Lon: 88°59'56.26"E) and ends at R-766 on the Satkhira - Bhomra highway (Lat: 22°40'10.79"N, Lon: 88°56'46.35"E).

xv. A 200m strip on either side of the road corridor has been considered to collect the primary baseline data along the project road corridor. In contrast, for secondary data analysis, a 5km strip for the cumulative impact assessment, a 10km strip on either side of the project road corridor has been considered the project area of influence (AoI). The information on the social baseline condition was collected based on field investigations from October 15, 2023, to June 30, 2024, using Census Surveys, Inventory of Loss (IOL) Surveys, socioeconomic surveys, stakeholder consultations, focus group discussions, and key informant interviews per ESS10. To assess baseline conditions for the environmental quality parameters, field sampling and laboratory analyses were carried out during the ESIA study using government-accredited analytical laboratory facilities. The findings indicate:

- **Land Topography and Uses:** The elevation profile of the existing Bhomra—Satkhira—Navaron Road alignment varies between 2 and 8 meters above mean sea level. The area's general slope is from north to south, and the road traverses from high to low land. The project road starts at a higher elevation in Navaron and descends to the lower-lying endpoint in Satkhira. The predominant land use pattern is agricultural land, built-up areas, fishing cultivation ponds/shrimp farming, water bodies, and others.
- **Soil Characteristic:** The project area's soil characteristically has textural classes ranging from silty clay to clay. The soils have an average bulk density with a range of particle density (<3 gm/cc) and low organic carbon content (indicative of low organic matter), which clearly indicates the good load-bearing capacity of the soils.
- **Air Quality:** The results of the ambient air quality testing at eight locations reveal that dust particles (PM_{2.5}) and gaseous pollutants (NO₂, CO, and O₃) were within standards, but SO₂ was higher than the allowed permissible limit, and at one location, PM₁₀ exceeded limits set by the Air Pollution (Control) Rules 2022. The average concentrations of PM₁₀ (83.56µg/m³), PM_{2.5} (50.23µg/m³), SO₂ (125.10µg/m³), and NO₂ (44.73µg/m³) are all well within the DOE National Standards of 150, 65, 80, 80 µg/m³ respectively but higher than WBG standards of 50, 25, 40, 40 µg/m³ respectively.
- **Noise and Vibration:** Daytime and night-time noise levels, conformed to the Noise Pollution Control Rules 2006 (within 70dBA), the ranges between 36.7 to 69.4 dBA but are sometimes higher than WB Standard (45dBA). The average vibration is between 0.08 and 1.97 mm/s.
- **Surface and ground water Quality:** Three surface water samples from river and a canal, and two groundwater samples from tubewells at different locations were tested. The surface water testing parameters BOD, DO, TDS

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were within national standard (30, >5, 1000mg/L respectively, while groundwater samples showed coliforms (average 28CFU/1000ml) Arsenic contaminated in both tubewells, one site having low pH, but other parameters were compliant with the threshold standards as per ECR, 2023.

- **Climate:** The project area has a humid subtropical climate with significant variations between summer and winter temperatures. The annual average temperature is 31.3°C, with a maximum of 31.3°C and a minimum of about 16 °C. In the study area, the average yearly rainfall is 1,651 mm. Humidity during the monsoon season is high, with a maximum average relative humidity of 93.9% in August and a minimum of 55.4% in March.
- The incorporation of climate resilience and adaptation measures into design consideration is a critical step in infrastructure planning, especially in climate-vulnerable areas. During design consideration, hydrological and drainage planning by upgrading and increasing the size of cross-drainage structures and elevating the road embankment height; material and pavement design for thermal damage and erosion control; and adherence to standards and safety of ESS-4.
- **Flooding and Natural Disaster:** Bangladesh is prone to seasonal floods (10%) and highly vulnerable during wet years (up to 24%). Its unique geography makes it susceptible to deadly tropical cyclones, which create tidal waves in the northern Bay of Bengal, impacting many along the coast. The area has a moderate risk of natural disasters like cyclones and floods due to its low-lying geography.
- **Ecological environment:** Field investigations along the road alignment established the baseline of ecology and biodiversity. The assessment of terrestrial and aquatic flora and fauna found no species listed under IUCN Red List categories or protected by CITES and the Wildlife Protection & Security Act, 2012, in the project area. A total of 101,660 trees needs to be removed due to the road development project. According to IOL, about 80,424 were situated in privately owned land, 8671 within affected CPRs and other entities, and 12,565 were RHD roadside avenue trees.
- **Social Environment (Settlement within proposed RoW):** The total population of the Affected Persons (APs) within the proposed right of way (RoW) was 16,126. The maximum APs were identified in Lot 2 (4867), followed by Lot 1 (4711), Lot 4 (4480), and Lot 3 (2068) during the IOL survey. The affected Titled Household (THHs), Non-Titled Household (NTHHs), and Encroached households were 2256, 575, and 725, respectively. Around 126 sensitive receptors are partially and fully affected. Of them, 42 mosques, 34 schools, madrasahs, and colleges, graveyards and 46 Eidgah, and 4 temples and mazaras. In addition, other entities are 118. The Male to Female Sex ratio in the project area is 1.04. There are no indigenous people/ethnic groups in the project-affected area. Social data collected from the RAP for the project, which is being prepared separately as a standalone document to address the social issues.

xiv. It is noted that presently, the implementation schedule for this project is uncertain. The baseline conditions of the project area will need to be updated, as social and environmental scenarios are expected to be changed within three to four years.

ANALYSIS OF ALTERNATIVE ALIGNMENTS

xv. To ensure sustainable development in the design of the proposed road, alternative alignments were studied by considering the social, environmental, and financial costs involved. A range of design and alignment alternatives was assessed to balance engineering efficiency, environmental protection, and social acceptability.

xvi. Alternative alignment options have been analysed in the congested road side sections, particularly in towns and bazar areas such as Bagachra bazar, Kalaroa, Jhaudanga and Satkhira Medical College, where RoW is insufficient for a four-lane with service road. This could lead to significant land acquisition and resettlement challenges. Three alignment and design options were considered for the Bhomra-Satkhira-Navaron Road:

- **Option 1:** Dual two-lane with service roads on both sides, mainly using the existing right-of-way. While technically feasible, it would cause land acquisition and high resettlement impacts in congested towns such as Bagachra, Satkhira Medical College, Kalaroa, and Jhaudanga. The widening of the existing narrow road sections with highly built-up up includes roadsides markets, commercial, and residential areas.
- **Option 2:** Dual two-lane with service roads and grade separation through flyovers. This reduced some impacts but created construction challenges (e.g., flyover at Level 3 at Navaron) and still required significant land acquisition and high resettlement impacts in congested towns at Bagachra, Kalaroa, and Jhaudanga, and Satkhira Medical College due to widening the existing road sections.
- **Option 3:** Dual two-lane with service roads, strategic realignments at Bagachra, Satkhira Medical College, and Combined Kalaroa and Jhaudanga, plus grade-separated intersections at Navaron. The realignment at Bagachra is proposed to be 4.40 km, whereas the existing road is about 4.025 km. The combined Kalaroa and Jhaudanga realignment is proposed at 8.250 km instead of the existing 8.710 km congested narrow road. The length of the

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bypass at Satkhira Medical College is minor. Therefore, this option minimizes resettlements, improves traffic flow and safety with less traveling time and overall land acquisition, and costs. Removal of trees within the proposed RoW would be less than other two options, since the proposed realignments are mostly agricultural lands and the planted trees are minimum.

xvi. After thorough analysis, Option 3: Dual 2 lane with Service Road on both sides, one ROP cum Flyover for Trumpet on Bhomra – Satkhira – Navaron Road at Level 2 and Bhanga-Benapole will be at grade at Level 1 with Access Controlled with three realignments at Bagachra, Combined Kalaroa and Jhaudanga, and Satkhira Medical College was considered the most feasible alignment option.

xvii. Further, “With the project” and “Without Project” options have also been studied by working on CO₂ emissions for both. It is found that there will be a reduction in the “With the Project” option, and it is recommended for implementation.

CONSULTATIONS, PUBLIC PARTICIPATION, AND INFORMATION DISCLOSURE

xvi. Various methods were used for carrying out under the Stakeholder Engagement and Information Disclosure (SEID) process during October 2023 and 27 April 2024. Nine (09) Stakeholder Consultation Meetings (SCM), 10 Focus Group Discussions (FGD), 28 Key Informant Interviews (KII), and several spot discussions were conducted. To organize these events, separate checklists/questionnaires were developed to assess the impacts and risks that arise from Land Acquisition (LA) and Rehabilitation Action Plans (RAP), and Gender-Based Violence.

xvii. The project's Primary stakeholders are affected people, including landowners, farmers, businessmen, structure owners, sharecroppers, poor, pro-poor, squatters, women's groups, underprivileged groups, owners of commercial and business enterprises, vendors, wage earners, marginal workers, drivers, and transport workers. Throughout the consultation process, in addition to LA and involuntary resettlement for the proposed development, the compensation process, issues of gender-based violence, human trafficking, and the need for skill development under the Livelihood Restoration Program for poor and vulnerable households were discussed. The influx of workers during construction, removal of trees to make way for road sections will occur. There will be an impact on pedestrian safety, pollution, and drainage due to the movement of construction vehicles and equipment, which was also of concern in the meetings.

xviii. Though people appreciate RHD for this proposed existing development, they raised some demands to be incorporated in road design, such as an effective drainage system and necessary bridges and culverts over the waterbodies, provision for underpasses or foot over bridges for pedestrian safety, toilet blocks, provision of adequate lighting systems, noise barriers, and retaining walls, etc. Participants have expressed their grave concern about wage discrimination and the lower participation of women in the project's construction work. Sexual Exploitation and Abuse (SEA)/Sexual Harassment (SH) risks can be increased and/or emerge due to influxes of male workers from outside the project area. These issues need to be considered by the project management.

xix. According with the Rules of 16 of the ECR, 2023 of the Department of Environment (DoE), the Consultant conducted two Public Disclosure meetings on disclosure of the Draft ESIA of the Phase-3, before that meetings schedule were advertised in one National and Two local papers. Two Public Consultation Meetings conducted one at Langoljhora Union Perished of Kolaron Upazila under Satkhira District dated on 29 June, 2025 and another at Uleshi Union Perished under Sharsa Upazila of Jeshore District dated on 30 June, 2025. These meeting Minutes have been published in the newspapers and the Minutes have been approved by Concern DoE Officers. The project design, benefits, and anticipated adverse environmental and social impacts were disseminated in these meetings.

xx. This final Environmental and Social Impact Assessment report for Phase 3, along with executive summary of Bangla version will be disclosed on the websites of RHD and the World Bank.

ENVIRONMENTAL AND SOCIAL IMPACTS, RISKS, AND MITIGATION MEASURES

xxi. The project will have the potential effect on the existing environmental and social parameters such as land use patterns, soil and sediment characteristics, air quality, noise levels, surface and groundwater quality, occupational health and safety, community health and safety, local traffic and transport, and aquatic and terrestrial ecosystems. The environmental and social impacts and risks from the proposed road development will occur during the Design consideration or preconstruction, construction, and operational periods.

Preconstruction Phase Impact and Measures

- **Design consideration:** Design parameters and construction planning may negatively affect infrastructure operations, such as the degradation of natural systems like drainage, contamination caused by the mismanagement of construction

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waste, etc. Improper Project geometrical improvement, pavement designs with concern to pavement damage, such as rutting, embrittling, softening, road migration of liquid asphalt, thermal expansion in bridge joints, realignment locations, siting of construction/labour camps, and other associated infrastructures can have significant impacts on the biophysical, economic, and socio-cultural environments of the project area. In this respect, the embankment height and pavement design complied with the relevant international and national approved design manual of RHD Geometric Design Standards Manual (Revised-2005); AASHTO "A Policy on Geometric Design of Highway and Streets" 2001, etc. The Bangladesh National Building Code (BNBC) is also considered in the design of road infrastructures, particularly all building structures. To mitigate other impacts, the area's hydrology and adequate drainage structures are provided. Pedestrian safety and road safety measures have been addressed by providing vehicular underpasses, pedestrian passes (POP), Flyovers, etc.

- Land acquisition and resettlement:** Implementation of the proposed road improvement will cause a significant adverse impact on the social environment. About 907.60 acres of land will be acquired for the widening and strengthening of the proposed highway improvement. Among them, 635.64 acres are private land, 124.36 acres are RHD lands, and 147.60 acres are other Government lands. The total population of the Affected Persons was 16,126. The affected THHs, NTHHs, and Enroached households were 2256, 375, and 725, respectively. Around 126 sensitive receptors are partially and fully affected, and other entities 118. To reduce these impacts, the mitigation measures are to implement the Land Acquisition Plan (LAP) and Resettlement Action Plan (RAP) of the Project following ARIPA, 2017, and the World Bank's ESS5. The Deputy Commissioner (DC) will pay Cash Compensation under Law (CCL) to the PAPs to compensate for the impact due to the loss of lands, structures, ponds, trees, standing crops, etc. The payment of compensation to Titled and Non-Titled households should be carried out according to the entitlement matrix defined in the RAP by the RAP Implementing Non-Government Organization (INGO) on behalf of RHD.
- Utilities shifting, Drainage problem, Road safety, and Community health and safety:** The risks and adverse impacts on the utilities shifting (power poles 2131, underground power line 106, substation 01, and 137 power related boxes), community's health and safety are expected during construction activities like excavation, earth working, dismantling the existing structures and road pavement, shifting of electric poles, siting of construction camps/labour camps, etc. Before starting the civil works, the contractor should plan the mitigation measures for utilities shifting, drainage problems, road safety, and community health and safety issues during the pre-construction phase.

Construction Phase Impacts and Mitigation Measures

Physical environmental impacts: -

- Dust and air pollutant emissions:** Construction vehicles and operations will affect the project's air quality. Key contributors to air pollution include land clearing, diesel engine use, demolition, and material transport. A safe distance of 500m downwind from residential areas is recommended for hot mix plants. The air pollution impacts during construction are expected to be short-term and localized, which can be mitigated through vehicle maintenance and dust suppression methods.
- Air Quality:** Construction activities such as land clearing, diesel engine use, demolition, and transport of materials will generate dust and air pollutants. Hot mix plants must be located at least 500m downwind from residential areas. Impacts are expected to be short-term and localized, mitigated by vehicle maintenance, tarpaulin covering, and dust suppression (e.g., water sprinkling).
- Noise pollution:** The equipment operation at the construction site will be the primary source of increased noise levels, expected to range from 74 to 101 dB (A). A point source of 95 dB (A) at 2m will not exceed 45 dB (A) beyond 250m from the site boundary. Noise control measures, such as silencers and earplugs, can significantly reduce impacts.
- Noise and Vibration:** Equipment operation during construction will generate noise levels of 74–101 dB(A). A point source of 95 dB(A) at 2m attenuates to 45 dB(A) beyond 250m, indicating local impacts. Mitigation includes silencers, restricted working hours near sensitive receptors, and the use of protective gear (earplugs).
- Soil Pollution:** Soil in the haulage roads and construction camps may become compacted and contaminated from construction vehicles, waste disposal, and liquid spills. Mitigation measures include proper waste storage and restricting movement to designated routes.
- Soil and Land:** Haul roads and camps may experience soil compaction and contamination from liquid spills, lubricants, and waste. Mitigation measures include designated routes, lined storage, spill management, and proper disposal of solid and liquid waste.
- Water and Drainage:** Risks of waterlogging, sedimentation, and pollution exist, especially near construction camps and borrow areas. Measures include drainage design, silt traps, and wastewater management to protect community health.

Ecological and Biodiversity Impacts: -

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EIS Consultant, STUP-2021

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- Tree Cutting:** Approximately 101,660 trees will be removed, including 80,424 private trees of 90 species and 8,671 within CRP and other entities of 34 species. Existing roadside avenue trees of RHD are also 12,565. To compensate for this impact, a replantation plan has been proposed in the ESMP, with a total of 56,387 trees to be planted. This total includes shrubs (13,800 in Lot 1, 15,420 in Lot 2, 13,227 in Lot 3, and 13,840 in Lot 4). Of the total tree plantation, 40% will be undertaken by RHD through a contractor, and the remaining 60% will be planted by the Forest Department under the social forestry program and the RHD Arboriculture Department. A total of 56,387 trees will be planted at a 1:4.5 ratio to the 12,565 RHD roadside trees that were cut. A typical road plantation scheme is presented in Annex 11, Volume 2. The issue of private tree cutting was discussed with the stakeholders, for which necessary compensation will be paid to the Affected Households (AH). According to the RAP, in addition to the compensation for the affected private trees, an extra 10-12 saplings would be given to each affected titled and non-titled households at free cost as the resettlement benefits. Stakeholder consultations confirmed that compensatory plantation and compensation to affected households (AHs) will be paid through the RAP implementation.
- Habitat and Biodiversity:** Loss of vegetation and disturbance to terrestrial and aquatic ecosystems are expected. Mitigation includes tree plantation, controlled clearing, and biodiversity conservation measures.
- Fish Resource:** Bridges and culverts construction negatively impacts on fish and aquatic ecosystems, primarily in the short term. Key activities like excavation, cofferdam installation, and pier driving release large amounts of soil and silt. This siltation suffocates fish eggs and larvae in spawning areas and causes high turbidity harms adult fish by irritating/clogging gills, and prevents sight-feeding fish from finding prey. Additional harm comes from water contamination such as leaking fuel, oil, hydraulic fluids, toxic concrete runoff, etc. all of which negatively affect fish. The mitigation measures includes, isolation of work area, maintaining fish passage. The flow of water through the river/canals should not be blocked completely and provide escape routes during dewatering. Proper construction scheduling to avoid critical fish life stages like spawning, egg incubation, or peak migration periods, using proper machinery, and monitoring of water quality during in water works.

Social Impacts:

- Land Acquisition and Resettlement:** The project will lead to the loss of agricultural land, private structures, ponds, and trees, requiring involuntary resettlement. A Resettlement Action Plan (RAP) provides mitigation through cash compensation, top-up payments where replacement value exceeds CCL, livelihood restoration, and support for women and vulnerable groups. The mitigation measures include Payment of Cash Compensation, Payment of Top-up, compensation for the loss of pond and private trees, social and economic development support to restore the livelihoods of women and vulnerable groups, Grievance Redress Mechanism (GRM), etc. Short-term disruption to vendors, farmers, and businesses is expected to affect livelihoods. Long-term benefits include improved connectivity and economic opportunities.
- Occupational Health and Safety:** Without OHS measures, workers risk temporary and sometimes permanent physical injuries such as hearing and sight loss, damage to limbs, etc. Workers may suffer from various physical problems, stress, and risks that could create long-term impacts on the health and safety of the construction workforce. To protect against these incidental risks, concerned workers should be provided with occupational safety equipment and forced to use safety measures. It is a major concern that construction workers do not use health and safety equipment. It is thus essential to ensure health and safety training for day-labor construction workers and provide appropriate protective equipment. Ensuring fair treatment of workers and maintaining health and safety. A Labor Management Plan (guideline in Annex 13, Volume 2), OHS standards, PPE use, and camp siting guidelines (≥500m from settlements/waterbodies) are mandated. The contractor shall prepare and approve an Emergency Response Plan (ERP) and shall provide training to workers accordingly, as documented in Annex 8, Volume 2.
- Community Health and Safety:** Risks include accidents, exposure to vector-borne and communicable diseases, and hazards from open excavation and camps. Measures include site barricading, warning signs, regulated vehicle movement, and drainage maintenance to prevent waterlogging. Mitigation measures are suggested to ensure Community Health and Safety, barricading excavated areas, and to prevent trespassing from construction sites/construction camps/labor camps, provision of warning sign boards, prevention of waterlogging at the construction sites to prevent community exposure to water-borne, vector-borne diseases, and communicable and non-communicable diseases. Accidental incidents, traffic congestion, and disruptions to traffic movement are expected, and communities will suffer severely. To mitigate these risks and protect communities, the contractor will monitor potential traffic and road safety risks throughout its life cycle and develop measures to address them.
- Stakeholder Engagement:** Multiple consultations will be conducted; concerns on compensation, tree cutting, pollution, and safety were addressed. A functioning **Grievance Redress Mechanism (GRM)** is central to conflict resolution.
- Gender and SEA/SH Risks:** Risks from labour influx and poor site management may expose women and girls to SEA/SH and GBV. To prevent impacts on gender, SEA/SH, the contractor will take the mitigation measures including the installation of close circuit cameras at prominent locations such as contractor's

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facilities/office camps/canteen, etc., needs necessary arrangements and systems for effective and timely patrolling to ensure the safety of the women and girls; implementation of a SEA/SH-free work environment at the project site in; measures for preventing gender-based discrimination and violation; Any sexual harassment shall be dealt strictly with as per local law of the country; Code of conduct (CoC) will be rolled out which require to be signed by each worker. Staff shall be encouraged to report suspected or actual GBV or SEA/SH incidents. A grievance redress mechanism is suggested to be established at the site to address issues immediately. In line with the Bangladesh Labor Act (2006, amended 2018) and the World Bank ESS2 on Labor and Working Conditions, the project will ensure equal pay for equal work, non-discrimination in recruitment, and safe working conditions for women. Contractors will be required to provide separate toilets and rest spaces, establish a zero-tolerance policy for sexual harassment and GBV, and make grievance redress mechanisms accessible to female workers. Training and awareness programs will also be introduced to enhance women's skills and participation in project activities. During the construction period, the ESMP is expected to be effectively followed, which will ensure a low-risk environment for Gender-Based Violence affecting community members, workers, service users, and any other relevant sections of the public, following the guidelines of the GBV Plan documented in Annex 12, Volume 2.

- **Traffic Disruption:** The project-related activities can significantly impact traffic movement and the occurrence of accidents in the project areas, including inconvenience or disturbing the local community who reside near the areas adjacent to construction works. The movement of heavy vehicles to carry construction materials and equipment will add congestion to existing traffic and increase the risk of traffic accidents of drivers at night. In addition, there are serious accident risks for pedestrians crossing the road at sensitive receptors, like schools, mosques, temples, hospitals, etc., and other CPRs. To mitigate these risks, a Traffic Management Plan (TMP) will be drawn up by the contractor and submitted to the CSC for approval before the commencement of construction. The traffic control plans shall contain details of temporary diversions and detouring, traffic safety arrangements during construction, and safety measures for nighttime traffic as follows the guideline for TMP in Annex 10, Volume 2.

Operation Phase Impacts and Mitigation Measures

The operation phase impacts covers mainly routine maintenance-related risks, road safety, habitat fragmentation, and RoW vegetation management. These are as follows;

- **Road safety:** To control the road safety, the road furniture, as provided in the operation phase, needs to be appropriately maintained. Potholes or any other damages shall be rectified immediately after post-monsoon. Highway Patrol/ Police deployment sufficiently at the project road in operation to oversee, monitor, and enforce traffic safety compliance on roads and highways as well as accident investigation and sexual misconduct, particularly women SH in the public buses during night.
- **Land use Pattern:** Implementation of the project will cause a permanent impact on the existing land use pattern by changing it from agricultural or rural residential/commercial to paved roads due to additional widening of the existing road and three realignments, development. Road projects often lead to increased urbanization alongside the project road sections. Due to increased accessibility, land prices along the road will also soar in nearby places. The mitigation measure to prevent ribbon development is to restrict land by placing concrete pillars by RHD, and master planning /zoning must be taken by the concerned authority, and routine inspections by the RHD and other concerned authorities are essential to observe and control any unplanned settlement are going to be built up. Integrated planning is crucial to address these impacts. Coordinating land use and transportation planning is must to ensure that new developments are sustainable and beneficial to the community.
- **Water Resources, Soil and Sediments:** The activity of the proposed development will be only vehicular movements on the newly developed flyover/bridge infrastructure. There will be impacts on soil and sediment, including continued erosion and sediment delivery from road surfaces and ditches, leading to water quality degradation during the operation phase. The heavy metals and other pollutants from traffic accidents and oil heavy metals and lubricants contaminate roadside soils, potentially entering the food chain, and soil compaction from traffic, changes in soil physical and chemical properties, and the risk of leaching into groundwater also occur. Erosion from surfaces, runoff from the road surface, and drainage ditches continue to carry sediment and silt into nearby water bodies. In addition, roadside ditches can be a continuous source of sediment that flows into larger streams and rivers. Usually, the sediment entering streams carries pollutants and can also smother aquatic habitats, negatively impacting fish and other wildlife. To mitigate planting and maintaining vegetation on slopes and in ditches helps stabilize soil and reduce sediment yield. Runoff controls are crucial to intercept and treat pollutants before they reach water resources. Proper maintenance of drainage systems and vegetated areas helps reduce ongoing sediment and pollutant transport. Any spills or accidental vehicles shall be removed immediately. Ensure maintenance of these issues necessitates ongoing management and the use of Best Management Practices at the site.
- **RoW vegetation management:** The shrubs and trees to be planted on the median and along the roadsides are to be maintained and trimmed regularly. Roadside planting and maintaining vegetation on slopes and in ditches help stabilize soil and reduce sediment yield.

- **Habitat fragmentation:** The existing national highway is already disturbed corridor, thus, this road improvements will not cause habitat fragmentation by dividing large areas into smaller, isolated patches and creating barriers that hinder wildlife movement.

LABOR MANAGEMENT PROCEDURE

xxii. The Labor-Management Procedure (LMP) has been prepared to ensure that the project complies with the Bangladesh Labor Act of 2006, as well as the World Bank's Environmental and Social Framework (ESF), and Environmental and Social Standard (ESS). The whole hiring and recruitment process will be conducted considering the standard procedure of relevant rules and regulations (national and international) and rolling out a code of conduct for workers.

xxiii. The contractor will follow the CoC/LMP for employment, remuneration, leaves, holidays, housekeeping, facilities, e.g., lodging, drinking water supply, sanitation, waste disposal, supply of fuel/cooking gas, firefighting, medical services, etc.

EMERGENCY RESPONSE AND DISASTER MANAGEMENT PLAN

xxiv. To prevent untoward incidents/accidents due to construction activities, an Emergency Response and Disaster Management Plan (ERDMP) is presented to manage emergencies and crises arising from construction activities. The ESMP suggests that the contractor engage a Safety specialist. The contractor must establish a Site Emergency Response Team (SERT), comprising senior management at the Project Management level and Deputy Project Management, among others, to address emergencies based on their severity.

xxv. Any emergency must be reported immediately to CSC and PIU so that the situation can be addressed at the district or national level if necessary. The contractor is also advised to maintain up-to-date information on local authorities, nursing homes/clinics, hospitals, and ambulances.

xxvi. The security coordinator will be responsible for strictly adhering to the project code of conduct, and the use/upkeep of any firearms will be subject to strict protocol.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

xxvii. An Environmental and Social Management Plan (ESMP) is devised to ensure the project's sustainable development. It is prepared for the Design/preconstruction, Construction, and Operation/post-construction phases. Provisions of ESMP will be included in the contractor bidding document as a mandatory requirement for the contractor to implement the mitigation measures.

xxviii. A matrix outlining mitigation measures for various construction activities, along with the implementing and responsible agencies, is presented in the ESMP. It includes an institutional agreement, capacity-building measures, tree and shrub plantations, and environmental checklists for environmental pollutants, such as ambient air quality and noise, as well as soils, sediments, and vibration, as suggested in the Environmental Statement of Management Practices (ESMP). Additionally, a provision is made for the contractor to purchase portable environmental monitoring equipment for each contract as an obligatory requirement of the ESMP for random monitoring by the PIU and CSC. This equipment will be kept at PIU.

xxix. The Project Implementation Unit (PIU) of RHD oversees project activities. The project road is divided into four lots, each managed by a Project Manager responsible for implementing project activities, including the ESMP. Therefore, there are four Project Managers in the PIU. The PIU has employed specialists, including an Environment Specialist, a Social Development and Public Relations Expert, a Land Acquisition/Resettlement & Rehabilitation Specialist, a Gender Specialist, and an Occupational Health and Safety Specialist, to support the implementation of ESMP and RAP. An Additional Project Director (APD) has been added as a focal point for ESMP implementation and will supervise the Project Managers. The head of the PIU is the Project Director.

xxx. Construction and Supervision Consultancy (CSC) will be engaged to serve as the project engineer, reporting to the PIU. They will manage contract administration and daily project supervision, ensuring the implementation of the environmental and social plan. The CSC's team will include an environmental and social expert, along with a national-level team for each contract, which features a senior environmental specialist, a public health specialist, a gender specialist, a senior resettlement specialist, and a rehabilitation/senior social development specialist.

xxxi. The total budgetary cost of the Environmental and Social Management Plan (ESMP) is approximately BDT 83,067,000 (Eighty-Three Million Sixty-Seven Thousand). This includes environmental monitoring costs and tree and shrub plantations per the Greenbelt development plan.

CONCLUSION AND RECOMMENDATION

xxxii. The anticipated negative environmental and social impacts will be prevented or mitigated through proper engineering design and implementation of proposed mitigation measures as defined in ESMP of the ESIA. Compliance with mitigation measures in the ESMP will ensure that the biophysical, ecological, and socio-cultural environments are not affected by the construction and operation of the 6-Lane Bhomra-Satkhira-Navaron Road Section (Phase 3) under the WeCARE Program. In the context of the Satkhira-Navaron Road Section, it can be confirmed that the aggregate positive impacts outweigh the negative impacts due to implementation of the recommended mitigation measures, and it can be concluded that the proposed Project is environmentally sound and sustainable. Based on the findings of the ESIA, the following recommendations are made:

- The ESMP needed to be included in the Bidding Documents as environmental specifications and BoQ items in the Tender Document.
- The Contractor must comply with applicable national rules and legislation and World Bank's ESF safeguards through implementation of their Construction Environmental and Social Management Plan (C-ESMP) for the compliance of the Project's Safeguard requirements following the ESMP of the Project.
- In addition to replantation on roadsides, tree plantation must be considered as a biological noise barrier and an enhancement measure. It is proposed that local plant, fast-growing trees to be planted instead of trees removed for the project road development; and a dense tree plantation in three (3) rows along the school's boundary wall, which shall be undertaken to reduce the noise levels' intensity and enhance the affected school's landscape and confers a psychological benefit in reducing the perceived nuisance of traffic noise¹. A 30-meter strip of dense vegetation can reduce noise by five decibels.
- Also recommended that an extruded acrylic (1.17 – 1.19 g/cm³ of density) sheet noise barrier of 6mm thick) to be provided on the loop, take-off, and landing sides of the Navaron junction to reduce the noise impact on the nearby community. This sheet should be fixed on both sides. This will attenuate the noise level by 20db (A).

¹ Roads and the Environment- A Handbook, World Bank Technical Paper No. 376, 1997

1 INTRODUCTION AND PROJECT BACKGROUND

1.1 INTRODUCTION

1. Bangladesh is one of the world's most densely populated countries, with a population density of 1333 persons/square km.^{2,3} It is a low-lying country in the delta region of several large rivers, including the Brahmaputra, Ganges, and Meghna Rivers. The country's landscape is crisscrossed by hundreds of smaller rivers, tributaries, and distributaries, making it highly susceptible to flooding. Flooding is a widespread feature in the country, particularly during the monsoon season, and has been a significant challenge for the country's development and economy.

2. The literature also reportedly states that cyclones and storms are the leading disaster types in Bangladesh, claiming 60% of total deaths worldwide. Flooding is the second most damaging disaster, with almost 75% of natural hazard-related disasters affecting the country.

3. The people of Bangladesh have developed many innovative ways to cope with flooding and have made significant progress in recent years in reducing the impacts of floods through improved infrastructure and disaster management systems. However, the country's existing road design standards lack climate resilience, especially in areas prone to flooding and storm surges that may cause erosion and road damage.



1.2 PROJECT BACKGROUND

4. Road transport is the prevalent mode of transport in the country. About 70% of passenger traffic and 60% of freight are on road transport. The government has significantly developed an extensive transport system, particularly road transport. The total road network size of the country is roughly 375,000 km (road density of approximately 250 km per 100 km²).⁴ The primary road network is congested and in poor condition.² It operates at or near maximum capacity and cannot meet rapidly increasing traffic demand. The vehicular average speed on the primary network is less than 30 km/hour. It is imperative to note that the country has made tremendous progress in improving connectivity, particularly at the subnational levels. However, considerable investment is still needed to improve, upgrade, and maintain the current road network.

5. Thus, to provide efficient, safe, and resilient connectivity along a section of a regional transport corridor in Western Bangladesh, the Government of Bangladesh (GoB), with the World Bank's (Bank) financing, is implementing the Western Economic Corridor & Regional Enhancement (WeCARE) Program through the Road and Highways Department (RHD) under the Ministry of Roads, Transport and Bridges (MoRTB).

1.3 THE PROGRAM AND THE PROJECT ROAD

6. The WeCARE Program is designed to upgrade and improve national highways, utilities, infrastructure, and services. Improvement through the program will help narrow the gap in poverty reduction measures between the eastern and western regions. These poverty reduction impacts have been substantive and concentrated in central and eastern regions since 2010, compared to western divisions.⁴

7. This program is a 10-year-long initiative that has the following four phases, as given in Table 1-1

² Project Appraisal Document, WeCARE, PAD3635, The World Bank.

³ <https://www.worldometers.info/world-population/bangladesh-population/>

⁴ Terms of Reference, RHD.

1. Introduction and Project Background

Table 1-1: Phases of the WeCARE Program

Phase	Scope
Phase-1: Upgrading the Jashore-Jhenaidah road section as an intelligent, resilient, and safe highway and local economic infrastructure	► This phase upgrades the Jashore-Jhenaidah National Highway (J-J)—about 48km—from a two-lane single-carriageway to a climate-resilient four-lane dual-carriageway. It includes separate service lanes for slow-moving vehicles and vulnerable users on both sides of the carriageway, the installation of Optical Fibre Cable (OFC), the Safe Corridor Demonstration Program (SCDP), and the deployment of an Intelligent Transport System (ITS). ► Upgrading of priority Upazila, Union, and village roads and complementary logistics infrastructure at rural markets (commonly called growth centers) in the four (4) Program Districts of Jashore, Jhenaidah, Magura, and Chuadanga. ► Establishing a Road Transport Sector Integration and Coordination Platform (RTSICP) and operationalizing the Road Maintenance Fund Board Act (RMFB).
Phase-2: Road Maintenance Financing and Strengthening Road Sector Management & Institutional Capacity	► This phase will primarily focus on improving the management and maintenance of road sector and will include mainly technical assistance.
Phase-3: Upgrading of Bhomra - Satkhira-Navaron road section as a smart, resilient, and safe highway; and local economic infrastructure	► Upgrade the Bhomra—Satkhira—Navaron National Highway 61.184 km from a two-lane single-carriageway to a climate-resilient four-lane dual-carriageway. This includes separate service lanes for slow-moving vehicles and vulnerable users on both sides of the carriageway, installation of OFC, and deployment of ITS. ► Development of Upazila, Union, village roads, and complementary logistics infrastructure in the three (3) Program Districts of Jashore, Satkhira, and Meherpur.
Phase-4: Upgrading of Local Economic Structure	Upgrade priority upazila, union, village roads and complementary logistics infrastructure in the four (4) Program Districts of Natore, Sirajganj, Pabna, and Kushtia.

Source: Terms of Reference (TOR), RHD

1.4 THE PROJECT ROAD

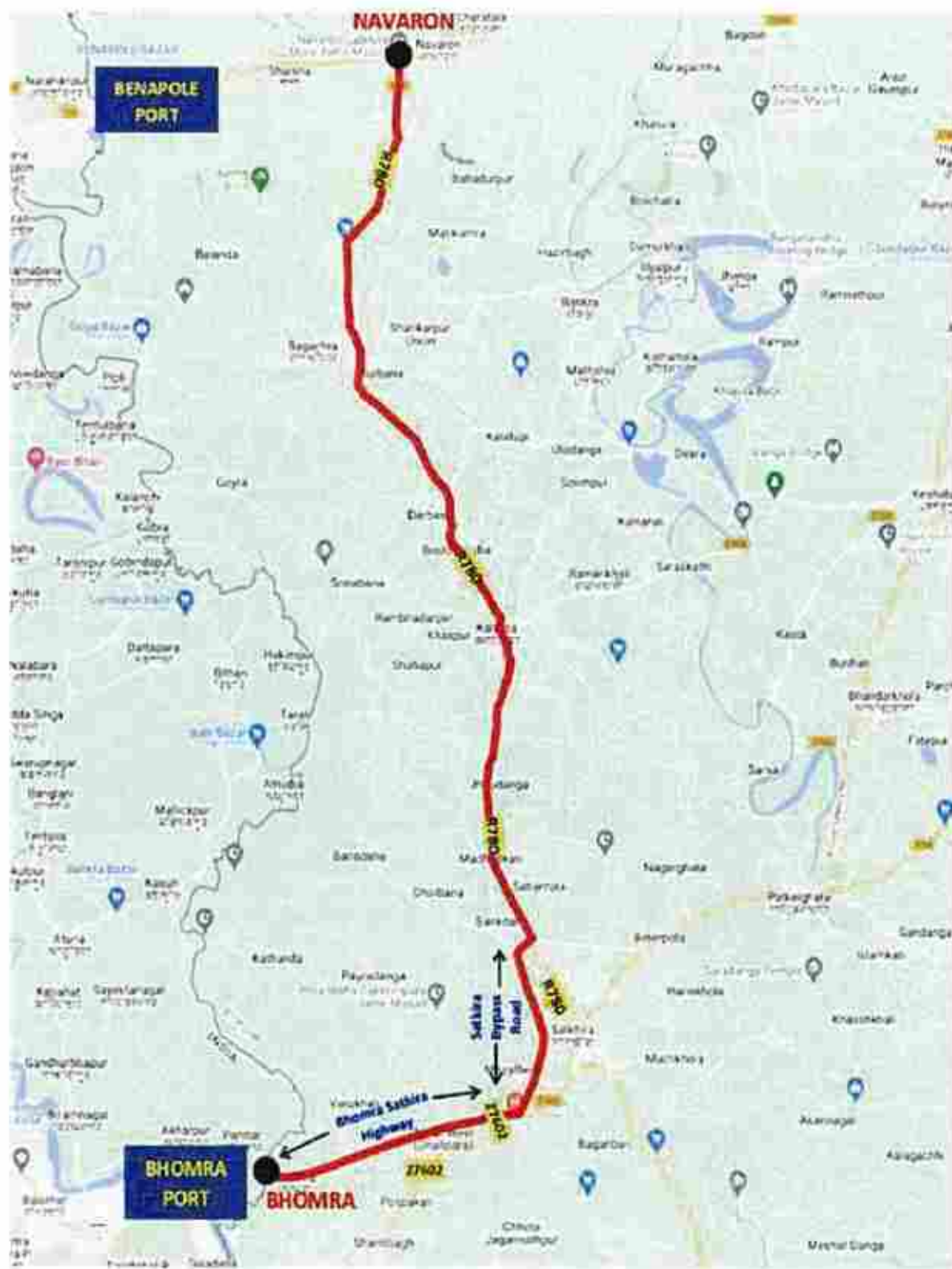
8. The project road Bhomra – Satkhira – Navaron Road is in western Bangladesh and is part of a significant regional infrastructure. This is proposed to be developed in phase 3 of the WeCARE program, as shown above in **Table 1-1**. Under the program, the existing two-lane highway will be upgraded to a safer and climate-resilient four-lane highway. This upgrade will enhance transportation efficiency, reduce travel time, and improve road safety. Additionally, the project includes the installation of fiber optic cables to provide reliable internet access, which is crucial for emergency responses and business continuity.⁵ The Index map of the proposed road is shown in **Figure 1-1**.

1.5 THE PROJECT PROPONENT

9. The Road and Highways Department (RHD) of the Ministry of Roads, Highways, and Bridges is responsible for constructing and maintaining major road networks, including national highways, regional highways, and district roads. As an implementing agency for Phase 1 and Phase 3 of the program, RHD is responsible for the sustainable development of the proposed road project. The address of the project proponent is as follows:

⁵ <https://documents1.worldbank.org/curated/en/151961615416765488/pdf/Disclosable-Version-of-the-ISR-Western-Economic-Corridor-and-Regional-Enhancement-Program-P169886-Sequence-No-02.pdf>

1. Introduction and Project Background



1.6 THE CONSULTANT

10. The project proponent, RHD has appointed Environmental and Social (E&S) Consultants – M/s Assystem STUP and BCL Associates (JV) – to carry out Environmental and Social Impact Assessments (ESIAs), including Environmental and Social Management Plans (ESMPs) and Resettlement Action Plans (RAPs) for the proposed development of Bhomra – Satkhira - Navaron section of the National Highway. The objective of the ESIA study is to:

1. Introduction and Project Background

- Establishment of Environmental and Social Baseline Conditions
- Identify and assess the potential environmental and social impact.
- Evaluate alternatives to the proposed development.
- Design appropriate mitigation, management, and monitoring measures
- Preparation of an Environmental and Social Management Plan (ESMP)

1.7 NEEDS FOR THE PROJECT

The Bhomra—Navaron and Jashore—Benapole Highways in the Khulna Zone serve as critical links between Bangladesh and West Bengal, India, via the Bhomra and Benapole land ports. These land ports are under a continuous improvement process through various multilateral funding. However, the existing Bhomra-Navaron route via Satkhira cannot accommodate future traffic needs. To enhance connectivity, the RHD is engaged in regional initiatives such as the Asian Highway Network, SASEC, BCIM-EC, BIMSTEC, SAARC Highway Corridor, and BBIN MVA dialogue. Thus, upgrading the Bhomra-Satkhira-Navaron stretch is essential for meeting growing transport demands. The development of the Bhomra - Satkhira - Navaron National Highway will be from a two-lane single-carriageway to a climate-resilient four-lane dual-carriageway, having the following salient features:

11. According to ECR 2023, this road project is also classified under the Red Category, necessitating obtaining an environmental clearance certificate from the Department of Environment (DOE). Consequently, the Roads and Highways Department (RHD) has secured approved Terms of Reference (TOR) from the DOE to conduct an environmental and social impact assessment study.

1.8 STRATEGIC ENVIRONMENTAL AND SOCIAL ASSESSEMENT AND ITS APPLICATION WITH THE PROGRAM INTERVENTIONS/PROJECT ESIA/ESMP

12. The Strategic Environmental and social Assessment (SESA) has been conducted for the entire WeCARE Program Corridor⁶ to assess the long-term and cumulative risks and impacts of all completed, ongoing, and future development in the Program Corridor. The SESA study has been conducted to inform the ESIA of roads in the succeeding phases and assist in developing a management plan that considers environmental and social risks and impacts.

13. The SESA, which is an effective tool for identifying environmental and social risks and impacts at the macro level and to mitigate the intensity of adverse impacts and risks associated with the development activities, was prepared. During the SESA study, a cumulative impact assessment of the Program has been studied.

14. SESA identified key environmental and social issues, considering other development projects, including the Phase 3 road stretch, and suggested mitigation measures at the macro-level. These issues were further narrowed down at the project level while carrying out this ESIA report, and environmental screening and a project-level impacts assessment were conducted.

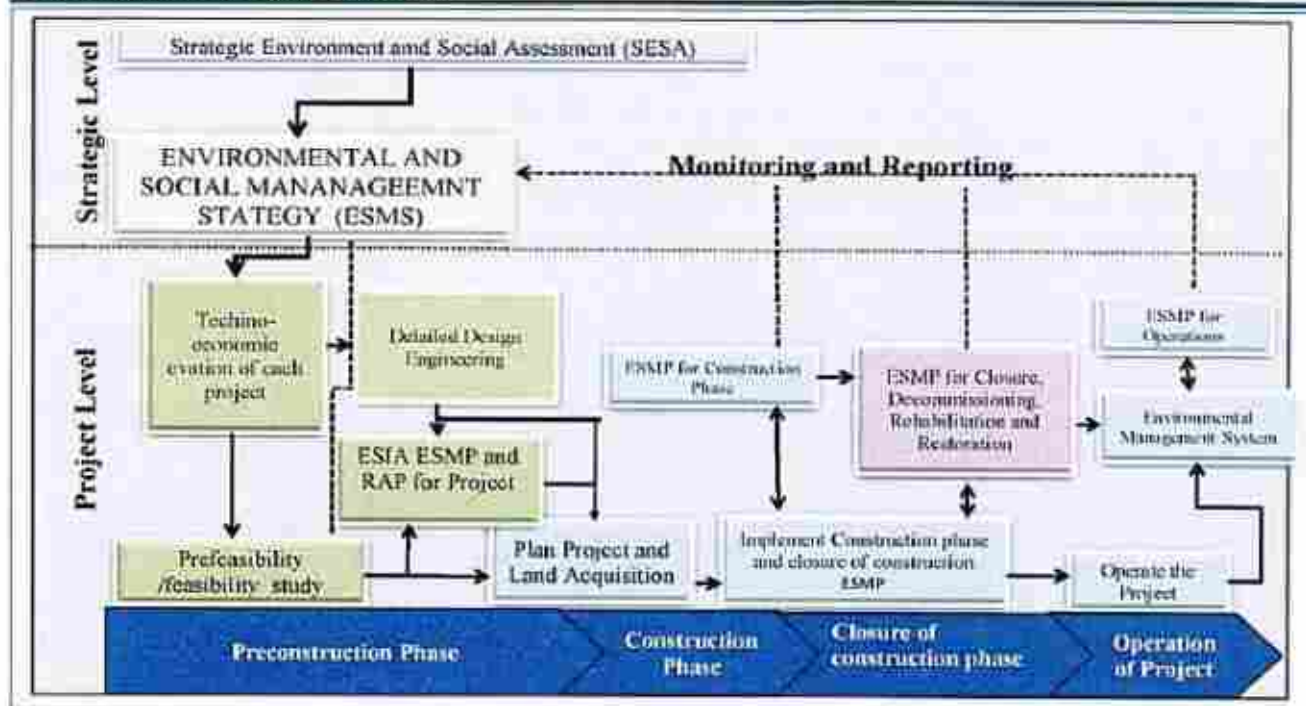
15. The SESA identifies priority impacts for Phase 3 ESIA⁷: land use change and tree felling, soil erosion, waterlogging, and natural hazards such as floods and cyclones, increased noise and air pollution, groundwater stress, water contamination during construction, loss of agricultural land and structures, livelihood disruptions, gender and social inclusion concerns, and community health and safety risks during construction. The project is classified as red under national regulations and requires a prior Environmental Clearance Certificate (ECC) from the Department of Environment. The consultant team prepared and obtained approval for draft Terms of Reference (ToR) following the prescribed procedure. The report recommends preparing a comprehensive Environmental and Social Management Plan (ESMP) for the project and a specific Contractor Environmental and Social Management Plan (C-ESMP) to manage construction-phase risks. The institutional setup at the PIU level has been adopted from the SESA.

16. The applicability of the SESA was prepared before conducting this ESIA study is shown in the Schematic Flow Diagram given in Figure 1-2.

⁶ Project Appraisal Document, World Bank (PAD 3635)

⁷ 3.6.3 Findings of Key Environmental and Social Issues and Risk Strategic Environmental and Social Assessment (SESA), 2024, RHD

1. Introduction and Project Background



1.9 PROJECT AREA OF INFLUENCE

17. A 200m strip on either side of the road corridor has been considered to collect the primary baseline data along the project road corridor. In contrast, for secondary data analysis, a 5km strip or, for the cumulative impact assessment, a 10km strip on either side of the project road corridor has been considered the project area of influence. However, the corridor of impact and the project area of influence are considered for assessing the environmental and social impacts of the study area.

1.10 APPROACH AND METHODOLOGY

18. To conduct this ESIA study, the methodology includes screening, scoping, baseline data collection, and identification and evaluation of impacts with the formulation of mitigation measures. Environmental and Social Impact Assessment (ESIA) baseline data were collected through field investigations from October 15, 2023, to June 30, 2024, in the Corridor of Impact (COI). Environmental baseline data are gathered by primary baseline surveys and filled out with available secondary data. The primary data on air, noise, and vibration levels, surface and groundwater quality, and soil quality were collected and analysed in the renowned laboratories. The social data are extracted from the draft RAP report of the project. The social team collected data through Census Surveys, Inventory of Loss (IOL) surveys, socioeconomic surveys, stakeholder consultations, focus group discussions, and key informant interviews as per ESS10.

19. The impacts are identified and assessed for intensity using modelling and/or matrix methodologies, and classified as Low, Moderate, High, and Very High that have implications impacts on the environment and communities in the study region, in accordance with the ECR 2023 and WB-ESF. The ESMP was developed after the impact assessment was completed and mitigation strategies were identified.

20. The EIA team obtained comprehensive information about the project design from the Design Team and Project Implementing Unit (PIU) of the RHD, which allowed them to gain a full knowledge of the proposed interventions, technical designs, and associated potential environmental and social effects.

1.11 ENVIRONMENTAL SCREENING AND SCOPING

1.11.1 SCREENING AS PER GOB CATEGORIZATION

21. Following the ECR 2023, the project is categorized as "Red" Category project. Schedule-1, **Item 38: Road construction/expansion** (more than 10km); **Item 39: Bridge/flyover construction** (more than 500m), which will require a comprehensive Environmental Impact Assessment (EIA) Report for getting Site Clearance Certificate (SCC) from the Department of Environment (DOE) before commencing construction works.

22.

1. Introduction and Project Background

1.11.2 SCREENING AS PER WORLD BANK ESF CATEGORIZATION

23. The World Bank screens all projects into four categories—**High Risk, Substantial Risk, Moderate Risk, and Low Risk**—is indeed based on an assessment of the project's type, location, sensitivity, scale, and the nature/magnitude of its environmental and social risks and impacts. This categorization determines the level of **Environmental and Social Assessment (ESA)** required (Table 1-2) and how the **Environmental and Social Standards (ESSs)** will be applied throughout the project life cycle.

Table 1-2: World Bank Categorizations

Typical Characteristics and Risk Level	
High Risk	Projects are expected to have potentially significant adverse environmental and social risks and impacts that are diverse, irreversible, or unprecedented.
Substantial Risk	Projects with potentially less significant adverse environmental and social risks and impacts than High Risk projects. Impacts are generally site-specific, largely reversible, and effective mitigation measures are readily identifiable.
Moderate Risk	Projects with minimal or no adverse environmental and social risks and impacts. Impacts are typically minor, localized, and readily manageable with routine procedures.
Low Risk	Projects are expected to have minimal or no adverse environmental and social risks and impacts.

24. A rapid risk rating screening of this project was carried out to determine the environmental and social impacts at an early stage of this study. The objectives of this screening were mainly to decide whether an ESIA is required or not. In addition, identify environmental sensitivities in the project road corridor, establish the primary assessment of potential environmental and social impacts from the project intervention on the valued environment and social component (VC), and determine the scope for further detailed environmental and social studies and mitigation measures to be adopted due to the project intervention all of which are the main objectives.

25. The screening process was mainly involved as of Desk review of pertinent documents and information of the project site and its surrounding areas. Reconnaissance survey of the site, surrounding areas, approach road, and initial conversations with local stakeholders' consultation including the Department of Environment (DoE), Bangladesh Forest Department (BFD), Department of Fisheries (DoF), etc. Results of screening to identify the study area, important data to be gathered, and project categorization. The scoping include discussion with the design team, PIU-RHD, and other relevant stakeholders for defining scopes for the impact assessment, planning and implementation of mitigation and monitoring, reporting for the project that will satisfy the national regulatory requirements and as well as RHD requirements, objectives of environmental screening, and scoping.

26. The total weighted score for the project was calculated to be 260. This score is derived from the individual scores assigned to each of the four environmental components:

- Natural Environment: 50
- Physical Environment: 70
- Biological Environment: 70
- Socio-Economic Environment: 70

27. The sum of these individual scores (50 + 70 + 70 + 70) equals the total weighted score of 260.

28. Out of this total score, a score of 186 was calculated based on the project's anticipated impacts on the environment. This score reflects the potential negative consequences that the project may have on the natural, physical, biological, and socio-economic environments.

29. To categorize the level of environmental risk associated with the project, a risk categorization system was established based on the total weighted score of 260. The categories are defined as follows:

- Low Risk: Score less than 119 out of 260
- Moderate Risk: Score between 120 and 150 out of 260
- Substantial Risk: Score between 151 and 182 out of 260
- High Risk: Score above 182 out of 260

30. Based on this categorization system, the project falls into the **High Risk** category. This is because the project's anticipated impact score of 186 falls within the range of 183 out of 260. (Details in Table 1-3 and Table 1-4).

31. The primary objectives of the environmental screening and scoping exercise are:

1. Introduction and Project Background

- ▶ To identify environmental sensitivities in the project road corridor
- ▶ To establish the primary assessment of potential environmental and social impacts from the project intervention on the valued environment and social component (VC).
- ▶ To the scope for further detailed environmental and social studies and mitigation measures to be adopted due to the project intervention

32. This environmental screening exercise will provide information/input for assessing the project interventions' technical, economic, and financial feasibility. This exercise would also help in scoping further studies.

1.12 IDENTIFICATION OF VALUED COMPONENTS

33. Based on the review of secondary data, the SESA document, and reconnaissance visit, the following relevant valued environmental components (VC) have been studied during the environmental screening process.

1.12.1 EVALUATION CRITERIA AND ASSIGNING WEIGHTAGE TO THE E&S SCREENING PARAMETERS

34. To carry out environmental screening, the four *prima facie* criteria parameters related to natural, physical, biological, and social environments are considered based on the key Environmental and Social issues identified in the SESA study. A detailed analysis and evaluation methodology based on the assigned weightages of these environmental screening criteria has been provided in the following sub-sections.

Natural Environment:

35. The project road passes through plain terrain with predominantly **low-lying alluvial plains**, with elevations mostly below 10 meters. The project road is intersected by tidal rivers, creeks, and canals, and it poses waterlogging conditions in and around the area. Since it is in the Southwestern coastal belt of Bangladesh, bordering the Bay of Bengal to the south and West Bengal (India) to the west, the groundwater in the district is in the black zone. Thus, under the natural environmental Topography, Vulnerability to natural hazards (earthquakes, floods, Cyclone winds, and climate changes), Affected Surface Water Bodies, Drainage Conditions/waterlogging, Groundwater resources, and Materials Availability are considered.

Physical Parameters:

36. The physical parameters related to environmental pollution (Air, Water, Noise, vibration), soil erosion, sensitive receptors, archeological sites, religious structures, and drinking water resources are considered to evaluate the conditions in and around the project area.

Biological Environment:

37. The project road passes through the roadside plantations, and these trees provide shade, reduce dust, and act as green buffers for communities and commuters. Thus, screening parameters for biological environmental parameters related to forests, protected areas (national park, tiger reserve, wetlands), agricultural land, green buffers, and trees (private and avenue) are considered.

Social Environment

38. The project road traverses through a combination of semi-urban, peri-urban, and rural settlements. The area along the project road passes through densely populated areas with population densities ranging from 900 to 1500 people/Km², compared to the national average of 1350 people/Km². The evaluation criteria are used to analyze social parameters for screening purposes, considering the various requirements necessary to develop the project road into a 4-lane highway with service lanes on both sides. The social parameters within the Corridor of Impact include land acquisition, affected households and individuals, structures (residential and commercial), markets, shops, and community health and safety issues.

39. The E&S screening assessment assigned a total weight score of 70 to the physical, biological, and social evaluation criteria parameters, reflecting their relative significance in determining project-related risks. The natural environment, encompassing broader ecological and landscape-level sensitivities, was assigned a total weight of 50, recognizing its cross-cutting influence on both environmental and social outcomes. The total score of these parameters was further distributed, reflecting the environmental and social risks and impacts due to the project interventions. These are presented in **Table 1-3**.

1. Introduction and Project Background

Table 1-3: Environmental Screening Parameter and Weightage Distribution		
S. No.	Environmental Screening Parameters	Weightage Distribution
1.	Natural Environment	50
	▶ Topography	10
	▶ Vulnerability to Natural Hazards	6
	▶ Surface water bodies	12
	▶ Drainage /Waterlogging	8
	▶ Groundwater Resources	6
	▶ Material Availability	8
2.	Physical Environment	70
	▶ Air Quality	10
	▶ Noise Quality	10
	▶ Vibration	10
	▶ Soil Erosion	10
	▶ Sensitive Receptors (schools/health centers)	10
	▶ Archeological Sites	10
	▶ Drinking Water Resources	10
3.	Biological Environment	70
	▶ Protected Areas (PA) under the Wildlife Conservation Act	10
	▶ Forest Areas (Protected/Reserved)	20
	▶ Agricultural Land	10
	▶ Green Tunnels	10
	▶ Trees (Private/Roadside Avenue Trees)	20
4.	Socio-cultural Environment	70
	▶ Land Acquisition	10
	▶ Number of Affected Households	10
	▶ Loss of Residential Structures	10
	▶ Loss of Commercial Structures	10
	▶ Loss of CPR (Mosques/Temples/Graveyards)	10
	▶ Loss of Hats/Market Areas	10
	▶ Community Health and Safety	10
Total Score		260

40. The cumulative score derived from the environmental and social evaluation screening has been classified into four distinct risk categories—low, moderate, substantial, and high—in alignment with the World Bank's Environmental and Social Framework (ESF). This classification enables a consistent and policy-aligned interpretation of potential risks associated with each project intervention. The corresponding color-coded thresholds for each risk category are presented in Table 1-3. This facilitates visual identification of and environmental and social risks based on their assessed impact level.

Table 1-4: Risk Classification Based on Environmental & Social Scores		
Score out of 260	Risk Category Color Index	
Less than 119	Low	
120 to 150	Moderate	
151 to 182	Substantial	
More than 182	High	

41. Each evaluation parameter was systematically assessed against a distinct set of key environmental and social attributes identified in the SESA process. These attributes are mapped in a matrix format with assigned scores, details given in Table 1-4 and Annex-1 of Volume-II.

Table 1-5: Weighted Scoring & Risk Classification			
Scoring Criteria	Total Weight	Total Score	Category
Natural Environment	50	40	High Risk
Biological Environment	70	56	

Physical Environment	70	28	
Social Environment	70	62	
The score	260	186	

42. The cumulative score for environmental parameters, including natural, physical, and biological components, stands at **124 out of 190**, representing **55%** of the total environmental weighting. In contrast, the social environment totals a score of **62 out of 70**, equating to **89%**. Applying the same scoring methodology used to determine the overall Environmental and Social (E&S) risk classification (refer to the **Table 1-4**). These results indicate that the project is considered a **High risk category project following World Bank ESF**. The total aggregated score is 186 (refer Table 1-5) which meets High risk category (scores more than 182 (refer to the **Table 1-4**).

43. These results indicate a **high environmental and social risk** associated with the proposed project interventions. The total aggregated score across all environmental and social screening parameters amounts to 186 (refer **Table 1-5**), which exceeds the established threshold of 182 (refer to the **Table 1-4**). This score places the project within the **"High Risk"** classification.

1.12.2 METHODOLOGY ADOPTED FOR ENVIRONMENTAL SCREENING

44. The environmental screening process has used the following:

- ▶ Secondary sources, including Google Earth (kmz files),
- ▶ Gather information on Environmental and Social Features
- ▶ Reconnaissance surveys,
- ▶ Transact walk along the project road corridor,
- ▶ Engaged in stakeholder consultation.
- ▶ Reviewed previous studies, such as the Strategic Environmental and Social Assessment, which identified key environmental and social issues.
- ▶ Impact screening using a matrix based on the VCs identified during the activities cited above
- ▶ Scoping of the ESIA study considering the DOE and WBs' ESF requirements
- ▶ Recommendations

1.12.3 KEY FINDINGS OF THE ENVIRONMENTAL AND SOCIAL SCREENING

45. Since it is a high-risk project, a comprehensive Environmental and Social Impact Assessment (ESIA) is to be carried out in accordance with the Environmental and Social Standards (ESSs).

- ▶ Waterlogging issues are present in the Satkhira district.
 - ▶ High noise pollution along the Bhomra – Satkhira – Navarun road.
 - ▶ Air pollution is there due to traffic
 - ▶ Vibrations are also monitored during the environmental baseline monitoring.
 - ▶ Roadside Avenue tree plantation and private trees are to be removed for the proposed development of the road.
 - ▶ Borrowing of the Earth
 - ▶ Land acquisition for the strengthening and widening of the road
 - ▶ Loss of commercial and residential structures
 - ▶ Loss of livelihoods
 - ▶ Impacts on Community property resources
 - ▶ Loss of agricultural land for the construction of realignments/bypasses

1.12.3.1 Scoping for the ESIA/ESMP Project Road Development

46. Considering the above key findings of the environmental and social screening of impacts and risks, this project scoping for the ESIA is discussed as follows.

1.12.3.2 Scoping considering the World Bank ESF

47. A high-risk project shall be carried out following the complete ESIA, following ESSs (1 through 10). The environmental and social assessment will also identify and assess to appropriate, appropriate, the potential environmental and social risks and impacts. The ESIA/ESMP will be disclosed to stakeholders and the WB for the high-risk project.

1. Introduction and Project Background

1.12.3.3 Scoping considering the National Rules

48. Per ECR 2023, which is described in subsequent Section 3 of this report, the more than 10km long road construction/expansion project falls under the red category project, and an Environmental Clearance Certificate is required based on the Environmental Impact Assessment Study. The ECR 2023 provisions are discussed in the following Section 3.

49. Since it is a brownfield project, the RHD requested a DOE waiver on site clearance for this road project's proposed strengthening and widening and submitted a draft Terms of Reference (TOR) to DOE for approval for carrying out the EIA study.

50. The DOE has approved the TOR, which is given in **Annex 2, Volume-II**. The content of the EIA report, per ECR 23, broadly covers the following points:

- ▶ Project Description.
- ▶ Analysis of Alternatives
- ▶ Description of the Existing Environment
- ▶ Potential Significant Impacts
- ▶ Mitigation and Abatement Measures
- ▶ Residual Impacts
- ▶ Environmental Management Plan
- ▶ Environmental Monitoring Plan

51. Thus, this ESIA report complies with WB's ESSs and ECR 2023 requirements.

1.13 STRUCTURE OF THE ESIA REPORT

52. The ESIA report contains:

Chapter 1: Introduction

Chapter 2: Regulatory Framework, Standards, and Guidelines

Chapter 3: Project Description

Chapter 4: Description of Environmental and Social Baseline

Chapter 5: Analysis of Alternatives

Chapter 6: Consultations, Public Participation, and Information Disclosure

Chapter 7: Environmental and Social Impacts, Risks and Mitigation Measures

Chapter 8: Labor Management Procedures

Chapter 9: Emergency Response Plan and Disaster Management

Chapter 10: Environmental and Social Management Plan

Chapter 11: Conclusion and Recommendations


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2 REGULATORY FRAMEWORK, STANDARDS AND GUIDELINES

2.1 INTRODUCTION

53. This section reviews the policies, laws, and administrative frameworks applicable to the Bhomra-Satkhira-Navarun Section (Phase-3) Road project. It presents the World Bank's relevant environmental and social safeguards (ESS) policies.

54. The World Bank's (WB) Environmental and Social Framework (ESF) is a set of policies, directives, and standards that guide the Bank's support to its client countries in achieving sustainable development.

55. A comparison of the national legislations and the ESSs is made to identify the gaps and opportunities for enhancing the environmental and social performance of the projects supported by the Bank in the country. Some of the areas where the national legislation may not fully align with the banks' ESSs are discussed in this section.

2.2 EXISTING NATIONAL LEGISLATIVE ACTS AND REGULATIONS

56. Bangladesh adopted its Constitution in 1972. The Constitution's third part ensures fundamental human rights, such as the Right to life, which the courts interpreted to cover the Right to Environment in 1997. The Constitution of Bangladesh has recently been amended, and provisions on environment and natural resource management have been added. This amendment underscores the State's crucial role in protecting and enhancing the environment and conserving and securing natural resources, biodiversity, wetlands, forests, and wildlife for current and future citizens. However, it's worth noting that this provision is now placed in part two of the Constitution under the Fundamental Principles of State Policy.

57. Bangladesh's national environmental protection and natural resource management legislative framework comprises various acts, rules, policies, and strategies, which are summarized in **Table 2-1**.

58. The institutional framework of environmental and social regulatory agencies in Bangladesh and their roles in project implementation and monitoring is presented in **Table 2-2**.


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2. Regulatory Framework Standards and Guidelines

Table 2-1: Existing Policy/Acts/Rules of Bangladesh

Sl. No.	Policy/Acts/Rules	Key Provisions and Purpose	Applicability to Project Road
1.	National Environmental Policy, 1992 (Amendment 2018)	This policy has been formulated based on the National Environmental Policy 1992, aimed at achieving Sustainable Development Goals (SDGs). The primary consideration of this policy is to ensure sustainable development, reducing humans' dependency on natural resources. A total of 19 sectors have been considered in this policy, including environment, water, agriculture, water resources dev.	National environmental policy aims to prevent pollution and resource degradation resulting from various development activities while promoting sustainable development through various acts and regulations. The construction of roads, which can lead to significant adverse effects, is encompassed within the scope of this policy.
2.	National Environmental Management Action Plan (NEMAP), 1995	The NEMAP was developed with the following objectives: to identify key environmental issues affecting Bangladesh, to identify actions to halt or reduce the rate of environmental degradation, to improve the management of the natural environment, to conserve and protect habitats and biodiversity, to promote sustainable development, and to improve the quality of life.	The plan proposes developing and applying guidelines to avoid environmental pollution; it particularly emphasizes different types of environmental pollution, the hampering of natural drainage patterns, and agricultural land acquisition due to the development of transport systems. Thus, it is applicable to the proposed road project.
3.	Environmental Conservation Act (ECA), 1997	The main objectives of ECA are the conservation and improvement of the environment and the control and mitigation of environmental pollution. The main focuses of the Act can be summarized as a Declaration of ecologically critical areas and restrictions on the operations and processes that can or cannot be carried out/ initiated in the ecologically critical areas (ECA); Regulations for vehicles emitting harmful pollutants to the environment; Environmental clearance; Regulation of industries and other development activities' discharge permits; Promulgating air, water, noise, and soil quality standards for different areas; Promulgation of a standard limit for discharging and emitting waste; and Formulation and declaration of environmental guidelines.	According to this law, no industrial unit or project shall be established or undertaken without obtaining an Environmental Clearance Certificate from the Director General, as prescribed by rules. The project was under the red category and required prior ECC.
4.	The Water Act, 2013	The Act recognizes the significance of managing all water resources in the context of the natural flow of surface water and groundwater recharging. Per the Act, private landowners can use the surface water inside their property for all purposes. No individuals or organizations can extract, distribute, use, develop, protect, and conserve water resources. They will not be allowed to build any structure that would impede the natural flow of rivers and creeks.	It is applicable to ensure water quality during the construction phase.
5.	Environment Conservation Rules, 2023	ECR 2023 is promulgated under the ECA 1995, superseding earlier ECR 1997 and amendments. (Based on actual) and anticipated pollution load, industries, development projects, and other activities are categorized into green, yellow, orange, and red categories. The rules set (i) the National Environmental Quality Standard for Surface Water, Groundwater, Drinking Water, Industrial effluents, Emissions, and Vehicular Exhaust. (ii) It also outlines the procedure for obtaining environmental clearance. (iii) Requirements for undertaking EIA and EIA study as well as formulating EMPs according to categories of industries/development projects/activities, (iv) procedures for damage claim by persons affected or likely to be affected due to polluting activities or activities.	Per ECR 2023, the Project is classified as Red Category item No 38, requiring an approved Terms of Reference (ToR) from the DOE to carry out the EIA study and to obtain Environmental clearance. Accordingly, RHD has submitted a letter dated 15-05-2023 to the Department of Environment (DoE) along with the requisite documents for site clearance and approval of Terms and Reference for conducting an Environmental Impact Assessment for the proposed project.

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2. Regulatory Framework Standards and Guidelines

Table 2-1: Existing Policy/Acts/Rules of Bangladesh

Sl. No.	Policy/Acts/Rules	Key Provisions and Purpose	Applicability to Project Road
		causing hindrance to normal civic life. The rules authorize the Director General of the Department of Environment (DoE) to grant the project "Environmental Clearance" with stipulated conditions to comply. Per ECR 2023, the road sector projects, including bridge construction, have been categorized as orange and red based on their length, as shown below: Orange Item 21: Road construction/expansion (5km to 10 km) Orange Item 22: Bridge construction (100m to 500m) Red Item 38: Road construction/expansion (more than 10km); Red Item 39: Bridge/flyover construction (more than 500m);	
6.	Environmental Courts Act, 2000	This act sets out a policy for effective prosecution and completion of legal proceedings related to environmental crimes. Under this Act, the Director General of the DoE has the power to impose heavy penalties on industrial polluters who dump untreated wastewater into the environment or do not operate their legally mandated ETPs.	According to this act, the government can take legal action if any environmental violations due to project interventions.
7.	National Land Transport Policy	This policy aims to introduce long-term network planning and maintain the road network at a level that protects the value of the investment. It also aims to secure a sustainable means of funding road maintenance, improve traffic management, manage road-side activities, develop an integrated planning approach in road construction, involve the private sector more in infrastructure, services, and maintenance, and protect the environment from road construction programs.	According to the policy, all new roads and significant improvements, tolled or otherwise, are subject to an Environmental and Social Impact Assessment (ESIA).
8.	RHD's Road Master Plan	The objectives of RHD's road master plan are: Protecting the value of RHD's road and bridge assets, Improving the connectivity of the road network, Enhancing and developing the strategic road network to meet economic and traffic growth targets, Improving the Zila road network to enhance connectivity, Improving road safety to reduce road accidents, Providing environmental and social protection, and outlining the institution improvements required for RHD.	According to the plan, the physical and social environment must be protected from the adverse effects of road construction.
9.	Water Reservoir Conservation Act 2000	It signifies the preservation of natural water bodies. Section 1 of this Act suggests that it has application to the water bodies of the cities, divisional and district towns, and municipalities. The water bodies in the rural areas are outside the jurisdiction of this Act.	As per this, water bodies shall be conserved during the construction and operation phase of the project.
10.	The Forest Act (1927) and the Forest (Amendment) Act (2000)	It is the main legislative context for forestry protection and management in Bangladesh. It was enacted to control trespass and illegal resource extraction from forests and to provide a framework for the forestry revenue collection system.	The act is relevant to the project as the road construction will require cutting trees belonging to government agencies.
11.	National Forest Policy (amendment), 1994	The policy is designed to conserve the existing forest areas, bring about 20% of the country's land area under the Forestation Program, and increase reserve forests by 10 percent annually to 2015.	The Act is relevant because trees will be removed for the project. Trees shall be planted in place of the trees removed to construct the road.

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2. Regulatory Framework Standards and Guidelines

Table 2-1: Existing Policy/Acts/Rules of Bangladesh			Key Provisions and Purpose	Applicability to Project Road
Sl. No.	Policy/Acts/Rules			
12.	The Private Forests Ordinance, 1959	Wildlife (Conservation & Security) Act, 2012 (previously known as Bangladesh Wildlife (Preservation) Order, 1973; amended as Bangladesh Wildlife (Preservation) Act, 1974)	An Ordinance to provide for the conservation of private forests and the afforestation in certain cases of wastelands in Bangladesh.	According to section 61 of this ordinance, if any land is required, such land shall be deemed needed for a public purpose.
13.	Bangladesh Wildlife (Conservation & Security) Act, 2012 (previously known as Bangladesh Wildlife (Preservation) Order, 1973; amended as Bangladesh Wildlife (Preservation) Act, 1974)		This Act protects 1307 species of plants and animals under four schedules, and it mandates imprisonment and fines for wildlife poaching, capturing, trapping, and trading.	This Act is relevant to those projects that may affect wildlife habitat or obstruct movement. However, the project does not pass through any wildlife areas, so it is not applicable.
14.	National Water Policy, 1999		The policy emphasizes efficient and equitable management of water resources, proper harnessing and development of surface and ground water, water availability to all concerned, and institutional capacity building for water resource management.	Measures must be taken to minimize disruption to the natural aquatic environment in streams and water channels (Clause 4.9b).
15.	National Fisheries Policy, 1998		The National Fisheries Policy focuses on aquaculture and marine fisheries development. The policy suggests, among other things, that biodiversity will be maintained in all natural water bodies and the marine environment, and control measures will be taken against activities that negatively impact fisheries and resources and vice versa.	Proper mitigation measures shall be adopted during the construction and operation phases to prevent an impact on biodiversity in natural water bodies and the aquatic environment.
16.	Protection and Conservation of Fish Act 1950 (Amended 1982)		This is framework legislation with rule-making powers. Among others, some of these rules may prohibit the destruction of, or any attempt to destroy, fish by the poisoning of water or the depletion of fisheries by pollution, industrial effluent, or otherwise.	Proper mitigation measures shall be adopted during the construction and operation phases of the project to prevent an impact on biodiversity in natural water bodies and the aquatic/marine environment.
17.	National Agriculture Policy, 1999		This policy aims to make the nation self-sufficient in food by increasing the production of all crops, including cereals, and ensuring a dependable and secure food system.	Adequate measures should be taken to prevent waterlogging or to protect the irrigation systems from damage caused by the construction of the project road.
18.	National Road Design Standard		A comprehensive National Transport Policy (NTP) needs to be formulated to integrate different modes of transport for the most efficient performance, consider intermodal interactions, develop a communications network without damaging the physical environment, and allocate resources according to conservation and environmental considerations and economic development priorities.	This will specify the proper design required for the project road to avoid maximum damage.
19.	National Land Use Policy, 2001		The main contents of this policy are: Stopping the high conversion rate of agricultural land to nonagricultural purposes. Utilizing agroecological zones to determine maximum land use efficiency and adopting measures to discourage the conversion of agricultural land for urban development.	The proposed project must adhere to this policy so that the environmental sustainability of land-use practices is assured.

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2. Regulatory Framework Standards and Guidelines

Table 2-1: Existing Policy/Acts/Rules of Bangladesh			Key Provisions and Purpose	Applicability to Project Road
Sl. No.	Policy/Acts/Rules			
20.	Bangladesh Inland Water Transport Authority (BIWTA)		Improving the environmental sustainability of land-use practices. Regulate, develop, and maintain inland waterways for safe navigation. Technical divisions with environmental and safety monitoring capacity.	Oversee dredging and river works; ensure compliance with environmental and navigational safety standards; coordinate with DoF and BWDB for impact mitigation.
21.	The Embankment and Drainage Act, 1952		It provides for constructing, maintaining, managing, removing, and controlling embankments and water courses to improve land drainage.	No dredging activities will be conducted during the construction period. Not applicable.
22.	Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2009		This is a comprehensive strategy to address climate change challenges in Bangladesh. Bangladesh Climate Change Strategy and Action Plan was built on and expanded the NAPA.	This is relevant as the project road is vulnerable to the effects of climate change.
23.	Constitution of the People's Republic of Bangladesh, 04 November 1972		Bangladesh's Constitution defines the rights of every citizen irrespective of their ethnicity and religion, where the State is responsible for the provision of Basic Necessities for the citizens.	This is applicable to ensure laborers' and project-related persons' health and safety.
24.	The Acquisition and Requisition of Immovable Property Act 2017 (ARIPA)		The Act is the main law for acquiring land in Bangladesh. The Act requires compensation for (i) land and assets that are permanently acquired (including crops, trees, and buildings) and (ii) any other damage from such acquisition. The Act also lets the government acquire the properties of religious groups like mosques, temples, pagodas, and graveyards if it is in the public interest. The Ministry of Land (MoL) oversees the land acquisition process. The MoL gives some of its power over land acquisition to the Commissioner at the Divisional level and the Deputy Commissioner at the District level. The Deputy Commissioner (DC) can acquire the land under the Act and compensate the legal owners.	The nature of the civil works related to the project will entail land acquisition and subsequent economic and physical displacement. ARIPA 2017 defines the land acquisition process and contains pertinent information related to titleholder compensation payments.
25.	Khas Land Policy 1997		In 1997, the Khas Land Settlement Policy was promulgated, allowing the distribution of Khas land for a 99-year lease (or for a one-year temporary lease). Khas land means government-owned fallow land, where nobody has property rights. The government owns the land, and it is available for allocation according to government priorities.	This is applicable to confirm the acquisition of Khas land along the RoW. The compensation will be handed over to the government authority as per policy.
26.	Vested Property (Repeal) Act, 2013		The Vested Property Act—2013 in Bangladesh amends the previous laws regarding the management and return of properties confiscated by the state government through the erstwhile "Enemy Property Act." The 2013 amendment aimed to rectify these issues by providing a legal framework for returning vested properties to their rightful owners or heirs. It also sought to streamline the process of identifying and releasing such properties, though it is a challenging task.	It is to be noted that no such or disputed property was found within the proposed ROW during the consultant's census and Inventory of Loss (IOL) survey. Thus, the Vested Property Act does not apply to the project.
27.	Labor Related Laws (Labor Act 2006; Bangladesh Labor Rules 2015; and Occupational Health and Safety Policies 2013)		Labor Act 2006: This act updates and combines the laws about labor employment, relations, wages, compensation, unions, disputes, and workers' rights.	To carry out the civil works, a significant amount of labor will be required to be hired. Therefore, these laws will be triggered to safeguard the interests of labor, the host community, project authorities, contractors, and other project stakeholders. The

2. Regulatory Framework Standards and Guidelines

Table 2-1: Existing Policy/Acts/Rules of Bangladesh	
SL No. / Policy/Acts/Rules	Key Provisions and Purpose
	health, safety, welfare, working conditions, and apprenticeship. ^{29, 30, 31} Bangladesh Labor Rules 2015:11-14. ³² These rules explain the Labor Act 2006 more, giving specific regulations on working terms, worker types, leave rules, pay, and more. It also has rules for health and safety at work. Occupational Health and Safety Policies 2013: ^{33, 34} The National Occupational Health and Safety (OSHS) Policy of 2013 requires using personal safety gear, having health centers in big companies, forming safety committees, keeping standard OSH protection, and planning for workplace safety.
28. Community Health and Safety-Related Laws	The management of community health and safety of development projects is covered under ECA and ECR. Typically, OHS measures extend to the public at construction sites. There are two components of CHS. One is the physical safety of project communities that are exposed to the project activities during construction and operation, including risks of accidents and risks of violence due to the increase in crimes and cultural conflict between locals and the migrant population. The other pertains to the community's exposure and/or increased risks of diseases due to the influx of people during construction and operation and the changes in the project area, including pollution and ecological change. The physical safety aspects are partly addressed by the OHS provisions of the Labor Act. Traffic road accidents are a severe issue in Bangladesh, and road safety issues have been incorporated into the projects.
29. Cultural Heritage	The Antiques Law of 1968 consolidates all laws relating to the preservation and protection of antiquities under the auspices of the Department of Archaeology. The law empowers the Director of the Department of Archaeology to take steps necessary for the custody, preservation, and protection of antiquity.
30. Stakeholder Engagement and Information Disclosure	The DoE guidelines for EIE/EIA preparation instruct the implementing agency to conduct public consultations of orange-B and red category projects. Implementing agencies usually conduct public consultations during EIA studies and present the outcome in the EIE/EIA reports, which they submit to
	Land acquisition and upgradation of roads are likely to cause negative impacts, especially on those communities living nearby.
	Project activities may lead to the unearthing of antiquities or may impact cultural heritage by chance. Therefore, laws related to cultural heritage and antiquities aim to protect these finds.
	Stakeholder engagement is an important instrument of public policy, and these regulations/laws aim to make the development project inclusive by giving the communities a

²⁹ <https://www.doh.gov.bd/>

³⁰ <https://www.doh.gov.bd/>

³¹ <https://www.doh.gov.bd/>

³² <https://www.doh.gov.bd/>

³³ <https://www.doh.gov.bd/>

³⁴ <https://www.doh.gov.bd/>

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³⁸ <https://www.doh.gov.bd/>

³⁹ <https://www.doh.gov.bd/>

2. Regulatory Framework Standards and Guidelines

Table 2-1: Existing Policy/Acts/Rules of Bangladesh			Key Provisions and Purpose	Applicability to Project Road
Sl. No.	Policy/Acts/Rules			
31.	Electricity Act 2018		It relates to the supply and use of electrical energy and allows any person to secure a license to supply energy and to put down or place electrical supply lines for the transmission of energy. The Act provides that the licensee, in the exercise of any of the powers conferred by or under this Act, will cause as little damage, detriment, and inconvenience as may be and will make full compensation for any damage, detriment, or inconvenience caused by the licensee or by anyone employed by the licensee. The ministry published Electricity Rules in November 2020 based on Clause 59 of the Electricity Act 2018 (SRO 297 of Act/2020). The main observation is to provide compensation for the installation of transmission line towers to the landowners as per the applicable laws and policy.	This Act applies to the project when electricity is used for construction camps, accommodation, machinery, vehicles, workshops, maintenance, road construction, etc.
32.	Electricity Rules (Amendment 2022)	2020		This rule applies to rearranging, installing, and shifting the transmission line, tower, poles, etc., along the project road.
33.	Solid Waste Management Regulations 2021		► The Solid Waste Management Regulations 2021 were published in Bangladesh on December 23, 2021, under the Bangladesh Environmental Protection Act, 1995. The Regulations define the responsibilities of businesses involved in solid waste management and impose collection, recycling, and disposal obligations according to Extended Producer Responsibility (EPR) on manufacturers of non-biodegradable products such as glass, plastic, and bottles. The Regulations also include provisions for treating solid waste, such as composting and energy recovery. The main provisions of the Regulations are as follows:- ► When recovering resources from waste, the principles of management that consider the waste hierarchy, such as the 3Rs, segregation, and reduction, must be followed at all stages, from waste generation to final disposal. Responsibilities of waste generators, consumers, and users: Dispose of waste per authorities' regulations, including local government. Dispose of waste separately; do not dump, store, or burn waste outdoors. Responsibilities of manufacturers (*not defined) and importers of products- Collect non-biodegradable products such as glass, plastic, polyethylene, multi-layered packaging, bottles, and cans from consumers and recycle or dispose of them if appropriate; Determine work plans and implementation procedures for recycling and	This is applicable to the project road to ensure the whole project area with zero waste pollution and also comprehensive practices for waste management as well as sourcing, separation, dumping, reuse etc. A vast number of solid wastes will be generated from the project activities and this regulation is applicable to proper management of the induced wastes.

2. Regulatory Framework Standards and Guidelines

Table 2-1: Existing Policy/Acts/Rules of Bangladesh		
Sl. No.	Policy/Acts/Rules	Key Provisions and Purpose
34.	E-Waste Management Rules, 2021	Under the Bangladesh Environmental Protection Act of 1995, Bangladesh's Department of Environment (DoE) announced the Hazardous Waste (e-waste) Management Rules, 2021, on June 10, 2021. The E-waste regulation imposes duties on the producers, assemblers, collectors, marketers, and users of the items mentioned in the Schedule (home appliances, monitoring and control equipment, medical equipment, automated machines, IT and communication equipment). Additionally, the regulation establishes restrictions on using the 10 compounds covered by the EU RoHS Directive. Following publication, this legislation became enforceable.

Source: Adapted from Environmental and Social Impact Assessment (ESIA) Report for Ashore-Siddhaha Road Corridor, 2019, RHD

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2.2.1 INSTITUTIONAL FRAMEWORK OF ENVIRONMENTAL AND SOCIAL AGENCIES IN BANGLADESH

59. The institutional framework of environmental and social regulatory agencies in Bangladesh and their roles in project implementation and monitoring is presented in **Table 2-2**.

Table 2-2: Institutional framework of environmental and social regulatory agencies in Bangladesh			
Agency / Institution	Mandate	Capacity	Roles in Project Implementation & Monitoring
Environmental Issues			
Department of Environment (DoE)	Enforce Environment Conservation Act 1995 and associated rules	Director General-led; ~1,100 staff	Conduct EIAs; Issue environmental clearances; Monitor compliance during implementation
Ministry of Environment, Forest and Climate Change (MoEFCC)	Formulate environmental policies and legislation	Strategic oversight and coordination among environmental agencies	Policy guidance; inter-agency coordination; setting national standards
Bangladesh Water Development Board (BWDB)	Manage water resources, flood control, and irrigation infrastructure	Project Implementation Units with Environmental Focal Points	Integrate environmental safeguards into projects; monitor impacts
Department of Forest (DoF)	Forest conservation and biodiversity protection	Manages protected areas and biodiversity hotspots	Regulates activities affecting forests; ensures compliance with conservation laws
Local Government Engineering Department (LGED)	Implement rural infrastructure projects	Field offices and large-scale project management experience	Environmental screening; prepare EMPs; community engagement
Social			
Ministry of Social Welfare (MoSW)	Develop and implement social welfare policies and programs	National coordination of social protection initiatives	Monitor social programs; ensure alignment with national objectives
General Economics Division (GED)	Support policy planning and social protection integration	Research and analytical support with policy think tanks	Integrate social strategies into development plans; provide analytical guidance
Directorate of Social Services (DSS)	Implement social welfare programs at the grassroots level	Field offices countrywide	Deliver social services; monitor effectiveness; report outcomes
Local Government Institutions (LGIs)	Implement local development initiatives	Local administrative units	Coordinate social programs; engage communities; ensure local needs are met

2.2.2 BANGLADESH INTERNATIONAL TREATIES AND AGREEMENT

60. Bangladesh is a party to several international treaties and agreements that are directly relevant to the project. These agreements impose specific concerns regarding environmental protection, biodiversity conservation, climate change, and social safeguards. Ensuring compliance with these concerns is critical for the project's success. These are illustrated in **Table 2-3**.

Table 2-3: Bangladesh International Treaties, Agreements and Compliance Matrix		
International Instrument (Treaty)	Specific Obligation Application to WeCARE Phase 3 (Roads)	Compliance
Paris Agreement (2015) & NDC	Mitigation: Integrate low-carbon design (e.g., energy-efficient construction, promoting public transport/cycling lanes) to meet the national Nationally Determined Contribution (NDC) targets for the transport sector. Adaptation: Ensure all infrastructure (roads, bridges, culverts) is climate-resilient and designed to withstand climate change impacts (e.g., higher flood levels, increased storm intensity).	The Environmental and Social Impact Assessment (ESIA) will include a GHG emission analysis.
Convention on Biological	Biodiversity Protection: Avoid or minimize direct and indirect impacts on critical habitats and biodiversity (e.g.,	Biodiversity Management Plan (BMP): Preparation and implementation of a

2. Regulatory Framework Standards and Guidelines

Diversity (CBD)	forests, wetlands, ecologically sensitive areas) along the corridor. Habitat Management: Implement afforestation/reforestation programs to offset unavoidable tree loss and minimize habitat fragmentation.	dedicated BMP with specific measures and monitoring indicators.
ILO Core Conventions (e.g., C.29, C.105, C.138, C.182)	Worker Safety & Rights: Ensure mandatory Occupational Health and Safety (OHS) standards for all construction workers. Labour Standards: Prohibit child/forced labour, ensure non-discrimination, and guarantee fair wages, working hours, and terms of employment as per national law and ILO principles.	Labour requirements are legally integrated into all Contractor Agreements. The Department of Inspection for Factories and Establishments (DIFE) and the PIUs conduct site inspections and audits. A confidential worker-specific Grievance Redress Mechanism will be established for reporting abuses.
Universal Declaration of Human Rights (UDHR) Principles	Involuntary Resettlement: Protect the right to property and livelihood. Ensure fair, transparent, and prompt compensation and assistance for all project-affected persons (PAPs), including those without formal legal title. Consultation: Guarantee inclusive and meaningful participation of affected communities, particularly vulnerable groups (women, ethnic minorities).	Resettlement Action Plan (RAP): Preparation, public disclosure, and implementation of a fully funded RAP with livelihood restoration programs. Stakeholder Engagement is carried out. Project GRM: An overall Project-Level GRM for community complaints is established and publicized.
World Bank ESF	Adherence to environmental and social standards to manage risks and impacts.	The project follows the ESF guidelines to ensure that environmental and social risks are properly managed. ESIA is conducted for this purpose.

2.3 WORLD BANK GUIDELINES

61. The World Bank is committed to sustainable development and has developed an environmental and social framework that sets mandatory requirements for the Bank's funded projects. The ESF outlines a set of Environmental and Social Standards (ESSs) designed to avoid, minimize, reduce, or mitigate the adverse environmental and social risks and impacts of projects. These ESSs establish project requirements for identifying and assessing environmental and social risks and impacts associated with projects supported by the Bank. These 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 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities.
- ▶ ESS 8: Cultural Heritage.
- ▶ ESS 9: Financial Intermediaries; and
- ▶ ESS 10: Stakeholder Engagement and Information Disclosure.

62. All projects are classified into four categories: High Risk, Substantial Risk, Moderate Risk, or Low Risk. In section 1 of this report, the risk classification of the project has been carried out considering relevant issues, such as the type, location, sensitivity, and scale of the project, and the nature and magnitude of the potential environmental and social risks and impacts. The various methods and tools employed to perform the environmental and social assessment and document the results of this evaluation, including the mitigation measures to be implemented. The project is high-risk and requires an Environmental and Social Impact Assessment (ESIA) study.

63. ESIA is an instrument for identifying and assessing the potential environmental and social impacts (E&S) of a proposed project, evaluating alternatives, and designing appropriate mitigation, management, and monitoring measures. As the World Bank financed the proposed project, the Environmental and Social Impact Assessment (ESIA) and ESMP have been developed following the ESSs. The ESSs, along with the gap between the World Bank's Environmental and Social Standards (ESS) and relevant national laws and policies are detailed in Table 2-4.

2. Regulatory Framework, Standards and Guidelines

Table 2-4: The World Bank's ESS, Related National Laws and their Gaps on WECARE Phase -3

World Bank ESS Standards	Objectives	Requirements	Applicability
ESS-1: Assessment and Management of Environmental and Social Risks and Impacts	Identify, assess, evaluate, and manage environmental and social risks and impacts in a manner consistent with the ESF. Adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable people.	The types of E&S risk and impacts should be considered in the environmental and social assessment. The environmental and social framework should be used and strengthened to assess, develop, and implement World Bank-financed projects where appropriate. Relevant GoB Laws/Regulation ▶ ECR 2023 Gaps: - The EIA screening and scoping study may not comprehensively cover all the WB's ESS in their analysis. - Stakeholder engagement is carried out during the EIA. However, the scope of the engagement is limited. The EIA report is also not publicly disclosed as required in ESS. - The EIA framework doesn't require the analysis of alternatives	10 Project will be hiring the following types of workers: i. Direct workers will include the project managers and supervisors, who are employees of RHD; ii) All the workforce deployed by the Contractors and the Project Management Consultant (for all contracts) under the RHD will be deemed to be contracted workers. The Contractor(s) might further engage multiple subcontractors; iii) Influx of migrant labor from other districts for construction works is a norm in this district and is likely to continue in this project; ii-A labor management procedure will be prepared to regulate working conditions and the management of workers' relations, including worker-specific GRM, terms and conditions of employment, non-discrimination, equal opportunity, GBV, protection of workforce, the prohibition of child/forced labor, and provision of OHS.
ESS-2: Labor and Working Conditions	Promote safety and health at work. Promote fair treatment, non-discrimination, and equal opportunity for project workers. Protect project workers, with particular emphasis on vulnerable workers. Prevent the use of all forms of forced labor and child labor. Support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law. Provide project workers with accessible means to raise workplace concerns.	Labor management procedures (LMP) covering terms and conditions of work, non-discrimination, equal opportunity, workers' organizations, and provisions to protect child/forced labor. Occupational health and safety requirements per the World Bank Group's Environmental, Health, and Safety Guidelines (EHSG) shall be prepared for the projects for direct, contracted, community, primary supply workers, and government civil servants. Relevant GoB Laws/Regulation ▶ Labor Act 2006 (Amendment 2013) ▶ Occupational Health and Safety Policy 2013 ▶ Public Procurement Rule 2008 Gaps: - The Labor Act does not require project interventions regarding labor and working conditions, including OHS, to be assessed and reviewed before approval. - The Labor Act does not require development projects to prepare labor management plans/procedures/OHS Plans.	

¹⁰ Note: Associated Facilities will meet the requirements of the ESSs to the extent that the Borrower has control or influence over such Associated Facilities.

Joint Venture of

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Table 2-4: The World Bank's ESS, Related National Laws and their Gaps on WECARE Phase-3

World Bank ESS Standards	Objectives	Requirements	Applicability
ESS-3: Resource-Efficiency-and-Pollution-Prevention-and-Management	Promote the sustainable use of resources, including energy, water, and raw materials. Avoid or minimize adverse impacts on human health and the environment caused by pollution from project activities. Avoid or minimize project-related emissions of short and long-lived climate pollutants. Avoid or minimize the generation of hazardous and non-hazardous waste. Minimize and manage the risks and impacts associated with pesticide use. It requires technically and financially feasible measures to improve efficient energy, water, and raw materials consumption, and it introduces specific water efficiency requirements where a project has high water demand.	It requires an estimate of gross greenhouse gas emissions from the project (unless minor) where technically and financially feasible. Requirements on managing wastes, chemicals, and hazardous materials, and contains provisions to address historical pollution. ESS-3 refers to national law and Good International Industry Practice, in the first instance the World Bank Group's EHSGs. Gaps: - ESS-3 requirements are addressed by existing regulations and indirectly for resource efficiency and climate change. - Existing energy and water conservation policies, laws, and regulations do not require development projects to assess resource efficiency issues and incorporate resource efficiency measures in their ES risk management plans.	Concerning Resource Efficiency, the project preparation and the ESIA process will identify feasible measures for: (a) energy use; (b) water usage and management to minimize water usage during construction, conservation measures to offset total construction water demand and maintain balance for water resource demand; and (c) raw materials use by exploring the use of local materials, recycled aggregates, and innovative technology to minimize the project's footprints on finite natural resources. Concerning Pollution Management, based on past road project experiences, the project will develop, as part of the ESIA process, prevention and management measures to offset risks and impacts of pollution from potential sources such as dust and emission from the operation of hot-mix and batching plants, crushers, construction and haulage vehicles, material and spoil stockpile, effluents and wastewater from labor camps, construction camp, spillage or leakage during handling of chemical admixtures, hazardous materials like bitumen, high strength diesel, used oil, battery wastes etc.; and disposal of non-hazardous wastes (municipal wastes) generated during project implementation period.
ESS-4: Community-Health-and-Safety	Anticipate or avoid adverse impacts on the health and safety of project-affected communities during the project lifecycle from routine and non-routine circumstances. Promote quality, safety, and climate change considerations in infrastructure design and construction, including dams. Avoid or minimize community exposure to project-related traffic and road safety risks, diseases, and hazardous materials. Effective measures should be put in place to address emergency events. Ensure that	Requirements on infrastructure, considering safety and climate change, and applying the concept of universal access, where technically and financially feasible. Requirements on traffic and road safety, including road safety assessments and monitoring. Addresses risks arising from provisioning and regulating ecosystem service. Measures to avoid or minimize the risk of water-related, communicable, and non-communicable diseases. Requirements to assess risks associated with security personnel and review and report unlawful and abusive acts to relevant authorities. GoB Laws and Regulation ► National Road Transport Act	In the project corridor there is likely to be, road excavation, use of vibratory equipment, construction debris handling and disposal etc. during construction; ii) high likelihood of direct exposure to increased construction related traffic and equipment especially at road sections traversing settlement area with limited carriageway/roadway width, and sensitive receptors such as schools, religious places, health center/hospitals; iii) high dust levels from earthworks, high noise and emission level from traffic congestion and idling of vehicles; and iv) influx of migrant workers could potentially cause local discomfort or potential conflicts with local people.

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2. Regulatory Framework Standards and Guidelines

Table 2-4: The World Bank's ESS, Related National Laws and their Gaps on WeCARE Phase-3

World Bank ESS Standards	Objectives	Requirements	Applicability
ESS-5: Land-Acquisition-Resettlement-on-Land-Use- and-Involuntary-Resettlement	personnel and property are safeguarded to avoid or minimize risks to the project-affected communities.	► ECR 2023 ► BLA 2006 ► Public Procurement Rule, 2008 ► Water Act 2013 Gaps: - While other acts cover all ESS-4 requirements, gaps exist for Community exposure to health issues. - Covered under ESIA, the systems do not provide clear requirements for the development project and implementation.	The gaps between GoB regulations and ESS-4 will be addressed through suitable provisions in the ESMP and the contractor's obligation as part of the Contractor's ESMP for CHS. This should also include an OHS plan, an influx management plan, a workers' camp management plan, and a traffic and road safety management plan.
ESS-5: Land-Acquisition-Resettlement-on-Land-Use- and-Involuntary-Resettlement	Avoid or minimize involuntary resettlement by exploring project design alternatives. Avoid forced eviction. Mitigate unavoidable adverse impacts from land acquisition or restrictions on land use by providing compensation at replacement cost and assisting displaced persons in their efforts to improve, or at least restore, livelihoods and living standards to pre-displacement levels or to levels prevailing before the beginning of project implementation, whichever is higher. Improve living conditions of poor or vulnerable persons who are physically displaced through provision of adequate housing, access to services and facilities, and security of tenure. Conceive and execute resettlement activities as sustainable development programs.	Applies to permanent or temporary physical and economic displacement resulting from different types of land acquisition and restrictions on access. Does not apply to voluntary market transactions, except where these affect third parties. Provides criteria for "voluntary" land donations, sale of community land, and parties obtaining income from illegal rentals. Prohibits forced eviction (removal against the will of affected people, without legal and other protection, including all applicable procedures and principles in ESS5). It requires that the acquisition of land and assets be initiated only after payment of compensation and resettlement has occurred. It requires community engagement and consultation, disclosure of information, and a grievance mechanism. GoB Laws and regulation Acquisition and Requisition of Immovable Property Act, 2017 Gaps: - Preparation of SIA and RAP is not required. - Compensation or assistance is not provided to non-title holders. - ARIPA does not include provisions for transitional allowances to restore livelihoods for informal settlers, which may be viewed as a short-term strategy. It does not include sustainable or inclusive developmental objectives. - No special provisions for specific groups, such as the vulnerable population groups. - Valuation of lost assets is not based on the replacement cost principle.	Land will be required for widening, upgradation works in identified corridors and possibly for rehabilitation corridor works, curve/geometric improvements, blind spots, etc. Hence impacts on land, private and community owned assets including structures, trees and crops within existing and proposed ROW is likely. Physical and economic displacement too is very likely.

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2. Regulatory Framework Standards and Guidelines

Table 2-4: The World Bank's ESS, Related National Laws and their Gaps on WECARE Phase-3

World Bank ESS Standards	Objectives	Requirements	Applicability
ESS-6: Biodiversity and Sustainable Management of Living Natural Resources	Protect and conserve biodiversity and habitats. Apply the mitigation hierarchy and the precautionary approach in designing and implementing projects that could impact biodiversity. To promote the sustainable management of living natural resources.	Requirements for projects affecting areas that are legally protected, designated for protection, or regionally/internationally recognized to be of high biodiversity value. Requirements on sustainable management of living natural resources, including primary production and harvesting, distinguishing between small-scale and commercial activities. Requirements relating to primary suppliers, where a project is purchasing natural resource commodities, including food, timber, and fiber. Gaps: - No equivalent requirements on: - the application of the hierarchy of measures. - the preparation of the Biodiversity Management Plan. - differentiated measures on types of habitats. - conduct of due diligence on primary suppliers.	Site clearance activities for road construction will involve removing roadside vegetation and felling trees. The biodiversity studies have indicated that the entire corridor along the project road is rich in biodiversity, interspersed with invasive species. Other than the clearance of roadside vegetation, road construction will also require felling trees.
ESS-7: Indigenous Peoples/Sub-Saharan African Historically Underserved Local Communities	To ensure that the development process considers full respect for affected parties' human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods. Promote sustainable development benefits and opportunities in a manner that is accessible, culturally appropriate, and inclusive. Improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with affected parties. Obtain the Free, Prior, and Informed Consent	This applies when the Indigenous Peoples are present or have a collective attachment to the land, whether they are affected positively or negatively and regardless of economic, political, or social vulnerability. The option to use different terminologies for groups that meet the criteria set out in the Standard. The use of national screening processes, providing these meet World Bank criteria and requirements. Coverage of forest dwellers, hunter-gatherers, pastoralists, and other nomadic groups. Requirements for meaningful consultation tailored to affected parties and a grievance mechanism. Requirements for a process of free, prior and informed consent in three circumstances. Gaps: - No equivalent requirements on: - coverage of IP impacts in the ESIA; - special treatment or differentiated approach to IPs and vulnerable groups; - conduct of FPIC; - development of IP Plan.	This ESS will identify measures to minimize the disruption of livelihoods caused by the project development. There are no indigenous people in the project areas.
ESS-8: Cultural Heritage	Protect cultural heritage from the adverse impacts of project activities and support its preservation. Address cultural heritage as an integral aspect of sustainable development. Promote	Requires the establishment of a chance finds procedure to ensure peoples' continued access to culturally important sites. It also requires confidentiality when revealing information about cultural heritage assets that would compromise or jeopardize their safety or integrity. The requirement also	The alignment of the project road does not have any ancient monuments and/or archaeological sites(s) protected.

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3. Regulatory Framework Standards and Guidelines

Table 2-4: The World Bank's ESS, Related National Laws and their Gaps on WeCARE Phase-3

World Bank ESS Standards	Objectives	Requirements	Applicability
ESS-9: Financial Intermediaries	meaningful consultation with stakeholders regarding cultural heritage. Promote the equitable sharing of benefits from the use of cultural heritage.	requires the fair and equitable sharing of benefits from commercial use of cultural resources. Provisions of archaeological sites and materials. Gaps: No equivalent requirements on: - the application of hierarchy of measures; - the development of Cultural Heritage Management Plan; the development and adoption of project-specific Change Find Procedures; and - the engagement of cultural heritage experts.	i) If any of them (antiques/cultural heritage) are found, they need to be relocated, and provisions must be made in the chance find procedures discussed in the ESMP.
ESS-10: Stakeholder Engagement and Information Disclosure	Sets out how Financial Intermediaries (FI) will assess and manage environmental and social risks and impacts associated with the subprojects it finances. To identify stakeholders and maintain a constructive relationship with them. Assess stakeholder interest and support for the project and enable stakeholders' views to be considered in project design. Promote and provide means for effective and inclusive engagement with project affected parties throughout the project life cycle. Ensure that appropriate project information is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner.	Financial Intermediaries (FIs) to have an Environmental and Social Management System (ESMS) - a system for identifying, assessing, managing, and monitoring the environmental and social risks and impacts of FI subprojects on an ongoing basis. Gaps: Not applicable to the country system. Project proponents are subject to the same country's laws regardless of lenders. It requires identifying the stakeholders, both project-affected and other interested parties and clarifying how effective engagement occurs. It requires stakeholder engagement throughout the project life cycle and the preparation and implementation of a Stakeholder Engagement Plan (SEP). GoB Laws/Regulation No Specific Policy or Legislation identified Gaps: - The ECA/ECR does not specifically require consultation, but the ESIA guidelines issued by the DoE and other agencies recommend public consultations during scoping and preparing the ESIA. - There is also no provision for stakeholder engagements during project implementation.	Not applicable This is relevant to the project, and RHD has prepared a stakeholder engagement plan. The project will ensure: iii. Stakeholders have been and are to be consulted on the Stakeholder's engagement plan. iv. The updated SEP will be followed during the project implementation. v. Ensure stakeholders are well informed and have access to the project documentation, which is expected to be publicly disclosed as and when available and in publicly accessible places in local languages to the people. vi. Stakeholder engagement is to be conducted in a manner proportionate to the project's nature, scale, risks, and impacts and appropriate to stakeholders' interests.
Gender-Based Violence	GBV are considered a cross-cutting theme across all the World Bank's ESS and are especially relevant for Major Infrastructure Projects.		Adequate measures to address gender issues and GBV, including GRM have been addressed in this ESIA

Sources: Adopted from Environmental and Social Impact Assessment (ESIA) Report for Jharkhand-Arthur Road Section, 2019, RHD

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2. Regulatory Framework Standards and Guidelines

2.3.1 WORLD BANK EHS GUIDELINES

64. The World Bank Group Environmental, Health and Safety Guideline (ESSGs) consist of the general Environmental, Health and Safety Guidelines (EHSG) and various Industry-Sector EHS guidelines. Particulars about these guidelines that apply to the project are included in **Table 2-5**.

Table 2-5: Applicable Guideline of World Bank EHSG for the Project

General EHS Guidelines (2007)		
EHS Area	Scope	Relevance to Project
Environmental	Air Emissions and Ambient Air Quality, Energy/Water Conservation, Hazardous Materials Management, Waste Management, Noise, and Contaminated Land.	Manages dust, noise, and vibration from construction traffic and equipment; handles project waste; ensures proper drainage and pollution prevention.
Occupational Health and Safety (OHS)	General Facility Design, Communication and Training, Physical Hazards (e.g., working at heights), Chemical/Biological Hazards, Personal Protective Equipment (PPE), and Monitoring.	Crucial for protecting construction workers on the road site from machinery, traffic, and physical dangers, as well as providing necessary training and PPE.
Community Health and Safety	Structural Safety of Project Infrastructure, Life and Fire Safety (L&FS), Traffic Safety, Transport of Hazardous Materials, Disease Prevention (e.g., vector-borne illnesses), and Emergency Response.	Directly addresses the project's most critical public risk: traffic safety for communities near the construction and operation zones, and preventing disease transmission.
Construction and Decommissioning	Specific guidance on environmental, OHS, and community safety during the active construction phase of the project.	Provides detailed mitigation measures for common construction impacts like erosion control, sediment runoff, noise, and worker management.
Industry-Sector EHS Guidelines		
Guideline	Scope	Relevance to project
EHS Guidelines for Toll Roads (2007)	Applies to the construction, operation, and maintenance of large, sealed road projects, including associated bridges and overpasses.	Traffic Safety Management, noise control, management of air emissions (operational vehicles), control of habitat impacts (e.g., provision of wildlife crossings, fencing), and erosion control.
EHS Guidelines for Construction Materials Extraction (2007)	Applicable to the activities involved in obtaining aggregates, sand, gravel, and limestone, typically required for road construction.	Managing environmental impacts from quarrying and borrowing sites, including fugitive dust emissions, noise, vibration (from blasting), water management, and site rehabilitation.
Weblinks		
General EHS Guidelines (2007)	General EHS Guidelines (PDF)	
EHS Guidelines for Toll Roads (2007)	EHS Guidelines for Toll Roads (PDF)	
EHS Guidelines for Construction Materials Extraction (2007)	EHS Guidelines for Construction Materials Extraction (PDF)	


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2. Regulatory Framework Standards and Guidelines

2.4 CLEARANCES/ PERMISSIONS REQUIRED FOR THE PROJECT ROAD

65. As listed in Table 2-6 for the proposed project's development, the following clearances/approvals must be obtained during the preconstruction and construction stages.

Table 2-6: List of Clearances/Approvals Required

Sl. No.	Clearances/Permissions Required	Competent Authority to Accord Clearances	Responsibility to Obtain Clearance	Remarks
A. Pre-construction Stage				
1.	Clearances for the project	Department of Environment (DoE) under MoEFCC, Bangladesh	RHD	The RHD has initiated the necessary process per ECR 2023, and accordingly, the terms of reference for carrying out the ESIA report have been received. This ESIA report is prepared considering the TOR received from the DOE and the requirements of the World Bank (ESS-1 through 10).
2.	Permission for Tree felling	Divisional Forest Officer, Department of Forests	RHD	RHD will request that the Forest Department and Zilla Parishad remove the tree before the construction work commences.
B. Construction Stage				
3.	Establishment and Operation of construction campsites, crusher units, hot mix plants, concrete batch mix plants, WMM plants, workforce camps	Department of Environment (DoE)	Contractor	To establish the construction camps, permission will be needed from the DoE, along with agreements from the landowners and the community through consultation meetings. The contractor must follow the ECC requirement and ESMP requirements.
4.	Water for construction activities (Surface Water)	Bangladesh Water Development Board	Contractor	The contractor must follow the ECC requirement, national rules/regulations, and ESMP requirements.
5.	Permission to Establish Construction Camps	As per the terms and conditions of ECC, agreement with the land owner and local community engagement.	Contractor	The contractor must follow the ECC requirement, national rules/regulations, and ESMP requirements.
6.	Extraction of Groundwater	DPHE and UP	Contractor	The contractor must follow the ECC requirement, national rules/regulations, and ESMP requirements.
7.	Labor License	Not Required	Contractor	The contractor must follow ECC (Mentioned in Chapter 8 and Annex 13), the Labor Act 2006, the Bangladesh Labor Rules 2015, the Occupational Health and Safety Policies 2013, Khulna Land Policy 1997, and Vested Properties (Repeal) Act 1974 requirement, national rules/regulations and ESMP requirement.

Source: Adopted from Environmental and Social Impact Assessment (ESIA) Report for Jashore-Jhenaidah Road Corridor, 2022. RHD

2.5 NATIONAL STANDARDS

66. For pollution prevention and abatement, the DOE has issued ambient air quality standards and groundwater and surface water quality standards, which the contractor shall meet at the construction site. These standards are documented in Annex 3, Volume-II.

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3. Description of the Project

3 DESCRIPTION OF THE PROJECT

3.1 PROJECT LOCATION

67. The project road under Phase 3 (Bhomra – Satkhira – Navaron Road) is an important western link that connects the Borpara – Jhennidah Road on the Northern Side and the Bhanga Benapole road section on the Eastern Side. The WGS 84 Datum Co-ordinates give the Geo-graphical disposition of the Start and End of the Project Road. The starting point is 22°40'09.98" N and 88°56'48.16" E, and the end point coordinates are 23°03'29.28" and 88°59'57.83" E. The length and Right of Way (RoW) of the existing and proposed design of the Project road under Phase-3, is presented in Table 3-1. Three (03) realignments are proposed in the road design as shown in Error! Reference source not found. The proposed road length will be 61.184 km, which is 0.328 km less than the existing road length of 61.512 km, because of the realignments/adjustment of the road design.

Table 3-1: Project road Sections under the Phase -3

Section No	Description	Existing Road		Proposed Road Design	
		Length (Km)	RoW (m)	Length (Km)	RoW
1.	Jashore-Benapole Highway	3.3	27-to 45	3.3	For Urban 49.2m For Rural 58m
2.	Navaron-Satkhira-Bhomra	54.812		55.304	
3.	Bhomra Loop or Land port Service Road	3.4		2.58	
4.	Total	61.512		61.184	

Source: Desing Team, WeCARE, Phase-3, 2024

Table 3-2: Proposed Realigaments, Road chainage and lengths of the proposed realignments

Location	From	To	Length (Km)
Bagachra	10+050	14+450	4.4
Kolaroa and Jhardanga	23+320	31+570	8.25
Satkhira Medical College	43+960	45+920	1.96
Total			14.61

Source: Desing Team, WeCARE, Phase-3, 2024

68. The alignment of the proposed project road passes through Jashore district and Satkhira district. Jashore district. The total area of the district is 6,674 sq. km and is bounded by Jhennidah districts on the north, Khulna and Satkhira districts on the south, Narail and Magura on the east, and West Bengal State of India on the west. Some prominent rivers in this district are Kopothakko, Bhairab, Chitra, Ichamoti, Harihor, Dadra, and Betraboti & Kodla. Satkhira District (Khulna division) is located between 21°36' and 22°54' north latitudes and in between 88°54' and 89°20' east longitudes. (Map in Figure 3-1).


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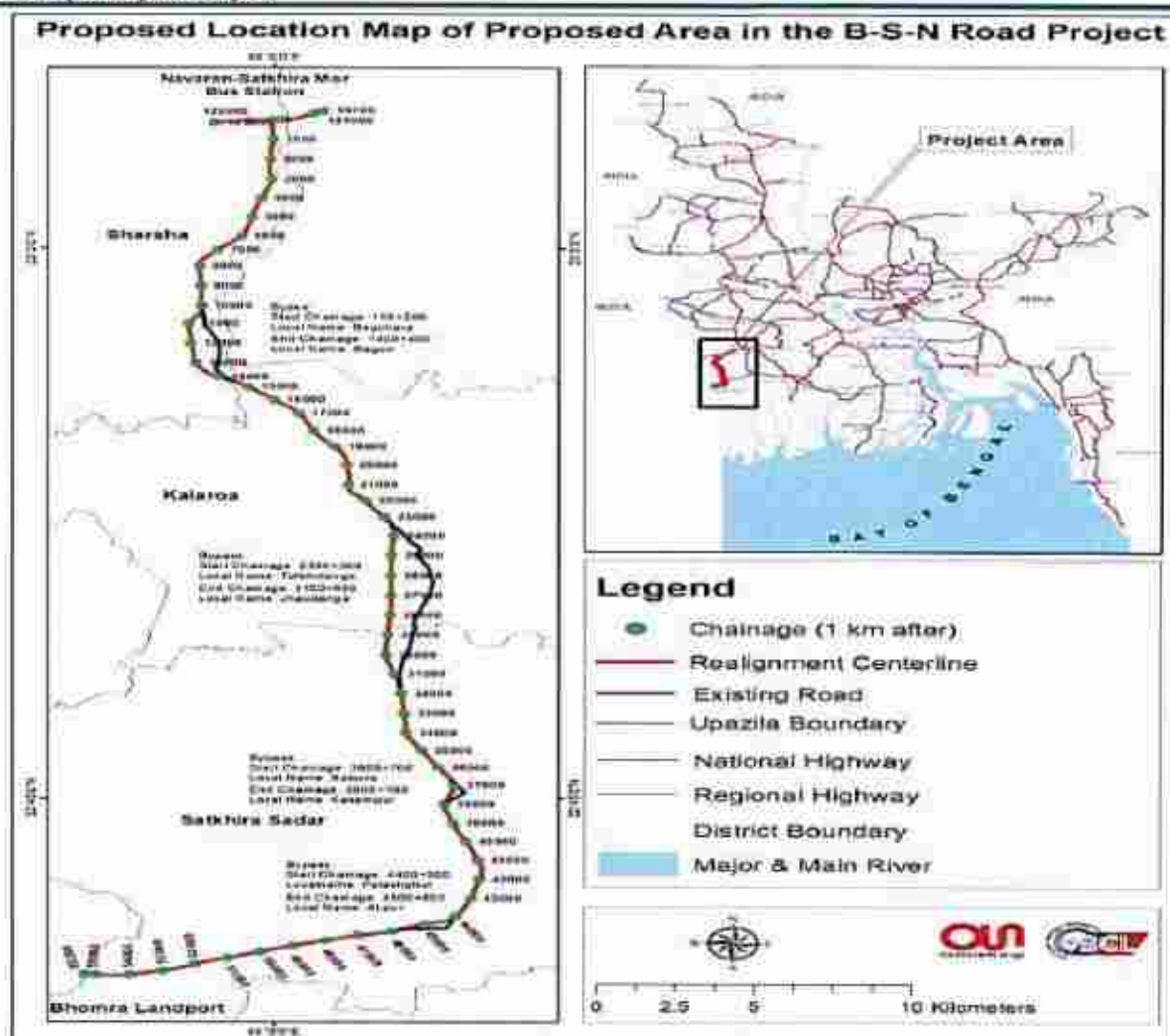


Figure 3-1: Location of the Project Road and Existing Road Network in the Area

3.2 PROJECT CATEGORY

69. The current project will be upgraded from the current 2-lane highway into a 4-lane national highway with separate service lanes for the slow-moving vehicles. According to the Bangladesh Environmental Conservation Rule, 2023 this project is deemed as “Red” which requires the preparation of an Environmental Impact Assessment (EIA) and an approval of Site Clearance Certificate (SCC) Environmental Clearance Certificate (ECC) from the Department of Environment (DoE) under the Ministry of Environmental, Forest and Climate Change. (MoEFCC) for implementation.

70. The proposed project interventions include the extensive civil works and land acquisition due to widening 2-lane National Highway into 4-lane Highways with service roads on both sides including other facilities and hence their impacts will be more significant on the social environments than the ecological impacts.

71. The existing RoW is between 24 to 36 m. In 2015, the engineering design of the proposed RoW for the project was considered 34.6-39 m wide, depending on the nature of areas, viz., rural, urban, or market setting. However, the present Technical Design Consultant of the RHD is now considering a total clear width of 45m in urban areas and 50m in rural areas for their proposed detailed design. Therefore, the project requires more land acquisition on both sides of the existing road than the proposed RoW, which was considered to prepare the previous design in 2016¹⁰.

72. The project alignment is outside of any legally protected area; that is, the road will not pass through any notified eco-sensitive zone boundary or through any critical protected area notified by the Government of Bangladesh or in accordance with the International agreement or Convention. Any impact on biodiversity due to the proposed widening and improvement may not be anticipated in terms of impact on wildlife movement,

¹⁰ Detailed Engineering Design Dacaula-Maguri-Jhenaidah-Jessore-Khulna Road (N7), Sub regional Transport Project Preparatory Facility (STPPF) Project RFD, 2015

3. Description of the Project

characterized by vehicular accidents during the operation of the project. Most of the adverse impacts are co-terminus with the construction stage, limited within the proposed RoW, which will be mitigated through a comprehensive plantation program, good engineering, and housekeeping practices.

73. However, the ESIA and ESMP for the project road, based on the final design, are required to comply with the World Bank's ESS guidelines, ECR, and relevant environmental and land acquisition laws and regulations of Bangladesh.

3.3 EXISTING ROAD PROFILE

74. The project road has major junctions with National and Regional Highways. It is also connected with LGED roads and various small, semi-pucca roads from nearby unions and growth centers. The primary modes of vehicles plying over project roads are local and long-distance, inter-district buses, trucks, cars and motorcycles, locally made vans, three and four-wheeler moving vehicles, etc.

75. The project road under Phase-3 (Bhomra—Satkhira—Navaron Road) is an essential western link connecting the Bonpara—Jhenaidah Road on the northern side and the Bhanga Benapole Road section on the eastern side. Improving the Project Road will significantly enhance the economic development along the Western Corridor and be part of the crucial Western link.

76. Bhomra -Satkhira- Navaron, a national plus regional highway N715 and R765, is about 61.512 q km long stretch that starts from Bhomra Land Port on the Western Border with West Bengal, India, at Ghozaldanga and ends at Navaron township of Sharsa Upazila on Jashore – Benapole Highway N706. The Bhomra-Navaron and Jashore–Benapole Highways are located within the RHD western network corridors under the Khulna Zone and are important gateways connecting Bangladesh with West Bengal and Mainland India. The Benapole is Bangladesh's largest land port, executing approximately 80% of the import-export trade between Bangladesh and India. The Bhomra Port was established in 2013 to handle bulk imports from India, which is close to Kolkata, and relieves Benapole from congestion.

77. The project involves the development of the Bhomra – Satkhira – Navaron Road section of Satkhira-Shakhipur-Kaliganj Road (Z-7602) into a 4-lane facility, which will facilitate passenger and goods movement from the hinterland to the land port at Bhomra at the Indo-Bangladesh border. This will also provide an alternative to the existing land port at Benapole near Jashore, where four-lane road connectivity is underway, and this may result in further congestion in the already busy land port. Bhomra-Satkhira-Navaron road (R765, N715) starts at the India-Bangladesh Border near Bhomra Land Port and ends at the junction with the Jashore-Benapole Highway near the Navaron bus terminal. The Bhomra-Satkhira-Navaron road section passes through the Bhomra under Satkhira District and Navaron under Jashore District.

78. The district's total area is 3,858.33 sq. km. The Jessore district on the north bounds the district, the Bay of Bengal on the south, the Khulna district on the east, and the West Bengal State of India on the west. Some prominent rivers in the project impacted districts are Bhairab, Kalindi, Arpangachhia, Malanehha, Kobadak, Raimangal, Betna, Hariabhangha, and Ichamoti. Bhomra -Satkhira- Navaron, a national plus regional highway N715 and R765, is a 62 km long stretch that starts from Bhomra Land Port on the Western Border with West Bengal, India, at Ghozaldanga and ends at Navaron township of Sharsa Upazila on Jashore – Benapole Highway N706. The Bhomra-Navaron and Jashore–Benapole Highways are located within the RHD western network corridors under the Khulna Zone and are important gateways connecting Bangladesh with West Bengal and Mainland India.

79. Bhomra-Satkhira-Navaron Road section is a two-lane asphalt road with earthen shoulders on both sides. The carriageway width varies from 5.5 m to 7.3 m. The road geometry is generally good; however, a few sharp horizontal curves with inadequate sight distance are noticed at isolated locations where improvement is required. A few locations along this road were identified as accident-prone, as explained by the locals during the site visit.

80. The existing pavement conditions vary from good to poor. Pavement distress, such as alligator cracks, raveling, and rut failure, was noticed during the site visit. The initial 12 km road section (from Km 0.00 to Km 12.00) is very poor, and rehabilitation work is underway.

81. The road intervenes with rivers Betna and Ichamoti Rivers by 2- lane bridges. Historically, the Bhomra – Satkhira – Navaron Road and Navaron –Benapole Road under the WeCARE Phase-3 project in the south-western zone of Bangladesh is not a flood-prone area. The historical Highest Water Level (HHWL) is the design flood level (DFL). BWDB flood embankment has controlled river flood water within the polder area. Considering this, the formation level of the road at this reach has been recommended as only 1.00 m above the existing road level.

3. Description of the Project

82. The road from Navaron to Satkhira Medical College spans 44.00 km and runs north to south. From Satkhira to Bhomra, the 11.00 km stretch runs east to west along the Bhomra – Satkhira – Navaron Road. A 2.90 km segment of the Navaron – Benapole Road major junction at the Navaron starting point is considered in Phase 3 of the WeCARE Program. This area is known to experience flooding during the wet season. Consequently, any road construction over the river would impede the natural surface water flow and cause drainage congestion. Therefore, an adequate number of drainage structures, such as culverts, must be implemented. The drainage structures have been identified from available information, and the catchment area of Bhomra – Satkhira – Navaron Road is shown in Figure 3-2.

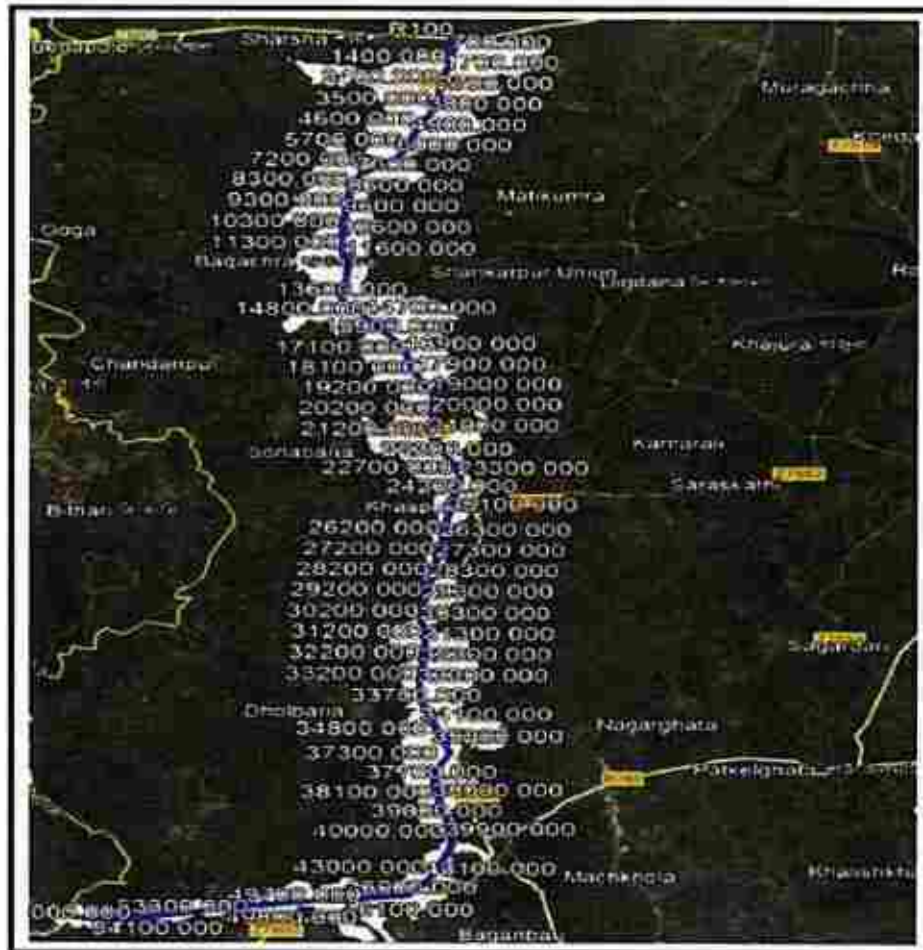


Figure 3-2: Chainage wise Bhomra – Satkhira – Navaron Road

83. There are 53 culverts with inadequate openings and insufficient drainage systems, and during the disruption of local drainage during the monsoon season, flooding occurs in agricultural lands, and waterlogging occurs in some places in urban areas.

84. No natural wetlands, forests, sensitive areas, or archaeological sites were noticed within the proposed RoW. The project is in the Betna River catchment and is interspersed with numerous interconnected canals and rivulets, often connected with low-lying areas and waterbodies. The project road crosses 3 canals and 1 tributary of the Betna River.

85. According to the survey, contract-wise, major and minor intersections have been designed where 6 major and 33 minor intersections for Lot 1, 6 major and 27 minor intersections for Lot 2, and 8 major and 31 minor intersections fall in Lot 3. The last six major and 36 minor intersections in Lot 4.

3.4 PROPOSED UPGRADING AND IMPROVEMENT OF THE PROJECT ROAD

86. The project road improvement will mostly follow special codal provisions relevant to highways prescribed by the design code standards of Geometric Design Standard and Manual 2005 of RHD and Geometric Design of Highway and Streets of American Association of State Highway and Transportation Officials (AASHTO), 2001, Asian Highway Classification Design standards of United Union's Economic and Social Commission for Asia and the Pacific (ESCAP), Overseas Road Note 6 "A Guide to Geometric Design" published

3. Description of the Project

by TRRL 1988. The improvement/upgrading of the Bhomra – Navaron Road Project road involves the following civil works:

- ▶ Widening of Bhomra-Navaron 2-lane national highway (N7) to 4-lane national highway configuration;
- ▶ Construction of Service lanes instead of SMVT route on both sides;
- ▶ Improved realignments in congested areas;
- ▶ Raising embankment height and widening of Cross drainage (CD) structures and provision of roadside drains in water-logged sections in urban areas;
- ▶ Construction of widened bridges and culverts, including a few new cross-drainage structures; Major two bridges at same locations in Lot-1 and one in Lot-4, Three Minor bridges in Lot-2, Lot 3 and Lot-4. Twenty Box culverts in Lot-1, 27 in Lot-2, 33 in Lot-3 and 38 in Lot-4. (Detail list, type existing and proposed design with cross structures are documented in **Annex-4, Volume-II**).
- ▶ Construction of VOPs, POPs, ROB, and Flyover at big and congested bazaar areas and grade U-turns;
- ▶ Improvement of the bus stop/bus shelter, FOBs, pedestrian crossings, rumble strips, wildlife crossings signage, footpath cum storm water drains, and road intersections improvements.
- ▶ Mandatory compensatory plantations and additional plantations alongside the proposed improved road
- ▶ Improved road furniture with safety provisions.

87. The full project length has been divided into four (4) lot-wise ; details are given in **Annex 4, Volume-II**.

88. The proposed RoW width of the project road in urban and rural areas varies according to the total available land, and the proposed RoW perimeter has been designed to provide a minimum of 5 meters' space between the outer extent of the construction works and boundary line of RoW for utility corridor. This margin will allow full access to all parts of the highway for maintenance and emergency vehicle parking/breakdown and equipment placement. No provision for borrow-pits has been considered within the RoW adopted. During road alignment design, land acquisition requirements have been kept to the minimum inconsistent with design standards.

3.4.1 ROAD DESIGN

89. The road design speed is reduced where restrictive site conditions (intersections, bridge approaches, curves, built-up sections, educational and other sensitive receptors, forest and potential wildlife crossing sections, etc.) and adequate land width are unavailable. In built-up sections, it is generally restricted to 20 km/h. Gradual changes will be introduced by providing successive sections of increasing/decreasing design speeds so that road users become progressively conditioned to such changes. Road safety, Speed limit, and Warning signs have been proposed at intersections, bazar, and commercial areas. The adopted geometric design criteria for the project road are shown in **Table 3-3**.

Table 3-3: Proposed Road Engineering Design

Sl.No.	Description	Value
1.	Speed Control	Design Speed (Km/h)
		80
2.	Sight Distance	Stopping Sight Distance (SSD) in meter
		120
		Overtaking /Passing
		500
		Intermediate
		250
3.	Horizontal Controls	Minimum Curve Radius (m)
		500
		Maximum Super Elevation
		5%
		Minimum Transition Curve (m)
		70
4.	Vertical Controls	Maximum Gradients
		3%
		Minimum K value
		70
		Vertical Clearance for roadway (m)
		5.7
		Vertical Clearance for Railway(m)
		8.5
5.	Cross Section Elements for main carriageway (each side)	Carriage width for dual carriageway(m)
		7.3
		Traffic lane width (m)
		3.65
		Normal cross fall
		3%
		Emergency Breakdown Lane (m)
		2.5
		Inner marginal shoulder (m)
		0.3/0.6
		Raised central median width (m)
		1.2/5.8
6.	Cross-Section Elements for Service Road (each side)	Service Road (m) (Rural)
		5.5
		Service Road (m) (Urban)
		7.3
		Carriageway cross fall
		3%
		Verge width (m)
		1.5
		Verge Slope
		5%
		Vertical clearance for underpass (m)
		4.5

3. Description of the Project

Table 3-3: Proposed Road Engineering Design

SLNo.	Description	Value
	Embankment slope	2H:1V

Source: Detailed design report, 2024

90. **Service Lanes:** The existing traffic on the project road consists of different types of vehicles, such as heavy vehicles and light vehicles with fast-moving and slow-moving vehicles (SMV), as well as local and long-distance vehicles. Two separate Service lanes are designed on both sides of the main road for the SMV and local traffic to achieve the optimum speed of the fast-moving vehicles and maximize the capacity and safety of the main carriageway as well as to avoid traffic congestion and accidents. The service lanes are proposed to have a width of 5.5m for urban/market areas and rural areas. The typical Cross- Section design of the proposed road is presented in **Figure 3-3**.


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Joint Venture of



STUP Consultant P.O. Ltd.
On July 1st, 2021, STUP was acquired by Assystem and
rebranded as Assystem STUP.



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3. Description of the Project

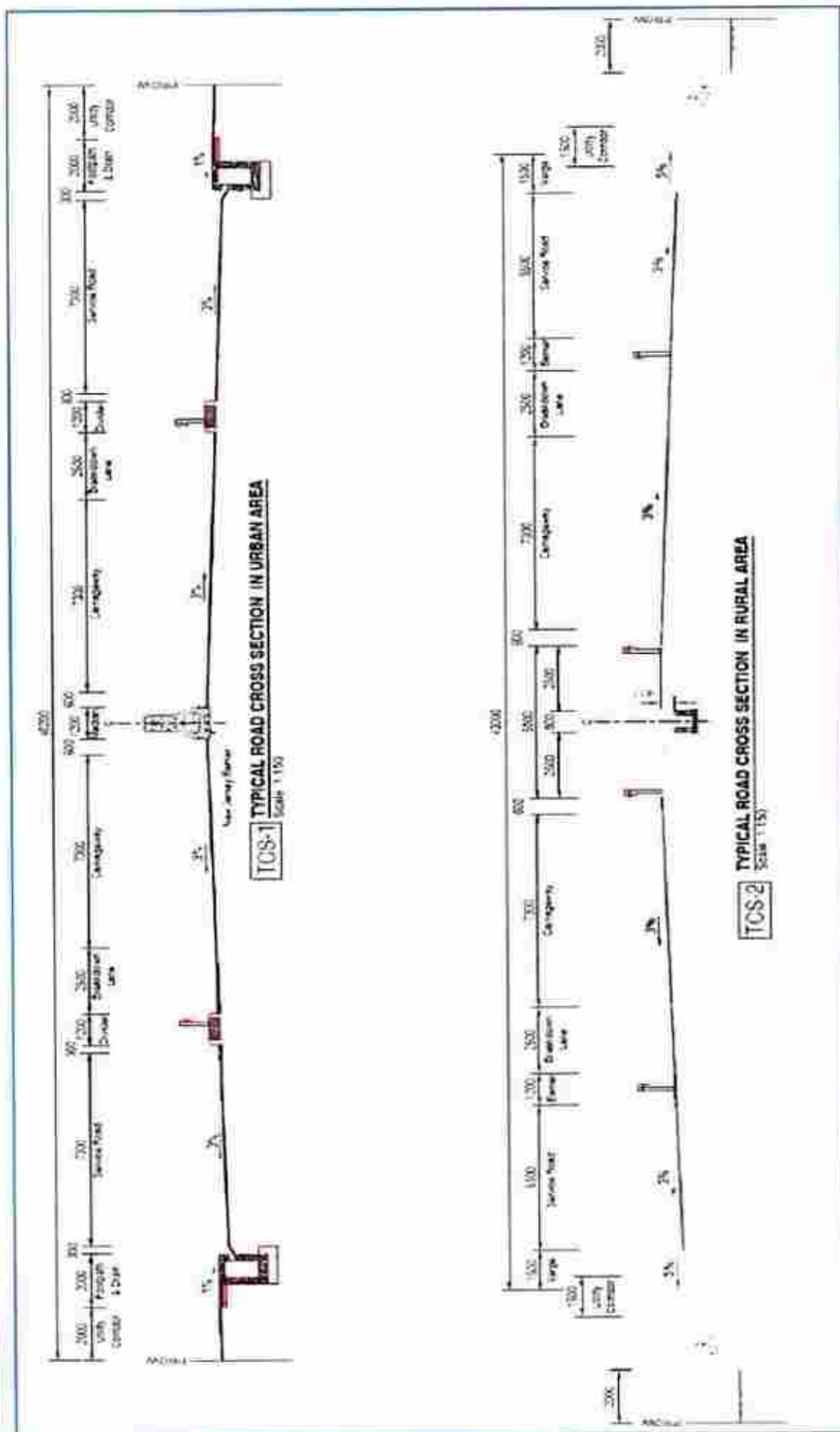


Figure 3-3: Typical Design Cross-Section of the Proposed Road

Source: Detailed design report, 2024

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BCL Associates Limited, Bangladesh

3. Description of the Project

91. **Type of Structures:** Different types of structures proposed under four Lots are presented in **Table 3-4**.

Table 3-4: Number of proposed Structures under Lot-I		
SL No	Type of Structures	Lot-I
Project Stretch Length		Km- 0.00 to km- 7.20
1.	(ROP cum Flyover)	1
2.	(Main directional Ramp)	1
3.	(Ramp 1)	1
4.	(Ramp 2)	1
5.	(Bhanga-Benapol Flyover)	1
6.	(SR Bridge 1)	1
7.	(SR Bridge 2)	1
8.	(U-Loop)	1
9.	LVOP	1
10.	FOBs	3

Source: Detailed design report, 2024

92. The number of proposed structures within Lot-II, Lot-III and Lot-IV are given in **Table 3-5**.

Table 3-5: Number of proposed Structures in Lot- (II, III, IV)				
L No	Type of Structures	Lot-II	Lot-III	Lot-IV
Project Stretch Length		Km- 7.20 to km- 23.0	Km- 23.0 to km- 39.40	Km- 39.40 to km- 55.245
1.	Bridges Over River	1	1	2
2.	Flyovers (Bhanga-Benapol)	0	0	0
3.	Vehicular Overpasses (VOPs)	2	3	1
4.	Light Vehicular Overpasses (LVOPs)	2	2	3

Source: Detailed design report, 2024

93. Typical Road Cross Sections for Urban and Rural Areas, over bridges, LVOPs TCS for VOP/LVOP, and Navarun intersection are shown in **Annex-4, Volume-II**.

94. Roadside drainage facilities are also required at several locations where the road passes through markets and local markets (bazaars). The total details of the proposed covered drains under all Lots. Provision of roadside drains to avoid waterlogging in built-up sections proposed with suitable outfalls, as given **Table 3-6**.

Table 3-6: Proposed Drainage Culvert under the Lots		
Lot Nos.	Project Stretch Length	No
Lot 1 (Bhanga-Benapole Section)	Km 3+300	5
Lot 1	Km- 0.00 to Km-7.20	15
Lot 2	Km- 7.20 to Km-23.0	27
Lot 3	Km-23.0 to Km-39.40	32
Lot 4	Km-39.4 to Km-55.245	35
Lot 4 (Bhomra Port Service road)	-	4
Total		118

Source: Detailed design report, 2024

95. The detail length of drainage are given below table.

Table 3-7: Lot Wise Drainage Detail		
LOT No	Drain Length (Km)	
	Urban Drain (Road side Drain)	Rural Drain (Median drain)
Lot-1	12.694	4.09
Lot-2	8.202	11.634
Lot-3	1.8	15.5
Lot-4	14.928	10.0631
Sub-total	37.624	41.2871
Total Drain length (Phase-3)		82.5742

Source: Detailed design report, 2024

3. Description of the Project

3.4.2 BRIDGES

96. The existing bridges and culverts are mostly 2-lane structures in poor condition and inadequate to handle the local drainage flow across the road. They need to be rebuilt, including the construction of a few new cross-drainage structures. To control the drainage congestion of the catchment areas, four (04) bridges and 118 culverts are proposed with widened openings.

97. The Bangladesh Inland Water Transport Authority's (BIWTA) inland navigable class river standards were adopted during the design of the horizontal and vertical clearances of the bridges. To minimize the obstruction to the waterways and keep the embankment height within permissible soil capacity are proposed at approaches of all Bridge locations. The existing bridge over the Bhairab River to be retained as it is still under the Defect Liability Period (DLP). In the Project Road Section in Phase 3, there are four bridges will be improved, as indicated below:

- Bridge over Braja Baksa canal
- Bridge over Pran Sayer canal
- Bridge over Bakal canal
- Bridge over Gangaria canal

98. A list of proposed bridges lengths, channel width with the recommended regime, and calculated Soffit levels are presented in Table 3-8 and Table-3-9.

Table 3-8: Proposed Length of Bridges

Package	Project Chainage (Km)	Proposed Structure ID in Drawing	Existing Size (m)	Proposed Size (m)	Location Name	Proposed Type	Girder+cross slope depth (m)
Lot-2	21+770	BR-1	1x11	15+45+15	Brajbaksha Canal	MNB+Viaduct spans (VC 4.5m)	3.56
Lot-3	37+593	BR-2	1x25.1	1x45 (Staggered)	Pran Sayer Canal	MNB	3.201
Lot-4	44+812	BR-3	10.3+28+11.4	1x62.2 (Arch)	Bakal Canal	MJBR	1.978
Lot-4	51+367	BR-4	2X10.6	1x62.2 (Arch)	Gangaria Canal	MNB+Viaduct spans (VC 5.7m)	1.978

Source: Detailed design report, 2024

Table-3-9: Calculated Soffit Levels of Bridges

Sl. No.	Chainage	Name of bridge/ river	Navigation class	Vertical clearance (VC) over SHWL (m)	Interpolated WL 20-years flood (mPWD)	SHWL from BIWTA hydrograph (mPWD)	Existing bridge top level (mPWD)	Recommended soffit level (SHWL + VC) (mPWD)
1	21+450	Length=11m	-	3	5.45	5	6.11	8
2	37+230	Length=25m	-	3	4.83	4.5	6.46	7.5
3	44+550	Length=30m	-	3	4.83	4.5	6.52	7.5
4	52+600	Length=25m	-	3	4.83	4.5	3.7	7.5

Source: Feasibility Study, WeCare program 2022

99. Bridge construction will require the placement of bored piles using drilling mud, followed by the pile casings being filled with concrete. All other elements of the Bridge, namely the pile caps and piers, will be fixed in place on top of the pile cap. The Bridge deck, consisting of precast concrete lengths as well as steel girders, will be set in place from the Bridge as it is built and the superstructures. The construction works from the water body also require the use of special cranes on barges. For designing the large Bridge, BIWTA's inland navigable class river standards were adopted according to the BIWTA's river classification standard for horizontal and

3. Description of the Project

vertical clearances. Minimizing obstruction to the waterways and keeping the embankment height within permissible soil capacity are proposed at approaches of major Bridge locations. All bridges are <100m span and do not require an environmental impact assessment.

100. The typical cross sections for the bridge and culvert are presented in Figure 3.4 and Figure 3.5.

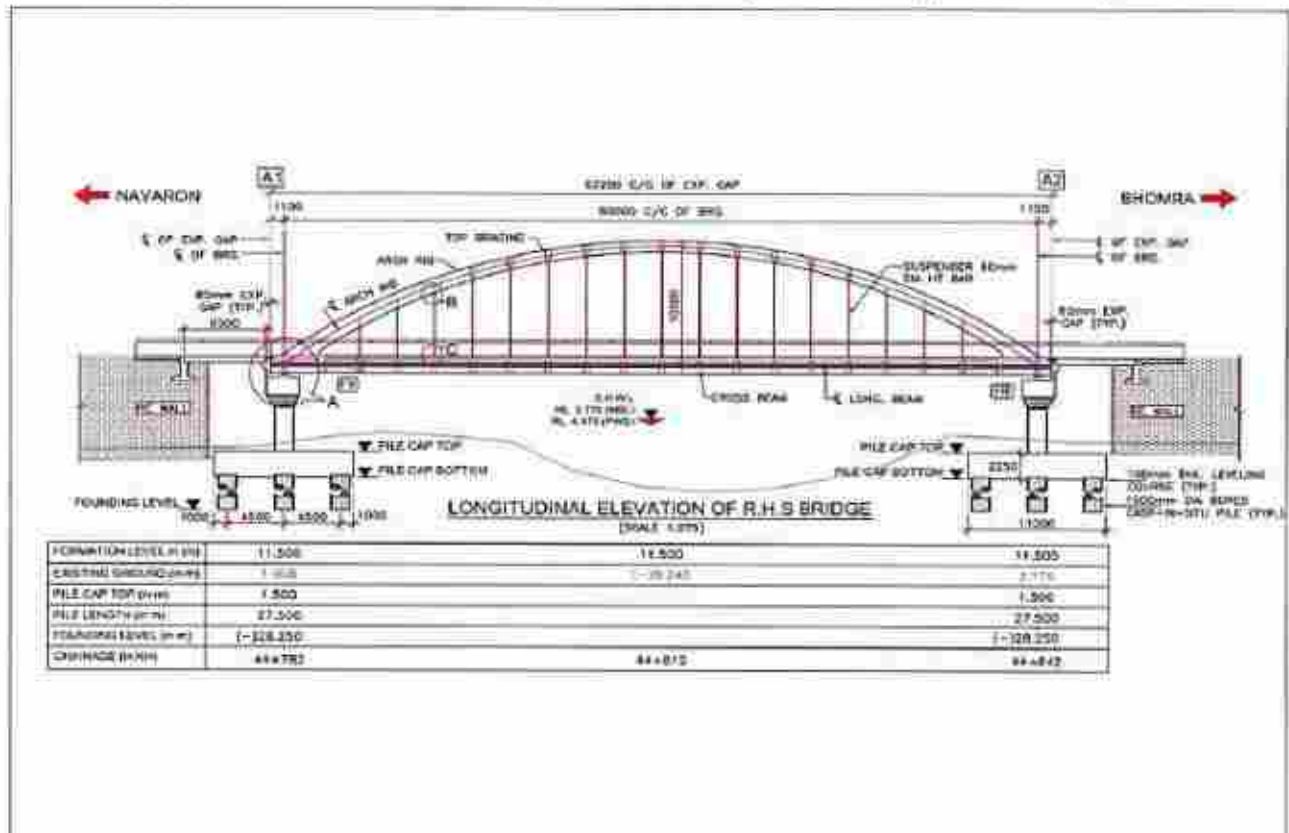


Figure 3-4: Typical Longitudinal Design of the Proposed Bridges

Source: Detailed design report, 2024

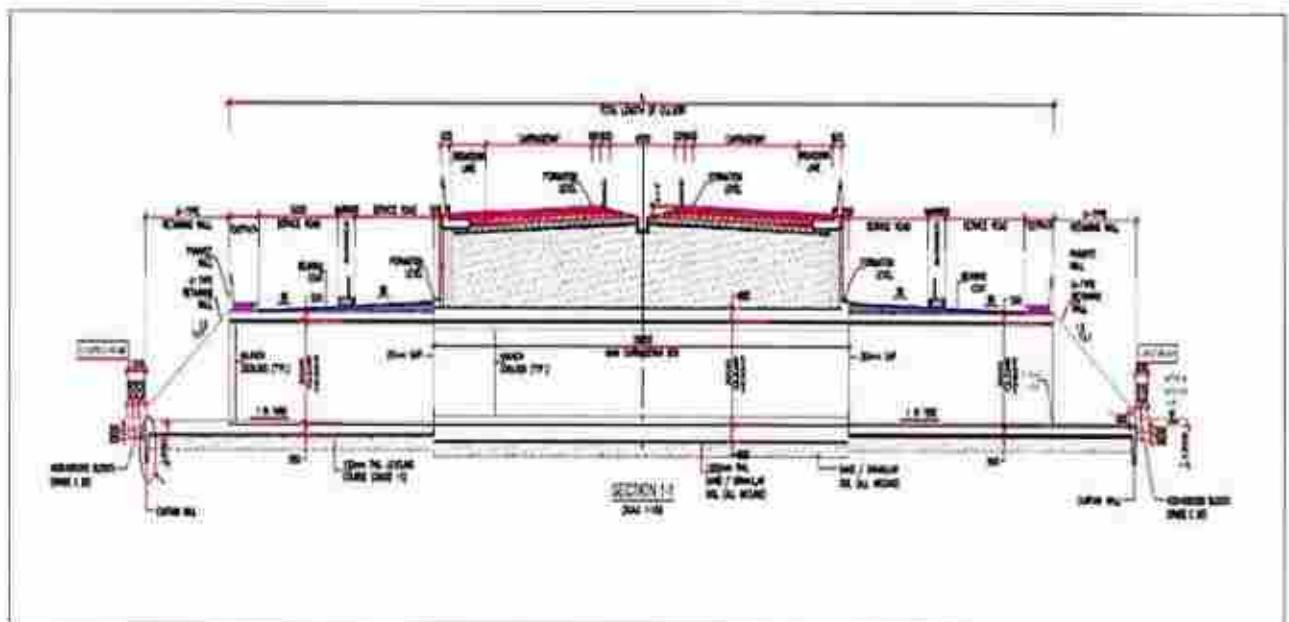


Figure 3-5: Typical Design of the Proposed

Source: Detailed design report, 2024

3. Description of the Project

3.4.3 PAVEMENT DESIGN

101. The road portions will be strengthened by adopting the following procedure:

- ▶ Bituminous layers will be removed from the site.
- ▶ The exposed granular layer top portion will be removed, and the surface will be prepared by leveling and compacting.
- ▶ Base course Type-I new materials will be used on the prepared surface according to engineering drawing and specification.
- ▶ Bituminous base course and wearing course to be placed on base course Type-I according to drawing and specification.

3.5 ROAD SAFETY

102. The general road safety issues for the project are largely dependent on the mode of motorized traffic movement, Non-Motorized Vehicles (NMVs) and pedestrian. The road safety design issues mainly lie with features of road infrastructure are Horizontal and vertical alignment of road, Cross section of roads and bridges, Lane configuration and provision for NMVs, Crash barrier, Pedestrian facility along and across the carriageway, Intersection, Pavement, etc. The important road safety elements are considered in the engineering design as follows

- ▶ Roadside Safety barriers,
- ▶ Intersection, Delineation and lighting,
- ▶ Median barriers,
- ▶ Pedestrian crossings and fences,
- ▶ Central hatching, Paved shoulders,
- ▶ Formation width,
- ▶ Medians / Dividers,
- ▶ Cross-section at bridges & culvert approaches,
- ▶ At Grade Rail Crossings,
- ▶ Pavement Width and Surfaces,
- ▶ Edge drop of Paved Shoulder,
- ▶ Junctions, Pedestrian under / Overpass,
- ▶ Footpath
- ▶ Traffic Calming Measures,
- ▶ Road Signs, Pavement Markings, etc.

103. The recommended designs of the identified safety issues are documented in detail in the Road Safety Audit of Phase -1, Study Road, 2022, prepared by the Technical Design Team and adopted in the design.

3.5.1 TRAFFIC SIGN AND ROAD MARKINGS

104. For night traffic, the proposed reflectors at railings are very necessary. There is a need use them also at the ends of islands, in front of raised zebra crossings and humps and along the median and edge marking (especially in curves and at junctions – island ends are commonly broken, today). In nighttime, the reflectors would indicate changes in traffic environment (e.g., junction/bazaar), and thus, improve safety. Reflectors also make a moving pedestrian visible in darkness as a kind of a shadow, when he/she moves in front of the reflection of light beam. The proposed traffic signs and features for the safety of road users are as follows;

- ▶ Road markings (edge and centerlines and between lanes)
- ▶ Adequate safety and cautionary sign and signal
- ▶ Well-marked zebra crossings (painted stripes)
- ▶ Marking any hump on the road in the driving direction
- ▶ Refuges at pedestrian crossing
- ▶ Well-maintained junction areas, with enough but not too much space
- ▶ Good guardrails at both the edges and the centerline, etc.

105. Traffic Signs Manual 2004 of Bangladesh Road Transport Authority (BRTA) will be followed in the Project, and 80 Km/h design speed is recommended in the RHD Standard for the national and regional highways.

3.5.2 PROTECTION WORKS

106. Grass turfing on the side slopes and the shoulder of the road embankment of the project will be done to prevent soil erosion. CC blocks and geotextile filter fabric shall protect bridge abutments/ approaches and culvert

3. Description of the Project

inlets per engineering specifications. The reinforced earth wall is also proposed at approach bridges/culverts, at Over Passes (OVP), and Rail Over Passes (ROB).

3.5.3 CONSTRUCTION MATERIALS, SOURCING, AND UTILITIES REQUIREMENT

Quarries in Bangladesh are not sufficient to meet the requirement. Therefore, most of the aggregates will be imported from other countries. Only authorized vendors who have valid licenses to import the materials will be engaged to supply the construction materials, such as aggregates. The vendors and suppliers must have regulatory clearances, including environmental clearances from their home country. They also need income tax certificates, VAT, and customs clearance to import materials per Bangladesh regulations. If boulders need to be crushed at the site, the necessary clearance as ECR 2023 is to be obtained before installation of the crushers. Besides, the construction supervision consultant (CSC) will closely monitor the vendors/suppliers' clearance validity and the E&S practices strategy, following the government's valid guidelines.

107. Construction materials such as earth/sand, cement, steel, aggregate, bitumen, and water are the main requirements for road construction. The construction materials will be procured/purchased from the approved suppliers by the Contractors of their arrangement, subject to compliance with statutory/legal requirements of the Bid Documents and approval of the Construction Supervision Consultant (CSC) or Engineer and RHD-PIU.

3.5.4 MANUFACTURED MATERIALS SOURCES

108. Inquiries were made at the site, along with desk studies to locate sources for cement, steel, and bitumen close to the project road. Cement and steel are available from the local market. Bitumen can be obtained from Eastern Refinery and abroad.

3.5.4.1 Stone/Aggregate Material

109. A few stone quarries have been identified for the pavement and structure construction of the project corridor. Limited aggregates are available in Bangladesh, namely Madhyapara, Dinajpur, and other places. Generally, Pakur aggregates are used to construct wearing and binder courses. Madhya Para aggregates can be used in granular aggregate base, RCC works. Aggregates can also be brought from Meghalaya, and crushed stone is available in Jaffong. Stone aggregates from Pakur and Madhyapara sources are used presently in the SASEC Phase 2 project. It is also observed that stone from India is available at Bhomra Land Port at the end of the project road. Information was gathered for the source of the aggregates. Aggregate from Bhomra is collected, and test results are presented in Table 3-10. Stones from Nohati (India) will be collected at Bhomra. It is also a good stone that can be used for both asphalt and concrete work.

Table 3-10: Test Results of the Aggregates

Description	TFV (kN)	ACV (%)	LAA (%)	Specific Gravity ⁺	Water Absorption (%)
Pakur	316	11	12	2.87	1.2
Madhya Para	218	18	23	2.83	0.5
Nohati	230	11.84	15.4	2.95	1.97
Limit	>150	<30	<30		<2%

Source: Detailed design report, 2024

110. From the test results and based on basic properties of the aggregates, it can be concluded that good quality aggregates are available which can be brought from India (Pakura, Nohati) and Madhayapara. The contractor may use aggregate from Bhomra Land Port, the project end point. These aggregates are suitable for road construction and concrete works.

3.5.5 QUANTITIES OF CONSTRUCTION MATERIAL AND LEAD CHART

111. During the collection of borrowed materials, if necessary, sand, coarse aggregate, and water, the representatives of the Design Consultants identified quantities of material and lead Chart, i.e., haulage distance from the project road. The tentative quantity of borrowed material is mentioned in Table 3-10. A huge quantity of sand is available within a 10-15 km lead distance from the project road. Aggregate will be available from Bhomra Land Port. Water will be available from roadside ponds and wells. The Pavement and Material Investigation Report mentions details (quantity and lead distance), which are submitted separately. The quantities of the construction material are presented Table 3-11.

Table 3-11: Lot-wise requirement of Construction Materials

Items	Unit	Quantity				Total
		Lot-1	Lot-2	Lot-3	Lot-4	
Cement (OPC)	Tonne	4	5	5	5	19

3. Description of the Project

Sand (1.8)	Cubic meter	115	125	130	125	495
Reinforcement -60 Grade	Tonne	2	2	2	2	8
Crushed stone-25 mm (LAA<25)	Cubic meter	50	50	60	55	215
Crushed stone-12 mm (LAA<25)	Cubic meter	42	45	50	48	185
1st Class Bricks	No	7	8	8	8	31
Bitumen (80/100 Drum)	Tonne	7500	9000	9000	8500	34000

Source: Detailed design report, 2024

3.5.5.1 Concrete Aggregate:

112. There are some quarries in Bangladesh that are not sufficient to meet the requirement. Therefore, most of the aggregates will be imported from other countries. Only authorized vendors who are having valid license to import the materials will be engaged to supply the construction materials such as, aggregates

3.5.5.2 Cement and Steel Reinforcement:

113. Bangladesh produces different classes of EN and ASTM standard cement and high strength deformed bar of 40, 60 and 75 grades. These materials are readily available in Bangladesh. There many steel rolling mills are established in Bangladesh, like KSRM, BSRM Bandar Steel Industries Ltd, High-tech Steel & Re-Rolling Mills etc.

3.5.5.3 Bitumen:

114. Bitumen will be imported. Commonly used bitumen in the road construction industry in Bangladesh is 80-100 penetration grade bitumen.

3.5.5.4 Earth or Embankment Fills:

115. The fill materials will be collected from nearby sand extraction sites or can be dredged from the nearby rivers or borrow pits. The present practice in Bangladesh is to construct roadway embankments using river sand rather than clayey agricultural soil. Sand can be easily compacted to a high degree of compaction but with a higher CBR value. The sand used as fill materials requires protection against erosion by cladding with a layer of cohesive soil. According to the Design Team estimation, the quantities of the filling material and construction material are presented in Table 3-12.

Table 3-12: Lot-wise the requirement of Filling materials quantities

No of Lots	Quantities in m3
Lot-1	1508282
Lot-2	2262561
Lot-3	2715581
Lot-4	2435989

Source: Detailed design report, 2024

3.5.5.5 Water:

116. In general the sources of the non-potable water for the construction works and sanitation purpose will extract from shallow aquifer. During construction period two types of water consumption will needed as follows;

- Water use with construction materials such as concrete mixing and compaction, etc;
- Water will be used for site offices, construction yards, and construction camps during project operation.

117. Non-potable water sources for the construction works will come mostly from shallow aquifers or surface water. Drinking water may be taken from the deep aquifer if the shallow aquifer is contaminated with excessive iron and arsenic. In addition, the contractor will provide safe drinking water by supplying bottled drinking water at the construction sites and offices. An overhead tank and water reservoir will be constructed to supply water facilities within the site project office, contractors office and labor camps.

3.5.5.6 Sewerage and Waste:

118. Project site office, contractor's offices, construction yard and construction camps will have sanitary toilets with proper solid/liquid waste management facilities. Sufficient numbers of the toilets will be provided in all construction camps for the workers, offices and construction yard, at a formula of one toilet for every 10-12 persons.

3. Description of the Project

3.6.1.2 Proposed Bagachra Realignment

123. Here, most of the land is agricultural; farmers cultivate the land 1-2 times a year. The main crops are BRRI Dhan 49, 50, 51, 52, and wheat²², etc. Mango, jackfruit, and litchi are cultivated on land. These are seasonal fruits and usually ripen once in a year.

3.6.2 KOLAROA TOWN AREA

124. These are built-up areas with large settlements of commercial structures, markets, residential houses, shops, Katcha bazaars, mosques, educational institutions, and hospitals, etc. This area is primarily agricultural, producing rice, jute, and mustard with two growing seasons per year. Mango orchards are located among rice, jute, and mustard. Mangoes are harvested once a year. Some lands have fish farms where fish can be farmed throughout the year.

3.6.2.1 Kolaroa Existing Road

125. According to the field survey of Form Km. 23+000 to Km 31+500, there are a lot of shops, markets, houses, mosques, temples, educational institutions, government offices, and health centers on both sides of the existing road. As per the LA plan, the average width of the road is 32m, and the total land on both sides of the road, which is considered for realignment, is 72.1293 acres, as per Khatian. Among them, the distribution of the land currently, as per Khatian, is 36.794 acres under the ownership of Roads and Highways, 24.217 acres under the ownership of District Counsel, 3.036 acres under the ownership of other government agencies, 13.787 is under the ownership of local people.

3.6.2.2 Proposed Kolaroa Realignment

126. Much of the area is agricultural and fish farming land. Farmers harvest crops one/two times a year and farm fish around the year. Among the crops are rice, jute, mustard, mango orchards, etc. Mangoes are harvested once a year. Some lands have fish farms where people farm fish throughout the year.

3.6.3 JHAUDANGA TOWN AREA

127. Jaudunga is an old and historical market in this area, situated on the bank of the River Betna; the river is 50 meters away from the main road, and there is no land to expand the road on the riverside. Therefore, prefer a bypass road. The market leases out nearly one crore taka every year, which goes to the government revenue fund. The Government will lose this kind of revenue if the road and the market area are in their original shape. Every businessman in the market desires realignment of RoW and to save the market from dismantling.

3.7 IMPLEMENTATION SCHEDULE

128. According to the Final Detailed Design Report, Phase-3, WeCARE that about four years will be required for the Construction works of the project. After the award and mobilization, Contractor will complete of the construction of the 6-Lane project road within 48 months from the Commencement date and Defect liability period-12 months. The project construction period will be 4 years after the land acquisition process is substantially completed.

129. Project Implementing Unit (PIU), Supervision Consultant or Project Implementation Consultant (PIC) and the Contractor will collectively ensure the implementation of the project ESMP and ESMoP. Compliance monitoring work will be carried out by the PIU, headed by RHD's Project Director, and the PIC. The estimated total project cost is approximately BDT 142,377,460,106.

130. Presently, the implementation schedule of the proposed project is uncertain, but it's expected to be realized in three to four years. The tentative project implementation schedule is indicated in Table 3-14.

Table 3-14: Tentative Implementation Schedule	
Major Work Components	Actual/Scheduled Of Completion
Final ESIA report	September 2025
Approval of EIA study	October-November 2025
Final RAP Report and approval	September- December 2025
Preparation of the Development Project Proposal (DPP) to ensure environmentally friendly and sustainable development	January 2026 - July 2026
Preparation of Final Bidding Documents with inclusion of ESMP of ESMoP as the technical specification on environmental and social issues	August 2026 January 2027

²² Department of Agriculture Extension Training, <http://dae.jessore.gov.bd/en>

3. Description of the Project

Table 3-14: Tentative Implementation Schedule	
Major Work Components	Actual/Scheduled Of Completion
Tendering Phase	February 2027-January 2028
Award of Contract	February 2029
Start of Construction	March 2029
Before starting the Civil work, the Contractor prepared C-ESMP as the project site-specific based on ESMP and an ESMoP of this ESIA report.	April 2029
Construction Period	48 Months (2029-2033)
Environmental and social monitoring in compliance of the World Bank's ESSs 2018 and National ECR 2023.	48 Months (2029-2033)
End of Construction	February 2033
Opening of Road to Traffic	March, 2033


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4 DESCRIPTION OF THE ENVIRONMENTAL AND SOCIAL BASELINE

4.1 INTRODUCTION

131. The primary objective of this chapter is to provide an environmental and socio-economic baseline that potentially impacts the construction and operation phases of the project. Baseline data includes an assessment of the physical environment along with the natural (pollution) of the project impact areas, the ecological environment, and the socio-economic environment of the project areas. Baseline data has been compiled in the ensuing sections to cover these aspects.

4.2 PHYSICAL ENVIRONMENT

132. The physical environment comprises the project area's physiography and topography, geology and soil, meteorology, hydrology, water resources, and natural hazardous conditions. The physical environmental data for the study area were collected through primary and secondary data from the project Aol defined in section 1.7.

4.2.1 PHYSIOGRAPHY AND TOPOGRAPHY

4.2.1.1 Physiographic Features

133. The Project area falls under the Bhomra, Satkhira, and Navaron regions in two districts, Jashore and Satkhira, in the country's southwestern region. The Proposed Project starts at N706 Navaron (Lat: 23° 3'29.07"N and Lon: 88°59'56.26"E) and ends at R-766 Satkhira Bhomra highway (Lat: 22°40'10.79"N and 88°56'46.35"E). The area is across the physiographic unit of the Ganges Floodplain. Jashore District borders India to the west, Khulna District and Satkhira District to the south, Khulna and Narail to the east, and Jhenaidah District and Magura District to the north. Satkhira is part of the Khulna Division. It is bordered to the north by Jashore District, on the south by the Bay of Bengal, to the east by Khulna District, and on the west by North 24 Parganas and South 24 Parganas districts of West Bengal, India. The district produces a variety of crops year-round. Date sugar, called patali, is made from the sap of locally grown date trees²³ Figure 4-1 shows the prominent Ganges Active and Granges Inactive floodplain in the project area. General Physiographic Features of the Bhomra – Satkhira – Navaron Road is shown in **Annex 5, Volume-II**.

4.2.1.2 Topography

134. The project area's topography is a rolling plain, as shown in **Annex 5, Volume-II**. The elevation profile of the exiting Bhomra—Satkhira—Navaron Road alignment varies between 2 and 8 meters above mean sea level. The area's general slope is from north to south, and the road traverses from high to low land.

135. The region's land can be broadly characterized by the Ganges-tidal floodplain having lower relief and being criss-crossed by innumerable tidal rivers and channels. It is nearly flat, and the surface is poorly drained. The land surface is not perfectly level and is characterized by six geomorphic units. These are natural levees, floodplains, old meander complexes, bars, tidal marshes, and backswamps. Natural levees are well developed along the Bhairab-Kopodak banks and are occupied mainly by the present built-up area of the town. The low-lying areas extend mainly towards fringe areas of the town, characterized by swampy areas, currently used for poorly drained agricultural purposes and persistent waterlogging problems (Reiman, 1993).

136. Jashore and Satkhira districts area formed entirely by the deltaic action of the Ganges, which brought mud and limestone from the Himalayas.

4.2.2 GEOLOGY

4.2.2.1 Geological Characteristics of the Project Area

137. The Navaron region has the deposition of sediments, which is vastly controlled by Quaternary sea-level fluctuation, climatic conditions, and tectonic activities. The Bengal Basin was filled with sediments of Tertiary and Quaternary age. The Ganges deltaic deposits of the Late Holocene to Recent age mainly cover the study area. The

²³ Design Report Bhomra-Satkhira-Navaron Road Section Phase-3

4. Description of the Environmental and Social Baseline

modern deltaic plain in the western Bengal Basin can be divided into two regions: the Upper Delta plain of meander belts of the Ganges–Bhagirathi River in the north and the lower delta plain with numerous tidal creeks in the south. The lower deltaic plain, formed in Pleistocene–Holocene time, is characterized by an extensive clay layer of varying thickness (15–76 m), underlain by silt, sand, and gravel. The landforms of the Bengal lowland, including the Ganges delta and its surrounding region, consist of Pleistocene uplands and alluvial lowlands. The Pleistocene upland's relative height above the alluvial lowland's surface is 3–10 m north and 0–5 m south. The alluvial lowlands are subdivided into three geomorphological regions, namely the Brahmaputra–Jamuna floodplain in the north, the Sylhet basin in the northeast, and the Ganges Delta in the south of the region.

138. The Ganges deltaic deposits of the Late Holocene to Recent Age cover the project area. The surface lithology of the area is of deltaic deposits, composed of tidal deltaic deposits, deltaic silt deposits, and mangrove swamp deposits. A heterogeneous mixture of sand, silt, and clay characterizes the subsurface lithology. The Latest Pleistocene and Holocene sediments in the Ganges Delta and its surrounding region are divided into five units: the lowest, lower, middle, upper, and uppermost. The Geological Map of Bangladesh is shown in Annex 5²⁴ Volume-II.

4.2.3 SEISMOLOGY

139. Bangladesh is one of the world's most tectonically active regions. Bangladesh has been divided into four generalized seismic zones based on the distribution of earthquake epicenters and the morphotectonic behavior of different tectonic blocks. The south of Bangladesh is a seismically severe zone represented by zone II with a basal coefficient of 0.05. So, considering Bangladesh's seismic zoning, the project area is less vulnerable to earthquakes. Characteristic features of seismic zonation of Bangladesh are presented in Table 4-1²⁵ and Volume-II, Annex 5.²⁶

Table 4-1: Characteristic features of seismic zonation of Bangladesh

ZONING	AREA MERCALLI SCALE	MODIFIED
I	North and eastern regions of Bangladesh (Seismically most active)	IX
II	Lalmai, Barind, Madhupur Tracts, Dhaka, Comilla, Noakhali and western part of Chittagong Folded belt.	VIII
III	Khulna division S-E Bangladesh (Seismically relatively quiet)	VII

4.2.4 SOIL/ LANDS DESCRIPTION

140. The project road passes through three Upazila, namely Sharsha Upazila of Jashore District and Kalaroa and Satkhira Sadar Upazila of Satkhira District. The soil and land descriptions of these Upazila are presented in the following subsections, and the pictorial view of the landforms and soils of these Upazila is shown in Annex 5, Volume-II.

141. The map showing the different land types and soil textural classes, considering a 5 km buffer on both sides of the Bhomra – Satkhira – Navaron Road section, is shown in Annex 5, Volume-II. The land type data is summarized in Table 4-2.

²⁴ Design Report Bhomra-Satkhira-Navaron Road Section Phase-3

²⁵ Design Report Bhomra-Satkhira-Navaron Road Section Phase-3

²⁶ Bangladesh National Building Code 2020

4. Description of the Environmental and Social Baseline

Table 4-2: Area-wise distribution of Landforms through the project road

Land Types	Sarsha	Kalaroa	Satkhira Sadar	Throughout the Road length	Land classification within 5km both side of Road (Total Area 89320.04 sq.km)
High Land	3894.58	6748.57	11731.33	22480.18	
Medium High land	2528.7	2252.87	6750.18	11578.15	
Medium Low land	540.39	582.8	996.69	2130.88	
Low land	238.2			240.4	
Settlements	3816.67			53055.73	
Total	11018.54	9584.24	19478.2	89485.34	

142. The soil classification texture-wise is shown in **Figure 4-1**. The clay is 34.9% followed by loam/clay (15.5%) and Clay loam/Clay (7.1%) and the rest (42.3) is covered by settlements/ponds/ river, etc. Further to this literature review of Upazila Nirdeshika of respective upazila (Sarsha, Kalaroa and Satkhira Sadar), Soil Resource Development Institute (SRDI), the soil samples were collected from the following stations, as given in **Table 4-1** to study the profile and establish the baseline which is briefly discussed in the following subsections.

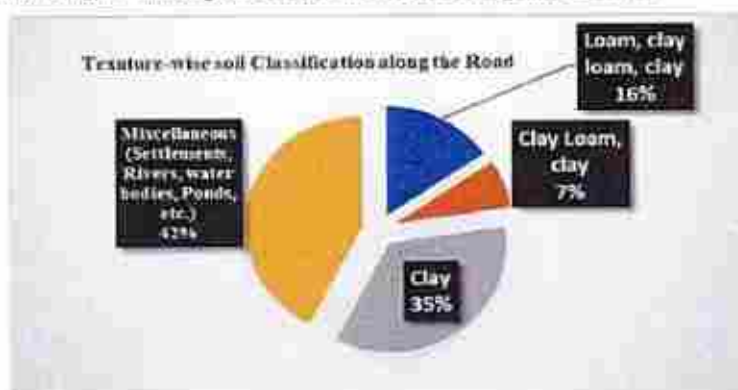


Figure 4-1: Soil Texture Pattern Classification Along The Bhomra – Satkhira – Navaron Road

Table 4-3: Soil sampling locations along the proposed road alignment

Sl No.	Chainage (Project Area)	Location	Station Code/Package	GPS Points Information	Land Use
SQ-1	Bhomra – Satkhira – Navaron Road road corridor, 6 km+400m	Village-Santa Union-Bagachra; Upazila-Sarsha; District- Jashore	Package 1	23°00'46"N and 88°98'58"E	Boro - Fellow - T. Aman
SQ-2	Bhomra – Satkhira – Navaron Road, 31km+600m	Village-Jhaudanga Union-Jhaudanga; Upazila-Satkhira Sadar; District-Satkhira	Package 2	22°80'12"N and 89°03'33"E	Boro - Fellow - T. Aman

143. The different horizons for sample collection are shown in **Annex 5, Volume-II**.

4.2.4.1 Results and Discussion

144. 19. The two soil profiles (Pit-1 & Pit-2) under two packages (Package-1 & Package-2) were described by delineating the horizons based on their differences in soil color, mottling, texture (clay content), structure, consistency, and moistness. Other identifiable properties (such as porosity, presence of plant roots, pH, etc.) visible in the field were also noted and included in the description of the respective profiles. The soil sampling for

4. Description of the Environmental and Social Baseline

establishing the review of the desktop review and the consultants' experience carrying out similar studies in the study area. The prominent land use is agricultural, so the samples were selected from agrarian fields.

145. Description for SQ1: Six soil samples were collected from the six different horizons (Ap, Ad, B21, B22, C1, C2) delineated in the field where the 'Ishwardi' soil series was identified. The geographic location of the 'Ishwardi' series was 23°00'46" N and 88°09'58" E in the village – Samta, union – Bagachara, upazila – Sharsha under Jashore district. The land type of the identified soil was medium highland with a topography of a nearly level shallow basin. The drainage condition of the surrounding area of the soil profile, as determined, was poorly drained and flooded up to 1.0 – 1.5 feet for about 3 – 4 months during the monsoon. The profile description of Pit No. is given in **Table 4-4**

Horizon	Depth (In Cm)	Description
Ap	0-15	Olive grey (5 Y 5/2) moist and light olive grey (5 Y 6/2) dry; common fine distinct yellowish brown mottles; silty clay; massive; sticky; plastic; firm moist; very hard dry; common very fine and fine tubular pores; non calcareous; common fine roots; abrupt wavy boundary; pH 8.03
Ad	15-25	Dark grey (5 Y 4/1) moist; few fine faint yellowish brown mottles; silty clay; massive; sticky; plastic; firm; moist; common fine roots; few medium pores; non calcareous; abrupt smooth boundary; pH 8.15
B21	25-38	Olive brown (2.5 Y 4/4) moist; common; fine distinct grey mottles; silty clay; strong coarse prismatic structure; sticky; plastic; firm moist; common very fine and fine tubular pores; thick grey cutans along the vertical ped faces; moderately calcareous; few fine roots; clear smooth boundary; pH 8.20
B22	38-76	Light Olive brown (2.5 Y 5/4) moist; common fine and medium distinct light olive brown mottles; clay; strong coarse prismatic breaks into strong coarse and medium angular blocky structure; thick; plastic; firm moist; few very fine and fine tubular pores moderately thick grey cutans along the vertical and horizontal ped faces; few fine roots; calcareous; clear smooth boundary; pH 8.07
C1	76-114	Olive brown (2.5 Y 4/4) moist; common fine distinct grey mottles; clay; massive; sticky; plastic; firm moist; many very fine tubular pores; calcareous; clear smooth boundary; pH 7.92
C2	114-140+	Light olive brown (2.5 Y 5/4) moist; clay; localized iron staining on soil mass; very sticky, very plastic, very firm moist, strongly calcareous; pH 8.00

146. Description for SQ1: Seven soil samples were collected from the seven different horizons (Ap, Ad, B21, B22, B23, C1, C2) delineated in the field where the 'Ishwardi' soil series was identified. The geographic location of the 'Ishwardi' series was 22°08'12" N and 89°03'73" E in the village – Jhaudanga, union – Jhaudanga, upazila – Satkhira Sadar under Satkhira district. The land type of the identified soil was medium highland with the topography of the upper slope of the nearly level ridge. The drainage condition of the surrounding area of the soil profile, as determined, was poorly drained, and flooded up to 0.6 – 1.0 feet for about 2– 3 months during the monsoon. The profile description of Pit No.-2 is given in **Table 4-5**.

Horizon	Depth (In Cm)	Description
Ap	0-13	Olive grey (5Y 5/2) moist and light olive grey (5 Y 6/2) dry; common fine distinct yellowish-brown mottles; silty clay; massive; sticky; plastic; firm moist; hard dry many fine roots; common fine tubular pores; noncalcareous; abrupt wavy boundary; pH 7.34
Ad	13-18	Dark grey (5 Y 4/1) moist; with few fine faint yellowish brown mottles; clay; massive; sticky; plastic; firm; moist; few very fine tubular pores; common fine roots; non-calcareous; abrupt smooth boundary; pH 8.0
B21	18-33	Olive brown (2.5 Y 4/4) moist; common; fine faint yellowish brown mottles; clay; sticky; plastic; firm moist; moderate coarse prismatic structure; moderately thin grey cutans along the vertical ped faces; many very fine tubular pores; common fine roots; moderately calcareous; abrupt smooth boundary; pH 7.06
B22	33-56	Olive brown (2.5 Y 4/4) moist; few, fine, faint, yellowish brown mottles; silty clay; strong coarse prismatic structure breaking into moderate coarse and medium sub angular blocky; sticky; plastic; firm moist; thick grey cutans along the vertical ped faces; many very fine and fine tubular pores, few fine roots; calcareous; clear smooth boundary; pH 8.23

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Table 4-5: Description of The Profile No.-2/Pit No.-2 Of (Sq2)

Horizon	Depth (In Cm)	Description
B23	56-81	Light Olive brown (2.5 Y 5/4) moist; few, fine, faint, yellowish brown mottles; Silty clay; moderate coarse prismatic structure; sticky; plastic; firm moist; common, very fine tubular pores; iron manganese concretion present, calcareous; abrupt smooth boundary; pH 7.95
C1	81-97	Light olive brown (2.5 Y 5/4) moist; clay; massive; sticky, plastic, firm moist; iron manganese concretion present, calcareous, clear smooth boundary, pH 8.14
C2	97-114+	Light olive brown (2.5 Y 5/4) moist; clay; massive; sticky, plastic, firm moist; iron manganese concretion present, calcareous, clear smooth boundary, pH 8.14

4.2.4.2 SOIL CHARACTERISTICS

147. The analytical data of the parameters planned to be determined in the laboratory for assessing the soil quality regarding the proposed road construction is given in **Annex 5, Volume-II**. Bangladesh has no soil regulations or standards except for the Fertilizer Recommendation Guide, published by the Bangladesh Agricultural Research Council (BARC) in 2018.

148. During the field survey, two profiles up to the depth of 140+ cm and 114+ cm were selected in Sharsha Upazila and Satkhira Sadar Upazila, respectively. It is evident from the particle size analysis data that the soil texture varies from silty clay to clay in both packages 1 and 2. The chemical properties of the soil samples are given in **Table 4-6**. The chemical properties of soil data reveal, the pH ranges from 7.92 to 8.20 in package-1, and in package-2, varies from 7.06 to 8.23, indicating that soils described in SQ1 are slightly alkaline. In contrast, soils described in SQ2 are neutral to slightly alkaline in reaction. Comparatively high status of the base material is evident in soils as defined under both soil sampling locations, signifying that neither soil is suitable for cultivating most of the crops since most of the crops thrive well in soils having a pH value ranging from 5.6 to 7.3 in terms of nutrient availability in soils for plant uptake. Analytical results depict that the organic carbon content of the soils, as identified under the two sites, ranges from very low to medium, and total nitrogen content is very low to low in both soil sampling stations. The chromium content is low in the soils of both sampling stations. Although soil sulfate, as determined, is high in both sites, the soils of the project area are saline, as per the laboratory analysis report. This may be caused by the higher adsorption and desorption phenomenon of the soils of both sites having high clay content, hindering the formation of bonds between the cations and anions.


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Table 4-6: Chemical properties of the supplied soil samples

S.NO.	CODE HORIZONS	Elements Contents										SO1					SO2												
		PH	EC (µS/CM)	OC+ (%)	N (%)	TOTAL P (MG/KG)	TOTAL K (%)	TOTAL S (MG/KG)	TOTAL CA (MG/KG)	TOTAL MG (MG/KG)	TOTAL NA (MG/KG)	CHLORIDE (MG/KG)	SULPHATE (MG/KG)	CR (MG/KG)	PH	EC (µS/CM)	OC+ (%)	N (%)	TOTAL P (MG/KG)	TOTAL K (%)	TOTAL S (MG/KG)	TOTAL CA (MG/KG)	TOTAL MG (MG/KG)	TOTAL NA (MG/KG)	CHLORIDE (MG/KG)	SULPHATE (MG/KG)	CR (MG/KG)		
1	Ap	8.03	137.9	1.29	0.17	1403	0.33	597.40	517.25	5.69	375	7.09	99.57	34.66	2	Ad	8.15	102.3	0.92	0.11	1367	0.33	575.76	1047.2	6.85	350	3.55	186.15	32.31
3	B21	8.20	120.2	0.37	0.04	1069	0.33	489.18	940.75	8.53	365	3.55	99.57	31.05	4	B22	8.07	104.6	0.26	0.03	1105	0.30	337.66	1021.17	8.01	350	7.09	279.44	29.24
5	C1	7.92	145.8	0.28	0.03	1319	0.40	467.53	1662.75	10.01	405	14.18	51.20	36.61	6	C2	8.00	98.50	0.32	0.04	1140	0.47	571.43	1890.25	11.49	480	3.55	41.19	36.45
7	Ap	7.34	232.0	1.26	0.18	1522	0.40	554.11	1384.0	6.96	395	14.18	445.89	30.50	8	Ad	8.00	139.3	0.81	0.10	1212	0.35	554.11	2085.0	7.54	350	7.09	445.89	34.79
9	B21	7.06	135.3	0.29	0.03	997	0.45	445.88	784.75	8.66	480	3.55	45.99	41.96	10	B22	8.23	140.3	0.26	0.03	1140	0.30	467.53	1804.75	10.23	360	17.73	186.15	32.63
11	B23	7.95	122.3	0.36	0.04	1081	0.30	489.18	1782.25	6.82	390	7.09	89.28	32.29	12	C1	8.14	122.6	0.42	0.05	1057	0.35	465.53	507.50	7.25	370	7.09	59.19	34.12
13	C2	8.09	137.7	0.23	0.02	1021	0.30	445.88	1154.75	7.29	480	14.18	229.44	31.14	Analysed Values														
		7.06-8.23	98.50-145.8	0.23-1.29	0.02-0.18	1021-1522	0.30-0.47	337.66-597.40	517.25-1890.25	5.69-11.49	350-480	3.55-17.73	41.19-445.89	29.24-41.96															
BARC, 2018		SA**	Non-Saline	VLM***	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A															

*Organic Carbon, ** Slightly Alkaline, *** Very low to medium

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149. The physical properties of soil samples are given in Table 4-7.

SL No.	Soil Code / Horizons	(%) Moisture	Particle Density (G/CM ³)	Bulk Density (G/CM ³)	Porosity (%)	WHC* (%) BY VOLUME	Permeability (CM/HR)
SQ-1							
1	AP	19.34	2.39	1.34	44.0	65.35	1.3
2	AD	23.88	2.45	1.53	38.0	55.97	0.1
3	B21	26.93	2.49	1.41	44.0	57.58	1.1
4	B22	26.82	2.60	1.46	44.0	61.78	0.1
5	C1	31.35	2.40	1.40	42.0	65.73	0.9
6	C2	34.23	2.51	1.29	49.0	68.06	0.2
SQ-2							
7	AP	25.93	2.37	1.18	51.0	69.35	2.0
8	Ad	25.16	2.42	1.46	40.0	63.54	0.3
9	B21	26.37	2.09	1.37	35.0	62.59	0.8
10	B22	28.82	2.46	1.31	47.0	61.29	1.9
11	B23	30.16	2.34	1.35	43.0	61.88	0.6
12	C1	31.81	2.53	1.42	44.0	62.31	0.1
13	C2	30.46	2.54	1.46	43.0	64.76	0.1

*Water Holding Capacity

150. Particle size analysis of the soil samples is summarized in Table 4-8

SL No.	Soil Profile Horizons	(%) Sand	(%) Silt	(%) Clay	Textural Class
SQ-1					
1	Ap	2.62	45.75	51.63	Silty clay
2	Ad	5.43	43.01	51.55	Silty clay
3	B21	4.09	51.75	44.16	Silty clay
4	B22	2.04	32.76	65.20	Clay
5	C1	1.16	32.86	65.98	Clay
6	C2	1.72	35.37	62.91	Clay
SQ-2					
7	Ap	4.79	42.50	52.72	Silty clay
8	Ad	4.55	39.91	55.55	Clay
9	B21	2.28	39.73	57.99	Clay
10	B22	3.16	44.70	52.14	Silty clay
11	B23	4.70	45.92	49.37	Silty clay
12	C1	2.04	31.76	66.20	Clay
13	C2	5.69	39.43	54.88	Clay

151. The Department of Soil and Water Conservation, University of Dhaka, analysed the soil test reports presented in Annex 5, Volume-II.

4.2.4.3 Conclusions and Recommendations.

152. The following remarks and recommendations can be provided based on the assessment of soil quality according to the field description and subsequent laboratory analysis of soils collected from different horizons of two soil profiles

- Soils of the project area characteristically have textural classes ranging from silty clay to clay in almost all horizons, possessing the good capacity of soil to remain compact with the removal of air voids and increased shear strength, decreased compressibility and permeability of soils leading to the reduction of voids ratio and limiting the flow of water through the soil.
- The project area, as consisting of soils having normal bulk density with such range of particle density (<3 gm/cc) and low organic carbon content (indicative of low organic matter), clearly indicates the good load-bearing capacity of the soils.
- Due to a good percentage (>35) of clay, the soils of the project area are potentially less permeable with very minimum susceptibility to erosion.
- The soil pH greater than 7.5 in almost all the horizons shows the presence of ample liming materials, including calcium and magnesium, which will significantly reduce wetness in soggy and clayey, enabling

4. Description of the Environmental and Social Baseline

the natural stabilization of the road infrastructure. In addition, the calcium combines with chloride present in the soils, producing calcium chloride (commonly known as hydrated lime), which may also be supplemented as an additive for obtaining optimum moisture during road construction.

► The relatively non-saline condition of the soils, together with the higher content of clay and calcium in the soils of two sites, will help the soils attain the expected compaction and soil stability for road construction.

► Sodium in soils may not cause destructive effects on soil structure owing to higher clay and calcium content, so sodium cannot negatively impact structural stability.

153. Moreover, the clay content, water holding capacity, porosity, and moisture content of the soils are not favorable for surface soil salinity in the project area due to the capillary rise and horizontal movement of salt water during the dry season.

4.2.5 LAND USE PATTERN

154. Identification, delineation, and mapping of Land use /cover are important for global monitoring studies, resource management, and planning activities. A land-use study has a pivotal role in identifying and assessing the likely impacts of the proposed project on the land environment.

4.2.5.1 Study Area

155. The land use map has been prepared for a 10 km buffer area of the road alignment to assess the impacts on the land environment.

4.2.5.2 Methodology

156. The downloaded satellite imagery from Google Earth was visually interpreted to study images' qualitative and quantitative aspects. On-screen digitization of the GeoEye Data has been carried out. The study area layers have been exported to ESRI shapefile format, and relevant attributes have been incorporated in GIS layer shapefiles. Land use spatial distribution statistics have been generated to study the land environment. The area statistics and maps generated have been presented in the following section.

4.2.5.3 Land Use Classification

157. The land use classification system presented in this report includes the more generalized first and second levels to understand changing land use patterns and the extent of spatial growth along the project road alignment. At the more generalized levels, it meets the principal objective of providing land use and land cover classification system to find land use patterns over the study area.

4.2.5.4 Existing Land Use Pattern along the Project Road Alignment

158. The analysis of the existing land use pattern along the project road alignment has been carried out for the entire alignment and is presented in Table 4-9²⁷.

159. Other than the common waterbodies (ponds and rivers), it is to be noted that Boar and Beel also fall within 10km of the road alignment.

Table 4-9: Distribution of Land Use and Study Area of the Study Area

Sl. No	Land Type	Study Area	
		Area (Squares)	Area (SqKm)
1.	Agricultural Land	568.736	
2.	Boar	0.675	
3.	Beel	3.591	
4.	Brick Field	1.171	
5.	Buildup Area	294.025	
6.	Commercial	0.487	
7.	Fisheries Area	285.060	
8.	River/Khal	33.623	
9.	Waterbodies	13.151	
10.	Road	21.845	

160. The percentage of different land uses is shown in Figure 4-2. The land use pattern shows the presence of Boar and Beels falling within 10km of both sides of the road alignments.

²⁷ Primary Data Collection by the Environment Team of BCL JV, January, 2024

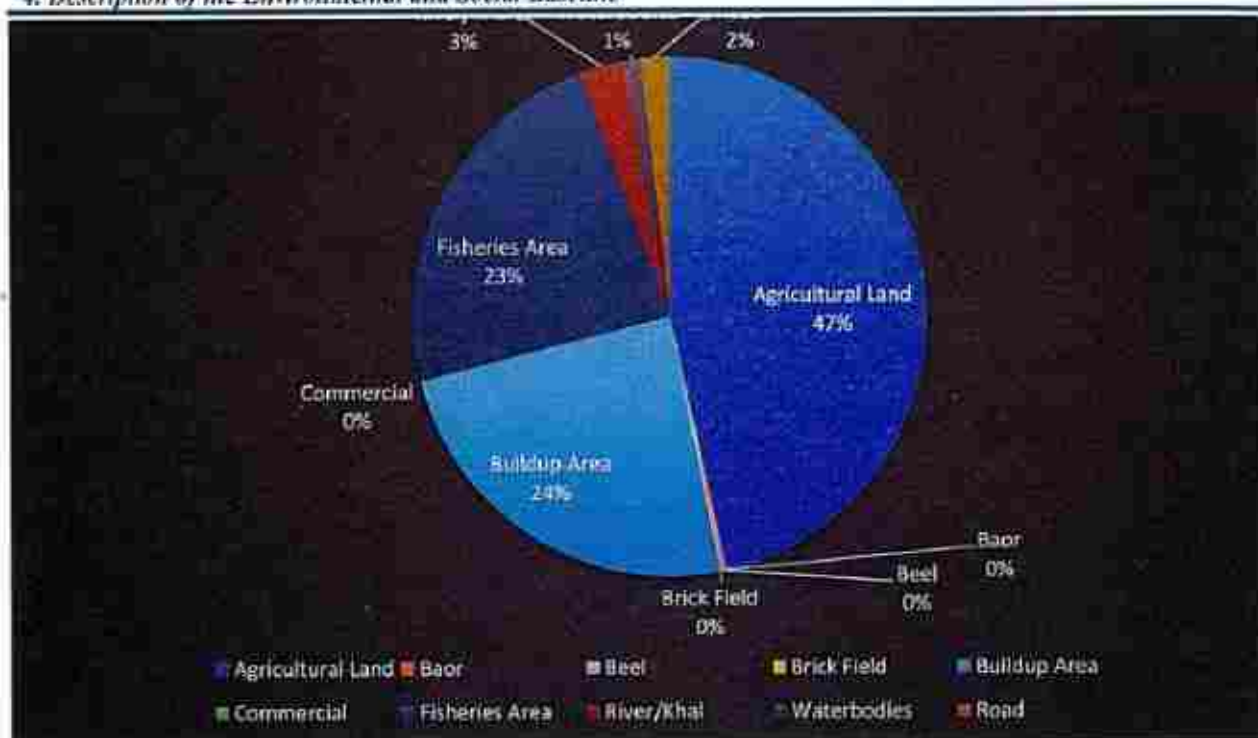


Figure 4-2: Percentage-wise land uses within 10 Km of Road Alignment

161. As shown in the **Annex 5, Volume-II**, within 10 km, the predominant land use pattern is agricultural land, followed by built-up areas, fishing cultivation ponds/shrimp farming, water bodies, etc. There is a right-hand side international boundary from Navara to Bhomra.

4.2.6 CLIMATE AND METEOROLOGY

162. The climate and meteorology of the study area are briefly discussed in the following subsections.

4.2.6.1 Climate

163. Bangladesh is in the central part of the Asiatic monsoon region, where the climate is tropical. Regional climatic differences in this flat country are minor. The relatively small size of the country and generally low-lying areas cause moderate spatial variation of temperature, precipitation, relative humidity, wind speeds, and other climatic variables. However, the climate of Bangladesh exhibits pronounced temporal variability. This is because the moisture-laden monsoon winds flow predominantly from the southwest during summer and the comparatively dry and colder north-western winds during winter.

164. The project area has a humid subtropical climate with large variations between summer and winter temperatures. The cluster has a tropical monsoon climate. It has three main seasons:

- ▶ Summer/Pre-monsoon-March to May
- ▶ Rainy Season/Monsoon-June to September
- ▶ Post-Monsoon-October to November
- ▶ Winter Season December to February

165. According to the Köppen climate classification, the project area is characterized by a tropical wet and dry climate. This region experiences a hot and humid summer and a dry winter. According to these climatic characteristics, Bangladesh has seven different climatic sub-regions (A through G). As shown in **Annex 5, Volume-II**, The project area is in the south-western climatic sub-region of the country²⁸. This zone generally receives abundant rainfall, receiving 85 percent of the annual rainfall.

166. The winter is predominantly cool and dry. The summer is hot and dry, interrupted by occasional heavy rainfall. The annual average maximum temperature is 35.7 °C, and the minimum is about 9.5 °C. The annual average rainfall in 2024 is about 2175 mm²⁹. This is a transitory zone between the Southeastern, northwestern,

²⁸ Primary Data Collection by the Environment Team of BCL JV, January 2024.

²⁹ Bangladesh Statistical Yearbook 2024.

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and southwestern zones, and most of the severe hailstorms, westers, and tornadoes have been recorded in the category 'F' Area.

4.2.6.2 Temperature

167. The project area experiences significant temperature variations as the season's change. May is the hottest month, with an average monthly high temperature of 35.7°C. The project area, on the other hand, has a milder summer than inland locations, particularly the northwest district, where summer temperatures can reach 40°C. The temperature drops dramatically in June owing to monsoon outbreaks. The monthly average temperature during the monsoon is highest 34.4°C. The cool, dry winter season begins in November, and the coldest month is January, with an average minimum temperature of 9.5°C depicted in **Figure 4-3**.

4.2.6.3 Rainfall

168. The charts of the highest rainfall recorded in 24 hours (1 day) at various stations in Bangladesh during the period (1948-2024) are as follows: Khulna - 430 mm (1986), Jashore - 281 mm (1965) & Satkhira - 302 mm (1986).²⁰ The southern monsoon was the primary source of rain. More than 85% of the total rainfall was received between May and September. The Northwestern influence causes rainfall between March and April. Winter is the driest season, with minimal or no rain. However, limited rain was recorded during December and February. The rainfall pattern between 2015 and 2024 is shown in **Figure 4-4**. According to the climate cell of the Department of Environment, changes have been seen in climatic variables such as heavy rainfalls during winter, droughts during summer, hailstorms in monsoon, and excessive temperature in pre-monsoon and monsoon seasons, and so on in the previous few years. The highest monthly average rainfall occurred in July (343.4 mm), with the lowest monthly average rainfall recorded during winter (Jan, 4.3 mm).

169. This indicates that the rainy season is very prevalent in this area. During the monsoon season, the average monthly rainfall in the project area was 202.3 mm to 343.4 mm. According to records, the maximum rainfall during the monsoon season (June-September) ranges from 396.0 mm to 735.0mm. Winter is the driest season, lasting from December to February, with an average rainfall ranging from 4.3 mm to 38.8 mm.

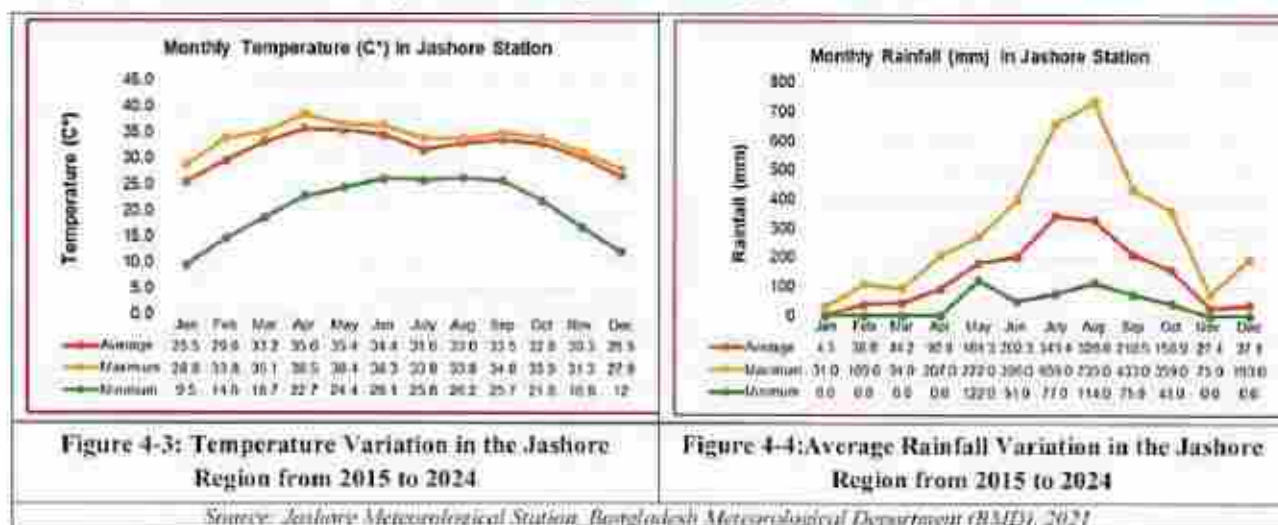


Figure 4-3: Temperature Variation in the Jashore Region from 2015 to 2024

Figure 4-4: Average Rainfall Variation in the Jashore Region from 2015 to 2024

Source: Jashore Meteorological Station, Bangladesh Meteorological Department (BMD), 2021

4.2.6.4 Humidity

170. As expected, humidity during the wet season is significantly higher than the other times of the year, as shown the **Figure 4-5**. The maximum average relative humidity for the project area is 93.9 percent in August, and the minimum relative humidity is 55.4 percent in March. Humidity is relatively dependent on temperature variations and fluctuates continuously based on the temperature of the project area. There has been a tremendous weather change observed in the project area over the last 10 to 20 years of meteorological data.

²⁰ Bangladesh Meteorological Department (BMD)

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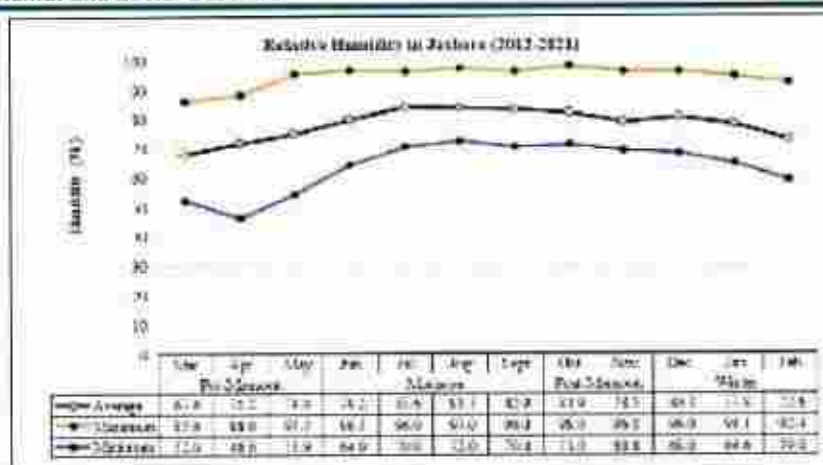
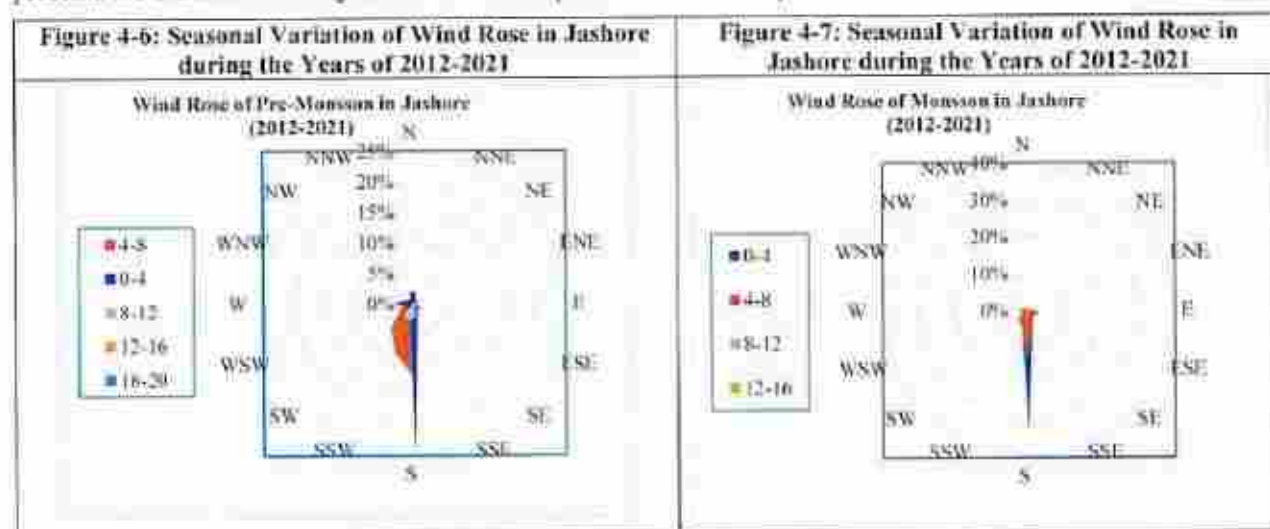


Figure 4-5: Relative Humidity Variation in Jashore Region from 2012 to 2021
Sources: Jashore Meteorological Station, Bangladesh Meteorological Department (BMD), 2021

4.2.6.5 Wind Speed and Direction

171. Wind patterns are among the most significant and influential weather factors. Therefore, understanding both direction and velocity is crucial. The Wind Rose model is employed to illustrate prevailing wind conditions in the project area, taking seasonal variations into account. This model shows the number of hours per year that the wind blows from specific directions per year. According to the wind rose diagrams, the region predominantly experiences winds from the West, West-Southwest, North, and Northwest. Throughout the year, wind speeds primarily range from 0 to 4 knots, encompassing the entire wind speed spectrum.

172. Monsoonal climate variations influence the Wind direction in the project area. The southwesterly monsoon starts in mid-March and concludes around the end of September. During this period, winds predominantly blow from the south with consistent force. In January, winds shift to originate from the north and northeast. February experiences relatively calm conditions, often characterized by foggy mornings. Figure 0-5 presents the seasonal monthly maximum wind speed direction rose plot from 2012 to 2021.



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Figure 4-6: Seasonal Variation of Wind Rose in Jashore during the Years of 2012-2021

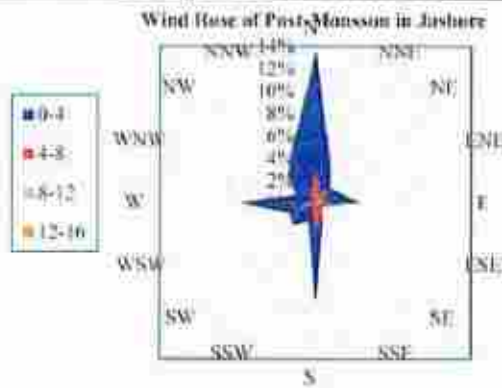
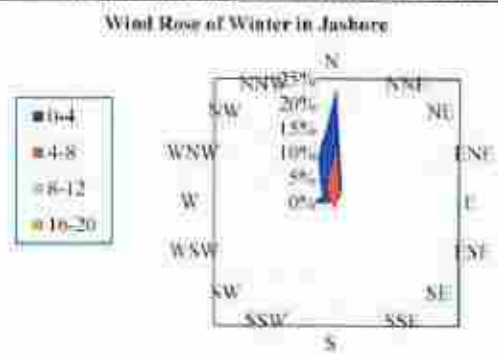


Figure 4-7: Seasonal Variation of Wind Rose in Jashore during the Years of 2012-2021



Source: Jashore Meteorological Station, Bangladesh Meteorological Department (BMD), 2021

4.3 COLLECTION OF THE BASELINE ENVIRONMENTAL CONDITIONS

173. The baseline environmental monitoring of vital environmental attributes such as ambient air quality, ambient noise level, vibration level monitoring, surface water quality, and groundwater quality was carried out along the road alignment, as shown in **Figure 4-8**. The environmental monitoring details and test report is shown in **Annex 5, Volume-II**.


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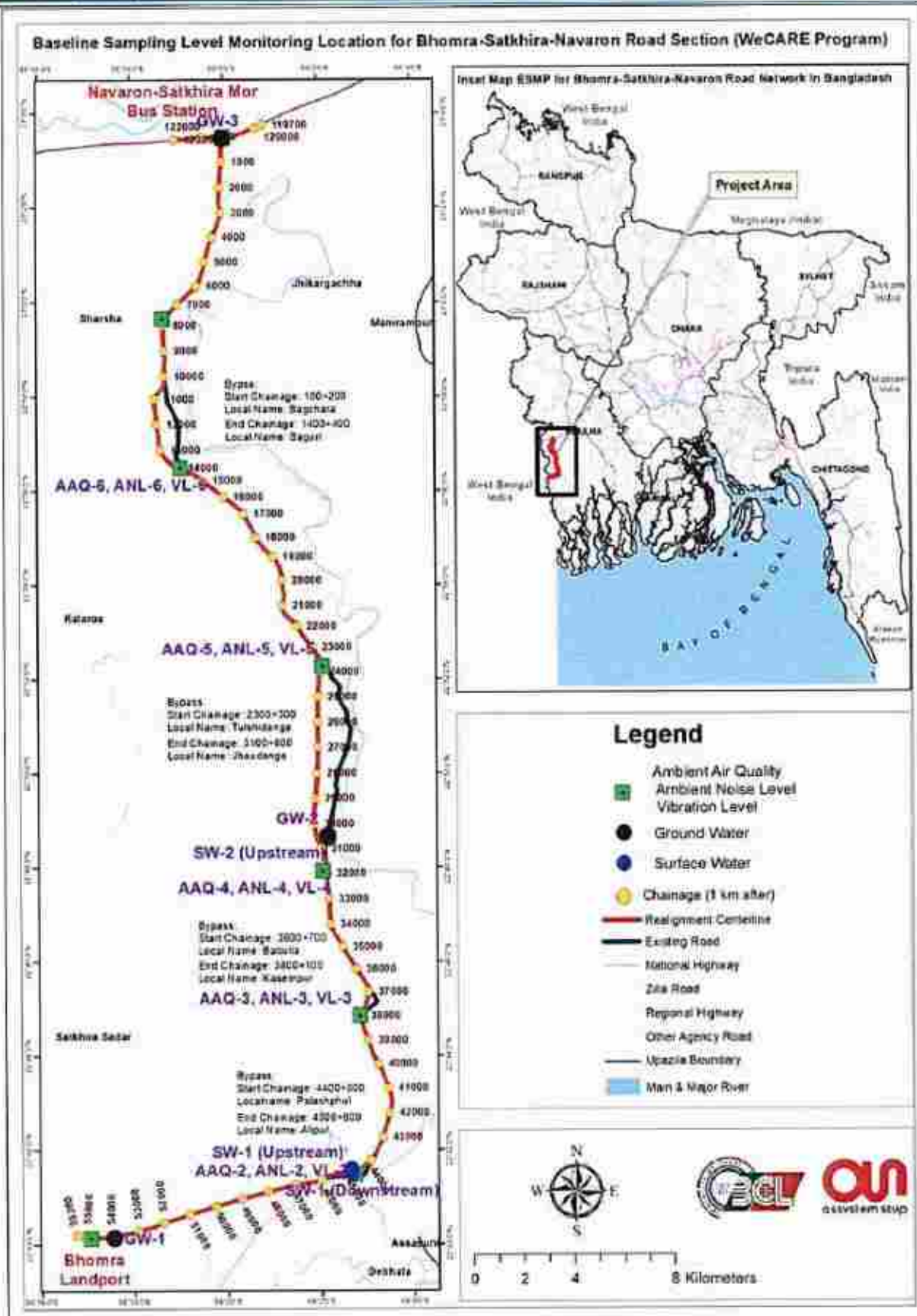


Figure 4-8: Location Map for Environmental Quality Parameters Measurement

4.3.1 AMBIENT AIR QUALITY

174. Ambient air quality measurements were conducted at nine locations along the Project Road. The sampling sites were selected based on land use patterns, including commercial zones, residential neighborhoods,

4. Description of the Environmental and Social Baseline

educational institutions, and mixed-use areas, where significant populations are present during the day and may be exposed to air pollution during road construction activities. The ambient air quality monitoring locations are detailed in Table 4-10.

Table 4-10: Ambient Air Quality Measurement Details

SL No.	Code	Locations	Area Settings	Gps Coordinate	Date and Time
1.	AAQ1	Bhomra land port, Satkhira.	Commercial	22°40'8.14"N 88°56'59.20"E	25.12.2023 11:07:16 AM
2.	AAQ2	Infront of Doctor's quarter, Satkhira Medical College, Satkhira	Residential	22°41'27.70"N 89°2'43.97"E	25.12.2023 02:38:52 PM
3.	AAQ3	Boro Jamtola, Kashiipur, Satkhira	Mixed	22°44'50.36"N 89°2'51.08"E	26.12.2023 03:48:23 PM
4.	AAQ4	Infront of Masum Billah's house, Biharinagar, Jhaudanga, Satkhira	Residential	22°47'54.73"N 89°2'4.92"E	26.12.2023 12:10:37 PM
5.	AAQ5	Shah Aamallah degree college, Tulshidanga, Kolara, Satkhira	Residential	22°52'15.31"N 89°2'5.49"E	26.12.2023 09:07:15 AM
6.	AAQ6	Infront of Abdur Rouf's house, Belola Bazar,	Silent	22°56'28.75"N 88°59'4.53"E	24.12.2023 03:25:45 PM
7.	AAQ7	Jamtola Bazar, Sharsha, Jashore	Mixed	22°59'37.92"N 88°58'42.61"E	24.12.2023 12:05:32 PM
8.	AAQ8	Navaron Mor, Sharsha, Jashore	Commercial	23°3'28.57"N 88°59'59.78"E	24.12.2023 09:14:24 AM

Source: Field Survey, 2024

175. Standard procedures were adhered to monitor and analyze ambient air quality. Samples collected at each site were analyzed for key air quality indices, including Particulate Matter with diameters of 10 microns or less (PM10), Particulate Matter with diameters of 2.5 microns or less (PM2.5), and Suspended Particulate Matter encompassing both PM2.5 and PM10 (SPM). Additionally, concentrations of Nitrogen Dioxide (NO2), Sulfur Dioxide (SO2), Ozone (O3), Carbon Monoxide (CO), and Carbon Dioxide (CO2) were assessed.

176. Among all the parameters of ambient air CO, CO2 and O3 had been converted for 8 hours and the rest of the parameters were transformed on a 24-hourly basis. Both particulate and gaseous samples were analyzed using the proper procedures.

4.3.1.1 Result and Discussion:

177. Analysis results of ambient air quality monitoring carried out along the road stretch are summarized in the following Table 4-11³⁷ these ambient air quality results are discussed in the following paragraphs.

Table 4-11: Results of the Ambient Air Quality Tastings

SL No.	Code	Concentrations (µg/m ³)					CO (ppm)	CO2 (ppm)
		PM2.5	PM10	NO2	SO2	O3		
1.	AAQ1	36.8	64.8	11.9	94.6	23.8	0.67	130.6
2.	AAQ2	27.5	31.9	2.3	83.7	21.1	0.46	124.7
3.	AAQ3	40.8	68.9	26.6	84.6	39.8	0.62	130.9
4.	AAQ4	21.9	26.7	6.6	73.0	27.7	0.39	125.0
5.	AAQ5	33.5	42.6	14.3	60.6	25.3	0.60	321.5
6.	AAQ6	24.5	33.5	11.4	163.2	23.1	0.39	129.0
7.	AAQ7	49.3	55.7	13.0	178.3	21.9	0.60	137.1
8.	AAQ8	62.6	72.0	27.1	132.3	28.1	0.74	152.0
National Standard ³⁷		65	150	80	80	100	05	-

178. Ambient air quality samples in the study area has been collected and compared with the applicable standard of Bangladesh considering Air Pollution (Control) Rules, 2022. According to the g results, dust particles (particulate matter), e.g., PM2.5 and PM10, have been observed below the national standard of Bangladesh. AAQ7 and AAQ8 showed comparatively high concentrations of particulate matter (PM 2.5 and PM 10) among all the sampling locations. Therefore, dust pollution is a common phenomenon in Bangladesh, including this project area, due to a lot of vehicle movement, sand transportation, transportation, local construction, road dust, etc. Besides, the main reason for the abundance of dust or particulate matter is people's unconsciousness. All gaseous parameters are within permissible limits except SO2. High-volume SO2 was found in AAQ6, AAQ7,

³⁷ Source: Primary Data Collection by the Environment Team of STUP-BCL JV, December 2023

³⁸ Air Pollution (Control) Rules, 2022

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BCL Associates Limited, Bangladesh

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and AAQ8. The standard also exceeds AAQ1, AAQ2, and AAQ3. High concentrations of SO₂ may be caused by domestic heating by firewood, high volume of vehicles, etc. Figure 4-9³⁵ depicts recorded Air Quality Results with Standard Comparison.

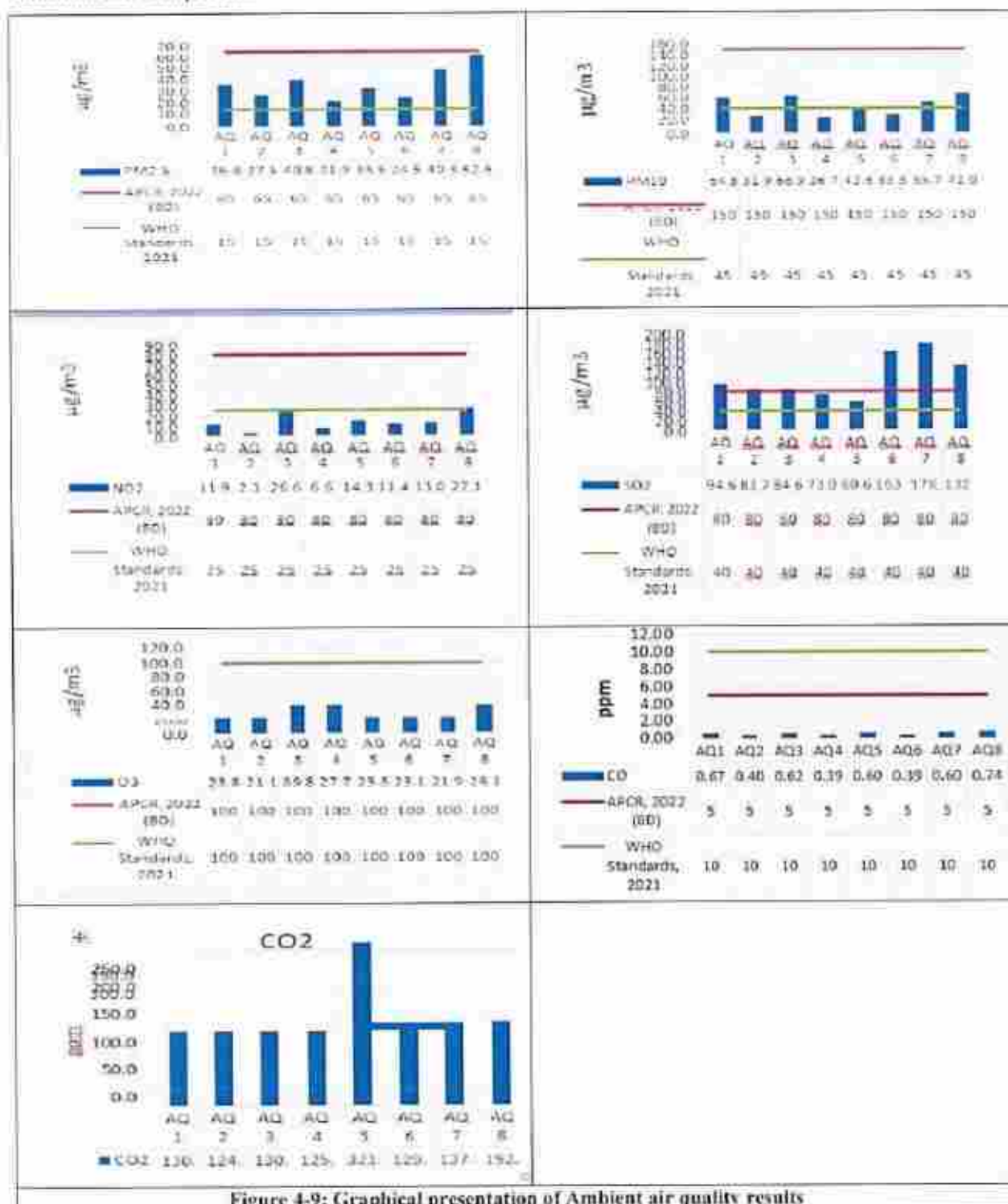


Figure 4-9: Graphical presentation of Ambient air quality results

4.3.2 AMBIENT NOISE LEVEL

179. 24. Continuous high noise level is harmful for human health. According to the World Health Organization's Guidelines for Community Noise (1999), while ongoing exposure to sound pressure levels over 85 dB is usually considered the critical level for temporary hearing damage. Two primary sources of noise have been identified in the project area:

³⁵ Source: Primary Data Collection by the Environment Team of BCL JV, May 2023

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- ▶ Road traffic is a primary noise source in the project area. The movement of numerous motorized vehicles on this roadway leads to noise along the road corridors.
- ▶ Commercial/Bazaar Areas: Markets and bazaars along the project's existing road are busy all day and generate significant noise.

180. To establish the baseline, eight (8) noise level stations were selected along the road, and these are the same locations where air quality monitoring was done during the field investigations. Noise levels have been recorded in the form of sound pressure levels using a digital sound level meter. Details of noise level sampling locations is given in **Table 4-12**¹⁴. The sound level is recorded as A-weighted equivalent continuous sound pressure level (Leq) values using A-weighted filters in the noise measuring instrument.

Table 4-12 Ambient Noise Level Measurement Details

Sl. No.	Code	Locations	Area Settings	GPS Coordinate	Date
1.	ANL1	Bhomra land port, Satkhira	Commercial Zone	22°40'8.14"N 88°56'59.20"E	25.12.2023
2.	ANL2	Hospitals,	Residential Zone	22°41'27.70"N 89° 2'43.97"E	25.12.2023
3.	ANL3	Boro Jamtola, Kashempur, Satkhira	Mixed Zone	22°44'50.36"N 89° 2'51.08"E	26.12.2023
4.	ANL4	, Biharinagar, Jhaudanga, Satkhira	Residential Zone	22°47'54.73"N 89° 2'4.92"E	26.12.2023
5.	ANL5	Shah Anullah degree college, Kolaroa, Satkhira	Residential Zone	22°52'15.51"N 89° 2'5.49"E	26.12.2023
6.	ANL6	Infront of Abdur Rouf's house, Beltola Bazar,	Silent Zone	22°56'28.75"N 88°59'4.53"E	24.12.2023
7.	ANL7	Jamtola Bazar, Sarsha, Jashore	Mixed Zone	22°59'37.92"N 88°58'42.61"E	24.12.2023
8.	ANL8	Bhomra land port, Satkhira	Commercial Zone	22°40'8.14"N 88°56'59.20"E	24.12.2023

4.3.2.1 Results and Discussion

181. An electronic and auto-recorded noise meter has been used to monitor ambient noise levels. The recorded noise level monitoring results are presented in **Table 4-13** and ¹⁵ **Figure 4-10**.

Table 4-13: Ambient Noise Level Analysis Results

Sl. No.	Code	Noise Level (dBA)							*Standard (dBA)	
		Leqday	Leqnight	L90	L10	L50	Lmax	Lmin	Day	Night
1.	ANL1	63.6	49.9	48.6	60.1	54.2	85.4	47.8	70	60
2.	ANL2	58.5	45.1	44.6	59.7	49.7	80.3	38.7	55	45
3.	ANL3	64.6	45.9	39.0	63.7	51.0	82.7	37.1	60	50
4.	ANL4	53.8	39.3	32.8	46.0	43.4	75.6	32.2	55	45
5.	ANL5	51.4	36.7	32.7	50.2	42.5	72.9	32.0	50	40
6.	ANL6	61.9	46.4	34.2	64.7	48.8	42.6	32.3	60	50
7.	ANL7	64.1	50.3	46.6	53.1	50.9	84.1	46.6	60	50
8.	ANL8	69.4	59.5	50.4	63.4	58.6	91.3	40.4	70	60

Note: *Noise Pollution (Control) Rules, 2006

182. According to the Noise Pollution Control Rules 2006, the project locations fall into four categories. Among these locations, ANL-2, ANL-3, ANL-5, ANL-6, and ANL-7 cross the national standard slightly because of the high noise from vehicles in the daytime. National and international standards and detailed results are shown in **Table 4-13** above, and a graphical presentation of ambient noise level monitoring results along with Standards is presented in **Annex 5, Volume-II**.

¹⁴ Source: Primary Data Collection by the Environment Team of STUP-BCL JV, December 2023

¹⁵ Source: Primary Data Collection by the Environment Team of BCL JV, December 2023

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By Association and
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E&S Consultant, WeCARE

BCL Associates Limited, Bangladesh

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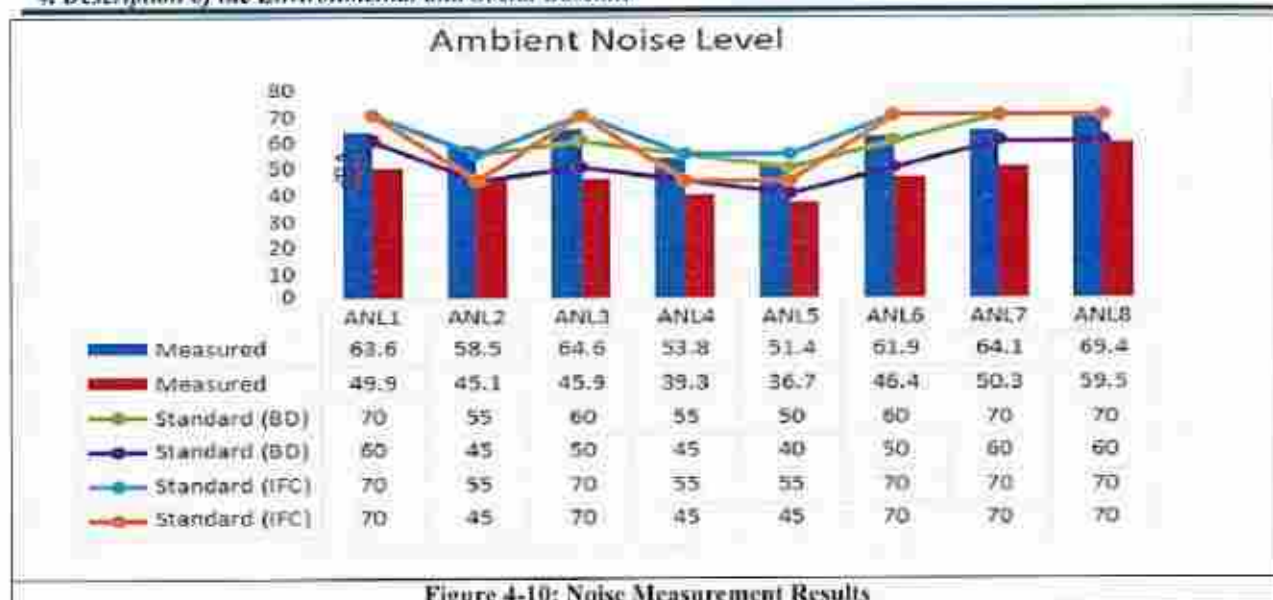


Figure 4-10: Noise Measurement Results

183. Vehicle movement, population gathering in local markets, and other noise-generating activities, such as loudspeakers, were the leading causes of noise in the project area.

4.3.3 AMBIENT VIBRATION LEVEL

184. Considering the movement of the heavy vehicle on the proposed road section, vibration levels were measured at eight locations and at the same locations where air and noise monitoring were carried out, presented in Figure 4-10⁶⁶. The ambient vibration monitoring locations show Table 4-14⁶⁷. A digital vibration level meter records the vibration level at eight locations in the study area.

Table 4-14: Vibration Level Measurement Locations

Sl. No.	Code	Locations	Area Settings	GPS Coordinate	Date and Time
1.	VL1	Bhomra land port, Satkhira	Commercial	22°40'8.14"N 88°56'59.20"E	25.12.2023
2.	VL2	Quarter, Satkhira Medical College, Satkhira	Residential	22°41'27.70"N 89° 2'43.97"E	25.12.2023
3.	VL3	Boro, Jamtola, Kashempur, Satkhira	Mixed	22°44'50.36"N 89° 2'51.08"E	26.12.2023
4.	VL4	Infront of Masum Billah's house, Biharinagar, Jhaudanga, Satkhira	Residential	22°47'54.73"N 89° 2'4.92"E	26.12.2023
5.	VL5	Shah Annullah degree college, Tulshidanga, Kolaroa, Satkhira	Residential	22°52'15.51"N 89° 2'5.49"E	26.12.2023
6.	VL6	Infront of Abdur Rouf's house, Beltola Bazar,	Silent	22°56'28.75"N 88°59'4.53"E	24.12.2023
7.	VL7	Jamtola Bazar, Sharsha, Jashore	Mixed	22°59'37.92"N 88°58'42.61"E	24.12.2023
8.	VL8	Bhomra land port, Satkhira	Commercial	22°40'8.14"N 88°56'59.20"E	24.12.2023

4.3.3.1 Results and Discussion

185. An electronic and auto-recorded vibration meter has been used to conduct the study. The recorded tested vibration levels summary results are shown in Table 4-15.⁶⁸ The project area's vibration intensity is negligible. On the other hand, the vibration from traffic on a neighboring road is insignificant.

⁶⁶ Source: Primary Data Collection by the Environment Team of BCL JV, December 2023

⁶⁷ Source: Primary Data Collection by the Environment Team of BCL, December 2023

⁶⁸ Source: Primary Data Collection by the Environment Team of BCL JV, December 2023

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Table 4-15: Vibration Level Analysis Results

Sl. No.	Code	Vibration Level (mm/s)			Standard (mm/s)
		Average	Maximum	Minimum	
1.	VL1	0.63	1.2	0.13	Not Set Yet for Bangladesh
2.	VL2	0.87	1.95	0.12	
3.	VL3	0.98	1.91	0.23	
4.	VL4	0.74	1.27	0.11	
5.	VL5	0.71	1.90	0.27	
6.	VL6	0.64	1.02	0.28	
7.	VL7	0.62	1.23	0.09	
8.	VL8	0.79	1.37	0.08	

Therefore, the average vibration level on the existing highway ranges from 0.63 to 0.98 mm/s. Many vehicles have been moving on this highway during both daytime and nighttime. The main sources of vibration generation in the study area are road traffic, local construction, heavy traffic, etc.

4.3.4 SURFACE WATER QUALITY

186. During the field survey, samples were collected from around the proposed highway's key rivers and canals (e.g., Betna River, Bakal Canal, and Noulhal Canal). Surface water samples were collected from the six selected locations given in **Table 4-16**. The consultant collected these samplings and testing is done by the Bangladesh Environmental Engineering Training and Lab Services Ltd. to test the water quality parameters. The water samples were analyzed for the bacteriological and physio-chemical parameters and compared to the national and international standards.

Table 4-16: Surface Water Sampling Details from River

Water Type	Code	Source of water	Sampling location	Date and Time	Coordinates
Surface Water	SW-1 (Upstream)	Bakal Canal	Alipur, Satkhira	08/02/2024 7:05 AM	22°41'40.12"N 89° 2'36.34"E
	SW-1 (Downstream)			08/02/2024 7:15 AM	22°41'27.53"N 89° 2'39.68"E
Surface Water	SW-2 (Upstream)	Noulhal Canal	Brozobaksha Bazar, Kolarna, Satkhira	08/02/2024 8:10 AM	22°53'22.22"N 89° 1'29.49"E
	SW-2 (Downstream)			08/02/2024 8:25 AM	22°53'4.31"N 89° 1'26.69"E
Surface Water	SW-3 (Upstream)	Betna River	Navaron, Jhikargacha, Jashore	08/02/2024 09:30 AM	23° 3'35.45"N 89° 0'9.07"E
	SW-3 (Downstream)			08/02/2024 09:50 AM	23° 3'24.38"N 89° 0'10.07"E

Source: Primary Data Collection by the Environment Team of BCL

187. The surface water of the project area is analyzed using biological and physiochemical parameters. All of the parameters are compared with the national standard as shown in **Table 4-17**. The surface water analysis results compared to the standard are shown in **Table 4-1**. The test reports are in **Annex 5, Volume-II**.

188. Surface water parameters from the project road alignment's water bodies have been compared with the Environmental Conservation Rules (ECR), 1997/2023. All the surface water parameters have been compared to Schedule 2 accordingly. All parameters in all sampling locations are found within the standard.


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Table 4-17: Surface Water Analysis Results of River

Parameters	Unit	SW1 (Upstream)	SW2 (Downstream)	SW2 (Upstream)	SW2 (Downstream)	SW3 (Upstream)	SW3 (Downstream)	Bangladesh Standard d ³⁰	Test Method (APHA)
TDS	mg/L	222	355	207	200	205	213	1000	APHA 23 rd EDN, 2017 (2540 C)
Turbidity	NTU	5.04	4.85	1.65	3.20	2.46	3.50	NYS	APHA 23 rd EDN, 2017 (2130 B)
pH	-	6.99	6.78	7.01	6.89	6.04	7.14	6-9	APHA 23 rd EDN, 2017 (4500 C)
DO	mg/L	6.02	6.08	6.97	7.01	6.80	6.14	≥5	APHA 23 rd EDN, 2017 (4500 B)
Phosphate (PO ₄ -P)	mg/L	<1.0	<1.0	<1.0	<1.0	1.1	1.3	NYS	APHA 23 rd EDN, 2017 (4500 P)
Nitrate	mg/L	3.1	6.2	4.4	7.2	5.3	8.2	10	APHA 23 rd EDN, 2017 (4500 NO ₃ -N)
Oil and Grease	mg/L	5.20	4.23	4.01	4.12	5.16	4.19	10	APHA 23 rd EDN, 2017 (5520 B)
TSS	mg/L	29.4	23.11	28.6	36.2	21.89	34.06	100	APHA 23 rd EDN, 2017 (2540 D)
TC	CFU/100 ml	120	123	219	116	225	227	≤5000	APHA 23 rd EDN, 2017 (9222 B)
FC	CFU/100 ml	17	20	15	14	21	23	NYS	APHA 23 rd EDN, 2017 (9222 D)
Temperature	°C	23	25	23	24	25	24	-	APHA 23 rd EDN, 2017 (2550 B)
BOD	mg/L	16.9	19.2	23.1	27.3	22.4	25.3	30	APHA 23 rd EDN, 2017 (5210 B)

Source: Laboratory Analysis by Bangladesh Environmental Engineering Training & Lab Service Ltd., February 2024

³⁰ Bangladesh Environment Conservation Rules, 2023, Schedule 2 (Standards for Inland Surface Water, Water Usable for Fisheries)

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4.3.5 GROUNDWATER QUALITY

189. The aquifer in the project region is primarily recharged by deep percolation of rain and floodwater. The actual recharge appears far less than its potential, resulting in a significant drop in the seasonal water table. During the dry season, the groundwater level in the Project area decreases yearly. The combined consequences of decreasing rainfall, severe droughts, increasing warmth, and reduced river flow during the dry season are most likely the reasons for this loss. The project site is in a high land area, and water is available at 150-200 feet depth.

190. Groundwater samples were collected from the project site to analyze chemical parameters and obtain a primary idea regarding groundwater quality. Shallow tube wells in the project area were selected as groundwater sources. Details of the groundwater sampling locations are shown in Table 4-18.

Table 4-18: Groundwater Sampling Details

Water Type	Code	Source of water	Sampling location	Date and Time	Coordinates
Ground Water	GW-1	Tube well	Bhomra Land port road, Alipur Bazar, Satkhira	08/02/2024 67:45 AM	22°41'13.03"N 89° 1'14.43"E
Ground Water	GW-2	Tube well	Khalsi, Helola, Kolaroa, Satkhira	08/02/2024 8:50 AM	22°53'16.45"N 89° 1'29.17"E
Ground Water	GW-3	Tube well	Ramizuddin's house, Islampur, Navara, Jashore	08/02/2024 10:05 AM	23° 3'34.04"N 89° 0'10.69"E

Source: Primary Data Collection by the Environment Team of BCL

191. The ground water of the project area is analyzed on biological and physio-chemical parameters. All the parameters are compared with the national standard. The groundwater analysis results compared to the standard are shown in Table 4-19.

Table 4-19: Groundwater Analysis Results

Parameters	Unit	GW1	GW2	GW3	Bangladesh Standard ⁴⁰	Test Method (APHA 23 rd Edn, 2017)
Fe	mg/L	0.67	0.77	0.54	0.3-1.10	3500- Fe
Mn	mg/L	0.38	0.42	0.19	0.4	(3500- Mn
pH	--	6.77	7.09	6.92	6.5-8.5	4500-O
As	mg/L	<0.002	<0.002	<0.002	0.03	3500- As
Cl ⁻	mg/L	24	49	54	250	3500- Cl
PO ₄ ³⁻	mg/L	4.02	6.08	8.01	15	3500 Pj
NO ₃ ⁻	mg/L	8	11	13	45	3500-NO ₃
SO ₄ ²⁻	mg/L	<25	<25	<25	250	3500-SO ₄ ²⁻
Temperature	°C	24	25	24	20-30	2500 B
TC	CFU/1000 ml	21	29	34	0	9222 B
FC	CFU/1000 ml	11	19	15	0	9222 D

Source: Laboratory Analysis by Bangladesh Environmental Engineering Training & Lab Service Ltd., February 2024

192. Groundwater parameters of the existing sources have been compared to the best practices tools in Bangladesh called Environmental Conservation Rules (ECR), 1997, Schedule 3 (B) for understanding the baseline status of the parameters' quality. After a comparative study between the testing data and the standard, it's easy to understand that Manganese (Mn) for GW2 is slightly higher than the standard. Total and fecal coliform also exceed the standard, indicating that the samples' groundwater is biologically polluted. Besides these, other parameters are within the standard. Literature also shows that with frequent waterlogging, floods, and improper sanitation, water bodies in the country are getting contaminated with fecal coliform and various pathogenic bacteria (Sarker et al.2019; Rahman et al., 2014). Most of the cities of Bangladesh rely almost exclusively on groundwater for their water supply (Khan, 2019; Hasan et al., 1999; Zuthi et al., 2009).⁴¹ This intensive water abstraction from the aquifer has induced rivers' recharge and enhanced vertical leakage from contaminated regions. Poor-quality water has invaded the aquifer from

⁴⁰ Bangladesh Environmental Conservation Rules, 2023, Schedule-2(B).

⁴¹ Parvin, F., Haque, M.M., & Tareq, S. M. (2021). Recent status of water quality in Bangladesh: A systematic review, meta-analysis and health risk assessment. Environmental Challenges, 0, 100416. <https://doi.org/10.1016/j.envc.2021.100416>

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a polluted stretch of river (Rampley et al., 2020; Burgess, et al., 2011).⁴¹ The SEA report Sundarbans reports that Arsenic contamination of drinking water is a serious issue in parts of the SW region and may be due to rice cultivation in the area⁴².

4.4 HYDROLOGY AND WATER RESOURCES

4.4.1 GENERAL HYDROLOGY AND RIVER NETWORK

193. Rivers play a crucial role in shaping geopolitics and human culture. Several rivers are in the Jessore and Satkhira districts, and project roads either run parallel to some of them or cross at different locations.

194. The project area belongs to the Gangetic Plain. The water of the Ganga once inundated it through several small rivers. During the exploration by the ecology team in the project area, five canals, rivers, and a good number of ponds were detected. These are Brozobaksha canal, Pran Sayer canal, Satkhira canal, and Gangria canal, crossing the project road at four different spots, and the Betna river does not cross the project road but rather moves parallel to the project road up to Satkhira town. The rivers and canals have now almost lost their navigation. Rivers and channels are essential habitats for many plants and animals. Aquatic plants, insects, aquatic birds, fish, reptiles, amphibians, and invertebrates live in the rivers and channels. They all find their food in the river. The river and canals connect different habitats and their value to plants and animals. Rivers, channels, and wetlands in the Satkhira district are sensitive issues related to commercial marine fish cultivation and waterlogging systems. Any impacts on the channels and rivers from development works may raise huge debates among the local people.

195. Betna River originates from India and enters Bangladesh along with the Benapole border of the greater Jashore district. The river moves towards the east along the Jashore road, finally crosses the road on the eastern side of Navaron, and moves towards the south along the Navaron – Satkhira Highway. Before crossing Navaron Road, the Betna River coiled many times in the Sarsha upazila, and blockages of many parts of the river created several Oxbow lakes. When the river reaches Khulna, it is called the Kalia River and forms a branch called the Dalua River. The Kalia River is a tributary of the Kobadak River. When it reaches the Sundarbans, the Betna River changes its name to the Arpungachhia River. The river changes its name again to the Malancha River before flowing into the Bay of Bengal. Upstream, the river is dissected into different ponds and used by the locals for fish cultivation. The Betna River flows during the rainy season and transports rainwater from the western part of Jashore district. During the dry season, the river lost its flow towards Satkhira. When the river lost its flow, it was occupied by several aquatic vegetation, including water hyacinths.

196. Brozobaksha channel is the natural distributary branch of the Betna River that originated from the Bikhali area near the north-eastern corner of Kalaroa upazila, crossed the Navaron-Satkhira road before Kalaroa upazila, and finally met in the Pransayer channel before Satkhira town at the bypass road. The water of this channel is mainly covered by aquatic vegetation, and an abundant one is water hyacinth with other associated aquatics. Some water-tolerant common tree species ornament both sides of the banks. Common insects, aquatic birds, fish, reptiles, amphibians, and invertebrates live in this channel.

197. Pran Sayer canal (manmade) is a downstream branch of the Brozobaksha channel; it started in the north of Satkhira Sadar, passed through Satkhira town, and finally met at the Satkhira channel in the southern part of the town. This canal is mainly created to drain water from the north part of Satkhira Sadar to the Satkhira canal at the south. Currently, this channel is polluted and sometimes logged by the solid pollutants from the town. The maximum area of canal water covered by aquatic vegetation, including water hyacinth. Some water-tolerant tree species are seen on both sides of the banks. Common pollutant-tolerant insects, aquatic birds, fish, reptiles, amphibians, and invertebrates live in this channel. Jhdjshjshs.

198. Satkhira canal (upstream of the Murrichap River and called Bakalabadani channel) was created from the Murrichap River endpoint to facilitate water drainage from upstream and to provide water for the cultivation of commercial fisheries in the northern part of Satkhira Sadar Upazila. This canal crossed the project road near the medical college on the west side of Satkhira town. On the bank of Satkhira canal, the district administration established an eco-park using both land and mangrove plant species. The plantation program and related works at the park are not finished yet. Any development activities near this eco-park are sensitive to the park environment. The water surface of this channel is free from substantial aquatic vegetation. Many mangrove plant species, like

⁴¹ Updated Draft Final SEA Report, September 2021, Bangladesh Forest Department (BFD) of the Ministry of Environment, Forests and Climate Change.

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Sundarban vegetation, ornament both banks. Common insects, aquatic birds, fish, reptiles, amphibians, and invertebrates live in this channel.

199. The Gangnia channel, a natural channel, started from the north-western part of the Satkhira district near the Indian border, crossed the road before the Bhomra landport moved south, and finally met the Labangabati River, where the Swish gate-controlled water flow. Currently, large-scale commercial marine fish farming is taking place in the upstream area of this channel. The water surface of this channel is free from huge aquatic vegetation. Several mangrove plant species, like Sundarban vegetation, ornament both banks. Common insects, aquatic birds, fish, reptiles, amphibians, and invertebrates live in this channel.

200. All rivers and canals usually lose their natural water flow due to siltation, encroachment, and fish cultivation wherever and whenever local people get the opportunity in the project area. These rivers and channels downstream are controlled by a SWISH gate to control water-logging upstream, where commercial cultivation of marine fish is practiced. Once Satkhira Sadar Upazila suffered permanent waterlogging, the water development board took the necessary steps to solve it by digging channels and making networks among the rivers and channels. In recent years, local entrepreneurs have subjected the water-logged area to marine fish cultivation. Such cultivation is enhanced by the water supply downstream. The water development board monitors all the channels. In some cases, water hyacinth is seen during the dry season.

201. The upgrade from a 2-lane to a 4-lane road won't significantly impact local or regional hydrology due to the area's southwest gradient. Existing east-west openings on the road embankment prevent drainage issues during monsoons. The construction will largely follow the current alignment, maintaining the number of hydrological structures but with larger water openings and additional cross-drainage structures to address hydrological and climate change considerations.

4.5 NATURAL HAZARDS

202. Bangladesh is almost 10% prone to seasonal floods and up to 24% vulnerable to flooding during wet years. Deadly tropical cyclones regularly hit it due to its unusual geographic location. When cyclones land, the funnel-shaped northern region of the Bay of Bengal creates tidal waves, affecting thousands of people along the shore. The project area is geographically elevated because Jashore is in Bangladesh's southwestern region and near the Bhairab River. It has a moderate risk of natural disasters such as floods, cyclones. Whereas, considering Bangladesh's seismic zoning, the project area is less vulnerable to earthquakes.

4.5.1.1 Flooding

203. The area has a moderate risk of natural disasters like cyclones and floods, as it is geographically low-lying. The start of the project road at Navarua has a higher elevation than the endpoint at Satkhira, which is low-lying. Floods occur moderately in the project region but not regularly due to its geographic location. The classification is based on the BWDB's flood management database from 1998. Flood zones are shown in **Annex 5, Volume-II**. According to the BWDB, a moderate flood zone is where 1-5 feet of flooding occurred in 1998. Rapid landfilling by land developers has significantly altered the terrain of the surrounding area, and it is expected that rapid filling will gradually encroach on the floodplains of the Bhairab and Chitra rivers. Both rivers' water levels will rise due to the current landfilling tendency and future urbanization. The crest level of the road must be calculated because of rising water levels in adjacent rivers and unpredictable local high rainfall in a short period due to climate change. The water levels of the Periphery Rivers determine the drainage of the surrounding areas. As a result, the project region is safe from intensive flooding. According to flood records from 1988 and 1998, during the high flood, the project road communication was never hindered or damaged. This national roadway is elevated above the flood level. There is no submergence of the road due to flooding in the area, but waterlogging is a problem.

4.5.1.2 Cyclone

204. Cyclones are most common in the Bay of Bengal between April and May and October and November. Bangladesh is frequently the landing ground of cyclones originating in the Bay of Bengal because of its funnel-shaped shoreline. From 1793 to May 2021, there were approximately 54 devastating cyclones in Bangladesh's coastal area. During this time, cyclones occurred around once every 4.5 years on average. These cyclones wreak havoc on the country's farms, crops, infrastructure, and the lives of coastal residents. The cyclone intensity around the project site is often lower than in other parts of the coastal belt. Deadly tropical cyclones regularly hit Bangladesh due to its

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unusual geographic location. When cyclones land, the funnel-shaped northern region of the Bay of Bengal creates tidal waves, affecting thousands of people along the shore. The project area is not located in a cyclone danger zone. The project area is geographically elevated because Jashore is in Bangladesh's southwestern region near the Bhairab River. It has a low risk of natural disasters like cyclones, floods, and earthquakes.

4.6 ECOLOGY AND BIOLOGY

205. To establish the baseline of ecology and biodiversity, field investigations have been carried out along the road alignment, and a study area has been defined. The study has been carried out from 21 May to 23 May 2024 and 20th September 2024.

4.6.1 STUDY AREA

206. The study area has been taken as a 61.125 km × 200 m area on the highway that extends from Navaron Point, Jessore, to Bhomra Land Port, Satkhira. The total length of the proposed highway (61.184 km) has been taken as the transect, and the width has been considered 200 m, i.e., 100 m from the center line of the proposed road on both sides (RHS and LHS), which formed the study area for carrying out the assessment. For the sampling, ten (10) square quadrats, each of area 200 m × 200 m, have been selected within the study area mentioned above. Four cross-canal sites have also been studied for carrying out aquatic surveys, especially for fish and aquatic fauna. Furthermore, the extended area also surveyed covering surrounding rivers and forest or dense orchard area. If the quadrat has fallen in the market area (*bazaar*), the quadrat has been shifted before or after the bazaar for better representation of ecological assessment. The locations of these sampling stations are in **Table 4-20**. In addition to this survey, another survey was conducted to enumerate all trees that fall on both sides (RHS and LHS) of the road from the center and will be cut down during the road construction. These trees belong to RHD, Social Forestry, Zila Parishad, and private owners.

Table 4-20: List of Field Investigations Sampling Sites for Terrestrial and Aquatic Ecology

Sl no.	Sampling Spot	Location	Latitude	Longitude
1	Quadrat 1	Navaron Mor	23°03'29"N	88°59'56"E
2	Quadrat 2	Harikhal	23°00'18"N	88°59'24"E
3	Quadrat 3	Bagachira	22°57'15"N	88°59'02"E
4	Quadrat 4	Kazirhat	22°54'39"N	89°00'55"E
5	Quadrat 5	Kalaroa	22°51'42"N	89°01'50"E
6	Quadrat 6	Jhaudanga	22°48'24"N	89°02'01"E
7	Quadrat 7	Betla	22°45'19"N	89°03'03"E
8	Quadrat 8	Fariduler Mor	22°42'11"N	89°03'18"E
9	Quadrat 9	Daspura	22°40'56"N	89°00'14"E
10	Quadrat 10	Bhomra Land Port	22°40'09"N	88°56'53"E

207. The location map of the sampling mentioned above sites is presented in **Annex 5, Volume-II**.

4.6.2 TERRESTRIAL ECOLOGY

208. Terrestrial habitats include roadsides, homesteads, and cultivated lands. A total of 119 woody plant species that include shrubs, trees, and climbers (excluding herbs) have been recorded from the terrestrial habitat of the study area. Among the recorded 119 species (Refer to **Figure 4-11** and **Figure 4-12**), 38% were represented by fruit-bearing tree species, followed by ornamental (25%), medicinal (24%), and timber-producing plants (13%). A detailed list of tree species is provided in **Annex 5, Volume-II**. From the assessment of terrestrial flora, species under the Red List categories of IUCN (Threatened, Endangered, Critically Endangered, Vulnerable, and so on), species protected by laws including CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), and species protected by the Wildlife Protection & Security Act, 2012 were not recorded. In addition, roadside flora, homestead flora, agricultural flora, and aquatic flora are briefly discussed in the following subsections.

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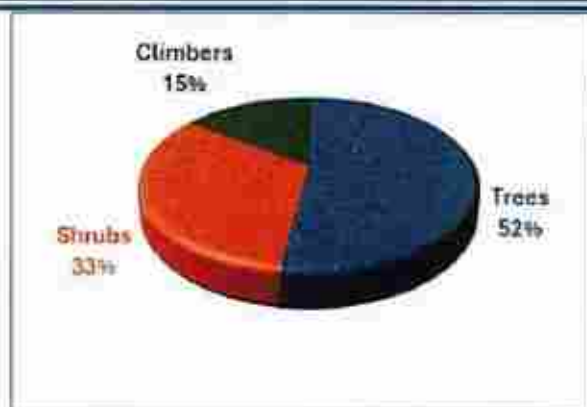


Figure 4-11: Habit Groups of Plant Species

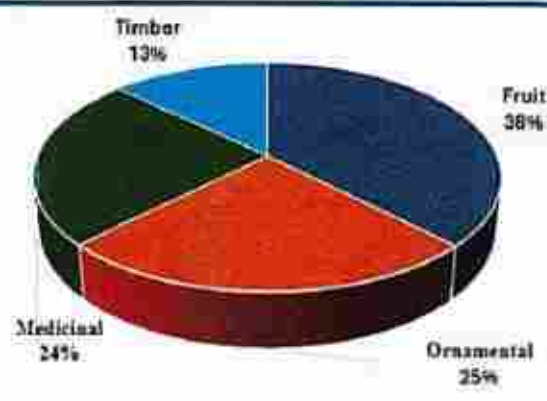


Figure 4-12: Percentage of Terrestrial Trees

4.6.2.1 Roadside Flora

209. The trees found in the road alignment were planted by RHD, Social Forestry Division, and Zila Parishad. Most common trees are *Samanea saman* (Rain tree), *Phoenix dactylifera* (Khejur), *Senna siamea* (Minjiri), *Terminalia arjuna* (Arjun), *Swietenia mahagoni* (Mahogoni), *Borassus flabellifer* (Taal), *Dalbergia sissoo* (Sishu Gach), *Ficus benghalensis* (Bot), *Ficus religiosa* (Ashwatha Bot), *Moringa oleifera* (Sajina), *Neolamarkia cadamba* (Kodorn), *Pithecellobium dulce* (Khoiya Babla), *Mangifera indica* (Aam), *Artocarpus heterophyllus* (Kanthal), *Albizia procera* (Sada Koroi), *Borassus flabellifer* (Taal), *Areca catechu* (Supari), and *Delonix regia* (Krishnachura). Some native bushy plants were also found on both sides of the road. The major species are *Calotropis gigantea* (Akanda), *Clerodendrum viscosum* (Vaat), *Ficus hispida* (Kak Dumur), *Glycosmis pentaphylla* (Motkila), and *Phyllanthus reticulatus* (Chitki). The ground has been covered by many herbaceous plants, particularly from the members of Poaceae, Cyperaceae, Asteraceae, Euphorbiaceae, Araceae, Vitaceae, and Fabaceae. *Parthenium hysterophorus*, an Invasive Alien Species (IAS) reported recently for its toxicity in different print and electronic media, is extant along the highway, even in the homestead and agricultural fields.

210. About 12,565 roadside trees within the proposed ROW of the project road are inventoried during field surveys. Details are in Annex 5, Baseline Condition, Volume-II.

4.6.2.2 Homestead flora

211. As observed in the field, many tree species have been planted in each homestead, and it has the most diversity of plants of the total species collected. Many homesteads look like a segment of mini forest that includes many herbs, shrubs, semi-shrubs, and small or big trees.

212. The most common recorded tree species from the homestead part of the project site are *Mangifera indica* (Aam), *Moringa oleifera* (Shajna), *Lannea coromandellica* (Jiga), *Areca catechu* (Supari), *Psidium guajava* (Peyara), *Artocarpus heterophyllus* (Kanthal), *Azadirachta indica* (Neem), *Cocos nucifera* (Narikel), *Streblus asper* (Sheora), *Swietenia mahagoni* (Mahagani), *Murraya paniculata* (Kamini), *Ziziphus mauritiana* (Boroi), *Strygium samarangense* (Jamrul), and *Litsea glutinosa*. Recorded common shrubs include *Carica papaya* (Pepe), *Clerodendrum viscosum* (Bhat), *Ficus hispida* (Kak Dumur), *Glycosmis pentaphylla* (Motkila), *Ocimum sanctum* (Tulshi), and *Bougainvillea spectabilis* (Baganbilash).

213. Besides, a good number of herbs have also been recorded from the area, including *Musa paradisiaca* (Kola), *Acalypha indica* (Muktajuri), *Ageratum conyzoides* (Fulkuri), *Amaranthus viridis* (Note Shak), *Eclipta alba*, *Euphorbia hirta* (Dudhina), *Agromone mexicana* (Shialkata), *Bambusa vulgaris* (Bash), *Centella asiatica* (Thankuni), *Euhadra fluctuans* (Helencha), *Heliotropium indicum* (Hatishur), *Cynodon dactylon* (Durba Ghas), *Nicotiana glauca* (Bor Tamak), *Oxalis corniculata* (Amrul), *Lippia alba* (Sada Motmotia), *Senna sophora*, *Senna tora*, *Sida acuta*, *Synedrella nodiflora* (Synedrella), *Vernonia patula* (Vernonia), and many other species. As homestead plantations for edible purposes, vegetables like *Colocasia esculenta* (Kachu), *Alocasia macrorrhiza* (Man Kachu), *Basella alba* (Pul Shak), and *Amaranthus gangeticus* (Lal Shak) have been observed.

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214. The local households are also abundant with climbers, especially if they contain backyard fallow lands. *Stephania japonica* (Akanodi), *Passiflora foetida* (Passion flower), *Cayratia trifolia* (Goale Lota), and *Mikania cordata* (Assam Lota) were common in those places. Besides, the tin-shed houses and their yards have also been found to contain vegetable climbers like *Benincasa hispida* (Chal Kumra), *Cucurbita maxima* (Misti Kumra), *Dioscorea alata* (Gach Alu), *Lalbah purpureus* (Shim), *Lagenaria siceraria* (Lau), and *Momordica charantia* (Korla). Local people use the homestead species as sources of fruits, timber, firewood, medicines, and other household purposes.

215. About 80,424 number no of trees were identified within the affected private lands of the affected households, and 8671 numbers of trees were identified within the premises of affected CPRs (Details in Annex 5, Volume-II)

4.6.2.3 Agricultural land flora

216. The project area includes huge cultivated/agricultural land. In dry and rainy seasons, locals mostly use such lands for rice production. Some of the lands are used for winter and summer crops. Moreover, many *Mangifera indica* (Aam), *Carica papaya* (Pepe), *Areca catechu* (Supari), *Musa paradisiaca* (Kola), and *Alocasia macrorrhizos* (Man Kachu) gardens have been observed during the survey. Large mango gardens were seen in agricultural lands between Navaron and the beginning of the Satkhira bypass, in place of rice and other commercial crops. Local people also use some agricultural lands for woody plant cultivation, which includes *Swietenia mahagoni* (Mahagoni).

217. Besides *Oryza sativa* (Dhan) & *Triticum aestivum* (Gom), the agricultural lands of the project area are mainly used for *Allium cepa* (Peyaj), *Allium sativum* (Rasun), *Amaranthus gangeticus* (Lal Shak), *Lagenaria siceraria* (Lau), *Momordica charantia* (Korla), *Vigna unguiculata* ssp. *sepioides* (Barbati), *Solanum melongena* (Begun), *Abelmoschus esculentus* (Dheros), *Cucumis sativus* (Shosa), *Basella alba* (Pui Shak), *Capricum annuum* (Morich), *Lalbah purpureus* (Shim), *Benincasa hispida* (Chal Kumra), *Cucurbita maxima* (Misti Kumra), etc.

218. Commercial cultivation of *Cenchrus purpureus* (Napier Ghas), *Phoenix dactylifera* (Khejur), *Musa paradisiaca* (Kola), *Carica papaya* (Pepe), *Mangifera indica* (Aam), *Areca catechu* (Supari), *Swietenia mahagoni* (Mahagoni), and *Khaya antholitea* (Lambu) trees were also found in the project area.

219. Mixed fruit cultivation has also been observed in some lands adjacent to households. Fruit trees like *Aegle marmelos* (Bel), *Annona squamosa* (Ata), *Areca catechu* (Supari), *Artocarpus heterophyllus* (Kanthal), *Mangifera indica* (Aam), *Averrhoa carambola* (Kamranga), *Citrus limon* (Lebu), *Citrus maxima* (Jambura), *Cocos nucifera* (Narikel), *Mankura zapota* (Sofeda), *Neolamarckia cadamba* (Kadam), and *Limonia acidissima* (Kodbel) were common in these spaces. The Girth sizes of the major tree species are listed in Table 4-21.

Table 4-21: Girth Wise List of Major Tree Species

Girth Size in cm					
<30	30-80	81-120	120-180	>180 cm	
<i>Artocarpus heterophyllus</i> (Kanthal), <i>Neolamarckia cadamba</i> (Kodam), <i>Mangifera indica</i> (Aam), <i>Cocos nucifera</i> (Narikel), <i>Terminalia catappa</i> (Kathbadam), <i>Moringa oleifera</i> (Sajina), <i>Areca catechu</i> (Supari),	<i>Alnusopsis elengi</i> (Bakul), <i>Neolamarckia cadamba</i> (Kodam), <i>Mangifera indica</i> (Aam), <i>Cocos nucifera</i> (Narikel), <i>Moringa oleifera</i> (Sajina), <i>Cocos nucifera</i> (Coconut), <i>Samanea saman</i> (Rainree/Motakoroi), <i>Laurea coromandelica</i> (Joli), <i>Tectona grandis</i> (Segun), <i>Mankura zapota</i> (Sofeda),	<i>Samanea saman</i> (Rainree/Motakoroi), <i>Ficus benghalensis</i> (Bot), <i>Artocarpus heterophyllus</i> (Kanthal), <i>Swietenia mahagoni</i> (Mahagoni), <i>Mangifera indica</i> (Aam),	<i>Samanea saman</i> (Rainree/Motakoroi), <i>Mangifera indica</i> (Aam), <i>Swietenia mahagoni</i> (Mahagoni), <i>Dalbergia sissoo</i> (Sishu),	<i>Samanea saman</i> (Rainree/Motakoroi), <i>Mangifera indica</i> (Aam), <i>Swietenia mahagoni</i> (Mahagoni),	<i>Samanea saman</i> (Rainree/Motakoroi), <i>Mangifera indica</i> (Aam), <i>Swietenia mahagoni</i> (Mahagoni),

4.6.2.4 Terrestrial Fauna

220. A total of 80 fauna species were reported in the proposed corridor from Navaron, Jessore, to Bhomra, Satkhira. Among them, 6 (7.41%) were amphibians, 8 (9.88%) reptiles, 55 (67.90%) birds, and 11 (13.58%) mammals. The list of this status for all the wildlife present in the project site is given in Annex 5, Volume-II. Among them, 11 species were observed; those have an amphibious nature, and most of them are herpetofauna (amphibians)

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and reptiles). Some reptiles, like *Varanus bengalensis* and *Calotes versicolor*, show arboreal nature. Almost 12 species of birds like *Pelargopsis capensis*, *Amurrcus phoeniceus*, *Nycticorax nycticorax*, *Bubulcus ibis*, *Alcedo atthis*, *Ardea alba*, *Ardeola grayii*, *Ardea intermedia*, *Dendrocygna javanica*, *Microcarbo niger*, *Egretta garzetta*, and *Haliastur myrionensis* are highly dependent on water bodies for their food. Among the 80 species, only one species is regarded as a threatened species, and it is the fishing cat (*Prionailurus viverrinus*), considered an endangered (EN) species according to the IUCN Red List Bangladesh, 2015. Two species, the Bengal Monitor Lizard (*Varanus bengalensis*) and Binoellate Cobra (*Naja naja*), are regarded as Near Threatened (NT) species due to the destruction of their habitat. The remaining species are regarded as Least Concern (LC) species. It noted that these three EN species are found far away, outside of the project road corridor of 61.125 km x 200 m area on the highway that extends from Navaron Point, Jessore, to Bhomra Land Port, Satkhira. Likely project activities will not hamper them and their habitat.

221. All the avifauna and amphibians found in the extended study area are regarded as least concern (LC) species. The survey found no endemic and Critically Endangered (CR) species, keystone, flagship, or umbrella species. Among the recorded species, 14 species are protected by CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). *Varanus bengalensis* is under the CITES appendix I, and *Herpestes edwardsii* and *Paradoxurus hermaphrodites* are under appendix III. *Hoplobatrachus tigerinus*, *Ptyas mucosa*, *Naja*, *Athene brama*, *Milvus migrans*, *Elanus coerules*, *Ninox scutulata*, *Tyto alba*, *Felis chaus*, *Canis aureus*, and *Prionailurus viverrinus* are under CITES appendix II. Finally, all these species are protected by the Wildlife Protection & Security Act of 2012.

4.6.3 AQUATIC ECOLOGY

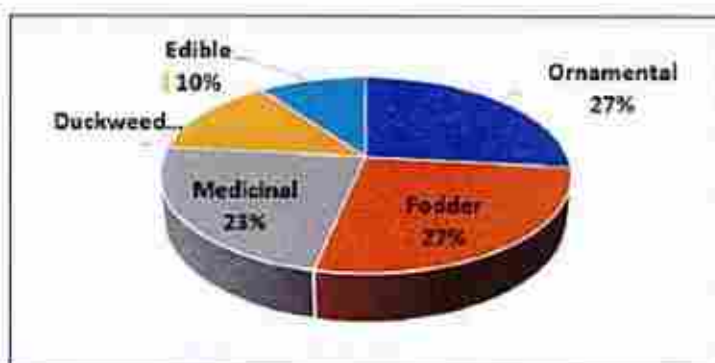
222. The aquatic flora and fauna are discussed in project area in the following subsections.

4.6.3.1 Aquatic flora

223. In the highway corridor from Navaron (Jashore) to Bhomra Land Port (Satkhira), only a few natural wetlands/baors (locally called bangor) were found during the field survey. The bangors are named Shamtar bangor and Belikhuri bangor, situated near Jamtola. Moreover, locals have informed us that another baor named Konida baor is also present in Jamtola. These baors were once huge; however, gradual exploitation of the river and canals feeding the baor has reduced their size. Now the baors are fragmented and owned for commercial fish production by the local landlords.

224. Besides, many man-made ponds, seasonal wetlands, and four small canals are present, sporadically supporting a non-luxurious growth of aquatic flora except by invasive alien species, including water hyacinth (*Eichhornia crassipes*). The water bodies also support many algal flora, though those are not counted and recorded in the study.

225. From the aquatic habitat assessment along the road alignment, 30 species have been recorded. Among the species, the maximum species are ornamental (27%) and used for fodder purposes (27%) followed by medicinal (23%), duckweed (13%), and edible (10%) (Figure 4-13). From the assessment of aquatic flora, species under the Red List categories of IUCN (Threatened, Endangered, Critically Endangered, Vulnerable, and so on), species protected by laws including CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), and species protected by the Wildlife Protection & Security Act, 2012 were not recorded. Apart from the lists of both aquatic and terrestrial angiosperm flora, a non-significant growth of lower groups of flora, such as fungi, algae, moss, and ferns, was observed along the alignment. A detailed list of the recorded aquatic flora has been provided in Annex 5, Volume-II. In the aquatic habitat of the project site, the most common aquatic species are *Eichhornia crassipes* (Kachuri pana), *Enhydra fluctuans* (Helenchu), *Alternanthera sessilis* (Sanchi), *Ludwigia*



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adscendens (Keshordam), *Ipomoea aquatica* (Kolmi), *Nymphaea nouchali* (Shapla), *Nymphaeoides hydrophylla* (Panchuli), *Utricularia* (Jhaji), *Pistia stratiotes* (Topapana), *Lemna minor* (Lemna), *Azolla* sp. (Azolla), *Orielia alismoides* (Punikola), *Schoenoplectus articulatus* (Chechra), and *Cyperus rotundus* (Sedge). Apart from this, luxuriant growths of the members of grass and sedge families were observed on the edges of wetlands.

4.6.3.2 Aquatic Fauna Including Fish

226. Forty-nine (49) fish and crustaceans were identified through field study, visiting local fish markets, interviews, and discussions with local fishermen. These fish species are said to be caught from 4 river/canal sites that crisscross the proposed corridor. These are listed in Annex 5, Volume-II. The area covered several man-made ponds, approximately more than 150 in number, four rivers and small channels, and some seasonal ditches. During the dry season, all seasonal ditches become dry. During the rainy season, they became full of water and supported several native fish populations. In the case of ponds, some are commercially cultivated, and some are not. The rivers have adequate flow during rainy periods, but the water becomes almost stagnant in the summer or dry season. A total of 7 threatened fishes were recorded, including 4 endangered (EN) and 3 vulnerable (VU) species in rivers, outside of the project road corridor.

227. No fishes observed in the four canals and other waterbodies, where bridges and culverts would be constructed under the project. These waterbodies were found almost dry and silted. However, during the monsoon season different types fishes might be available.

228. A good number of local fish were recorded during the catchment survey and market survey. The major fishes and crustaceans are *Amblypharyngodon mola* (Mola), *Puntius* spp. (Poti), *Channa punctatus* (Taki), *Channa striata* (Shoal), *Lepidocephalichthys guntea* (Gutum), *Channa gachua* (Chang), *Chanda nama* (Lomba Chanda), *Pseudambassis ranga* (Chanda), *Mystus tengra* (Bajari Tengra), *Clarias batrachus* (Magur), *Heteropneustes fossilis* (Shinghi), *Mastacembelus armatus* (Baim), *Trichogaster fasciata* (Kholisha), *Heteropneustes* (Shing), *Clarias batrachus* (Magur), *Anabus testudineus* (Koi), *Channa marulius* (Gojar), and *Macrobrachium rosenbergii* (Golda Chingri). Besides, 9 exotic species are also found in cultivated ponds, and they are *Oreochromis mossambicus* (Telapia), *Cyprinus carpio* (Common Carp), *Pangasianodon hypophthalmus* (Pangas), *Ctenopharyngodon idella* (Grass Carp), *Hypophthalmichthys molitrix* (Silver Carp), *Cyprinus carpio* (Mirror Carp), *Barbonymus gonionotus* (Java Barb), *Mylopharyngodon piceus* (Black Carp), and *Oreochromis niloticus* (Nile Telapia). From the survey recorded data on aquatic fauna in large study area, some species are under the Red List categories of IUCN (Endangered, Critically Endangered, Vulnerable, and Least Concerned), will be protected by laws including CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), and by the Wildlife Protection & Security Act, 2012. However, these fish species are also common in the greater adjacent part of the corridor.

4.6.4 ECOSYSTEM SERVICES

229. Ecosystem services are the direct or indirect benefits that ecosystems and their components provide to local communities. These services are generally classified into four categories: supporting, cultural, provisioning, and regulatory. In relation to the project corridor, no naturally sensitive, significant, or designated critical ecosystem areas are nearby. The Sundarbans, which is a notable ecosystem, is located 50 kilometers from the corridor, indicating that the project is unlikely to affect it.

230. However, project activities may have a temporary impact, potentially affecting local environmental components such as soil, water, air and tree cutting as discussed above. An environmental and social management plan is devised to minimize and mitigate potential impacts from the project implementation and operation phase. There are no legally protected species or ecosystems in the project area. Nevertheless, an ecosystem restoration plan has been included to ensure that any temporary disruptions are managed effectively.

4.6.5 CONCLUSION

231. From the assessment of both terrestrial and aquatic flora and aquatic fauna, some species under the Red List categories of IUCN (Threatened, Endangered, Critically Endangered, Vulnerable, and Least Concerned), species protected by laws including CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), and species protected by the Wildlife Protection & Security Act, 2012, were recorded in the project area. In the case of terrestrial fauna, the species observed in the project site belonging to the IUCN category were seen occasionally during the survey. Road alignment is not their permanent habitat. So, ultimately, these fauna species will

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not stay in the project site; rather, they will return to their original habitats. Moreover, no endemic species were found in the study area, and no genetic resource was recorded from the survey. Further, no flagship, umbrella or keystone species are found in the study area. Some faunal supporting species, such as *Ficus benghalensis* (Bot), *Bombax ceiba* (Shimul), *Ficus religiosa* (Ashwat), and *Multhua longifolia* (Mohua), were found during the survey within the study area; however, these are also available outside the study area. Thus, removing these species will not cause any impact on faunal species due to the construction of the project road. No previously declared protected area/national park/wildlife sanctuary is located within the study area or along the project corridor except an eco-park at the bank of Satkhira Khal @1.74Km from the proposed alignment.

4.7 SOCIOECONOMIC CONDITION

232. The present subsection described the existing socioeconomic condition along the project road alignment.

4.7.1 CENSUS AND INVENTORY OF LOSS SURVEY

233. The following tasks have been carried out during the field investigations to establish the baseline conditions within the Corridor of Impact (COI). The field investigation was conducted between October 15, 2023, and June 30, 2024.

- Census Survey
- Inventory of Loss (IOL) Survey.
- Socioeconomic survey.
- Stakeholder Consultation Meetings.
- Focus Group Discussion
- Key Informant Interviews as per the ESS1:

234. Environmental and social risks and impacts have been assessed using the corresponding outcomes of the tasks carried out in the field investigations.

235. The social baseline has been gathered⁴¹ disaggregated data on 'vulnerable households, disadvantaged, and marginalized groups/people. Relevant information will be presented later in this chapter in the ESMP and in the updated RAP. Disaggregated data on the 'vulnerable households, disadvantaged, and marginalized groups/peoples, anticipated risks and impacts of the project on them, and mitigation measures are presented in the ESMP and the Entitlement Matrix of the updated RAP.

236. The data analysis covers (a) the affected population by gender, (b) affected households, (c) age distribution, (d) dependency ratio, (e) household size, (f) religious demographics, (g) educational levels; (h) marital status; and (i) economic profiles including occupations, income, expenditures, vulnerable groups, and a list of CRPs.

4.7.2 ADMINISTRATIVE STRUCTURE

237. The implementation agency of the Bhomra-Satkhira-Navaron Road Section in Phase 3 of the WeCARE program is the RHD, through the World Bank Assistance. Local Government Institutes at different levels, from Union Parishad, Union Land Office, AC (Land) Office, Upazila Land Settlement Office, Upazila Parishad, UNO Office, Pourashava, District Parishad, and Deputy Commissioner Offices have been playing necessary significant roles in land acquisition. They will also be involved in implementing the project and the RAP.

238. The proposed road extends between Satkhira and Jashore districts, affecting four upazilas. In the Jashore district, these are Jhikorgachha and Sharsha, while in Satkhira district, Satkhira Sadar and Kalaroa are affected. Table 4-22 shows the distribution of existing road of 61.512 km passes through affected mouzas, Unions, upazilas, and Districts. The designed proposed road is 61.184 km.

Table 4-22: Lot wise affected Upazilas, Unions and Mouzas crosses by Existing road under the Project

Lots	Chainage (km+m to km+m)	Existing Length (Km)	District	Upazila	Union/Pourashava	Mouza
Lot-1	120 Km +100 m to 120 Km +850 m	0.75	Jashore	Jhikorgachha	Navaron	Bade Navaron

⁴¹ BCL Social Team

Joint Venture of



STUP Consultants Pvt. Ltd.
On July 1st, 2021, STUP was acquired by Assystem and rebranded as Assystem STUP.



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E&S Consultant, WeCARE

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	120 Km +850 m to 123 Km +000 m	2.15		Sharsha	Sharsha	Buruz, Jadabpur, Bagan,
	0+000 M to 7 Km +200 m	7.2			Ulshi	Khajura, Gilapal, Ulshi, Jadumathpur, Bara baria
Subtotal (Lot-1)		10.1				
Lot-2	7 Km +201 Km to 9 Km +900 Km	2.7	Jashore	Sharsha	Bagachra	Santa, Pipragochi, Bagachra
	9 Km +901 Km to 14 Km +230 m	4.33		Sharsha	Bagachra	Bagachra
	14 Km +231 M to 23 Km +000 m (B) Propose Bypass alignment of 15+470 m	8.77	Satkhira	Kolaroa	Kerakata	Kisamat, Hishpur, Putuni, Kerakata, Fazilkati, Nakila Kauria
					Helatala	Raghumathpur, Braja Baksha, Khulsi
Subtotal (Lot-2)		15.8				
Lot-3	23 Km+001 m to 31 Km+240 m	8.24	Satkhira	Kolaroa	Helatala	Helatala, Tulsidanga, Jikra, Mahamudpur, Gopinathpur, Rudrapur
	Satkhira Sadar	Jhandanga		Uaria, Gobmulakati, Jhandanga, Beharinagar		
	31 Km+241M to 39 Km+400 m	8.16	Satkhira	Satkhira Sadar	Jhandanga	Beharinagar, Tujalpur, Baladanga, Madhabkati
				Agardari	Jograpur, Bansghata, Babuliz, Kasempur	
Subtotal (Lot-3)		16.4				
Lot-4	39+401 Km to 52 Km+500 m	13.1	Satkhira	Satkhira Sadar	Agardari	Rasulpur, Palashpur
	Two (2) Service Road length				Alipur	Alipur, Mahmudpur
	52 Km+501 m to 55 Km +212 m	2.712	Satkhira	Satkhira Sadar	Bhomra	Sreerampur, Nabulakati
Subtotal (Lot-4)		19.212				
Grand Total (Lot-1 + Lot-2 + Lot-3 + Lot-4)		61.512				

4.7.3 DEMOGRAPHY OF AFFECTED POPULATION

239. The total population of the Affected Persons (AP) in the corridor of impacts is 16126. The distribution of the population of AP is presented Table 4-23. The maximum population is affected in Lot 2, followed by lot 4 and Lot 3. The minimum impact on lot 3 is due to proposed bypasses on the alignment. The Sex ration (Male to Female in project area is 1.04.

Table 4-23: Distribution of the population of affected persons														
Total Affected Persons			Lot-1			Lot-2			Lot-3			Lot-4		
Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
8215	7911	16126	2389	2322	4711	2451	2416	4867	1046	1022	2068	2329	2151	4480

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4.7.3.1 Age-Wise Distribution of Population

240. Table 4-24 presents the age-wise distribution of affected persons (AP) of the affected households within each lot. It shows that out of the total AP, the maximum AP is in Lot 2 (4867), followed by Lot 1 (4711), lot 4 (4480), and Lot 3 (2068).

Age of Persons (Years)	Number of Affected Persons											
	Lot-1			Lot-2			Lot-3			Lot-4		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-4	172	146	318	165	166	331	80	67	147	177	170	347
May-14	382	361	743	401	388	789	138	178	316	368	341	709
15 to 45	1150	1239	2389	1216	1318	2534	522	537	1059	1180	1173	2353
46 to 64	494	405	899	497	411	908	231	196	427	451	364	815
65 and above	191	171	362	172	133	305	75	44	119	153	103	256
Total	2389	2322	4711	2451	2416	4867	1046	1022	2068	2329	2151	4480

Source: Field survey conducted by BCL and STUP, November 2023-February 2024

241. The tabulated data (Figure 4-14) is analyzed further to assess how different age groups of affected persons are impacted in each lot through a graphical presentation of the distribution of AP by age group. Distribution of AP by Age Group in each Lot. The maximum number of individuals in the age group 15-45 are primarily affected in lot 2, followed by lot 1, lot 4 and lot 3. This analysis is carried further to assess which gender is affected by the age group of AP due the project.

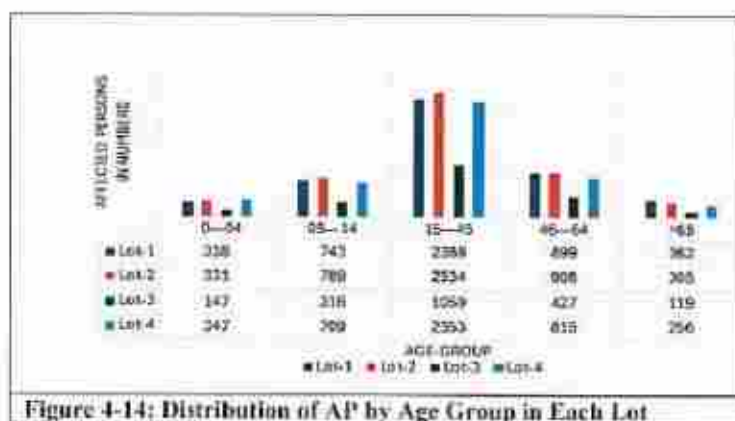


Figure 4-14: Distribution of AP by Age Group in Each Lot

242. The analysis reveals that 51.69% of affected persons belong to the age group of 15-45. This is followed by 18.91% in the age group of 46-64, 15.86% in the 4-15 age group, 7.09% in the 0-4 age group, and the lowest percentage, 6.46%, in the group above 65 years.

243. A graphical representation of this analysis on distribution of APs by age group and gender is shown in the accompanying chart (Refer to Figure 4-15). The graph indicates that the highest number of affected individuals are females within the age group of 15-45.

4.7.3.2 Dependency Ratio

244. The dependent population is divided into three age groups: a) 0 to 4 years, b) 5-14 and (ii) 65 years and older. In contrast, the active income-earning population comprises people of age groups: a) 15 to 45 years and b) 46 to 64 years. The data on the dependent population of AP is summarized in Figure 4-15 the total population of AP is 16126. Out of this, the dependent population is 4742, and the active-earning population is 11384. The total dependency ratio is calculated by comparing the dependent population to the active-earning population, which comes out to be 42.2%.

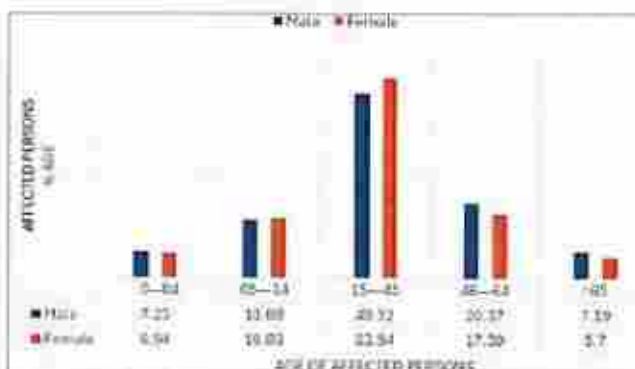


Figure 4-15: Distribution of AP by Age Group and Gender

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4.7.4 HOUSEHOLD CHARACTERISTICS

245. Household characteristics have been studied to gain a comprehensive understanding of the dynamics of a household—the number of people living in the house in a family and house head. These are discussed briefly in the following subsections:

4.7.4.1 Household Size

246. The household size within the project area is 4.64. This is according to the national figure. The distribution of affected by size is given in **Table 4-25**. The data in the table shows that 46.62% of affected households belong to 3-4 households, followed by 31.93% of affected households belonging to 5-6 household sizes. The lowest 1.12% of affected households belong to > 10 household sizes.

Table 4-25: Distribution of Affected Households by Household Size

Household Size	No. of Affected Households					
	Lot-1	Lot-2	Lot-3	Lot-4	Total No. & % of HHs	
	No. of HH	No. of HH	No. of HH	No. of HH	No. of HH	%
1 to 2	93	141	62	149	445	12.11
3 to 4	444	545	239	483	1711	46.62
5 to 6	357	348	151	317	1173	31.93
7 to 8	79	61	23	67	230	6.26
9 to 10	23	25	5	19	72	1.96
> 10 (10 above)	19	7	5	10	41	1.12
Total	1015	1127	485	1047	3674	100
Household Size	3.62	3.26	7.6	3.5	4.4	-

Source: Field survey conducted by BCL and STUP, November 2023-February 2024

4.7.4.2 Distribution of Households Head by Sex

247. Distribution of households headed by sex is summarized in **Table 4-26**. This summary table shows that 3,674 households will be affected by land acquisition for the project across Lots 1 to 4. Lot 1 has 1,015 affected households, Lot 2 has 1,127, Lot 3 has 485, and Lot 4 has 1,047. Among these, 87.56% are male-headed households, and 12.44% are female-headed. Lot 2 has the highest number of female-headed households at 154 (13.66%). This is followed by Lot 1 with 122 (12.02%), Lot 4 with 108 (10.32%), and Lot 3 with 73 (15.05%).

Table 4-26: Lot-wise Type of Affected Households Head

Details of Household	Lot-1		Lot-2		Lot-3		Lot-4		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Male Headed HHs	893	87.98	973	86.34	412	84.95	939	89.68	3217	87.56
Female-Headed HHs	122	12.02	154	13.66	73	15.05	108	10.32	457	12.44
Total	1015	100	1127	100	485	100	1047	100	3674	100

Source: Field survey conducted by BCL, November 2023-February 2024

4.7.5 RELIGION

248. The details of lot-wise AP by religion is presented in **Table 4-27**. Islam (95.40% followers) is the main religion, followed by Hinduism (4.37% followers) COI. According to the Bangladesh Population and Demographic Indicators, 88% of Bangladeshis are Muslims, and the remaining are of other religions (-).

Table 4-27: Distribution of Affected Population by Religion among the Survey Population

Religion	Distribution of affected Population by Religion				Total	
	Lot-1	Lot-2	Lot-3	Lot-4	No.	%
Islam	4638	4617	1987	4165	15407	95.54
Hinduism	54	222	81	315	672	4.17
Christian	19	28	0	0	47	0.29
Indigenous peoples	0	0	0	0	0	0
Total	4711	4867	2068	4480	16126	100

Source: Field survey conducted by BCL and STUP, November 2023-February 2024

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4.7.6 EDUCATION LEVEL

249. The literacy rate in Bangladesh is currently 75%. In the Sathkira district, the literacy rate for individuals aged seven and over is slightly higher at 75.32%, compared to the national average of 74.80%. During primary data collection, information regarding the education levels of affected individuals was collated and analyzed and is shown in Table 4-28.

Table 4-28: Distribution of Affected Population (7 Years and Above) by Education Level

Sl. No.	Education Level	Lot-1			Lot-2			Lot-3			Lot-4			Total	
		Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1	Just Literate*	173	190	363	191	236	427	72	96	168	156	182	338	592	704
2	Up to IV or Madrasah	304	341	645	304	294	598	104	127	231	275	269	544	987	1031
3	Primary Certificate	242	218	460	255	239	494	130	129	259	305	258	563	932	844
4	Class VI-VII	134	144	278	170	208	378	67	78	145	181	190	371	552	620
5	JSC Exam	147	163	310	197	208	405	81	87	168	155	195	350	580	653
6	Class IX-X	242	178	420	171	216	387	59	72	131	139	151	290	611	617
7	SSC Exam or Equivalent/Dakhil	327	312	639	311	299	610	114	133	247	258	266	524	1010	1010
8	HSC Exam or Equivalent/Alim	192	215	407	235	202	437	122	89	211	207	145	352	756	651
9	B.A. or Equivalent/Fazil	194	141	335	145	99	244	73	31	104	121	78	199	533	349
10	M.A. or Equivalent/Kamil Pass	161	96	257	134	80	214	72	33	105	156	64	220	523	273
11	Haifez	15	9	24	12	5	17	7	2	9	7	2	9	41	18
12	Dip. (Eng.)	18	5	23	18	5	23	6	1	7	3	2	5	45	13
13	BSe (Eng.)	31	6	37	14	2	16	4	0	4	7	2	9	56	10
14	MSe (Eng.)	7	3	10	3	1	4	1	1	2	1	1	2	12	6
15	Higher Education Degree (General)	7	11	18	8	4	12	1	2	3	0	0	0	16	17
16	Higher Education Degree (Eng.)	5	2	7	0	0	0	2	0	2	1	1	2	8	3
17	Other	4	3	7	2	3	5	4	3	7	4	4	8	14	13
18	Total Literate (sum of Row 1-17)	2203	2037	4240	2170	2101	4271	919	884	1803	1976	1810	3786	7268	6832
	Total Illiterate	41	68	109	36	64	100	22	24	56	83	98	181	182	264
19	Population below 7 years	244	217	461	245	251	496	105	104	209	171	243	414	765	815
20	Grand Total	2488	2322	4810	2451	2416	4867	1046	1022	2068	2230	2151	4381	8215	7911

Notes: *Just Literate means who can only read & write without any formal education. Total population is 16126.

250. The population under 7 years old has been excluded from calculating the literacy rate. As a result, the total number of literate individuals among the affected persons is 14100 (87.44%), while the illiterate population stands at 446. The type of education that the AP is having is shown in Figure 4-16.


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4. Description of the Environmental and Social Baseline

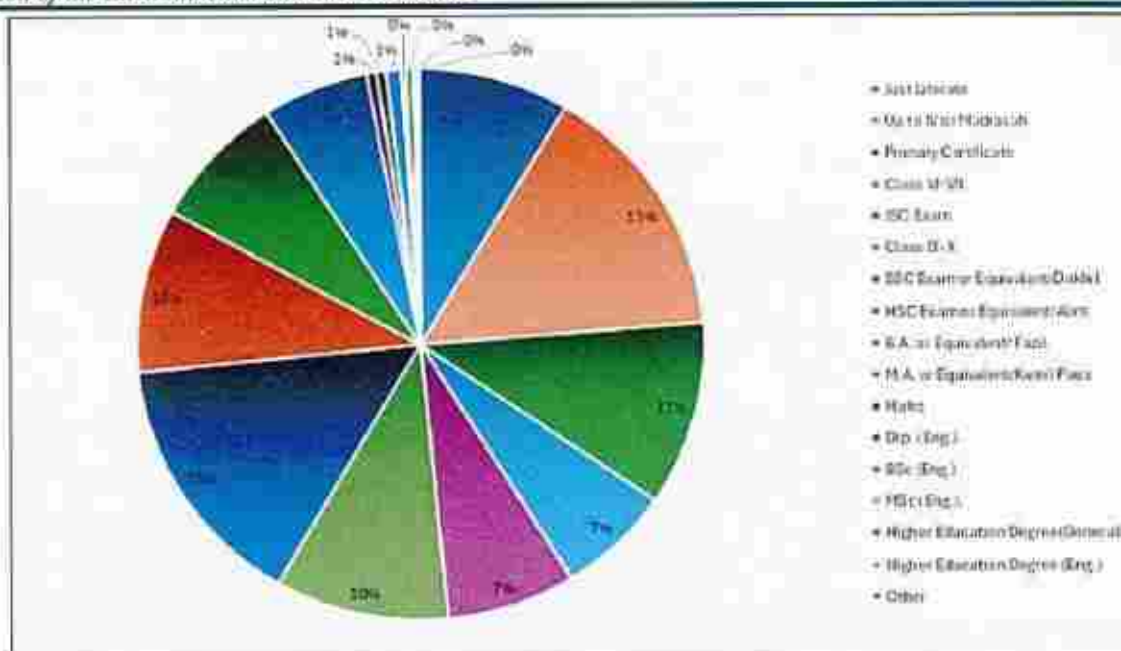


Figure 4-16: Spectrum of Type of Education among the Affected Persons

4.7.7 MARITAL STATUS

251. The marital status data has been collected during the socioeconomic survey. Collecting and analyzing marital status data is crucial for gaining a comprehensive understanding of the social landscape, guiding effective policymaking, and addressing the population's diverse needs. It is to be noted that the legal age for the first marriage is 21 years for males and 18 years for females in Bangladesh. However, the Child Marriage Act 2017 allows girls under 18 to marry with the consent of their parents. The marital status among the surveyed population of AP shows that most marriage is solemnized above the marriageable age. The details of marital status in different Lots are presented in Table 4-29.

Table 4-29: Marital Status within the COI

Marital Status Affected Population	Marital Status of AP within Marriageable and below marriageable age					
	Lot-1	Lot-2	Lot-3	Lot-4	Total Male & Female Population	%
	Male & Female Population	Male & Female Population	Male & Female Population	Male & Female Population		
Married	2676	2838	1236	2651	9401	58.30
Unmarried	421	350	166	286	1223	7.58
Widow	193	187	69	142	591	3.66
Widower	18	19	3	26	66	0.41
Abandoned by Husband	5	8	0	13	26	0.16
Abandoned by Wife	4	4	2	5	15	0.09
Divorced Woman	3	1	1	8	13	0.08
Divorced Man	1	2	2	2	7	0.04
Population below 21 age for male & 18 age for female	1390	1458	589	1347	4784	29.67
Grand Total	4711	4867	2068	4480	16126	100

Source: Field survey conducted by BCL and STUP, November 2023-February 2024

4.7.8 OCCUPATIONAL PATTERN

252. The occupational pattern data analysis in socioeconomic impact assessment provides valuable insights into individuals' and households' economic activities and social status. The data on the occupation pattern of AH is

4. Description of the Environmental and Social Baseline

summarized in Table 4-30. It shows that the highest primary occupation of affected male household heads is businesses (male) for 1820 HHs (49.54%). This is followed by housewife household heads (285/7.76%) whose occupation is service (employment) and skilled laborers (284/7.73%).

Table 4-30: Occupational Pattern within the COI

Sl. No.	Primary Occupations	Primary Occupations of AH – Heads					
		Lot-1	Lot-2	Lot-3	Lot-4	Total No.	%
1	Farmer	53	80	21	44	198	5.39
2	Teacher	34	37	11	24	106	2.89
3	Employed Abroad/Overseas	24	42	10	9	85	2.31
4	Employment or Service (Male)	85	87	38	74	284	7.73
5	Employment or Service (Female)	9	12	6	6	33	0.90
6	Housewife	76	102	50	57	285	7.76
7	Fisherman	0	2	0	0	2	0.05
8	Business (Male)	563	521	216	520	1820	49.54
9	Business (Female)	14	11	5	7	37	1.01
10	Daily Labor	33	51	33	144	261	7.10
11	Driver	14	47	33	39	133	3.62
12	Manson's Helper	2	4	2	1	9	0.24
13	Mason	10	14	10	16	50	1.36
14	Carpenter	4	2	1	2	9	0.24
15	Tailor	2	2	0	2	6	0.16
16	Doctor	6	11	5	9	31	0.84
17	Kabiraj	2	0	1	0	3	0.08
18	Boatman	0	0	0	0	0	0.00
19	Student	7	12	3	5	27	0.73
20	Rickshaw/Van Puller	10	34	21	38	103	2.80
21	Old Man	35	23	7	20	85	2.31
22	Old Woman	13	22	7	19	61	1.66
23	Maid Servant	1	1	0	0	2	0.05
24	Barber	0	2	0	2	4	0.11
25	Renting House	8	0	0	0	8	0.22
26	Cobbler	1	0	0	0	1	0.03
27	Mechanic/Technician	4	4	4	5	17	0.46
28	Unemployed	5	3	1	3	12	0.33
29	Other	0	1	0	1	2	0.05
Total		1015	1127	485	1047	3674	100

*Note: Skilled laborers include (i) carpenter, (ii) mason, (iii) barber, (iv) blacksmith, (v) driver, (vi) mechanic, (vii) rickshaw driver, (viii) tailor, (ix) imam, (x) cobbler, (xi) kabiraj, etc.

253. The primary occupation data of other members of AH is summarized in Table 4-31. It shows that the highest primary occupation of other active members of AHs is a housewife (33.11%) in the project areas, followed by students (32.55%) and unemployment (0.74%). The prevalence of child labor not recorded in the survey area

Table 4-31: Primary Occupations of Other Members of AH within COI

Primary Occupations	Primary Occupations of Other Members of Affected Households					
	Lot-1	Lot-2	Lot-3	Lot-4	Total No.	%
Farmer	35	33	8	0	76	0.83
Teacher	36	15	14	1	66	0.72
Employed Abroad/Overseas	71	101	31	1	204	2.23
Employment or Service (Male)	135	128	54	10	327	3.55
Employment or Service (Female)	24	38	8	4	74	0.80
Housewife	1167	1226	520	135	3048	33.11
Fisherman	0	1	0	0	1	0.01
Business (Male)	222	164	65	29	480	5.21
Business (Female)	22	19	5	3	49	0.53

Joint Venture of



STUP Consultant Pvt. Ltd.

On July 1st, 2021, STUP was acquired by Anysystem and rebranded as Anysystem STUP.



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4. Description of the Environmental and Social Baseline

Table 4-31: Primary Occupations of Other Members of AH within COI

Primary Occupations	Primary Occupations of Other Members of Affected Households					
	Lot-1	Lot-2	Lot-3	Lot-4	Total No.	%
Daily Labor	26	25	45	9	105	1.14
Driver	17	40	29	3	89	0.97
Manson's Helper	8	3	0	1	12	0.13
Mason	16	16	3	4	39	0.42
Carpenter	3	7	3	1	14	0.15
Tailor (Male)	4	0	0	0	4	0.04
Tailor (Female)	4	1	0	2	7	0.08
Doctor (Male)	6	6	0	1	13	0.14
Doctor (Female)	10	4	0	4	18	0.20
Kabiraj (Male)	2	0	1	0	3	0.03
Kabiraj (Female)	5	0	0	0	5	0.05
Boatman	0	0	0	0	0	0.00
Student (Male)	641	613	249	52	1555	16.89
Student (Female)	606	559	219	58	1442	15.66
Rickshaw/Van Puller	13	14	7	3	37	0.40
Old Man	69	52	17	7	145	1.58
Old Woman	171	140	43	10	364	3.95
Maid Servant	4	1	2	0	7	0.08
Barber	0	1	0	0	1	0.01
Renting House	0	0	0	0	0	0.00
Cobbler	0	0	0	0	0	0.00
Mechanic/Technician	7	18	2	2	29	0.32
Unemployed (Male)	18	21	9	2	50	0.54
Unemployed (Female)	6	4	7	1	18	0.20
Other (Male)	185	184	88	30	487	5.29
Other (Female)	160	182	73	22	437	4.75
Total	3693	3616	1502	395	9206	100

Source: Field survey conducted by BCL, November 2023-February 2024

4.7.9 INCOME AND EXPENDITURE

254. The highest number of affected households is 1,140 (31.03%), belonging to the BDT 135,001 to BDT 300,000 annual income range. This is followed by 1,028 households (27.98%) in the BDT 300,001 to BDT 500,000 range. The least affected are 37 households (1.01%) earning up to BDT 60,000. Table 4-36 shows that 188 affected households (37 and 151 HHs) fall within the income levels of up to BDT 60,000 and BDT 60,001 to BDT 135,000, with Lot 1 having a higher number of affected poor households than Lots 2, 3, and 4. Detailed information on the distribution of project-affected households by annual income ranges for Lots 1, 2, 3, and 4 is presented in Table 4-32.

Table 4-32: Affected Households by Annual Income

Annual Income Level (BDT)	No. of HHs in Lot 1, Lot 2, Lot 3, and Lot 4				
	Lot 1	Lot 2	Lot 3	Lot 4	Total
Up to 60,000	8	7	8	14	37
60,001 to 135,000	27	42	24	58	151
135,001 to 300,000	234	306	180	420	1140
300,001 to 500,000	265	363	131	269	1028
500,001 to 1,000,000	279	298	90	169	836
1,000,001 and above	202	111	52	117	482

Source: Field survey conducted by BCL, November 2023-February 2024

255. The monthly expenditure data of AH is presented in Table 4-33. The data shows that the highest number of households is 1864 HHs (50.73%), which belong to the monthly expenditure range BDT 25001-83330. The second highest number of households is 1140 HHs (31.03%), whose monthly income range is between BDT 11251-25000. The lowest number of households is 37 HHs (1.01%), whose monthly income range is BDT up to 5000.

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On July 1st, 2021, STUP was acquired by Assystem and rebranded as Assystem STUP.



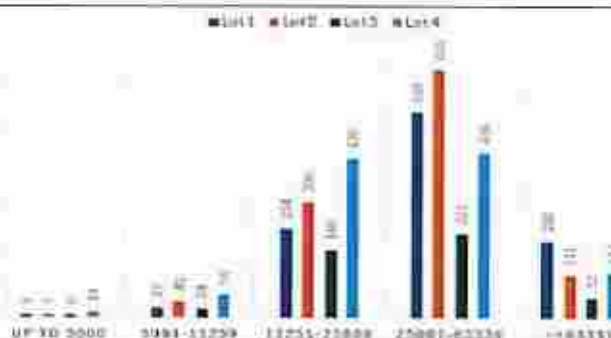
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4. Description of the Environmental and Social Baseline

Table 4-33: Affected Households by Expenditure Status					
Expenditure (BDT)	No. of AHs in Lot 1, Lot 2, Lot 3, and Lot 4				
	Lot 1	Lot 2	Lot 3	Lot 4	Total
Up to 5000	8	7	8	14	37
5001-11250	27	42	24	58	151
11251-25000	234	306	180	420	1140
25001-83330	544	661	221	438	1864
>=83331	202	111	52	117	482



Source: Field survey conducted by BCL November 2023-February 2024

4.7.10 VULNERABLE GROUPS

It is essential to identify the vulnerable households and groups that are likely affected by the project. The vulnerable households and groups include (i) woman-headed households, (ii) disabled woman-headed households, (iii) disabled man-headed households, (iv) elderly (>64 years) man-headed households, and (v) man-headed households under the poverty line (annual income BDT 135,000) and below. Nine hundred sixty-six (966) vulnerable households have been identified through the census and IOL survey. The highest vulnerable households are 454 (47.00%) woman-headed households, followed by 357 (36.96%) elderly (>64 years) man-headed households under the poverty line, further followed by 90 male-headed households under the poverty line (9.32%). Particular attention should be given to the affected vulnerable households and groups to ensure payment of assistance, allowances, and grants. The needs of affected vulnerable groups, such as the poor, woman-headed, landless persons, there are no indigenous peoples, ethnic minorities, the elderly, and disabled persons, will be adequately addressed. They had been identified through the census, IOL, and socioeconomic survey (Table 4-34).

Table 4-34: Distribution of Vulnerable Households Head									
Type of Vulnerable Households	of Affected Vulnerable Households in Under Lot 1, 2, and 4								
	Lot-1		Lot-2		Lot-3		Lot-4		Total
	No.	%	No.	%	No.	%	No.	%	No. %
Woman headed households	121	44	152	48.56	73	48.34	108	39.56	454 47.00
Disabled woman-headed households	1	0.36	2	0.64	0		0		3 0.30
Disabled man-headed households	21	7.64	18	5.73	4	2.65	29	6.96	62 6.43
Elderly (>64 years) man-headed households	110	40	112	35.78	46	30.46	89	32.60	357 36.96
Male-headed households under the poverty line (annual income BDT 135,000 and Below)	22	8	29	9.27	29	18.54	57	20.88	136 13.44
Total	275	100	313	100	151	100	273	100	1012 100

Source: Field survey conducted by BCL and STUP, November 2023-February 2024

4.7.11 AFFECTED COMMON PROPERTY RESOURCES (CPRS)

According to the census and IOL survey findings, a total of 129 affected common property resources (CPRs) have been identified across four lots. These include 23 CPRs in Lot 1, 50 in Lot 2, 12 in Lot 3, and 44 in Lot 4. The highest number of affected CPRs are graveyards, totaling 50, with 11 in Lot 1, 17 in Lot 2, 4 in Lot 3, and 18 in Lot 4. The second highest number of affected CPRs are schools, which amount to 37, distributed as follows: 7 in Lot 1, 15 in Lot 2, 3 in Lot 3, and 12 in Lot 4. Additionally, there are 29 affected mosques, with 3 in Lot 1, 10 in Lot 2, 4 in Lot 3, and 12 in Lot 4. Lot 3 also contains three affected training institutes and training centers. Furthermore, three hospitals, clinics, health centers, and veterinary hospitals are affected, with one located in each of Lots 1 and 2. These are summarized in Table 4-35.

Table 4-35: Lot-wise Affected Community Property Resources within the Proposed ROW of Phase -3

4. Description of the Environmental and Social Baseline

Lot No.	Type	Mosque	School/Madrasah /College	Graveyard/Cemetery	Eidgah	Temple/Mandir/ Mazar	Total
Lot-1	Title	4	5	9	0	0	18
	Non- Title	0	2	1	0	0	3
	Encroacher	8	2	1	0	0	11
Lot-2	Title	4	0	5	0	1	10
	Non- Title	1	0	0	0	0	1
	Encroacher	0	0	0	0	0	0
Lot-3	Title	15	12	11	1	2	41
	Non- Title	0	0	0	0	0	0
	Encroacher	0	0	0	0	0	0
Lot-4	Title	7	7	18	0	1	33
	Non-title	1	2	0	0	0	3
	Encroacher	2	4	0	0	0	6
Total		42	34	45	1	4	126

4.7.12 SANITATION AND WATER SUPPLY

4.7.12.1 Sanitation

256. It was reported that the affected businessmen and their employees who either stay or live at bazaars in urban areas utilize sanitary latrines in most cases. However, some businessmen in rural market areas use both sanitary and ring slab latrines. The affected households that have pucca structures utilize sanitary latrines attached to their pucca structures. However, some affected households have semi-pucca structures with ring slab latrines outside their structures. They utilized sanitary and ring slab latrines. Households living in tin-made houses and Katcha houses generally utilize the following types of latrines, which were found in the findings of the census. The IOL survey shows that 76.78% of such households utilize sanitary latrines, followed by ring slab latrines (22.01%) in the project-affected areas. Table 4-36.

Table 4-36: Distribution of Affected Households by Type of Latrine						
Type of Latrines	No. of Affected Households Utilize Latrines				Total	
	Lot-1	Lot-2	Lot-3	Lot-4	No.	%
Sanitary Latrine	824	983	387	782	2976	76.78
Ring Slab Latrines	242	207	113	291	853	22.01
Katcha Latrines	2	2	3	13	20	0.52
Pit Latrines	1	3	1	20	25	0.64
Other	0	1	0	1	2	0.05
Total	1069	1196	504	1107	3876	100

Source: Field survey conducted by BCL, November 2023-February 2024

4.7.12.2 Water Supply

257. Almost 100% of affected households use underground water for their drinking, domestic, bathing, washing, and other purposes in Lots 1, 2, 3, and 4. Groundwater is lifted with the deep, shallow, and hand tube wells. Commercial entities, including businessmen, factory owners, and CPRs, also use groundwater for drinking, washing, bathing, and other necessary purposes. Underground water is lifted with motor pumps and stored in the water tank in the ground and on the rooftop.

4.7.13 UTILIZATION OF ELECTRICITY

258. Almost 100% of affected households, commercial entities, and CPRs under Lots 1, 2, 3, and 4 use electricity for various purposes, such as various residential and commercial purposes, including light, fans, lifting water with motor pumps, cooking, etc.

4.7.14 HEALTH FACILITIES

259. Land acquisition affects a limited number of health facilities in Lot 2, specifically the Upazila Livestock Department and Veterinary Hospital at 12+700, and Kalaroa Diabetic Hospital at 22+750. (Refer Table 4-37)

Table 4-37: Affected Health Facilities in Lot 1 and 2

4. Description of the Environmental and Social Baseline

Sl. No	Name of Affected Health Facilities	Chainage	Lot#
1.	Upazila Livestock Department and Veterinary Hospital signboard	12+700km	Lot-1
2.	Kolaroa Diabetic Hospital	22 + 750km	Lot-2

4.7.15 GENDER-BASED VIOLENCE (GBV) IN JASHORE AND SATKHIRA

260. The worst manifestation or existing form of GBV is child marriage, also known as early marriage. Child marriage and the dowry system put girls at particular risk of sexual, physical, and psychological violence throughout their lives. Bangladesh has one of the highest early marriage rates in the world, at 59 percent in 2018 (UNFPA, 2019). Early marriage nearly always results in school dropouts or from pursuing higher education, and early childbirth and is often used as a way for trafficking young girls. This is hazardous from a health perspective and hinders academic and economic development. GBV services for host communities in the project corridor are limited to the One Crisis Center at District Sadar Hospital and one-stop cells in Jashore and Satkhira, part of the Multisectoral Program on Violence Against Women (MSPVAW) led by the Ministry of Women and Children Affairs in Bangladesh (MOWCA) in coordination with various ministries and agencies. The local population also faces a few GBV issues, highlighting the urgent need for additional services. According to the Violence Against Women Survey (VAW) 2024⁴² report, in Barishal and Khulna Divisions the highest prevalence of gender-based violence (GBV) in Bangladesh, approximately 70% of women experiencing some form of violence, but neither district-level data nor national reports identified for Jashore and Satkhira districts as having the highest rates of GBV or SEA/SH risk rating. In consultation meetings, though participants mentioned that some sort of incidents currently occurs, but not within project study areas.

⁴² Bangladesh Bureau of Statistics (BBS) and UNFPA. (2024). Violence Against Women Survey 2024: Key Findings. Dhaka, Bangladesh. Available at: <https://bangladesh.unfpa.org/en/2024-violence-against-women-survey>

5 ANALYSIS OF ALTERNATIVES

5.1 GENERAL

261. The proposed widening and strengthening of Bhomra – Satkhira – Navaron Road will enhance economic and social dynamism by reducing travel times, lowering vehicle costs, and improving access to markets, jobs, education, and health services. Some impacts are unavoidable, as listed below, due to the project's proximity to natural and social environments.

- ▶ Cutting of avenue trees and vegetation
- ▶ Impact on water bodies (ponds and channels)
- ▶ Social impacts due to land acquisition include loss of structures/land and relocation of residents and commercial entities.

262. There will be indirect impacts on the social environment due to livelihood disruptions, loss of familiar travel routes, and weakened community connections. The land use pattern along the existing road alignment is primarily agricultural, with built-up areas including townships, commercial spaces, major road intersections, parking facilities, and industrial zones. The project may have partial or complete effects on various structures, such as houses, offices, mosques, temples, graves, educational institutions, existing utilities, and the health and safety of workers during construction.

263. The right way is insufficient for a four-lane service road, which could lead to significant land acquisition and resettlement challenges. Widening the carriageway will impact adjacent agricultural land, residential areas, markets, and institutions, which will need careful management during construction. Localized issues may arise due to the numerous settlements alongside the project road, necessitating management strategies to offset the intensity of impacts during the construction phase.

5.2 THE PROJECT FEATURES AND ALTERNATIVES

264. The proposed project involves a road with a design length of 61.184 km, which will generally follow the existing alignment, except for three sections that will be realigned. These realignment sections were chosen to ensure social acceptability and to address community safety concerns while minimizing environmental impact.

265. During the design process, various environmental issues were considered when reviewing alternative alignments and structures to determine the best solution. Multiple options were evaluated closely with Environmental and Social (E&S) Consultants and the Engineering Design Team. The project has been divided into four lots:

- ▶ Lot-1: from Km 0+000 to Km 7+200 and from Km 119+700 to Km 123+000 (Bhanga-Benapole Road)
- ▶ Lot-2: from Km 7+200 to Km 23+093
- ▶ Lot-3: from Km 23+001 to Km 39+400
- ▶ Lot-4: from Km 39+401 to Km 55+212 +2.58 Service Road only (Loop)

266. Various structures have been proposed as alternatives for the existing alignment to ensure smooth traffic flow and enhance the roadway geometry. These structures include new bridges, new culverts alongside additional culverts, flyovers, railway overpasses (ROPs), vehicular overpasses (VOPs), light vehicular overpasses (LVOPs), pedestrian overpasses (POPs), foot over bridges (FOBs), and viaducts.

267. The construction of a four-lane road and improvement of junctions require land acquisition, which may lead to the demolition of residences and commercial areas. This process will impact local commercial activities and livelihoods, causing significant disturbances for the residents living near the road alignment. The government has already imposed a ban on using agricultural land to minimize losses. Consequently, there are limitations on acquiring excessive agricultural land for road expansion. Therefore, the proposed design aims to minimize land acquisition as much as possible.

5.3 ROAD STRUCTURES AND CONCEPTUAL DESIGN

Certain alignment sections run through commercial areas, ribbon development, and congested locations. Widening and strengthening the road along the existing alignment will impact business activities due to the land

5. Analysis of Alternatives

acquisition required for the expansion if proper mitigation measures are not implemented. The ribbon development along the road will also cause increased risks for pedestrians and other road users. Thus, different types of structures and geometry improvement proposals of the existing alignment have been considered in the design for the smooth and safe free flow of traffic. Adopted measures for built-up areas, rural commercial areas, and road intersections adopted in the design are as follows:

- ▶ Structures include vehicular overpasses (VOP), pedestrian overpasses (POP), and foot overbridges (FOB).
- ▶ Geometry improvement proposals consist of intersection improvement, realignment, and bypass strategies.

5.3.1 INTERSECTION AT NAVARON ON BHANGA – BENAPOL ROAD

268. The flyover will alleviate a bottleneck at the intersection of the project highway and the Bhangra–Benapole Road at Navaron. This intersection involves the Bhangra–Benapole Road, designated National Highway N7. It has become a crucial cross-border transit route following the opening of the Padma River Bridge in Bangladesh. Furthermore, the Bhomra – Satkhira – Navaron Road is anticipated to be upgraded to National Highway status due to its connectivity to the port.

269. Further, two major highways (N706 and Project Road) intersect at Navaron, and the project highway will be a controlled access road, necessitating a flyover at this location.

270. The following are the recommendations for the Navaron Intersection:

- ▶ To cater to the movement of all local traffic at the grade roundabout at the Navaron Intersection.
- ▶ Since Bhangra-Benapole is an important Trans Asian Highway, the flyover along Bhangra-Benapole is required and will significantly relieve the Navaron Intersection. Bhangra – Benapole Flyover will be at level 1.
- ▶ A Railway Overpass (ROP) is required over the Navaron–Benapole Railway Line and the movements from Bhomra to Jashore and Jashore to Bhomra are significant; ramps are also provided. Thus, a directional ramp at level 2 from Bhomra towards Jashore for right-turning traffic, a directional ramp from Jashore to Bhomra for left-turning traffic, and a directional ramp from Bhomra towards Benapole is also required for left-turning traffic are suggested.
- ▶ Traffic from Benapole to Bhomra will be turned through a U-loop provided at the Bhangra – Benapole Road. A U-loop for U-turns is provided for the Benapole to Bhomra traffic movement. This is provided after the Betna River and goes towards the Jashore side. This Loop will have a U-turn for traffic on the Level 1 flyover over at-grade Bhangra – Benapole Road.

5.3.2 REALIGNMENT OR BYPASS:

271. This is an option that will have a permanent impact on existing land use patterns from agricultural to paved roads. Land and farmers must be compensated per the Resettlement Action Plan (RAP). In this project, three realignments have been identified and evaluated, considering the alternatives analysis. These three alternatives have been studied as follows

- ▶ Proposed Realignment at Bagachra
- ▶ Satkhira Medical College
- ▶ Combined Realignment of Kalarou & Jhaudanga

5.3.3 PROPOSED REALIGNMENT AT BAGACHRA

272. One of the Settlement areas along the Project Road is the Bagachra Urban Area. About 682 structures along the Existing Corridor will be impacted, and the Resettlement Cost would be about BDT.5396 Crores. The number of structures impacted along the realignment would be about 262, and the likely resettlement cost would be about 885 Crores. Therefore, a realignment of about 4.40 Km has been proposed, whereas the length of existing road alignment is about 4.025 Km. The Proposed Realignment for the Bagachra Settlement along the existing alignment is shown in **Figure 5-1**.

5. Analysis of Alternatives

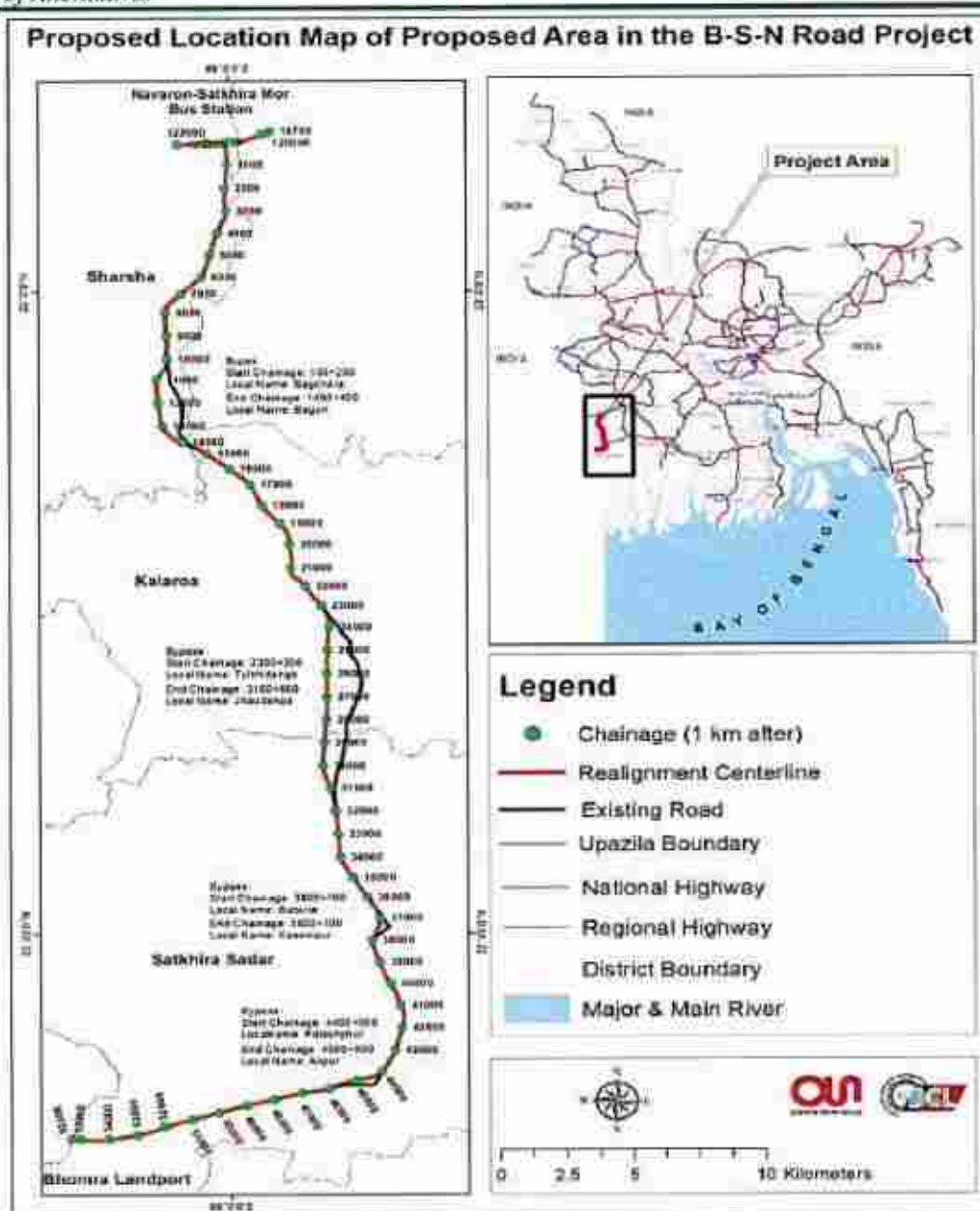


Figure 5-1: Existing and Proposed Realignment for Bagachra Urban Area

5.3.3.1 SATKHIRA MEDICAL COLLEGE

273. The Realignment has been proposed for avoiding the Sathkira Medical College and other considerations given while proposing a bypass at this location are as follows:

- ▶ The land for widening the existing road is unavailable. It will further impact the Medical College building on the left-hand side and the Hostel Buildings on the right-hand side of the road.
- ▶ Further, the curve along the current alignment is sharp and poses road safety issues.
- ▶ The only problem with the realignment is that the new alignment will be through the agricultural land, which will require land acquisition.

5.3.4 COMBINED REALIGNMENT OF KALAROA AND JHAUDANGA

274. Kalaroa and Jhaudanga are the major twin settlements on the Bhomra – Sathkira – Navaron Road Section are Kalaroa and Jhaudanga Township. The current highway improvement plan affects 1013 structures.

5. Analysis of Alternatives

while the proposed realignment impacts only 118. Land acquisition along the existing alignment is limited and costly, estimated at BDT 1830 crores, compared to BDT 209 crores for the realignment. Therefore, a combined Kalaroa & Jhaudanga realignment of approximately 8.250 km has been proposed instead of the existing 8.710 km route. Figure 5-2 illustrates the proposed realignment.

275. In addition to the above, an Integration of the Highway and port Plan at Bhomra has been provided, with eight lanes in the Port Expansion Area to allow for Port operation near the Highway.

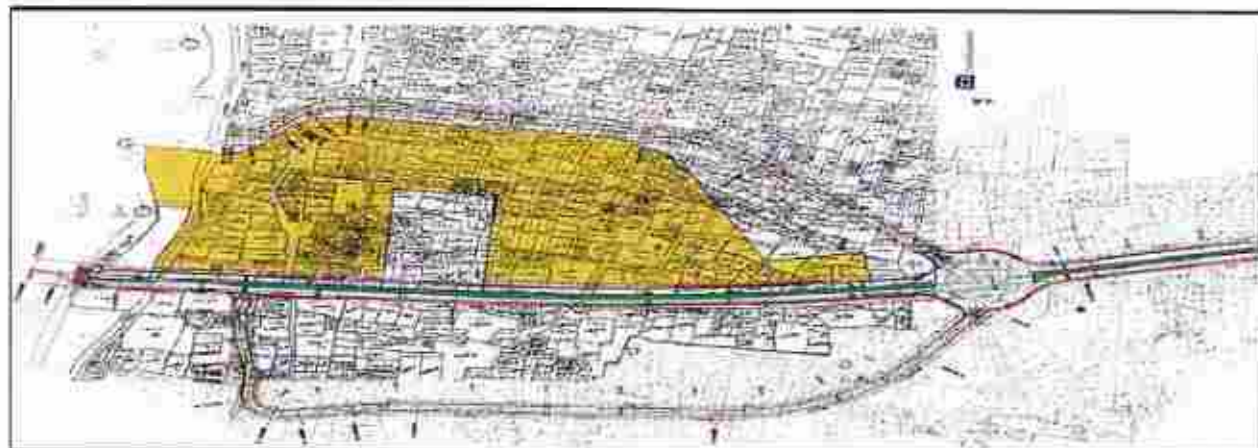


Figure 5-2 Proposed Expansion of the Bhomra Port

5.3.5 OPTIONS STUDY FOR THE BHOMRA – SATKHIRA – NAVARON ROAD

276. Based on the above, three options were considered for the Bhomra – Satkhira – Navaron Road. It is summarized as follows:

A. Option 1

277. As shown in Figure 5-3, Option 1 consists of the following:

- ▶ Dual 2-lane with Service Road on both sides of the Highway throughout the length. The Length is about 61.184 Km.
- ▶ In this option, there are four major bridges and one RUP.
- ▶ The geometry of the proposed Road improvement will be as per the RHD Standard and the Design Speed of 80 Km/h.
- ▶ No Direct Junction with high-speed main carriageway.
- ▶ This Option will involve Maximum utilization of EROW.
- ▶ However, Implementing the proposed four-lane Service Road on both sides will involve resettlement issues in the congested towns of Bagachra, Kalaroa, and Jhaudanga.
- ▶ Due to the Provision of RUP, there is a chance of a Drainage issue at the Navaron Intersection.



Figure 5-3: Alignment Option-1

B. Option 2

278. As shown in Figure 5-4, Option 2 consists of the following:

- ▶ Dual 2-lane with Service Road on both sides of the Highway throughout the length. The Length is about 61.184 km, and the total Number of Major Bridges is 2.
- ▶ In this option, there is one ROP cum Flyover for Trumpet on Bhomra – Satkhira – Navaron Road which will be on Level 2 as Service Road will be at Level 1. This means that the Bhanga-Benapole Flyover will be in level 3 which will be difficult to Construct.
- ▶ Geometry of Proposed road is improved as per RHD Standard for Design Speed of 80 Km/h.
- ▶ Kalaroa has dense built up and substandard Geometry. The Town has been realigned on the RHS because of River Betna on LHS. Very less resettlement Cost. Bagachra and Jhaudanga Flyovers with service roads underneath have been proposed to minimize the impact on settlements in Bagachra and Jhaudanga.



Figure 5-4: Alignment Option-2

C. Option 3

279. As shown in Figure 5-5, Option 3 consists of the following:

- ▶ In this option, the highway is 61.184 km long, features two major bridges, and consists of dual lanes with service roads.
- ▶ One ROP cum Flyover for Trumpet on Bhomra – Satkhira – Navaron Road at Level 2 and Bhanga-Benapole will be at grade at Level 1 with Access Controlled. The Service Road will be routed through the Underpass at either end.
- ▶ The geometry of the proposed Road is improved as per the RHD Standard for a Design Speed of 80 Km/h.
- ▶ Kalaroa and Jhaudanga are dense settlements, and road geometry is substandard. A realignment of 13 km on the RHS is proposed, resulting in less resettlement cost. Bypass has been provided in Bagachra area to minimize the impact on settlements in Bagachra Town.



Figure 5-5: Alignment Option-3

280. The Comparative Study of the Alignment Options on some Key Indicators are tabulated below before the final option is recommended: (Refer to Table 5-1)

5. Analysis of Alternatives

Table 5-1: Comparative Study of the Alignment Options

Indicators	Option 1	Option 2	Option 3	Overall Ranking
Length (Km)	55.374-61.125	55.164-61.125	54.975-61.125	With some trade-off Option 3 is best
Road Geometry (Km/hr) Design Speed (Km/hr)	80	80	80	Road Geometry is the same,
Land Acquisition	Higher Urban Land is involved.	Higher Urban Land is involved.	Lesser Urban Land Involved.	
Involuntary resettlement	High	High	Less	
No of Bridges	04	04	04	
Navaron Intersection	Complete Grade Separation is not achieved	Grade Separation is achieved. But Bhanga-Benapole at Level 3.	Grade Separation has to be provided for easy traffic movement	
Bagachra Urban Area	Bypass	Bypass	Bypass	
Kalaroa Settlement Area	At Grade (Major Settlement Impact)	Grade Separation (Flyover)	Realignment with less land Cost.	
Jhaudanga Settlement Area	At Grade (Major Settlement Impact)	Grade Separation (Flyover)	Realignment with less land Cost.	
Environmental Sensitivity	No Major Environmental Impact	No Major Environmental Impact	The land use pattern will be changed from natural to paved road. Usually, this area is a low-laying area with 1-2 crops harvested in a year, so there is no major environmental impact.	
Trees and Vegetation Removal	Large no of Trees removal	Large no of Trees removal	Less no of trees removal will be needed, because realignment sections at Kalaroa and Jhaudanga are mostly agricultural lands and fellow lands	

281. The ranking of the option based on E&S issues is presented in **Table 5-2** following the color index with the allocation of score.

Table 5-2: Comparative Study of the Alignment Options

Options	Description of Options	Air	Noise	Water	Soil	Drainage	Agriculture land	Tree Cutting	Land	Involuntary resettlement	Community Health and Safety	Road safety	Total	Ranking
1	Dual 2 lane with Service Road on both sides of the Highway throughout the length - No Bypass												-26	3
2	Dual 2 lane with Service Road on both sides, Railway overpass and trumpet at Navaron			0									-22	2
3	Dual 2 lane with Service Road on both sides, ROP cum Flyover for Trumpet on Navaron-Sakhira Bhomra, Kalaroa & Jhaudanga.			0									-18	1

Color Legend

Magnitude of Impact	Allocation of scoring		
	High	Mild	Low

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5. Analysis of Alternatives

High	3	2	1
Moderate	2	2	1
Low			

282. Option 3 is recommended based on the comparative study of the alignment options. The details of this section are discussed in the following subsections.

5.4 NAVARON INTERSECTION

283. Three Options have been considered for the Navaron Intersection, which is described below:

► OPTION 1:

284. This option includes an underpass for the Main Carriage Way (MCW) at the railway line located at Km 0+260, extending to Bhanga – Benapole Road. Service roads will run alongside the MCW at ground level. The section of the MCW between the railway line and the roundabout will be open to the sky, while Bhanga Benapole Road will be elevated on a flyover. Service roads will be situated beneath the flyovers and will connect at a grade roundabout at zero point. A loop ramp arrangement is proposed to ensure smooth connectivity between these two major roads. Refer to Figure 5-6 for the layout of Option 1.

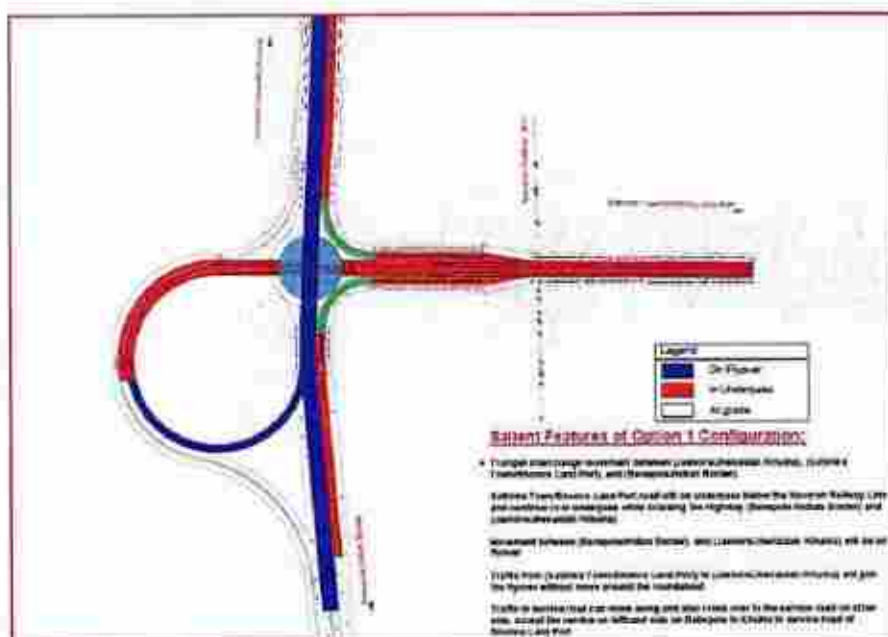


Figure 5-6 : Navaron Intersection Option-1

► OPTION 2:

285. In another alternative, Option-2, for Navaron Zero-point, a Railway overpass cum flyover has been proposed for the MCW of the project road. In contrast, Bhanga Benapole will be on Flyover, one level above the Railway overpass cum Flyover of Bhomra – Satkhira – Navaron Road. Service roads of both roads will meet at the at-grade roundabout at zero point underneath the flyovers. A loop ramp arrangement has been proposed to provide a smooth arrangement between the two Major roads. Option 2 arrangement is shown below in Figure 5-7.

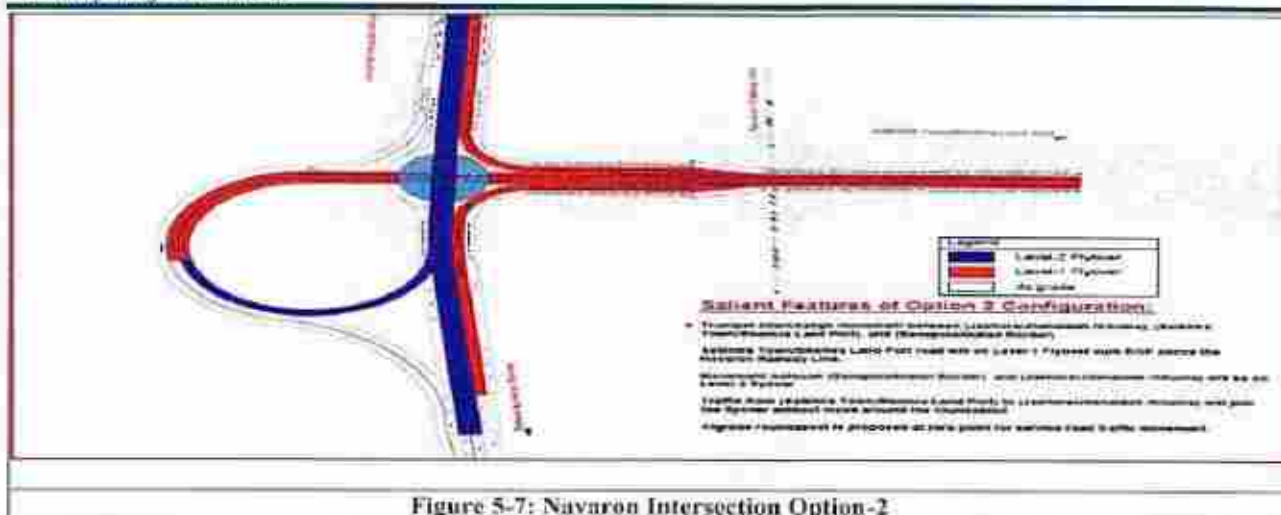


Figure 5-7: Navaron Intersection Option-2

► Option 3:

286. In another alternative, Option-3, for Navaron Zero-point, Project Road is proposed with a Railway overpass cum flyover over the Railway line and Bhanga Benapole Road. Bhanga-Benapole Road will be access-controlled. Service roads on both highways will have connectivity at zero point through an underpass. To provide a smooth arrangement between the two Major roads, a loop ramp arrangement has been proposed. Loop and ramps will merge with the MCW of Bhanga-Benapole Road before the Bridge on Betna River. Option 3 arrangement is shown below in **Figure 5-8**.

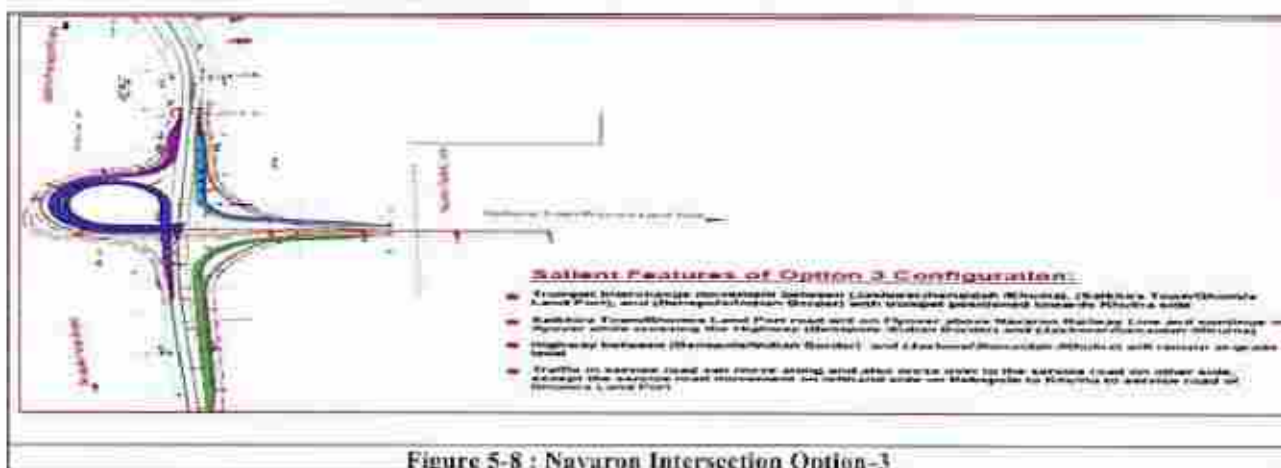


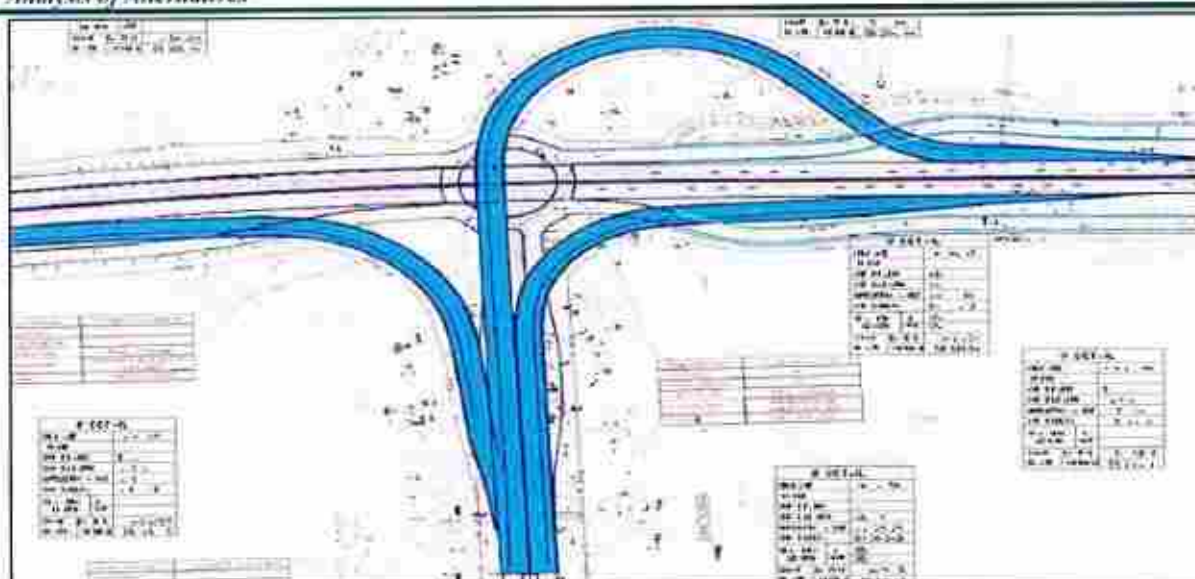
Figure 5-8 : Navaron Intersection Option-3

287. The following are considered for the Navaron Intersection and is shown in **Figure 5-9**:

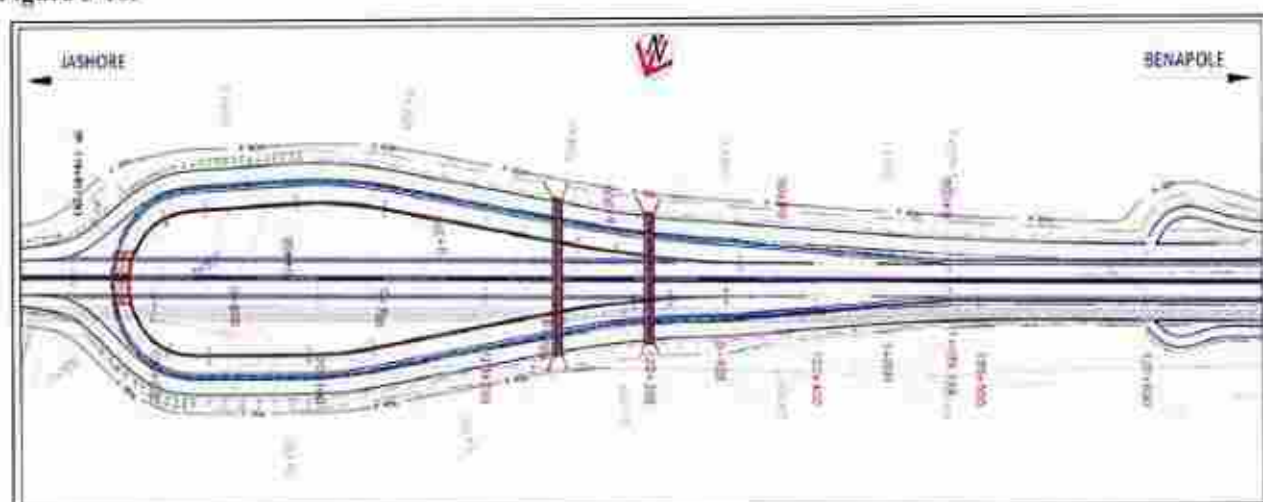
- At the grade roundabout at the Navaron intersection.
- A flyover on Bhanga-Benapole is proposed at level 1.
- A railway overpass (ROP) is proposed on the Navaron-Benapole railway line

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288. The schematic diagram of the Directional Ramp for the U-Turn on Bhanga-Benapole Road is shown in Figure 5-10.



5.5 CARBON SAVINGS DUE TO 'WITH PROJECT' SCENARIO

289. Bangladesh is highly vulnerable to climate change, making it essential for its development to be environmentally sustainable and economically viable. Reducing greenhouse gas emissions from vehicles is crucial, as this correlates with lower global warming. Ultimately, decreasing these emissions benefits the environment both nationally and globally.

290. An analysis of carbon reduction, presented in Table 5-3, indicates a positive difference between the 'with project' and 'without project' scenarios. Carbon emissions are higher in the 'without project' option. Notably, the gap between these scenarios has grown over the years, showing that emissions with the project will consistently be lower.

Table 5-3: Comparative Study of the Alignment Options for Carbon Emissions

Year	CO ₂ Emissions (in Ton)		Difference
	Existing Condition	After Improvement	
2025	5,646	4,236	1,410
2026	5,988	4,492	1,496

5. Analysis of Alternatives

Table 5-3: Comparative Study of the Alignment Options for Carbon Emissions

Year	CO ₂ Emissions (in Ton)		
	Existing Condition	After Improvement	Difference
2027	6,352	4,765	1,587
2028	6,736	5,053	1,683
2029	7,183	5,388	1,795
2030	7,663	5,748	1,915
2031	8,171	6,129	2,042
2032	8,713	6,536	2,177
2033	9,292	6,970	2,322
2034	9,951	7,464	2,487
2035	10,304	7,729	2,575
2036	11,038	8,280	2,758
2037	11,825	8,870	2,955
2038	12,670	9,503	3,167
2039	13,466	10,100	3,366
2040	14,310	10,734	3,576
2041	15,209	11,408	3,801
2042	16,165	12,125	4,040
2043	17,181	12,887	4,294
2044	18,030	13,524	4,506
2045	18,921	14,191	4,730
2046	19,856	14,893	4,963
2047	20,838	15,629	5,209
2048	21,868	16,402	5,466
2049	22,725	17,045	5,680
2050	23,617	17,714	5,903
Total Design Life	3,43,718	2,57,815	85,903

5.6 ENVIRONMENTAL IMPACT OF ‘WITHOUT PROJECT’ AND ‘WITH PROJECT’ ALTERNATIVES

291. The “With Project” scenario involves new road investment to meet future traffic demands, while the “Without Project” scenario would lead to negative consequences and could result in traffic congestion, increased noise and air pollution, and a rise in road accidents due to poor design. Although the “With Project” scenario will still have some environmental and social impacts, these can be mitigated through measures outlined in Chapter 7 of the report. A traffic analysis indicates that without the project, significant issues are expected to arise in the future.

- Crossing the road will become more dangerous
- Traffic congestion will increase
- Economic disadvantages will result from vehicle idling, increased travel time, and increased operating costs due to frequent wear and tear.

5.6.1 COMPARISON SCENARIO MATRIX

292. The following matrix describes the comparison scenarios, including both environmental and social factors associated with the project. A comparison scenario of “with the project” and “without the project” is presented in **Table 5-4**.

Table 5-4: Comparison Scenario Matrix of With and Without the Project

Sl. No.	Factors	With the Project	Without the Project
1.	Connectivity & Economic Growth	This will facilitate faster, safer economic links by improving connectivity and reducing commute times.	The current road system cannot support the increasing traffic, causing congestion and inadequate logistical support for the regional economy.

5. Analysis of Alternatives

Table 5-4: Comparison Scenario Matrix of With and Without the Project			
SL No.	Factors	With the Project	Without the Project
2.	Social and environmental conditions	Implementing this project will offer improved environmental and social conditions.	The current road network is congested and inadequate to support the expanding economy. It is straining the existing environmental and social conditions.
3.	Community health and safety	The new road will enhance safety and reduce travel time for the community with safe crossings and foot bridges.	The road is congested and lacks public crossings, such as foot-over bridges.
4.	Flooding and drainage	The upgrade includes installing 118 culverts, 04 bridges, and drainage lines to improve water flow during heavy rainfall, reducing waterlogging/flood risks.	The project area is influenced by the changes in rainfall patterns and sea-level rise, which can increase flooding and waterlogging.
5.	Traffic congestion	The proposed development will ensure the free flow of traffic and help keep it organized.	Current roads cannot handle rising traffic, causing congestion and delays.
6.	Topography and soil	The project alignment will mainly traverse flat terrain, causing minimal impact on topography and soil.	There is no impact on the topography and landscape.
7.	Trees and vegetation	The project will involve cutting down older trees in the ROW, primarily those nearing the end of their lifespan. However, for each tree removed, three will be replanted, focusing on younger trees that will benefit the environment.	The project area has several mature, decaying trees that are rotting and broken, posing a threat to the community and risk of accidents.
8.	Wildlife and Aquatic Biology	No national reserved areas exist in the project area, so the project will not harm the existing wildlife and aquatic biology.	The existing road system faces traffic congestion and water logging, negatively impacting local fauna.
9.	Climate	There will be a decrease in greenhouse emissions from vehicles, thus positively impacting global warming.	The current road network is causing higher greenhouse gas emissions from vehicles.
10.	Noise pollution	The project will provide noise barriers (trees) at necessary locations to protect the community from pollution.	The roads are congested with traffic, causing frequent honking and h.
11.	Carbon emission	With project, a significant amount of decrease is anticipated in the carbon emission.	Without the project, rising traffic will lead to an increase in carbon emissions.

293. Overall, the quality of the environment and social conditions will deteriorate further if the 'without project scenario' is adopted with the present road condition. Thus, with project scenario is a better option.


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6. Consultation, Public Participation, and Information Disclosure

6 CONSULTATION, PUBLIC PARTICIPATION, AND INFORMATION DISCLOSURE

6.1 INTRODUCTION

294. This section details consultation, information disclosure, and stakeholder participation. The Stakeholder Engagement and Information Disclosure (SEID) framework allows stakeholders to raise their concerns and offer suggestions during the project's design, planning, and implementation. The public communications policy of WB aims at enhancing stakeholders' trust in WB operations. The Policy among others promotes-

- ▶ Awareness and understanding of ESS2, ESS3, ESS4, ESS5, ESS7, ESS8 and ESS10 ESS5 of WB
- ▶ Activities, policies, strategies, objectives, and results among the public
- ▶ Participatory development, ensuring a greater two-way flow of information between Client, consultant, WB and its stakeholders, including affected people;
- ▶ Transparency and accountability in ESF (ESS1-ESS10s) of the WB operations.

295. The SEID meetings aim to identify potential stakeholders and PAPs, engage in beneficial discussions with them using a methodology, and assess their interest in the project to determine the social issues or valued environment component in the project region and to make sure that pertinent environmental and social information has been addressed and shared, and their opinions have been appropriately included in the project.

6.2 STAKEHOLDERS

296. The project's Primary stakeholders are affected people, including landowners, farmers, businessmen, structure owners, sharecroppers, poor, pro-poor, squatters, vulnerable persons and groups, women's groups, underprivileged groups, owners of commercial and business enterprises, vendors, small ethnic communities, wage earners, marginal workers, drivers, and transport workers.

297. The people who have a great influence on the project are the Secondary stakeholders, such as RHD and LGED, District Administration, District Forest Office (DFO), Department of the Environment (DoE), BWDB Local government representatives (Municipal Mayor, Councillor, and UP Chairmen, Members), Local Elites, influential personnel, and other people who have stakes in the project.

6.3 APPROACH AND METHODOLOGIES

298. The consultation and participation process has been conducted following the Bank's ESF. The strategy for discussing the possible environmental and social effects of land acquisition on the Bhomra-Saikhira-Navaron Road Phase 3 and consulting with the assembled stakeholders involves enabling their active participation to obtain their concerns, opinions, suggestions, and pertinent inputs for minimizing the adverse impacts.

6.3.1 PUBLIC PARTICIPATION PROCESS

299. Various methods were used for carrying out SEID namely Stakeholder Consultation Meetings (SCM), Focus Group Discussions (FGD), Key Informant Interviews (KII) and spot discussions during the census, and holding stakeholder consultation meetings with stakeholders and PAPs. To organize SCM and FGDs, and KIIs, separate checklists/questionnaire was developed to assess impacts and risks arises from Land Acquisition (LA) and Rehabilitation Action Plans (RAP), gender-based issues (Violence), and to devise mitigation measures for the preparation of Environmental and Social Management Plan (ESMP).

300. The alignment suggested by the design team engineers was used to identify the project's affected parties. The stakeholders were notified of the location, venues, date, and time through announcements, miking, leaflet distribution, etc.

6.3.2 IDENTIFICATION LOCATIONS AND SELECTION OF VENUES

301. Locations for stakeholder consultation meeting (SCM), Focus group Discussion (FGD), and KII were chosen according to the design team's roadmap for the ESIA phase of the WeCARE program. Venues were selected in coordination with RHD officials and in line with the Bank's ESS requirements. Potential PAPs were notified about the venue, date, and time through announcements, leaflets, and local administration support. There are nine (9) SCMs.

and ten (10) FGDs and twenty-eight (28) conducted in the project area between October 2023 and 27 April 2024 as summarized in Table 6-1.

Table 6-1: Summary of SEID tools used in the ESIA process

Sl. No.	Type of SEID	Number of Events	Period		Participants		
			Earliest Date	Latest Date	Male	Female	Total
1.	Stakeholder Consultation Meets (SCM)	9	19.10.2023	27.04.2024	553	171	724
2.	Focused Group Discussion	10	17.12.2023	27.04.2024	134	70	204
3.	Key Informant Interview	28	03.09.2023	27.04.2024	25	4	29
	Total	47			712	245	957

Note: Details of Participant, venue and schedule of SEID events conducted between 03.09.2023 and 27.04.2024 are given in Annex 6, Volume-II

6.4 CONSULTATION AND PARTICIPATION

302. The following information has been brought up during the stakeholder consultation process: relevant project-related information; project objectives and benefits; removal of trees for road section development; pollution from construction equipment and vehicle movement; and prevalent diseases along the road; pedestrian safety; labor influx during the construction phase; land acquisition (LA) and resettlement for the proposed development and LA process; utility relocation requirements; CPR requirements; gender-based violence issues; etc.

303. A total of 957 individuals participated in the discussion about the Bhomra- Satkhira- Navaron Road in WeCARE program . Male involvement in SEID for the Bhomra-Satkhira-Navaron road was 712, while female participation was 245. During the discussion, participants engaged in various environmental and social challenges, including the provision of underpasses, pedestrian overpasses, and foot-over bridges for pedestrians; realignments; road safety; culverts and bridges; tree removal and utility moving, among other topics.

304. Ten focus group discussions were conducted, targeting individuals who fell into a specific affected group due to their homogeneity. The focus was on the damage to property and/or livelihoods (eg. farmers, business owners, affected merchants, damaged residential structures, nearby neighbors, etc.). Additionally, from October 20, 2023, to April 27, 2024, twenty-eight (28) Key Informant Interviews (KIIs) were conducted. The consultant sought feedback from the parties involved regarding possible adverse effects and proposed remedies.

305. The conducted P SCM, FGDs, KIIs and attendance sheets are presented in Annex 6 in Volume-II

6.4.1 STAKEHOLDER CONSULTATION MEETING

306. The Environmental and Social Consultants team held several discussion meetings in Jashore and Satkhira districts following Upazila: Sharsha Upazila, Satkhira Sadar, and Kalaroa Upazila which are passing through the proposed Bhomra-Satkhira-Navaron road project. Implementation of Safe Corridor Demonstration Program (SCDP), to widen and strengthen this road to a four-lane highway with two service lanes for slow-moving vehicles (SMVT) on both sides of the highway, as well as laying optical fiber cable (OFC) and install Intelligent Traffic Signals (ITS), among other things, will require the acquisition of additional land. Passenger and freight travel costs and times will be shortened as a result. This road will play a big role in strengthening the country's regional economy. Several components of the WeCARE program will be jointly financed by the Asian Infrastructure Investment Bank (AIIB) and the World Bank (WB).

307. To implement the Bhomra-Satkhira-Navaron road section under Phase-3, the participants were informed that approximately 941.2089 Acres of land, 479.7117 comprising Acres of private land, 157.5430 Acres of RHD land, and 146.4112 acres of land belonging to the government (DC as well as other government institutions), need to be acquired.

308. The meetings included detailed discussions regarding potential risks, impacts, and implications on social, environmental, and land-related issues including on the project design and implementation arrangement. For example, land acquisition or requisition may lead to the loss of agricultural land, homesteads, ponds, and residential and commercial structures for potentially affected families. Permanent or temporary damage to residential and business units for Project Displaced Persons (PDP)/Project Displaced Households (PDH). Moreover, the acquisition of land will affect the wealth of common or community property. Temporary economic displacement of vendors and traders conducting their business along the RoW, damage to trees, crops, fisheries, etc.

Dissemination of Project Related Information in the Stakeholder Consultation Meeting and Outcome

309. The following information was disseminated in the consultation meeting:

- ▶ Importance of proposed development of Bhomra- Satkhira- Navaron Road section; In the following three Upazila which are Sharsha, Satkhira Sadar, and Kalaroa passing through the proposed Bhomra-Satkira-Navaron road project.
- ▶ It made them clear that this highway is very important as it has been linked with three land ports i.e. (i) Benapole, (ii) Bhomra, (iii) Darshona, and extensive road networks with different Districts and Upazila under Khulna, Barisal, and Rajshahi Divisions as well.
- ▶ The ITS will provide the opportunity for authorities to take necessary action such as the availability of ambulances within shorter time gaps, police patrolling, etc.
- ▶ The number of accidents will decrease to a large extent.
- ▶ The proposed Bhomra-Satkira-Navaron road project passes through the three Upazila of Satkhira Sadar, Kalaroa, and Jashore Sadar. The Safe Corridor Demonstration Program will be put into place to fortify and expand this route, turning it into a four-lane highway with two service lanes for slow-moving vehicles (SMVT) on either side. Additionally, intelligent traffic signals (ITS) and optical fiber cables (OFC) will be installed.
- ▶ Adequate drainage system (side drains culverts, minor bridges, major bridges), FOB, and POP will be constructed as per the requirement of the project.
- ▶ It will bring a positive drive for social and economic development.
- ▶ Land Acquisition Impacts and Issues including loss of structures, loss of livelihood, loss of fruit bearing trees, compensation etc.

Environmental Impact Assessment and Mitigation Measures

310. The Stakeholder Engagement Expert and E&S Consultants highlighted the environmental issues impacting the native villages and the project vicinity. Some exotic species will be removed due to project intervention. Some terrestrial and aquatic faunal resources such as frog, snake, squirrel, assorted birds, falcon, etc. will lose their habitats. During construction work, people may be affected by natural hazards like; dust, noise water, and air pollution which may cause health issues. Huge gathering of migrant people (labor influx) during the project's construction. The consultant has included the following environmental issues in the updated ESMP.

311. (i) Steps to be taken to save the terrestrial flora and fauna and to uphold bio-diversity in the locality. (ii) Maintain occupational health and safety during pre-construction and construction period; (iii) Steps to be taken to mitigate environmental degradation.

- ▶ Construction activities such as crushing, piling, driving of construction vehicles, and moving machinery will increase noise pollution as well as dust pollution during construction work.
- ▶ Labor influx during the construction of the project.
- ▶ Construction work will be a cause of land and landslide erosion and water logging in agricultural land.
- ▶ Necessary culverts, service roads, cross-sections, and poles have to be constructed.
- ▶ An adequate amount of foot over bridges, underpasses, overpasses for the movement of school and college-going students, markets, mosques, and temple worshippers, and animals, has to be constructed.

Mitigation Measures

- ▶ Avoiding adverse environmental impacts to save biodiversity resources.
- ▶ Effective noise barriers will be built to reduce noise pollution at an acceptable level.
- ▶ Regular water spraying will reduce dust pollution.
- ▶ Preparation of a Biodiversity Management Plan and tree plantation plan against the tree-cutting.
- ▶ Construction of drainage in the lower part of the road to maintain the rainwater to prevent water logging and saving the agricultural land from landslides.
- ▶ Construction site should be established at a safe distance to avoid disturbance of native peoples' daily life and nature.
- ▶ Maintaining the occupational health and safety (OHS) plan.
- ▶ Environmental and Social Management Plan (ESMP).
- ▶ Preparation of a Traffic Management Plan (TMP).
- ▶ Various pedestrian overpass, vehicular overpass, and foot overpass project designs are included.
- ▶ Alternative passage for everyday movement.

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6. Consultation, Public Participation, and Information Disclosure

- ▶ Preparation of Grievance Redress Mechanism to resolve conflict
- ▶ Monitoring

Social and Resettlement Impacts, Risks, and Mitigation Measures:

312. Acquisition of land will affect persons, households, businesspersons and some other entities including Community/Common Property Resources (CPRs), such as mosques, madrasas, temples, schools, colleges, Compensation for affected land, homesteads, water-bodies including ponds, structures, trees, CPRs, etc. will be given as per the ARIPA 2017 & the project's RPF which has been prepared and approved as per WB's ESS5 and ESS10. Individual Consultant, RHD described the Regulatory Framework and Guidelines of the GoB and WB. As mentioned, the affected persons, households, and entities will be assisted and compensated for their losses due to land acquisition and the implementation of the project.

Resettlement & Rehabilitation Specialist of E&S Consultant Briefed about the Followings:

Social impact and mitigation measure

313. Before the land acquisition process, all affected parties knew the steps they needed to take to prepare for relocation, resettlement, and economic rehabilitation. Each affected person must remove their structure from the affected land to implement the project. They were informed that the affected persons would be compensated at market value for the affected land and 200% premium as per ARIPA-2017; for structures, they will be compensated at the market price determined by the PWD and 100% premium; and more on relocation grants and restructuring grants. Affected persons shall be permitted to remove all salvageable housing materials from the damaged structure free of charge.

Social problems

- ▶ Loss of livelihood
- ▶ Loss of land, homestead, business structures
- ▶ Loss of rented-out commercial structures built on own land
- ▶ Damage to residential, commercial, and CPR structures
- ▶ Displacement from land, which may cause landlessness
- ▶ Damage to structures of squatters/occupiers/vendors
- ▶ Land acquisition can disrupt their daily life
- ▶ Loss of their social bonds
- ▶ Mental dissatisfaction
- ▶ Finding new land for relocation is uncertain
- ▶ Impeding the movement of people Unsafe movement
- ▶ Damage to trees, crops, fisheries, agricultural land
- ▶ Environmental degradation, etc.
- ▶ Regular traffic jams (due to narrow roads)
- ▶ People gathering from outside (labor influx) may cause social conflict
- ▶ Accidents occur regularly

Mitigation measures

- ▶ Preparation of Social and Environmental Impact Assessment and preparation and implementation of RAP
- ▶ Equitable and straightforward compensation
- ▶ Support for finding a new location
- ▶ Fair compensation for all kinds of losses
- ▶ Construction of recreational areas for recreation of local people
- ▶ Road safety measures to be adopted in the project.
- ▶ Construction of a sufficient number of FOB, POP, and VOP in a meaningful location
- ▶ Provide livelihood restoration support and training
- ▶ Preparation of an Environmental and Social Management Plan (ESMP)
- ▶ Development of a Grievance Redress Mechanism to resolve any project-related problem
- ▶ Road safety measures to be adopted in the project
- ▶ Widen the road
- ▶ Grievance Redress Mechanism

The outcome of Open Discussion:

6. Consultation, Public Participation, and Information Disclosure

314. The participant's insights on land acquisition procedures, compensation payment mechanisms, relocation requirements, negative and positive social and environmental impacts on the project, and alternative solutions were recorded. Women and other vulnerable groups were also consulted regarding specific project impacts and issues related to their livelihoods.

- Affected people will lose their agricultural land, habitations, water bodies, ponds, and residential and commercial structures for land acquisition
- 80% of people need a bypass, but 20% are against the use of agricultural land for bypass as food production will be disrupted
- It is crucial to provide fair compensation to the local small-scale retailers and markets
- People are worried about the potential negative environmental impact of cutting down 100-year-old trees to widen the road
- Many trees should be planted, and a mitigation plan should be developed to avoid negative impacts
- During the discussion, participants expressed concern about the potential effects of an influx of labor on the members of the community
- Participants expressed their concerns about land acquisition, physical displacement of residential and commercial structures due to the project
- The affected people have requested fair and adequate compensation, not only for loss of land and income but also for other assets
- The present market value of land is not sufficient to offset the existing mouza rate
- Anticipating compensation based on the current market value
- Considerations must be made for vulnerable PAPs, women's safety at work, and new skill development for vulnerable populations
- The participant raises their queries about potential different environmental and social pollution and impacts such as air pollution, sound pollution, water pollution, noise, loss of livelihood houses, and various diseases etc. due to the construction activities
- The safety of women workers and female members of the community must be ensured during the influx of laborers during project construction
- Participant requested to construct adequate numbers of underpasses and foot over bridges at appropriate locations (e.g., in vicinities of schools, madrassas, areas of bazaars and hats, etc.)
- A proper drainage system should be there to stop water logging, which will save crops and stop land sliding
- They raised points on environmental and social risks and impacts on the disadvantaged, marginal aged, and vulnerable groups. In response, they were informed that the disadvantaged, marginalized, and vulnerable groups would receive income restoration grants, special assistance of a one-time payment, and training along with their other entitlements*
- Labor Health and Safety (LHS) will be ensured
- If DC bases the compensation amount on the recorded category of land rather than the actual category of land, the participants expressed concern that they will not receive just and sufficient compensation.

6.4.2 FOCUS GROUP DISCUSSIONS

315. A total of 10 (ten) focus group discussions (FGDs) were conducted during the study period from October 19, 2023, to April 27, 2024. One of these discussions, held in Tulshidanga, Kalaroa Upazila, Satkhira, included a larger-than-usual group of around 35 participants (refer to **Annex 6, Volume-II**). These FGDs focused on the Management Committees of Project Displaced Persons (PDP), Project Displaced Households (PDH), Community Property Resources (CPR), women's groups, and other stakeholders. Focus Group Discussions (FGD) aim to gather information from stakeholders, PAPs, and various programs affecting women, focusing on losses of properties and/or livelihoods of individuals belonging to a particular affected group based on homogeneity (such as bus/truck drivers, affected businessmen, affected residential structure losers, and nearness, neighbors, etc.). We polled women-headed households, housewives, students, community leaders, landowners, and vulnerable people for their thoughts, ideas, and suggestions. The project consultant developed a questionnaire on gender issues and other project aspects, a structured outline was followed and implemented so that the main outcomes of the FGDs could largely cover. The project will consider the comments/concerns and ideas of the FGDs while preparing the migration plan. The main concerns raised by PAPS are as follows:

Concerns:

- ▶ The project activity must not create water logging in their living areas
- ▶ It is better to avoid agricultural land for bypass
- ▶ Due to scarcity of land, new land is not available in this area (nobody sells)
- ▶ The safety and security of a female labor is to be ensured at the construction yard during construction phase
- ▶ Toilet for male and female should be in opposite direction
- ▶ Skill training and credit support for the poor and restoration of livelihoods
- ▶ The participants demanded the construction of an overpass/underpass in a suitable location near the School and Bazar areas to avoid traffic accidents and easy crossing
- ▶ Adequate, proper, and hassle-free compensation demanded
- ▶ Implementation of Income and Livelihood Restoration Plan
- ▶ Current market value of the structure on GoB land demanded
- ▶ Notice for at least 3-4 months before relocation
- ▶ Payment of compensation before displacement
- ▶ Payment of moving/shifting allowance
- ▶ Employment opportunities for eligible female laborers during
- ▶ Occupational health and safety for labor
- ▶ Construction camp should be constructed far from the locality
- ▶ Equal wage for woman laborers during construction work was demanded
- ▶ Vulnerable HHs would have additional benefits
- ▶ Display adequate safety signs and diversion marks during construction especially in the location of schools, mosques, and Bazar
- ▶ Requested to stop the slow-moving vehicles (e.g., Alom Sadu and 3-wheelers) on the highway
- ▶ Raising a labor welfare fund to assist the injured drivers and their family
- ▶ Construction-related hazardous waste management should be in place

6.4.3 KEY INFORMANT INTERVIEWS

316. Twenty-eight Key Informant Interviews (KIIs) have been conducted with the secondary stakeholders such as public administrators, local government representatives (UP Chairmen, Members), Local influential personalities, and others who will play an important role in the project. The following are concerns, expectations, opinions expressed by the stakeholders'. Details are given in Annex 6, Volume-II):

Concerns:

- ▶ Land acquisition resettlement issues and compensation
- ▶ Problems related to road construction Air, Water, and Dust pollution
- ▶ Gender-Based Violence, Sexual Exploitation, and Abuse/Sexual Harassment
- ▶ Proper drainage system, waste management system
- ▶ Occupational Health & Safety
- ▶ Resting place and toilet facilities with the passenger shed
- ▶ Footpath and proper lighting system
- ▶ Selected place for vendors
- ▶ Time frame of construction work, quality control, and construction materials
- ▶ Compensation for the change of land classification, compensation for CC loan
- ▶ Loss of homestead and structures
- ▶ Loss of business centre
- ▶ Loss of livelihood
- ▶ Having no remaining alternative income source
- ▶ Loss of rented-out commercial structures built on own land
- ▶ Displacement from land, which may cause landlessness
- ▶ Road updating will affect the social and environmental conditions; people will lose land, structures, businesses, agricultural land, forests, fruit trees, ponds, schools, mosques, and other establishments
- ▶ A significant number of old trees are to be felled; enough trees should be planted to protect the environment
- ▶ Crops and land may be affected by water contamination

6. Consultation, Public Participation, and Information Disclosure

- Poor and vulnerable people lose their livelihood

Expectations:

- Fair/adequate compensation for loss of commercial land and structures
- Tree plantation
- Assistance to start the business at the alternative place and
- Expectation of getting jobs
- Provide livelihood restoration /skill development training
- Encourage them to establish connections with government facilities
- Proper maintenance during construction work to avoid social and environmental issues
- Occupational Health and Safety measures should be providing
- Grievance Redress Mechanism should be in place
- Proper drainage system to stop water logging, save crops, and stop land

Opinions/suggestions:

- Suggests a pollution-safe and secured road
- Slow-moving Vehicle (SMV) shall have to be strictly prohibited from the highway, a separate land is required
- Less time and traffic jams will result from the road widening
- As much government land as possible should be used to widen the road instead of private property
- Keep provision for underpass or foot over bridge for crossing students and the people who come to prayer in the mosque regularly
- Suggestion for an effective drainage system and necessary bridge over the pool and culvert
- Simultaneously, a plantation will be needed. Local people are suffering from water logging; drainage systems need to be updated to save them. Sufficient underpass and overpasses are required

6.4.4 ESIA DISCLOSURE

317. According with the Rules of 16 of the ECR, 2023 of the Department of Environment, the Consultant conducted two Public Disclosure meetings on disclosure of the Draft ESIA of the Phase-3, before that meetings schedule were advertised in one National and Two local papers. Two Public Consultation Meetings conducted one at Langoljhora Union Perished of Kolaroa Upazila under Satkhira District dated on 29 June, 2025 and another at Uleshi Union Perished under Sharsa Upazila of Jeshore District dated on 30 June, 2025. These meeting Minutes have been published in the newspapers and the Minutes have been approved by Concern DoE Officers. 1st Consultation meeting attendees were 56 including five (05) women and, attendees were 47 including 3 women in the 2nd meeting. The project design, benefits, and anticipated adverse environmental and social impacts were disseminated in these meetings. Women and other vulnerable groups were also consulted concerning the specific project impacts and their livelihood aspects. The participants were asked for their views on the Project's overall environmental impacts due project implementation and the compensation process to be adopted for the project affected persons. The provisions of the WB policy ESS1, ESS5, ESS10, and Government Act ARIPA 2017 on land acquisition were also disclosed in this ESIA Disclosure meetings. The meetings were successful in addressing key issues and gathering important recommendations, which will play a vital role in guiding the project forward. Details of both meetings minutes, attendant sheets are presented in **Annex 14, Volume-II**.

318. Draft EIA report uploaded in the Websites of DoE and RHD for the Comments, opinions and recommendations for 30 working days. In the websites, no any opinion, suggestion and recommendation were observed in both websites. The links of website were given below.

<https://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/nphlock/2025-05-22-11-56-62170a7bac9ca40c1af705b84b8639d.pdf>.

https://rhd.portal.gov.bd/sites/default/files/files/rhd.portal.gov.bd/notices/2b2ac724_48cd4de3_8568_8bc62603_81ec/2025-06-01-09-51-1533547c950d96deaca73621f7eb68a3.pdf.

319. This final Environmental and Social Impact Assessment report for Phase 3, along with translated in Bengali executive summary for the sake of interest of local people will be disclosed on the websites of the RHD and the World Bank.

7 ENVIRONMENTAL AND SOCIAL IMPACTS, RISKS, AND MITIGATION MEASURES

7.1 GENERAL

320. The chapter discusses the environmental and social impacts and risks arising from the Bhomra – Satkhira – Navaron Road project. Various environmental and social impacts during the construction and operation phases may be direct, indirect, short-term, long-term, adverse, or beneficial. These impacts were discussed with stakeholders and the engineering design team to enable the adoption of mitigation measures during the early phase of the project.

7.2 IMPACTS AND RISK AND THEIR SIGNIFICANCE ON RECEPTORS

321. The assessment of effects and identification of residual impacts considers any mitigation measures carried out in response to the potential impacts of project activities. It mainly depends on the extent and duration of change, the number of people affected, the size of the impacted resource, and their sensitivity to the change. Potential impacts can be both negative and positive (beneficial), and the methodology used to identify both beneficial and adverse impacts. The criteria for determining significance vary by environmental and social aspect; however, the magnitude of each potential impact is generally evaluated in conjunction with the sensitivity of the receptor. Typical criteria for defining magnitude and sensitivity used for the project are summarized below.

Impact Magnitude

322. The assessment of magnitude shall be undertaken in two steps. Firstly, the key ES issues associated with the WeCARE program are categorized as beneficial or adverse. Secondly, potential impacts shall be categorized as Very High, High, Moderate and Low based on consideration of the parameters such as:

- ▶ Duration of the potential impact;
- ▶ Spatial extent of the potential impact;
- ▶ Reversibility;
- ▶ Likelihood; and
- ▶ Legal standards and established professional criteria.

323. The magnitude of potential impacts of the program shall be identified according to the categories outlined in Table 7-1.

Parameter	High (4)	Higher Substantial (2)	Lower Moderate (2)	Low/Nil (1)
Duration of potential impact	Long Term	Medium to term	Medium term	Short-term and Temporary
Spatial extent of the potential impact	Beyond immediate Program components, site boundaries, or the local area, 5000m core study area	Within 1000m of the Primary study area	Within 500m of the Primary study area	Within the corridor of Impact or 50m on both sides
Reversibility of potential impacts	Irreversible, e.g., change in land use pattern	Reversible in the long run	Reversible in the long term	No change on baseline
Legal standards and established professional criteria	Exceeds the limits given in national standards	Sometimes it exceeds the limits of national standards but mitigates the risks at a significant level	Meets minimum national standard limits	Not applicable

7. Environmental and Social Impacts, Risks and Mitigation Measures

Likelihood of potential impacts occurring	Occurs under worst case (negative impact) or best case (positive effect) operating conditions (Likely)	Very common occurrence but manageable at a significant level.	Occurs under abnormal, exceptional or emergency conditions (occasional)	Unlikely to occur
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Sensitivity of Receptor

324. The sensitivity of a receptor shall be determined based on review of the population (including proximity/numbers/vulnerability) and the presence of features on the site or the surrounding area. Criteria for determining the receptor sensitivity of the program's potential impacts are outlined in Table 7-2.

Table 7-2: Criteria for determining the sensitivity of Receptors for Different Construction Activities			
Score	Sensitivity Level	Color Code	Mitigation Action
4	High (4)	● (Red)	Unacceptable; major mitigations required.
3	Substantial (3)	● (Orange)	Significant; specific, effective mitigation measures are mandatory.
2	Moderate (2)	● (Yellow)	Discernible; minor management/mitigation required.
1	Low (1)	● (Blue)	Acceptable; no specific mitigation required.

325. The significance of each potential impact is established using the matrix given in Table 7-3.

Table 7-3: Matrix for determination of Significance from Magnitude and Sensitivity of Impacts				
Magnitude of Impact \ Sensitivity Level	High (4)	Substantial (3)	Moderate (2)	Low (1)
	Significance Level			
High (4)	● 16	● 12	● 8	● 4
Substantial (3)	● 12	● 9	● 6	● 3
Moderate (2)	● 8	● 6	● 4	● 2
Low (1)	● 4	● 3	● 2	● 1

Note: Considered the Significance of weightage score ranging as High=(12-16), Substantial=(8-11), Moderate=(4-7), and Low=(1-3)

326. Based on the experience of the consultant elsewhere on similar types of projects, the environmental and social impact matrix for the construction phase has been worked out, and is given in Table 7-4. This table presents the significance of potential impact with and without mitigation measures. These impacts may include issues such as land use, air and noise pollution, soil erosion, water pollution, aquatic ecology, disruption of local communities, occupational health and safety risks, and pressure on local resources due to labor influx.

Table 7-4: Environmental and Social Risks Significance							
Impacts	Duration	Reversible/ Irreversible	Spread	Sensitivity for Impact (1-4) a	Magnitude of Impact (1-4) b	Significance Value $c = a * b$	Significance Level
Physical Environment							
Change of land use and land cover	Long term	Irreversible	Moderate	4	4	16	High

7. Environmental and Social Impacts, Risks and Mitigation Measures

Table 7-4: Environmental and Social Risks Significance

Impacts	Duration	Reversible/ Irreversible	Spread	Sensitivity for Impact (1-4) a	Magnitude of Impact (1-4) b	Significance Value c = a * b	Significance Level
Surface Water Quality	Short term	Reversible	Moderate	3	2	6	Moderate
Drainage Congestion/Waterlogging	Short term	Reversible	Substantial	3	3	9	Substantial
Groundwater Quality	Short term	Reversible	Moderate	3	3	9	Substantial
Materials Management	Short term	Reversible	Moderate	2	3	6	Moderate
A. Sub-Total						46	
Natural Environment							
Air Quality	Short term	Reversible	Moderate	4	3	12	High
Noise Levels	Short term	Reversible	Moderate	4	3	12	High
Vibration levels	Short term	Reversible	Moderate	3	3	9	Substantial
Soil Quality	Short term	Reversible	Moderate	4	3	12	High
B. Sub-Total						45	
Biological Environment							
Protected Areas	NA	NA	NA	NA	NA	NA	NA
Forest (reserve forest, protected forest)	NA	NA	NA	NA	NA	NA	NA
Agricultural land	Short term	Reversible	Moderate	2	3	6	Moderate
Green tunnels	Long term	Reversible	Moderate	2	4	8	Substantial
Private Trees cutting	Short term	Reversible	Moderate	4	3	12	High
Avenue Trees cutting	Short term	Reversible	Moderate	2	3	6	Moderate
C. Sub-Total						32	
Social Environment							
Land Acquisition	Long term	Reversible	High	4	4	16	High
No of affected people	Short term	Reversible	High	4	3	12	High
No of affected households	Short term	Reversible	High	4	3	12	High
No of residential structures	Short term	Reversible	High	4	3	12	High
No of commercial structures	Short term	Reversible	High	4	3	12	High
Common property resources	Short term	Reversible	Moderate	2	3	6	Moderate
Sensitive Receptors (educational and health facilities)	Short term	Reversible	Moderate	3	3	9	Substantial
Community health and safety	Short term	Reversible	Moderate	2	3	6	Moderate
D. Sub-Total						85	
Total Score (A+B+C+D)						208	

Note: Calculation was made based on color Index score identified through the expert's judgement (ref. Table 7.3).

327. The total weightage score for the project was calculated out of 260 score. This score was derived from the individual scores assigned to each of the four environmental components (Refer to Annex-1, Volume-II). The above analysis indicates that the total score is 208 out of 260 for the environmental and social risks significance as shown in Table 7-4. The results suggest that, the project is categorized as a High-Risk Project (score is above established threshold of 182, Refer to Table 1-4) in accordance to risk classification of the World Bank ESF.

7.3 IMPACTS AND MITIGATION DURING DESIGN PRE-CONSTRUCTION PHASE

7.3.1 IMPACTS ON DESIGN CONSIDERATION

328. The design stage requires surveys, field investigations, meetings, and desktop work for designing the project. Thus, no significant impacts on the existing environment are envisaged. Similarly, the pre-construction stage pertains to the mobilization of the Contractor, the Construction Supervision Consultant (CSC), the engagement of the NGOs to support RHD in the implementation of the Resettlement Action Plan (RAP), and Land acquisition work. However, before mobilization of the Contractor, RHD needs to undertake various activities to provide encumbrance-free alignment, which involves the demolition of structures, tree cutting, utility shifting, and compensation to be paid to the project-affected persons (PAPs), etc. Some of the activities do not require any specific mitigation, but some activities require mitigation measures.

329. Project Design Specifications: Design parameters and construction planning may negatively affect infrastructure operations, such as the degradation of natural systems like drainage, contamination caused by the mismanagement of construction waste, etc. Improper Project's geometrical improvement and pavement designs, realignment locations, siting of construction/labor camps and other associated infrastructures, not the least of them being human waste draining into the river, construction methods applied can have significant impacts on the biophysical, economic, and socio-cultural environments of the project area along the phase 3 road alignment. Natural hazards and climate change risks are also design concerns due to pavement damage, such as rutting, embrittling, softening, road migration of liquid asphalt, thermal expansion in bridge joints, etc.

330. The project area's seismicity could significantly affect heavy infrastructures like VOP, POP, flyover, and drainage structures, particularly bridges. Therefore, the impact on the design considerations is significant.

Mitigation Measures

- ▶ Considering the area's hydrology, an adequate drainage structure will be provided.
- ▶ Culverts of adequate spans have been provided to meet the requirement of animal crossing
- ▶ Issues about Pedestrian safety and road safety measures have been addressed by providing vehicular underpasses, pedestrian passes (POP), Flyovers, etc.
- ▶ Ensure road design, embankment height, and Pavement design to comply with the relevant international and national approved design manual of RHD Geometric Design Standards Manual (Revised-2005); AASHTO "A Policy on Geometric Design of Highway and Streets" 2001, etc.
- ▶ The Bangladesh National Building Code (BNBC) should be considered for the design of road infrastructures, particularly all building structures.

7.3.2 COMMUNITY HEALTH AND SAFETY (ESS-4)

331. The risks and adverse impacts on the community's health and safety are expected during construction activities like excavation, earth working, dismantling the existing structures, pavement works, siting of construction camps/labor camps, water logging, accidents at residential and commercial areas alongside the project roads, disruption traffic movement, etc. Therefore before start the civil works, the contractor should adopt the following mitigation measures,

Mitigation Measures

- ▶ For community health and safety, the contractor shall plan activities in residential areas after discussing with the community
- ▶ Locals should be informed about the activities the contractor is taking up in their areas.
- ▶ Excavated areas should be adequately barricaded.
- ▶ Trespassing of construction sites/construction camps/labor camps shall be prohibited.
- ▶ OHS and CHS Plan: the prevention and management of HIV/AIDS and other STIs as suggested in B-22 of Chapter 10
- ▶ Contractors should take all precautionary measures to prevent community exposure to water-borne, water-based, water-related, and vector-borne diseases and communicable and non-communicable diseases that could result from project activities.
- ▶ Control of accidents, trained drivers with valid licenses shall be allowed to drive construction vehicles/heavy equipment.

Joint Venture of



STUP Consultant Pvt. Ltd.
 On July 1st, 2021, STUP was acquired by Aecsystem and
 rebranded as Aecsystem STUP.



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Md. Mustafizur Rahman
 As Quality Specialist, STUP-BCL JV
 E&S Consultant, WeCARE

Md. Asaduzzaman Chowdhury
 Deputy Team Leader, STUP-BCL JV
 E&S Consultant, Joint JEP

7. Environmental and Social Impacts, Risks and Mitigation Measures

- ▶ The speed and fitness of the construction vehicles/equipment shall be defined in the contractors' ESMP.
- ▶ Contractor should prepare a site-specific Traffic Management Plan to be used during construction work, following the guidelines of the Traffic Management Plan in Annex 10, Volume-II.
- ▶ Vehicles/construction equipment need to be maintained and inspected/tested regularly.
- ▶ Highway Petrol / Police should be adequately deployed, particularly at night, to prevent the harassment of women passengers in the public busses on the project road during the operation of the project
- ▶ Finally, regular consultation with the community will be conducted to determine the effectiveness of implementing mitigation measures at construction sites/camps.

7.3.3 ACQUISITION AND CLEARANCE OF PRIVATE STRUCTURES (ESS-5)

332. The proposed development of this road section requires additional land to improve the geometry of the existing alignment. The requirement of Lands from the private owners, RHD land and other agencies for the proposed project road is presented in Table 7-5.

Ownership of Proposed Land for Acquisition								Grand Total Land within proposed RoW
Lot	Private Land			Government Land				
	Private land owned by individual owners	CPRs on Private Land	Subtotal	RHD Land	CPRs	Other Government Agencies	Subtotal	
Lot-1	34.73	1.16	55.89	62.15	0.37	17.07	73.33	135.48
Lot-2	192.28	2.01	194.29	21.68	0.51	42.24	237.04	258.72
Lot-3	221.27	0.78	222.04	37.39	0.55	21.82	244.41	281.80
Lot-4	162.44	0.97	163.41	3.14	0.68	64.36	228.45	231.59
Subtotal	630.72	4.92	635.64	124.36	2.11	145.49	783.24	907.60

Source: RAP- Phase 3, WeCARE, RHD, September 2025

Mitigation Measures

- ▶ Implement Land Acquisition Plan (LAP) and updated Resettlement Action Plan (RAP) of the Project prepared in compliance with the amended ARIPA, 2017 and World Bank's ESS5.
- ▶ DC will pay Cash Compensation under Law (CCL) to the PAPs to compensate for the impacts due to the loss of lands, structures, ponds, trees, standing crops, etc.
- ▶ Payment of compensation to Titled and Non-Titled households according to the entitlement matrix defined in the updated RAP by the RAP Implementing Non-Government Organization (INGO) on behalf of RHD
- ▶ Payment of Top UP (Replacement Value (RV)/Cost minus CCL where RV is higher than CCL) by RHD facilitated by INGO.
- ▶ Provide the resettlement benefits to the affected disadvantaged, marginalized, and vulnerable households to restore their livelihood by implementing the Livelihood Restoration Plan as documented in the updated RAP
- ▶ Proper compensation will be given for the loss of water bodies and trees by DC/RHD with assistance from INGO.
- ▶ Ensure adequate compensation is provided to the Project Affected Persons (PAPs) on time and without hassle.
- ▶ Affected HHs will be given cash compensation for the land and structures, as well as additional transfer grants for the relocation of each structure.
- ▶ Cash assistance for dismantling and reconstruction will be provided as per the assessed value.
- ▶ Vulnerable groups should be identified, and provisions made for social and economic development support, employment, and means of subsistence to improve their status/livelihoods.
- ▶ Provide support for livelihood and business restoration.
- ▶ The project's Grievance Redress Committees (GRCs) will ensure participation and speedy, out-of-court settlement of as many disputes as possible.

7.3.4 ISSUES OF THE CPRS (ESS-4)

333. The Inventory of Losses (IoL) survey identified about 126 CPRs alongside the existing road within proposed RoW requiring relocating or partially damaging structures or their premises will cause community stress. Lot-wise affected CPRs within the proposed ROW are presented in Table 7-6.

7. Environmental and Social Impacts, Risks and Mitigation Measures

334. It is observed during the IOL study that no historical, or archeological resources are falling along the project road; however, during site clearing and grubbing, excavation, or digging for construction purposes, it may unearth chance artifacts. A rapid response procedure in assistance with officials of the Department of Archeology, Bangladesh, shall be prepared to protect and preserve artifacts if found by chance, minimizing the disruption to project activities.

Table 7-6: Affected Lot Wise Affected CPRs within Phase-3

Lot No.	Type	Mosque	School/ Madrasah/ College	Graveyard/ Cemetery	Eidgah	Temple/ Mandir/ Mazar	Total
Lot-1	Title	4	5	9	0	0	18
	Non- Title	0	2	1	0	0	3
	Encroacher	8	2	1	0	0	11
Lot-2	Title	4	0	5	0	1	10
	Non- Title	1	0	0	0	0	1
	Encroacher	0	0	0	0	0	0
Lot-3	Title	15	12	11	1	2	41
	Non- Title	0	0	0	0	0	0
	Encroacher	0	0	0	0	0	0
Lot-4	Title	7	7	18	0	1	33
	Non-title	1	2	0	0	0	3
	Encroacher	2	4	0	0	0	6
Total		42	34	45	1	4	126

Source: RAP- Phase 3, WeCARE, RHD, September 2025.

Mitigation Measures

- ▶ CPRs, such as mosques, schools, temples, clubs, etc., fall within the corridor of impact and need to be properly shifted.
- ▶ Implementation NGO (I-NGO) has been engaged to assist PIU/RHD in the overall resettlement and relocation process as well as to facilitate the CPRs shifting.
- ▶ Payment of Cash Compensation under Law (CCL) for affected structures by DC for relocation of the structures.
- ▶ RHD, with assistance from INGO, pays the top-up (Replacement Value/Cost minus CCL where RV is higher than CCL) for structures.
- ▶ Compensation must be provided per guidelines specified in the RAP and mutual understanding between RHD and affected communities/committees.
- ▶ Affected CPRs must be rebuilt at the expense of RHD or payment of cash compensation in consultation with the affected communities.
- ▶ Affected communities will be given cash compensation for the land and structures and additional transfer grants according to the entitlement policy as defined in the RAP.

7.3.5 UTILITIES SHIFTING (ESS-4)

335. About 2133 Electric poles are to be shifted (Table 7-7). A discussion meeting has been conducted between the utility providers, the PIU, and E&S consultants to shift the utilities falling within the corridor of impact. Increased pollution in ambient air quality due to heavy equipment operation and an increase in ambient noise Levels due to excavator operation, concrete mix, and the traction of electric lines will be carried out. Unsafe to the public while working near residential/commercial areas, and shifting utilities like electric poles may require temporary power cuts, disturbing ordinary local people's commercial activities, and domestic life. However, the impact will be short-term and only in the daytime. Sometimes, underground cable faults may be anticipated during shifting, which will cause a dangerous situation in the locality. Generally, shifting optical fiber cables may create communication problems due to damage during relocation. In addition, shifting of utilities may block access to houses, business centers, and health centers. The erection of electric poles may cause inconvenience and block access to the residents, shopkeepers,

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students, and children. Possibilities of accidents and health hazards, if piled near houses on the roads, markets, schools and playgrounds, and parks without considering safety. Occupational and public safety issues of the workers, technicians, and residents are a serious concern during the shifting of the utilities.

Table 7-7: Utilities Shortening within the proposed ROW of the project

Road Side Electrical Utilities within proposed ROW									
LAP No.	Number of Power Pole	Number of Power Outlet Box (POB) owners are DESCO, RAB and PDB			Number of BTCL Box			Sub Station	Number of underground Power Line
		Both Side	Left Side	Right Side	Total	Left side	Right Side		
Lat-1	147	0	2	2	0	0	0	1	3
Lat-2	645	5	18	23	12	5	17	0	37
Lat-3	603	13	27	40	12	2	14	0	38
Lat-4	738	24	14	38	1	2	3	0	28
Total	2133	42	61	163	25	9	34	1	106

Mitigation Measures

- ▶ The RAP details the mitigation measures for the risks mentioned above and the impacts associated with Utility shifting.
- ▶ Machines and equipment that are well-maintained and in good working condition and meet the pollution board requirements shall be deployed at the site during the erection of electrical poles.
- ▶ Warning signboards shall be placed at visible locations.
- ▶ Proper safety measures should be adopted during the implementation of utility shifting so that accidents of workers, technicians, and local people can be avoided. All workers and project personnel should use PPE at the site.
- ▶ The contractor will prepare a Utilities Shifting Plan in consultation with the responsible agencies, such as West Zone Power Distribution Company Limited (WZPDCL), Jashore Palli Bidyut Samity (JPBS), and Bangladesh Telecommunication Company (BTCL), for utilities' relocation to RHD. The concerned authorities, JPBS of Jashore, have already submitted a budget for utilities' shifting to RHD.
- ▶ Utility shifting shall be done as per the agreed Utility shifting plan.
- ▶ The contractor, in consultation with the responsible agencies and RHD, will inform the local people about the schedule of the utility shifting before the start of the work.
- ▶ Any grievance/complaint shall be recorded and resolved by the competent authority as soon as possible.
- ▶ To reduce the impacts, shifting shall be carried out in phases.
- ▶ Excavation/concreting for erecting the electric poles shall be planned so as not to disturb the movement of the local people and traffic.
- ▶ Installation of the electric poles and cable holders shall be done in such a way that it shall not disturb or be a concern for the safety of the children playing in the park or going to schools.
- ▶ Shifting shall not disturb access to religious places, community halls, municipal services, local water sources, or tourist locations/spots.
- ▶ No material shall be so placed that it may pose a risk or cause inconvenience to any person or the public.

7.3.6 DRAINAGE IMPACTS MITIGATION MEASURES (ESS-3, ESS-4)

336. The natural drainage flow in the area needs to be maintained, as well as its interconnection with other natural drains in the area; the drainage flow should also maintain existing connectivity to any water body along the alignment.

337. Impacts due to drainage diversions must be mitigated by providing engineering measures such as box/pipe 118 culverts, cross-drains, bridges, etc.

Mitigation Measures

- ▶ Provision of adequate side drains to evacuate the rainwater/stormwater from the roadway and to ensure minimum disturbance to the natural drainage of surface and subsurface water in the area.
- ▶ The drainage canal must be constructed of an adequate size and with the necessary number of manholes to ensure an optimal level of stormwater and wastewater flow. The manholes will be periodically cleaned and maintained to ensure the drainage system's effectiveness and efficiency.
- ▶ Stormwater drains shall be effectively designed and constructed to carry and dissipate the stormwater without causing any unwanted collection of water/water stagnation.

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- ▶ Dumping of waste in the storm drains shall be prevented
- ▶ It shall be ensured that soil and muck do not choke the drains, making it ineffective; drains should be cleaned before and after monsoon to ensure their proper performance
- ▶ As part of the project design measures, the construction of the concrete drainage canal with manholes and effective, efficient, and timely maintenance is proposed
- ▶ Bridges and culverts of adequate capacity have been provided in the design
- ▶ In general, the project design intends to install necessary culverts, bridges, and drainage lines so that the natural flow of water is undisturbed. Also, it will decrease the chance of flooding as it will provide better water channels to support excess rainfall incidents.

7.3.7 ROAD SAFETY ISSUES (ESS-4)

338. The major bottleneck areas identified based on social and engineering points of view in the project roads are the Navaron Intersection, Settlement on both sides of roads, and Satkhira Medical College. Thus, appropriate countermeasures are required in the design of the project road. Poor road geometry and mixed Traffic, like fast and slow-moving, will cause vehicular accidents, inconveniences to road users, and pedestrian health hazards. Vehicular and pedestrian overpasses must be provided based on traffic and pedestrian demand. Many side roads will join the Service Road, and if entry is not properly controlled, these points become a bottleneck.

Mitigation Measures

339. Slow-moving vehicular traffic lanes, Bus bays, Vehicular Overpasses (VOP), foot over bridge (FOB), pedestrians overpass (POP), a pedestrian subway, and one elevated flyover along with a ramp are proposed. Compliance with International highway for curvature and grading and safety curve at all Grade, U-Turn, and bridge approaches

340. Sidewalks/pedestrian zones along the road near habitat areas, schools, hospitals, and religious places need to be included in the design, which the EPC contractor will further review

7.3.8 PERMISSION AND CLEARANCES

341. Smooth and safe construction work requires permission from different authorities before the Contractor commences civil works. The project will be As few components/structures are added in the new design, DoE clearance is to be obtained incorporating these along with the cleared version of ESIA.

Mitigation Measures

- ▶ Contractor shall follow the Environmental Clearance Certification (ECC) requirement and mitigation measures suggested in ESMP while establishing the construction campsites, crusher units, hot mix plants, concrete batch mix plants, WMM plants, and workforce camps.
- ▶ Consent to establish and operate construction campsites, crusher units, hot mix plants, concrete batch mix plants, WMM plants, workforce camps, etc., need to be obtained.
- ▶ Permission to Establish Construction camps
- ▶ Permissions for extraction of Groundwater, if required
- ▶ Layout approval for construction camps/labor camps
- ▶ Permissions for sourcing of water for construction activities (Surface Water), if required
- ▶ Contractor shall follow standard procedures as per Bangladesh Labor Act 2006 for labor recruitment

7.3.9 ORIENTATION TO CONTRACTORS

342. If proper orientation and training on the Environmental Assessment, ESMP implementation, and safeguard process of national and funding institutions are not conducted for the contractors and RHD, then the compliances of ESMP provision cannot be realized efficiently and effectively and would be challenging to achieve.

Mitigation Measures

- ▶ The RHD/PIU will conduct the orientation program for the contractor after the appointment to meet the ESMP and ESS of WB requirements. The salient features of the program are as follows:
- ▶ The contractor will initiate no works until the site induction training of workers/staff is carried out
- ▶ Obligations under contract to submit the Contractor's Environmental and Social Management Plan
- ▶ Regulatory compliance requirements

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- ▶ Grievance redress mechanism for both social and environmental issues
- ▶ Various plans required under C-ESMP related to Occupations Health & safety, traffic and road safety, community health and safety, hazardous and non-hazardous waste, campsite management, emergency response, blasting, borrow area, muck disposal, restoration, etc.
- ▶ Labor management procedures
- ▶ Community health & safety aspects at the workplace and Reporting requirements etc., under the project
- ▶ The Stakeholder Engagement Plan Contractor shall appoint one Environmental safety and health Officer, Social-cum-Community Liaison Officer, and one Health and Safety Officer, both of whom shall solely be responsible for the implementation of all ESMP provisions in close co-ordination/consultation with Environmental and Social Specialists in the RHD
- ▶ Training includes discussion and review of ESMP detailing how specific environmental risks associated with their scope of work, legal compliance, inspection and audits, and progress tracking and reporting
- ▶ Individual Environmental Consultants under the Project Implementing Unit of RHD will monitor and supervise all training sessions and provide training modules

7.4 IMPACTS AND MITIGATION DURING CONSTRUCTION PHASE

343. Construction stage activities require careful management to avoid environmental impacts. Activities that trigger the need for environmental measures to be followed include:

- ▶ Implementation of site-specific mitigation/management measures
- ▶ Monitoring the quality of the environment along the construction sites (as air, noise, water, and soil & Sediment)

344. Several other environmental issues have been addressed as part of good engineering practices, which have been accounted for in the engineering costs. They include roadside drainage improvement, soil erosion prevention measures, etc. Therefore, these mitigation measures shall be included in the contract document of the contractor for its implementation by the contractor and the sustainable development of the project

345. To implement it properly, it is suggested that non-compliance should be considered a major lapse from the contractor for which they need to be penalized. All lapses on the clearances/NOCs obtained by the contractor shall be deemed as major non-compliance. They must ensure all these approval/NOCs are valid throughout the construction stage/liability/maintenance period. The contractor needs to follow the conditions stipulated in the environmental clearance (EC), consent to establish (CTE), and consent to operate (CTO), as well as other approvals given by the regulatory authorities and as well as in compliance of the Bank's ESSs under ESF.

7.4.1 SITTING HOT MIX PLANT/WMM/BATCHING PLANT/CRUSHERS (ESS-3)

346. Poor siting of Hot mix, Wet Mix Macadam (WMM), Batching Plant, and Crushers will cause (i) air pollution, (ii) fugitive Dust Emission, (iii) Noise Pollution, Surface water pollution in case nearby water body /water logging, (iv) drainage problem and (v) Safety Hazards for electrical and other safety risks for the workers. Thus, the contractor should take care of pre-requisite considerations and measures for siting the construction equipment.

Mitigation Measures

- ▶ For installing different plants, the constructor shall obtain the necessary permission from the competent authorities
- ▶ A hot mix plant shall be installed on the downwind side and 1000m from the residential area.
- ▶ Batching plants/WMM shall be installed 1000m from the residential area on the downwind side.
- ▶ These plants shall be 500m from the water bodies or rivers/canals.
- ▶ No batching plant /labor camp/construction camps shall be allowed to be established on the banks of the river/canal.
- ▶ To prevent water logging in the batching plant, drainage, and sump shall be provided and cleaned regularly.
- ▶ Hot mix plant shall be fitted with pollution control devices, Bag filters, etc.
- ▶ The stack height shall be at least 10m above the ground.
- ▶ The premises shall be enclosed, and trespassing shall not be allowed.
- ▶ The contractor shall submit the detailed layout plan for approval from the Engineer before getting into a formal agreement with landowners to set up such site.
- ▶ Actions by the Engineer and PIU against any non-compliance shall be borne by the Contractor at his own cost.

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7.4.2 LABOR CAMP/CONSTRUCTION CAMPS (ESS-2)

347. A code of conduct (CoC) and GBV Action Plan has been prepared separately with provisions to comply with the construction/labor camp management. A Labor-Management Plan (LMP) has been prepared to take necessary action when the construction and labor camps are established. Improper and poor layout of worker's camp may cause loss of agricultural produce if (i) visited on cultivable land, (ii) health hazard to workers and nearby community, (iii) surface water pollution in case sited near water bodies, (iv) local drainage problem (v) wear and tear to haul routes if material is transported via village roads, and (vi), fire, electrical and other safety risks. The camp siting for construction workers is important as they may significantly impact health and possible hazards on sensitive environmental receptors or existing infrastructures of nearby communities.

348. Though identification of the location and setting of the worker's camp, construction yard with machinery layout, storage of construction materials, and other facilities are in the scope of the Contractors' arrangement, the location, layout, and basic facility provision of each labor camp will be submitted to CSC and PIU before their construction.

Mitigation Measures

- ▶ The camps siting should be designed in line with the IFC/EBRD Guidelines on Workers' Accommodation as well as Bangladesh National Building Code (BNBC) 2020
- ▶ Ensure that processes and Standards, including minimum spacing, sanitation, water supply, waste management, and provisions for worker welfare
- ▶ Labor camps shall be located at least 500m away from residential areas and waterbodies, such as the River, wetlands, or any Beels or Baor.
- ▶ A code of conduct for all workers will be strictly enforced.
- ▶ A labor related and grievance management (GM) consistent with ESS-2 will be set up. Alongside, a SEA/SH compliant GM will be equally set up.
- ▶ A detailed layout plan for all such sites shall be submitted for approval from the CSC.
- ▶ Contractors shall prefer the non-productive lands with access to the existing roads.
- ▶ The contractor must agree with the land parcel owner along with the photographs of the original land.
- ▶ Rooms of the labor camps must be properly ventilated.
- ▶ Hygienic conditions must be ensured in the labor camps
- ▶ To prevent soil erosion, the construction/labor camps shall not be established on the banks of rivers or water bodies.
- ▶ No timber or wood shall be used for cooking purposes
- ▶ No illegal tree-cutting shall be allowed.
- ▶ Mobile toilets or toilets with septic tanks shall be provided.
- ▶ Either a canteen facility or cooking gas shall be provided.
- ▶ Labor/construction camps shall be properly fenced, and an Informatory board and project details shall be displayed at the entrance and exit of the camp.
- ▶ Pre-requisite consideration and measures should be taken care of by the contractor for siting the camps and other facilities.

7.4.3 POTABLE WATER AND SANITATION FACILITIES (ESS-2)

349. Inadequate potable water supply, unsanitary toilet facilities, and washing areas can lead to water-borne/Fecal disease outbreaks in the workers' camps. Poor sanitation may result in the transmission of communicable diseases among the workers and the host community. Unsafe potable water facilities and washing areas can also lead to water-borne disease outbreaks.

Mitigation Measures

- ▶ Potable water shall be provided by the contractor in the construction camps/labor camps/construction sites.
- ▶ Water quality shall be tested to check its portability to meet the requirement of drinking water quality standards
- ▶ Drains shall be provided.
- ▶ Proper lavatory facilities for male and female workers shall be provided per ESMP.
- ▶ Proper hygienic conditions must prevail in such facilities.
- ▶ The mobile toilet shall be periodically replenished with fresh water

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- ▶ Wastewater from ablution purposes shall be emptied through suction tankers and carried to the nearest municipal sewage treatment facilities, or soak pits shall be provided.
- ▶ Untreated liquid waste shall not be allowed to be discharged into surface water bodies.

7.4.4 SOLID WASTE MANAGEMENT (ESS-3)

350. A wide range of waste may be generated during construction, including gravel, concrete, miscellaneous structures such as poles and cables, steel, and organic materials. Construction camp wastes are often poorly managed, leading to chronic pollution of surface and groundwater and soil contamination. Construction work creates areas of water stagnation during monsoons or heavy rain. These places become ideal places for mosquitos to breed and cause malaria and dengue. This includes storage for outdoor equipment, empty construction material drums, and used tires.

Mitigation Measures

- ▶ The contractor shall make the necessary arrangements to segregate the waste at the source.
- ▶ Biological waste from labor camps, construction camps, or other contractor facilities shall be collected for composting and gardening.
- ▶ Intermingling of waste shall not be allowed.
- ▶ Municipal waste shall be disposed of at the approved landfill sites only, or the contractor shall make necessary arrangements with the municipalities/Zila Parishad.
- ▶ Construction and demolition (C&D) waste shall be disposed of at identified and approved locations.
- ▶ C&D waste shall not be dumped into the water bodies.
- ▶ About 40% of the **Construction and Demolition (C&D)** waste material will make up a large portion of the reusable materials for road sub-bases. After processing (crushing and screening), these materials can often directly replace natural aggregates
 - **Recycled Concrete Aggregate (RCA)**- crushed concrete from demolished structures can be used as an effective material for sub-bases and granular fill due to its good load-bearing qualities,
 - **Reclaimed Asphalt Pavement (RAP)** material from old road surfaces is excellent for use in new sub-base layers or as an aggregate in new asphalt mixtures.
 - **Crushed Brick** and other masonry materials can be used as aggregates, often blended with other materials like recycled concrete to optimize performance.
 - **Excavated Clean Soil** can often be repurposed as general or capping fill in large groundworks projects.
- ▶ The contractor shall store the usable material properly impervious to prevent mixing with the earth.
- ▶ Contractor shall prepare a waste management plan.
- ▶ Open burning of solid wastes, whether hazardous or nonhazardous, shall not be allowed.
- ▶ E-waste shall be appropriately collected and disposed of by approved vendors only.
- ▶ Contractor shall maintain a register for record-keeping of waste generated by type, amount, transportation, and final disposal site approved by RHD.
- ▶

7.4.5 HAZARDOUS MATERIAL MANAGEMENT (ESS-3)

351. The potential sources of hazardous waste at the construction site are oil, fuel, grease, chemicals from plants, equipment, vehicle servicing, and construction camps. Poor management of these wastes is the potential source of surface water, groundwater, and soil contamination. The Contractor will adopt the following mitigation measures.

Mitigation Measures

- ▶ Oil/fuel shall be stored per the approved design and safety protocol applicable in the country, e.g., The Petroleum Act, 2016, The Petroleum Rules 2018, The Explosives Act, 1884, The Explosives Rules 2004
- ▶ If there is any spillage of hazardous waste, the contractor will sort it out immediately.
- ▶ An area shall be assigned for storing the oil/oily waste or any flammable material.
- ▶ Smoking shall be prohibited in such areas.
- ▶ Drip trays shall be provided at DG sets/below the nozzles to fuel the construction vehicles and equipment.
- ▶ Used oil or hazardous /flammable material shall be collected in the drums and stored on the impervious platform sloped or beamed to contain a minimum of 25 percent of the total storage volume.
- ▶ It shall be disposed to the authorized/approved vendors per the DOE norms.
- ▶ Tires shall be appropriately stored under the shed and disposed of by approved vendors.

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- ▶ The transfer of hazardous materials from vehicle tanks to storage shall be carried out on impervious surfaces to avoid environmental risk and impacts; the surface shall be sloped to a collection or containment structure. This shall not be connected to the municipal wastewater/stormwater collection system.
- ▶ To the extent feasible, secondary containment for components (tanks, pipes) of the hazardous material storage system shall be provided.
- ▶ Periodic (e.g., daily or weekly) reconciliation of tank contents and inspection of visible portions of tanks and piping for leaks shall be undertaken.
- ▶ Inform the employees about the hazards presented by their work.
- ▶ Warning signboards shall be displayed at such locations.
- ▶ Awareness training shall be given to workers by the contractor's environmental safety health officer.
- ▶ Material Safety Data Sheets (MSDS) shall be compiled.
- ▶ Standard operating procedures (SOPs) for fueling/storing or other operations about the hazardous material shall be prepared.
- ▶ Contractor shall prepare a Hazardous Waste Management Plan.

7.4.6 WATER RESOURCES AND WATER QUALITY (ESS-3)

352. Uncontrolled dumping of wastes, sewage, excavated materials, and accidental spillage of fuels and chemicals into the water bodies may greatly pollute them. Disposal of sewage and wastes from the construction camps to surface water bodies without treatment will deteriorate the water quality. The seasonal ponds are unlikely to be affected by construction activities. In addition, there will be spillage oils, fuel, grease, and chemicals from plants, equipment, and vehicle servicing. However, the pollution of perennial water bodies can adversely affect their aquatic population. The dumping of waste, sewage, and excavated materials should be done at a particular place, and accidental spillage from vehicles can be checked by maintaining active surveillance of vehicles in operation.

Mitigation Measures

- ▶ DC/RHD will give the proper compensation with assistance from INGO for the Loss of the water body.
- ▶ Contractors shall ensure that construction materials like earth, stone, and ash do not block the water flow of any watercourse and cross drainage channels.
- ▶ No waste shall be allowed to be dumped in ponds. Any accidental spillage shall be reported to the project authorities for necessary action, such as clearing and disposing of the spilled material safely.
- ▶ Workers will not be allowed to pollute the water body.
- ▶ No illegal excavation shall be allowed from the bunds of water bodies.
- ▶ The water flow will be restored soon after completion of the work.
- ▶ No waste will be dumped into the water bodies.
- ▶ Oil and grease separators shall be provided near the vehicle washing area/maintenance workshop.
- ▶ Drains and soak pits shall be provided in labor camps, construction camps, workshops, and other contractors' facilities.
- ▶ Silt fencing at the mouth of the water body shall be provided.
- ▶ Waste, sewage, and excavated materials should be disposed of at an approved location. Accidental spillage from vehicles can also be checked by maintaining active surveillance of vehicles in operation.
- ▶ Waste shall not be allowed to be dumped in ponds. Any accidental spillage shall be reported to the project authorities for necessary action, such as safely clearing and disposing of the spilled material.
- ▶ Water Quality shall be monitored during the baseline survey. During construction activities, contractors will undertake water quality monitoring as per the environmental monitoring program.

7.4.7 CLEARING AND GRABBING (ESS-3)

353. Clearing and grabbing at the project site will cause fugitive dust emissions and the removal of fertile topsoil. The top 12-15cm soil is usually rich in organic soil and microorganisms, a source of good fertility. The loss of organic matter can alter the soil's physical properties, especially soil density.

Mitigation Measures

- ▶ Clearing and grabbing shall be restricted to the working area within the toe line.
- ▶ Further activities shall be planned/ started immediately to prevent fugitive dust emission and soil erosion during monsoon.

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- ▶ The top (15cm) soil shall be preserved to redevelop the areas as required.
- ▶ Revegetation/turfing shall be started immediately after completion of the work.

7.4.7.1 Borrow Areas (ESS-3)

354. If there are no other options and a compulsion to choose cultivated land for procure the earth from borrow areas during construction stage, the fertile soil will be removed from the agricultural cultivated lands, and the owners of the borrow pits area will be affected due to the loss of their produce. In addition, dust will be generated if the pits are dug at a shallow level. Erosion will occur; a risk to the nearby habitation, trees, and other vegetation.

Mitigation Measures

- ▶ Borrowing of earth from the cultivable land shall not be allowed.
- ▶ If there are no other options and a compulsion to choose cultivable land, then depth shall be restricted to 45cm.
- ▶ Only approved by RHD and identified borrow areas shall be used by the contractor.
- ▶ When borrowing the earth from the cultivable lands, the depth of the borrowed earth shall not be more than 45cm.
- ▶ The top 15cm of soil shall be removed and stored separately. Thereafter, excavation shall not exceed 30cm, and topsoil shall be spread over the land.
- ▶ Borrow areas shall be dug at least 800m from the habitation. If unavoidable, the depth should not be more than 30cm and should be adequately drained.
- ▶ Borrow pits shall not be dug continuously but should be dug according to the necessity of construction work.
- ▶ The borrowing of the earth shall be used only after having an agreement between the contractor and land parcel owner and must include photographs of the original land.
- ▶ The haulage of borrowed earth will be maintained dust-free by sprinkling water.
- ▶ The borrow areas shall be 500m away from the toe line of the road.
- ▶ If trees are there, they should be protected by providing slopes in 1:2 around them while borrowing the earth.
- ▶ Side slopes of 1:4 shall be maintained in the borrow areas.
- ▶ A redevelopment plan shall also be prepared and agreed to by the land parcel owner and approved by the CSC.
- ▶ To reduce earth requirements, the construction and demolition waste materials should be reused in the subbase material whenever possible.

7.4.8 LOSS OF TOPSOIL (ESS-3)

Mitigation Measures

- ▶ The topsoil (15cm) shall be removed, if necessary and preserved for reuse for redevelopment purpose.
- ▶ Topsoil shall be preserved outside drainage lines, and stockpiles should be protected from erosion by silt fencing and diversion channels.
- ▶ Use stripped topsoil to cover all disturbed areas along the proposed tree plantation sites.
- ▶ Limit equipment and vehicular movements within the approved construction zone.
- ▶ Topsoil shall be distributed free to local people who need it for their own purposes.
- ▶ The residuals shall be reused to form the ground around the interchanges, the areas along the road within the acquired land.
- ▶ To recover the vegetation in some affected areas due to the road project.
- ▶ The material stockpile sites shall be 500m away from surface water bodies and areas prone to surface run-off.
- ▶ Loose materials shall be bagged and covered.
- ▶ An open ditch shall be built around the stockpile sites to intercept wastewater. If necessary, retarding basins shall be constructed to remove sand and other solids in the stormwater before it reaches the downstream rivers.
- ▶ During rainstorms, open stockpiles of construction materials (e.g., aggregates, sand, and fill material) of more than 50 m³ shall be covered with tarpaulin or similar fabric.
- ▶ Measures shall be taken to prevent the washing away of construction materials, soil, silt, or debris into any drainage system.
- ▶ At the start of site establishment, perimeter cut-off drains to direct off-site water around the site shall be constructed, and internal temporary drainage works and erosion and sediment control facilities shall be implemented.

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7.4.9 SOIL EROSION (ESS-3)

355. The project corridor is along relatively plain terrain. Soil erosion is not envisaged as a major concern in the development. However, as per the site requirements, depending on the soil types or composition of soil structure, different techniques will be applied for slope stabilization in the different parts of the project road, as found necessary. As needed, the contractor will prepare detailed stabilization techniques for various soils. Soil erosion may occur near cutting areas, at steep and un-compacted embankment slopes, bridge locations, and wherever vegetation is cleared. Soil erosion may have cumulative effects like siltation, embankment damage, bridge pier damage, drainage problems, etc. Soil loss due to runoff from earth stockpiles may also lead to siltation. Gully erosion along the exposed track slope during the rainy season may damage mother field crops in adjacent areas.

Mitigation Measures

- ▶ The contractor shall reuse excavated soil as much as possible unless the soil is considered unsuitable for filling.
- ▶ The Contractor shall plan his works as to minimize surface excavation works during the rainy season where practicable
- ▶ Immediately after work on bridges or high embankments is completed, slope stabilization measures such as turfing, etc., shall be taken.
- ▶ Excavation or similar activities will not be undertaken during the monsoon period.
- ▶ Construction and demolition waste shall not be stored near the bridge construction sites; it shall be disposed of at approved landfill sites.
- ▶ Ground clearance area shall be minimum
- ▶ Approach roads shall be provided in construction facilities to reduce soil erosion.
- ▶ Exposed earth areas shall be completed and revegetated as soon as possible after earthworks have been completed.
- ▶ If soil excavation is unavoidable during the rainy season or at any time of year when rainstorms are likely, exposed slope surfaces shall be protected by temporary drainage measures.
- ▶ The working area shall be marked to restrain the activity within the demarcation area only.
- ▶ Ensure that dredge materials do not contain heavy metals exceeding international standards by testing prior to use.

7.4.10 SOIL QUALITY (ESS-3)

356. The soil may be compacted due to movement of construction vehicles, machineries and equipment, and due to and workshops. Soil may get contaminated due to inappropriate disposal of liquid waste, like lubricant and fuel spills; washing effluent from vehicles and equipment) and solid waste (fuel filters, oily rags) likely to be generated from the repair and maintenance of transport vehicles, construction equipment, and machinery. Soil may also get contaminated due to inappropriate disposal of domestic solid waste and sewage from construction camps.

357. Subsoil contamination may also be attributed to scarified bitumen wastes, operation of the emulsion sprayer and laying of hot mix, storage and stockyards of bitumen and emulsion, excess production of hot mix, and rejected materials.

Mitigation Measures

- ▶ Fuel or other petroleum products shall be stored on the impervious platform.
- ▶ The movement of construction vehicles, machinery, and equipment shall be restricted to the corridor or identified route.
- ▶ Soil contamination by bitumen, fuel, and chemical storage shall be prevented by storing them on an impervious base
- ▶ Any spillage of hazardous material shall be removed and disposed of at identified and approved sites.
- ▶ Soil quality monitoring shall be undertaken as per ESMP

7.4.11 AIR POLLUTION (ESS-3 & ESS-4)

358. Dust emission is one of the issues in the construction phase of a road project. The dust emission/ air pollutant emissions due to movement of construction vehicles/plants during construction and the gaseous air pollutant emission from vehicular exhaust during operation phase will have impact on the existing air quality within the project area. The air quality of the area will be affected due to the transport of materials, quarry/borrow operations, movement of

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vehicles on haul roads/construction yards and fugitive emissions from the construction sites/plant sites. Construction activities that contribute to air pollution include land clearing, operation of diesel engines, demolition, loading and unloading of construction materials, movement of material transporting vehicles, and operation of hot mix plants. Construction sites generate dust emissions. Construction dust is classified as PM10 - particulate matter less than 10 microns in diameter. The construction phase impacts due to vehicle movement and operation of the hot mix plant have been worked out using mathematical equations in the following sub-sections:

Pollution from Hot Mix Plant Operations

359. The following assumptions have been made to work out the emission of air pollutants from Hot Mix Plant (HMP). Emissions rates of air pollutants from hot mix plant stack are as follows:

- ▶ PM10 emissions = 0.09 g/sec, (EPA, AP-42 methodology)
- ▶ CO Emissions = 3.8 g/sec (EPA, AP-42 methodology)
- ▶ NOx Emissions = 1.11 g/sec (EPA, AP-42 methodology)
- ▶ SO2 Emissions = 0.008 g/sec (IS Specifications)
- ▶ VOC Emissions = 0.00059 kg/sec = 0.59 g/sec (EPA, AP-42 methodology)

360. The following assumptions have been made to work out the pollution emission:

- ▶ Capacity of HMP = 75 tph (assumed)
- ▶ Bulk density of hot mix (Ref workbook) = 2.19 tones/m³
- ▶ Max duration of operation = 12 hrs.
- ▶ Height of Stack = 10m
- ▶ Efficiency of bag house filters/wet scrubbers = 99.5%
- ▶ Exit gas velocity = 15 m/sec
- ▶ HMP Stack diameter = 1.2 m
- ▶ S in Furnace oil = 50 mg/kg [Source: IS:1460-2005-Bharat Stage (IV)]
- ▶ Consumption of fuel oil (as per manufacturer literature) @ 350 liters per hour
- ▶ Using the above data and Screen 3 model of the Lakes environment was employed to determine the maximum concentration will be at the distance of 300m - 450m from the HMP. Thus, a safe distance of 500m away in downwind of from the residential areas has been recommended for establishing the HMP.
- ▶ Mitigation Measures
- ▶ The construction phase's environmental impacts on air pollution will be short-term and localized. These can be mitigated by adopting the following mitigation measures.
- ▶ HMP shall be installed on the downwind direction at 1500m away from the environmental/ecologically sensitive areas.
- ▶ HMP shall be installed at least 500m away from the nearest residential areas on the downwind side of the prevalent wind direction.
- ▶ Low-emission construction equipment, vehicles, and generator sets shall be used at the site.
- ▶ vehicles shall be covered by tarpaulin if required.
- ▶ Pollution control monitoring of construction vehicles shall be carried out and fit certification must be valid for all equipment and vehicles.
- ▶ By regularly sprinkling water on unpaved surfaces and covering raw material and hot mix-laden trucks with tarpaulin, the generation of fugitive particulates can be reduced by about 70%.
- ▶ Adequate dust suppression measures such as regular water sprinkling on unpaved haul roads and borrow area vulnerable areas of the construction sites. Special attention during the summer season shall be considered.
- ▶ The air pollution will also be greatly reduced by erecting windscreens of galvanized iron sheets cordoning off the construction sites to a height of about 5 meters from the ground surface.
- ▶ Wind shields shall be provided around the periphery of the HMP area to a height of 5m to reduce the impact of fugitive dust emissions.
- ▶ HMP shall be fitted with pollution control devices (Wet Scrubber for stack emission)
- ▶ Wind shields shall be provided around the wet mix macadam (WMM) plant, stock yard and batching plants to prevent fugitive dust emissions.

² Technical Support Document for The Asphalt Plant (Portable and Stationary) General Order, Department of Ecology, State of Washington, 2011

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- ▶ Diesel generator shall be provided with proper stack height as per Department of Environment requirement.
- ▶ Ambient Air Quality Monitoring shall be carried out as per the Environmental Monitoring Program suggested in the ESMP.
- ▶ The stack height of the Hot Mix Plant shall be at least 10m from the ground.
- ▶ Regular maintenance of construction vehicles and equipment/plants shall be undertaken.
- ▶ The construction vehicles/machinery/equipment shall use only designated routes.
- ▶ DG sets shall comply with the requirements of the Department of Environment.
- ▶ The construction machinery/equipment shall be used only designated sites.
- ▶ Movement of Construction Vehicles (Air Pollution)

Impact due to Vehicle Movement

361. The impact on the air environment is due to the movement of hot mix laden trucks, raw materials such as cement, steel, fine and coarse aggregates, bitumen, and earth/burden soil carrying trucks and tippers. It further depends on various factors like haulage capacity, condition of haul roads, dust suppression measures adopted, duration of operation & maintenance of vehicles, and content of silt and fine dust on the unpaved and barren surfaces.

362. the road surface is assumed to be unpaved to work out dust emissions. The fugitive particulate generation due to vehicular wheels will be uncontrolled without adopting control measures on the unpaved haul roads.

- ▶ Movement of Construction Vehicles for transportation of construction materials
- ▶ The following assumptions have been made to work out emissions due to haulage of materials (wheel-based fugitive dust) on unpaved roads.
- ▶ Length of road for influence of fugitive dust = 20 km (10+10)
- ▶ Total number of trucks in operation = 50 trucks per day
- ▶ Cumulative distance traveled by the trucks: 1000km (Assumed about 20km in a day)
- ▶ Emission Factor to be worked out using the following formula as per EPA, AP-422

$$E = \frac{K \times \left(\frac{S}{12}\right)^A \times \left(\frac{W}{3}\right)^B}{\left(\frac{M}{0.2}\right)^C}$$

- ▶ E= emission factor, lb/VMT (pounds per vehicle mile traveled); k=empirical constant 2.6 lbs/VMT for PM₁₀; A, B, C are empirical constants 0.8, 0.40, 0.3, S=Silt=5%, W=weight of vehicle=20 tones, M=moisture=0.75%

363. Based on the above, the emission factor from the movement of construction vehicles on the unpaved roads has been worked to be 0.713 lb/vmt, equal to 201.04 g/vkt. Fugitive dust generation = 201.04 x1000 =201040 g per day =2.33 g/sec. It is further assumed that the maximum 10 number of construction vehicles in an hour will move over the unpaved haul roads. The particulate matter concentration from the movement of construction vehicles on the unpaved haul roads has been worked using Cal3QHC of CalRoads view of Lakes Environment, which is given in Table 7-8.

Table 7-8: PM10 Concentration due to movement of Construction Vehicles on Haul Roads

Sl. No	Distance from haul road in (m)	Increment Concentration (µg/m ³)
1.	50	123.8
2.	100	73.5
3.	200	40.5
4.	300	28.1

364. The Highest incremental concentration, 123.4 µg/m³, is near the road at 50m, but it is getting reduced; at 300m, the incremental concentration is 28.1 µg/m³. Thus, it is suggested that water sprinkling be routinely carried out on haul roads to keep the incremental concentration low.

Mitigation Measures

- ▶ Water sprinkling using sprays shall be done on the unmetalled haul roads
- ▶ Water sprinkling shall also be carried out on the construction sites where the earthwork is unattended for four (4) days, especially in the summer season
- ▶ Construction vehicles/equipment shall comply with national standards

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7. Environmental and Social Impacts, Risks and Mitigation Measures

- ▶ Routine maintenance of emissions to control the pollution
- ▶ Low-emission construction equipment, vehicles, and generator sets shall be used at the site.
- ▶ Only those construction vehicles shall be used shall be used.
- ▶ Vehicles transporting construction material shall be covered by the tarpaulin.
- ▶ Speed of construction vehicles will be identified in contractors ESMP, which will be approved by the CSC.

7.4.12 NOISE ENVIRONMENT (ESS-3 & ESS-4)

365. Noise associated with the construction phase is discussed in the following subsections:

366. Operation of equipment/machinery or other activities such as piling, excavation etc. at construction site/camp will be the main source of increased sound levels in and around the area. The noise levels from the construction equipment depends on different factors such as type of equipment, condition of equipment, the operation which are undertaken at site, duration of the operation of equipment and specific model of the equipment⁴⁶. The equivalent sound level (Leq) of the construction activity also depends on the fraction of time that the equipment is operated over the time of construction. Diesel engines are the main source of noise from the equipment when used without protection. The construction equipment is expected to produce noise levels in the range of 74 - 101 dB (A) at the⁴⁷ construction site, as presented in Table 7-9.

Table 7-9: Typical Noise from Construction Equipment

Equipment	Typical Noise Level (dBA) 50 ft from Source	Equipment	Typical Noise Level (dBA) 50 ft from Source
Air Compressor	81	Pile-driver (Impact)	101
Backhoe	80	Pile-driver (Sonic)	96
Ballast Equalizer	82	Pneumatic Tool	85
Ballast Tamper	83	Pump	76
Compactor	82	Rail Saw	90
Concrete Mixer	85	Rock Drill	98
Concrete Pump	82	Roller	74
Concrete Vibrator	76	Saw	76
Crane, Derrick	88	Scarifier	83
Crane, Mobile	83	Scraper	89
Dozer	85	Shovel	82
Generator	81	Spike Driver	77
Grader	85	Tie Cutter	84
Impact Wrench	85	Tie Handler	80
Jack Hammer	88	Tie Insertor	85
Loader	85	Truck	88
Paver	89		

367. With a point source of a strength of 95 dB (A) at a reference distance of 2m, the noise produced will not exceed 45 dB (A) beyond 250 m from the boundary of the construction yard (the drop-off rate will be 6 dB (A) for doubling the receptor distance from a point source).

Mitigation Measures

368. The following mitigation measures shall be adopted to reduce the intensity of impacts:

- ▶ Construction camp/yard shall be located at least 500m from the inhabitant/sensitive areas.
- ▶ Silencers and mufflers shall be fitted and regularly maintained on construction equipment.
- ▶ All construction vehicles and machinery/plants shall be serviced regularly. During routine servicing, the effectiveness of exhaust silencers needs to be checked, and if found defective, shall be replaced immediately.
- ▶ Well-maintained vehicles and machinery/equipment shall be deployed at the site.
- ▶ Work shall be scheduled so that activities generating high noise levels are not done simultaneously, and such activities shall be restricted to daytime only.

⁴⁶ Transit Noise and Vibration Impact Assessment, IFA

⁴⁷ Data compiled from IFA, FHWA, and other relevant documents, (e.g. Noise Pollution and its Control, Public, K.J.)

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- ▶ Use low noise-generating equipment or construction vehicles near sensitive receptors such as health centers/schools, etc.
- ▶ Contractors shall hold meetings with neighborhood champions/locals/school or college management before the start of high-noise-generating activities, such as piling, etc.
- ▶ Truck loading, unloading, and hauling operations shall be scheduled to minimize noise impact near sensitive locations and neighborhood communities.
- ▶ Placards shall be displayed near highly noisy areas.
- ▶ Earplugs/Earplugs shall be made mandatory for workers working in high-noise areas.
- ▶ Construction equipment and vehicles shall be maintained regularly.
- ▶ 'No honking' board shall be placed near sensitive receptors.
- ▶ Noise quality monitoring as suggested in the Environmental Monitoring Plan as ESMP.
- ▶ The Contractor shall abide by the provisions of the Specifications of Contract regarding environmental protection and DoE regulations (≤ 60 dB levels at mosques, schools, populated areas, and other sensitive sites).
- ▶ Noise-generating equipment/plants shall be provided with dampeners.
- ▶ No noisy construction activities will be permitted around educational institutions/health centers (silence zones) up to 100 m distance from the sensitive receptors.
- ▶ Diesel Generating must be enclosed with soundproof acoustic enclosures to meet the Noise standards.
- ▶ Construction vehicles/equipment must be fitted with silencers.
- ▶ Routine maintenance of equipment and construction vehicles shall be carried out.
- ▶ Low noise-generating equipment/construction vehicles shall be used.
- ▶ Noise monitoring shall be undertaken as per the Environmental Monitoring Program.
- ▶ Workers working in noisy areas shall be provided with PPE, such as earplugs, and shall not be allowed to work near equipment generating more than 90 dB (A) noise for 8 hours continuously.
- ▶ Contractors' facilities will be sited away from the residential areas/sensitive receptors as mentioned above.
- ▶ Noise-generating activities in near-sensitive receptors such as schools, mosques, and hospitals shall be carried out after consultation with the management committee, or low-noise-generating equipment shall be used only.
- ▶ Noise-generating activities shall be prohibited in residential areas, hospitals, etc., and work shall be scheduled in consultation with neighborhood champions.
- ▶ Reducing construction vehicles through the residential area in consultation with the local champions.
- ▶ Vegetative noise barriers in the sensitive receptor.
- ▶ Any issue shall be resolved through a grievance redressal mechanism (GRM) developed by the contractor.

7.4.13 BIO-DIVERSITY AND LIVING NATURAL RESOURCES (ESS 6)

7.4.13.1 Removal of Tree-cutting

369. During the pre-construction period, about 101,660 trees were identified as being removed due to the road development project. According to IoL, about 80,424 are from privately owned land, 8671 within affected CPRs premises, and 12,565 are roadside avenue trees (Table 7-10). The loss of private trees is affected by the cutting of giant trees and vegetation will cause psychological stress to the owners. The loss is of common species such as Rain trees, Mahagoni, Babul, Neem, Mango, Jackfruit, Debdaru, Deoa, Dumur, Gamari, Ipilipil, Jalpai, Jam, Kanthal, Khejuri, etc. No endangered/threatened species are to be affected. The loss of nest/resting/feeding sites of birds is anticipated.

Table 7-10: Affected Trees within the Proposed RoW

Lot No	Number of Private Trees					Roadside Avenue Trees (Girth size wise Trees as per the survey)											
	Large	Medium	Small	Sapling	Total	Girth size (30-40) inch			Girth size (20-30) inch			Girth size (10-20) inch			Girth size (01-10) inch		
						Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total
Lot-1	455	720	286	799	2260	288	246	534	158	124	282	52	40	92	0	1	1
Lot-2	4708	4386	3199	5228	17441	1310	1070	2380	842	729	1571	177	32	209	0	0	0
Lot-3	3757	14091	12674	10295	40817	399	2413	2812	83	1514	1597	113	162	275	57	65	122

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Lot-4	10454	9158	5942	3023	28577	520	446	966	218	193	411	302	355	657	322	334	656
Total	19374	28275	22101	19345	89095	2517	4175	6692	1301	2560	3961	644	589	1233	379	400	779

Mitigation Measures

- ▶ Necessary permission from the concerned agency shall be obtained before cutting the trees.
- ▶ Identified/marked trees shall be removed.
- ▶ No trees will be cut beyond the toe lines, if possible.
- ▶ For private trees, DC will pay compensation to titleholders and RHD will disburse to the non-titleholders. In addition, the RHD will distribute 10-12 saplings to the non-titled and titled households as the resettlement benefit.
- ▶ The contractor should implement a site-specific replantation plan. A replantation plan is proposed in the ESMP, with a total of 56,387 trees to be planted. This total includes shrubs (13,800 in Lot 1, 15,420 in Lot 2, 13,227 in Lot 3, and 13,840 in Lot 4). Of the total tree plantation, 40% will be undertaken by RHD through a contractor, and the remaining 60% will be planted by the Forest Department under the social forestry program and the RHD Arboriculture Department. A total of 56,387 trees will be planted at a 4.5:1 ratio to the 12,565 RHD roadside avenue trees that were cut. A typical road plantation scheme is presented in **Annex 11, Volume-II**.
- ▶ A 95% survival rate shall be considered for the release of the tree plantation.
- ▶ The contractor shall be responsible for six (6) years of maintenance of tree plantations.
- ▶ Shrubs Plantation on medians & its maintenance for six (6) years.
- ▶ Compensatory tree plantation shall be 40% done by PIU through a contractor and 60% done by the Forest Department under Social Forestry.
- ▶ Proper safety measures should be adopted when cutting and removing trees during clearing sites to avoid accidents involving contractors, workers, and locals. All workers and project personnel should use the site's Personal Protective Equipment (PPE).
- ▶ Through consultations, INGO should motivate and encourage the affected households to plant at least three times the number of trees they cut down after relocating, provided that space is available.
- ▶ Through consultations, INGOs should motivate and encourage affected households to plant at least three times cutting trees after they relocate to another place, provided that space is available.
- ▶ To prevent the destruction of birds' nests, resting and feeding site, as well as the abandonment of young birds, the cutting of trees during the bird breeding season should be avoided. This sensitive period is often from early spring to late summer, when birds are actively nesting, laying eggs, and raising young.
- ▶ Contractor shall prepare the Tree Removal schedule during the preconstruction phase based on site-specific conditions and outside of the breeding season. If that's not possible, pre-construction surveys are essential to identify active nests.

7.4.13.2 Decrease in Carbon Sequestration (ESS-3)

370. Removal of the number of trees will cause a decrease in CO₂ sequestration. As a result, the amount of CO₂ in the atmosphere will increase, and the local temperature will rise. The reduction of O₂ generation from the tree's photosynthetic process will cause an imbalance in local climatic conditions for a short time.

Mitigation Measures

- ▶ The Forest Department will carry out tree plantation under social forestry and the Arboriculture Department of RHD.
- ▶ Watering of the tree plantation will be ensured.
- ▶ Necessary tree guards shall be provided to protect saplings.
- ▶ Cluster plantations need to be considered on community lands, such as ponds/mosques, or at other locations desired by the community.
- ▶ All realignments shall be enhanced with the tree plantation.
- ▶ Trees will be planted as an enhancement measure around the ponds or LGED link roads and vegetative noise barriers along the sensitive receptors in consultation with the stakeholders as required.
- ▶ Tree plantation around the monuments and other enhancement measures shall be undertaken.
- ▶ Fast-growing native trees will be planted to improve carbon sequestration.
- ▶ The contractor shall take reasonable precautions to prevent his workmen or other persons from removing and damaging flora and fauna.

7. Environmental and Social Impacts, Risks and Mitigation Measures

- ▶ While clearing vegetation, it must be ensured that no faunal species, such as mongooses, foxes, squirrels, etc., are injured and/or die.
- ▶ When the tree is removed, the work shall be stopped immediately if any endangered or endemic species is cited. The species' name, etc., must be reported to the nearest forest department through RHD.

7.4.14 IMPACT ON TERRESTRIAL FAUNA (ESS-6)

371. A total of 80 species were observed in the proposed expressway, including six amphibians, eight reptiles, 55 birds, and 11 mammals. Among them, 11 species were observed; these are amphibious, and 12 birds depend on water bodies for food. Only one species is regarded as endangered, and two species are found to be near threatened, according to the IUCN Red List-Bangladesh, 2015. The potential project activities will set up temporary or long-term camps and cause site clearance that might result in the potential entry of wildlife into the workers' camp, who, in turn, can prey on the workforce. Strict guidelines should be prepared so that no such event occurs. Though a few animals mentioned above are concerned, their original habitat is not the expressway. Instead, they either pass through the highway, temporarily go there for food searching, or cross the road to return to their habitat. So, the removal of the roadside flora and aquatic habitats will not cause any havoc to them. Potential impacts are summarized in Table 7-11.

Table 7-11: Potential impact on wildlife and proposed mitigation measures

Activities	Potential Impacts	Proposed Mitigation
Temporary or long-term camp preparation for the workforce, site clearance	May destroy their habitat.	▶ The sites shall be well-bordered and protected to prevent the entry of wild fauna.
Tree cutting and felling	It may hamper their daily activities like mating, breeding, feeding, foraging, etc.	▶ Immense roadside tree plantation program
Fill up the roadside aquatic resources.	Human-Wildlife conflict	▶ No killing and torturing of wildlife animals by road constructors.
Conducting heavy machine	Increase roadkill and habitat fragmentation.	▶ Make underpasses, overpasses, or animal corridors for habitat connectivity and minimize roadkill. ▶ No disturbance should be caused to them while passing through the road. ▶ Workers shall remain calm and quiet and should silently pass them in case of their sighting.
	Decrease of animal population Less gene flow or inbreeding.	Make a speed limitation notice board where necessary. ▶ Strict guidelines regarding the treatment of wildlife by the authorities should be made. ▶ Hunting, trapping, and poaching shall be strictly prohibited during constructed works. ▶ The nearby Wildlife Office of the Forest Department shall be informed in case of rescuing any wildlife. ▶ An awareness program shall be undertaken to sensitize the workers and other relevant stakeholders to the importance of wildlife, such as birds, mammals, amphibians, etc. Posters and animal image signs shall be hung along the road alignments to raise awareness.

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7.4.15. IMPACT ON AQUATIC FLORA (ESS-6)

372. The project area consists of different seasonal and permanent aquatic bodies. Five canals/small rivers crisscross the highway. Besides some *bangors*, large ponds and many seasonal aquatic bodies and ditches were observed along the road. Aquatic vegetation of the rivers was dominated by water hyacinth and many more aquatic or semi-aquatic plants like *Enhydra fluctuans* (Helencha), *Alternanthera sessilis*, *A. philoxeroides*, *Ludwigia adscendens* (Molsi), *Ipomoea aquatica* (Kolmi), *Nymphaea nouchali* (Shapia), *Sagittaria vaginalis*, *Sagittaria sagittalis* (Nukha), etc. Luxurious growth of grass and sedge families was observed in the wetlands during the rainy period of the year. These aquatic bodies, along with the aquatic flora, will be impacted due to highway construction activities. Besides, the primary producers of the aquatic habitats might not get enough elements to sustain them due to pollution that might occur because of the construction process. Still, the activities will not pose such problems that might result in biodiversity loss, as many aquatic bodies containing the mentioned aquatic flora are outside the highway, nearer or distant. However, some mitigation measures are suggested below, along with the potential activities and impacts that, if taken, shall help restore the damaged ecosystem. The potential impacts of aquatic flora are summarized in Table 7-12.

Activities	Potential Impacts	Proposed Mitigation Measures
Filling of the seasonal wetlands and ponds along the roadside.	Common aquatic vegetation will be removed, and as it is present outside the project area, removing it will not harm the environment. Water will be polluted due to project activities.	▶ If possible, they will be relocated to the nearest wetlands. ▶ Enhancement plantation of aquatic species such as <i>Nymphaea nouchali</i>, <i>N. stellata</i>, <i>Oenothera lutea</i> shall be done in the nearest suitable wetlands. ▶ Both solid and liquid pollutants shall be purified before discharging in the aquatic habitat. ▶ Invasive Alien Species (IAS), such as water hyacinths, shall be eradicated.
Bridge construction, piling, riverbank training	Flow can be damaged, pollution may occur, and sound and vibration will be produced. Production by primary producers may be hampered due to pollution.	▶ Without treatment, no pollutants shall be discharged into the water. ▶ No blockage to the flow shall be created. ▶ Solid and liquid debris shall not be discharged into the water. ▶ Muddy water formed during piling shall be assigned to a designated place instead of flowing it to the river water directly.
Bridge construction, piling, riverbank training	Flow to the local <i>bangers</i> may be hampered, resulting in the loss of commercial fish production in the area.	▶ The flow must be maintained with proper bridge construction. ▶ Pollution discharge in aquatic bodies without treatment must be strongly avoided.

7.4.16. IMPACT ON FISHERIES (ESS-6)

373. Forty-nine fish species and crustaceans were identified through field study, visiting local fish markets, interviews, and discussions with local fishermen. A total of 7 threatened fishes were recorded, including four endangered (EN) and three vulnerable (VU) species. The area was not an actual habitat for these threatened species. Occasionally, they appeared here in the project area. The project area includes over 150 man-made ponds, four rivers, and many small ditches. Most natural aquatic bodies are seasonal except for the rivers and commercial ponds. The major fishes and crustaceans are *Amblypharyngodon mola* (Mola), *Puntius* spp. (Puti), *Channa punctatus* (Taki), *Channa striata* (Shoal), *Leptodactylus guntea* (Gutun), *Channa gachua* (Chang), *Chanda nama* (Lomba Chanda), *Pseudorasbora ranga* (Chanda), *Mystus tengra* (Bajari Tengra), *Clarias batrachus* (Magur), *Heteropneustes fossilis* (Shinghi), *Mastacembelus armatus* (Baini), *Trichogaster fasciatus* (Kholisha), *Heteropneustes* (Shing), *Clarias batrachus* (Magur), *Anabas testudineus* (Koi), *Channa marulius* (Gajar), *Macrobrachium rosenbergii* (Gola Chingri) and so on. Besides, nine exotic species are also found in cultivated ponds. A detailed list of these fishes is given in Appendices 1-4.

374. The construction of bridges and especially culverts can have negative impacts on fish resources and aquatic ecosystem during the construction phase, which is mostly short-term impacts. Likely, excavation, cofferdam installation, pier driving, and bank disturbance release large amounts of soil and silt into the water. As a

7. Environmental and Social Impacts, Risks and Mitigation Measures

results, the silt settles on the streambed, suffocating fish eggs and larvae in spawning areas. Usually, the cloudiness due to high turbidity can physically harm adult fish by clogging or irritating their gills. The murky water prevents sight-feeding fish from finding prey. Contamination of the water quality due to leaks of fuel, oil, and hydraulic fluids from machinery; runoff of highly toxic and alkaline from concrete and improper waste disposal. Pile driving, drilling, and heavy machinery operations transmit significant underwater noise and vibration, which will have negative impacts on fish. However, the construction work on the highway might cause some potential impacts on fish. Potential impact and mitigation measures are given in Table 7-13.

Table 7-13: Potential impact on fish and proposed mitigation measures

Activities	Potential Impacts	Proposed Mitigation
Construction work of 04 bridges and 118 culverts	Erosion due to construction at the river site	► Erosion and siltation must be prevented. ► Mufflers shall be used with the instruments to reduce vibration and sound pollution.
	Vibration and noise will be produced.	
	River training and construction of embankment in water works	► Isolation of Work Area: Using cofferdams and sediment curtains during construction to completely isolate the work zone from the flowing water. ► Maintaining fish passage: all the holes along the banks of the rivers should be checked, and ensure the safe passage and exits of fish. • Bridges and culverts should be made to maintain the proper water flow. The flow of water through the river/canals shouldn't be blocked completely • Ensure culverts are sized and installed to allow natural fish movement. • Use embedded culverts, open-bottom arches, or natural streambed materials. • Match natural stream slope, width, and substrate and avoid perched culverts that block movement. - Provide escape routes during dewatering ► Timing: Scheduling construction activities to avoid critical fish life stages like spawning, egg incubation, or peak migration periods. ► Minimizing noise & vibration, such as use low-noise equipment where possible. Avoid pile-driving during sensitive fish periods or use vibratory hammers instead of impact hammers ► Using proper machinery practices, such as keep heavy machinery out of the water when possible. Use biodegradable hydraulic fluids. Maintain machinery to prevent leaks and operate from the bank or spans rather than in the channel. ► Monitoring: Monitoring of water quality such as turbidity, pH, suspended sediments. Protecting water quality and restoring habitat ► Fish mortality: Monitoring during in-water works, if necessary.
	Catchment of fish by the road workers	Catchment of fish should be prohibited.
	Dumping of wastes in the river site or canals or any aquatic body	► Strict guidelines must be maintained, and no such dumping should be done in seasonal and perennial aquatic habitats. ► The waste shall be discharged only after being treated.

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7. Environmental and Social Impacts, Risks and Mitigation Measures

7.4.17 SOCIOECONOMIC ENVIRONMENT

7.4.17.1 Community Health And Safety (ESS-4)

375. The risks and adverse impacts on the community's health and safety are expected during construction activities like excavation, earth working, dismantling the existing structures, pavement works, sitting of construction camps/labor camps, water logging, accidents, etc. at residential and commercial areas alongside the project roads.

Mitigation Measures

- ▶ The contractor shall plan activities in residential areas after discussing them with the community for community health and safety.
- ▶ Local shall be kept informed about the activities which the contractor is taking up in their areas.
- ▶ Excavated areas shall be properly barricaded.
- ▶ Trespassing of construction sites/construction camps/labor camps shall be prohibited.
- ▶ Occupational Health and Safety Plan as well as Community Health and Safety (CHS) Plan shall be prepared that will include a Code of conduct for all workers and will be strictly enforced. The CHS plan will also set out a SEA/SH compliant GM.
- ▶ The prevention and management of HIV/AIDS and other STIs as suggested below in B-22 of Chapter 10.
- ▶ Contractors shall take all precautionary measures to prevent community exposure to water-borne, water-based, water-related, and vector-borne diseases, as well as communicable and non-communicable diseases that could result from project activities.
- ▶ Water logging shall not be allowed at the construction site. To prevent vector-borne diseases such as malaria, areas of standing water must be minimized by providing effective drainage in construction areas.
- ▶ Trained drivers with valid licenses shall be allowed to drive construction vehicles/heavy equipment.
- ▶ Speed of the construction vehicles/equipment shall be defined by the contractor in the contractors' ESMP.
- ▶ Vehicles/construction equipment need to be maintained and inspected/tested regularly.
- ▶ Drivers must have appropriate government licensing or certification and be provided with proper training.
- ▶ Finally, regular consultation with the community to know the effectiveness of the implementation of mitigation measures at construction sites/camps.

7.4.17.2 Influx of Labor (ESS-2)

376. It is expected that around 1423 labors will be engaged during construction works, of them 443, 490 and 490 numbers of skilled, semi-skilled and non-skilled laborers are respectively involved in four lots (Error! Reference source not found.). Most will be engaged during the peak period, and primarily, locals will be encouraged to engage in the project. The contractor will engage local and outsiders labors as their own decision and arrangement and likely the non-local workers will stay in the labor camp. There will be certain social and environmental impacts due to the influx of outside population/workforce at the project site, such as social conflicts, illicit behavior, and crime, the influx of additional population, communicable diseases, inflation of prices, pressure on accommodation and rents, unhygienic conditions, waste discharge, etc. It has already been mentioned in public consultations that matters and issues related to the anticipated project impacts on Sexual Exploitation and Abuse (SEA)/Sexual Harassment (SH) and Gender Based Violence (GBV), Labor Health and Safety; Occupation Health and Safety, are grave concern due to influx of labor. There would be impacts on local economy like, such as an increase of rented houses/accommodations, significant increase in demand for goods and services due to labor influx, which may lead to local price hikes and/or crowding out of community consumers.

Mitigation Measures

- ▶ Trespassing on the contractors' facilities/construction camps/labor camps will be strictly prohibited.
- ▶ Contractor will engage local and outsider labors as their own arrangement and likely the non-local workers will stay in labor camps.
- ▶ Contractor camps/construction camps/facilities must be located 500m away from residential areas.
- ▶ Any issue shall be resolved through a grievance redressal mechanism (GRM) developed by the contractor.
- ▶ Contractors shall be encouraged to recruit local skilled/unskilled workers.
- ▶ The Labor Management Procedure is given in Chapter 8.
- ▶ Install a generator for power supply to meet the emergency power requirement.
- ▶ Contractor will arrange either canteen facilities or gas for cooking to prevent illicit cutting of the trees.

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7. Environmental and Social Impacts, Risks and Mitigation Measures

- ▶ Arrange purchase of commodities from the district-level market or set up special shops for labor.
- ▶ Contractor will prepare a labor-management plan in C-ESMP as per the proposed ESMP of the ESIA.

7.4.17.3 Child Labor (ESS-2)

377. The contractor should follow the code of conduct or term of reference for hiring or recruiting the workforce into the project. In keeping with internationally recognized standards, the project will make a distinction between child labor and young workers. The project will not tolerate child labor under any circumstances. The employment of young workers, i.e., minors aged from full 15 years to under 18 years who have reached the minimum age of employment and completed compulsory schooling, will be allowed under strict conditions and in compliance with requirements of internationally recognized standards and local relevant laws and regulations. The risk of child labor will be mitigated through the Certification of laborers and will be confirmed by using legally recognized documents such as the National Identification Card and Birth Certificate.

Mitigation Measures

- ▶ Bangladesh Labor Act 2006 section 34 prohibits the engagement of child labor in any activity of the project.
- ▶ According to Section 44, anyone under 14 is considered a child, and anyone between 14 and 18 is considered an adolescent.
- ▶ It is recommended that people under 16 years of age should not be employed in any type of work and shall be encouraged to go to schools.
- ▶ People between 16 and 18 years of age can be employed for lighter work/office work for 6 hours only with prior approval.
- ▶ Company policy on labor engagement rules shall be displayed at prominent locations, such as contractor camps, labor camps, contractor offices, etc.
- ▶ Between 16- and 18 years of age, the child shall not be deployed to any hazardous works such as painting or other construction activity.
- ▶ To ensure the age, the contractor must refer to the Certification of laborers' age, the National Identification Card, the birth Certificate, etc.

7.4.17.4 Public Safety and Access (ESS-4)

378. Temporary access and diversion, with proper drainage facilities

Mitigation Measures

- ▶ The contractor shall provide adequate warning signboards in the local and English languages.
- ▶ Flagmen shall be deployed to control the traffic during tree felling or removal/erection of electric poles.
- ▶ Locals shall be kept informed about the activities which the contractor is taking up in the residential areas.
- ▶ The contractor shall provide temporary access to the local religious place, schools, or nursing home in consultation with the local champions.
- ▶ Excavated areas shall be properly barricaded.
- ▶ Trespassing on the construction site shall be prohibited.
- ▶ A traffic management plan will be prepared according to the activity schedules and approved by CSC/RHD.
- ▶ Trained drivers having a valid license shall be allowed to drive construction vehicles/heavy equipment.
- ▶ Speed of the construction vehicles/equipment shall be defined by the contractor in the contractors' ESMP.
- ▶ A grievance redressal mechanism shall be adopted at the site, which needs to be approved by the CSC, to address the issue at the site.

7.4.17.5 HIV and STD (ESS-4)

379. Due to the influx of workers in the Project area, AIDS/HIV may spread in the local community. Different types of diseases related to communicable diseases need to be controlled.

Mitigation Measures

- ▶ Awareness campaigns on HIV/AIDS/STD
- ▶ HIV/STD voluntary counselling, testing, and treatment.
- ▶ Ensuring that construction workers have access to condoms
- ▶ Provision of vending machines at the identified location

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- ▶ Monitoring of outcomes in collaboration with National HIV/AIDS Authorities

7.4.17.6 Labor Management (ESS-2)

380. GRM with GRCs related to (i) Labor Health and Safety will facilitate smooth labor management through redressing any complaint/grievance raised by laborers/against any laborer, (ii) Gender Based Violence (GBV) related grievances will be redressed by GRC related to Sexual Exploitation and Abuse/Sexual Harassment (SH). The roles and functions of these GRCs are presented in section 7.6.1 in this ESIA.

Mitigation Measures

- ▶ Contractor shall follow the national legislation
- ▶ The contractor shall obtain the Labor License from the Department of Inspection and Factories Establishment (DIFE) under MoLE.
- ▶ The contractor shall follow the conditions stipulated in the license regarding labor management, workplace safety and health, and protection.
- ▶ Pooled transportation facilities, as may be required, shall be provided by the contractor.
- ▶ Contractors' company policy on prohibiting Child Labor shall be displayed at the construction camps/labor camps, etc.
- ▶ All basic facilities shall be provided within the labor camp, such as water supply, cooking gas, sanitation facilities, and a mobile toilet (of adequate capacity for men and women separately).
- ▶ Crèche for female works to be made.
- ▶ Compensation, leave, working schedules, etc. for different types of workers will be ensured following the Bangladesh Labor Rules 2015 and other related laws.
- ▶ A specific chapter (Chapter 8) of this ESIA has been induced on Labor Management Procedures (LMP) to clarify every aspect of labor management and their facilities.

7.4.18 OCCUPATIONAL HEALTH AND SAFETY ASPECTS (ESS-2)

381. Without Occupational Health and Safety (OHS) procedures, workers risk temporary and sometimes permanent physical injuries such as hearing and sight loss, damage to limbs, etc. Due to continuous exposure to activities like lifting heavy tools and tackles, construction equipment, and cabling of electrical wires, the workers may suffer from various physical problems, stresses, and risks, such as carpal tunnel syndrome, tendonitis, back pain, muscle soreness and nerve damage, chest pains, etc. These risks could create long-term impacts on the health and safety of the construction workforce.

- ▶ Lack of safety training by contractors can lead to accidents and lost productivity. Construction workers need training on general health and safety matters and on specific hazards of their work.
- ▶ The contractor shall follow safe work systems and administrative or institutional control measures.
- ▶ Measures such as job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc., shall be adopted.
- ▶ No employee shall be exposed to a noise level greater than 85 dB(A) for more than 8 hours per day without hearing protection.
- ▶ In addition, no unprotected ear shall be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C). Workers working in noisy areas shall be provided with earmuffs.
- ▶ Exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc., shall be provided per CSC's direction.
- ▶ The Contractor shall always take all reasonable precautions to maintain the health and safety of the contractor's personnel.
- ▶ The contractor shall, in collaboration with local health authorities, ensure that medical staff, first aid facilities, and ambulance service are always available at the site.
- ▶ Workers shall wear protective footwear such as safety boots/gumboots, helmets, and protective goggles.
- ▶ Welders shall use protective eye shields or safety goggles, all-electric wire must have proper insulation.
- ▶ The workers and flagmen shall use lifesaving jackets.
- ▶ Fall prevention and protection measures shall be implemented for workers at more than 2m height.
- ▶ Safety belts shall be provided and used by workers working at heights (more than 2m), and trained workers shall use ladders and scaffolds.

7. Environmental and Social Impacts, Risks and Mitigation Measures

- ▶ Necessary lighting, which has proper illumination, shall be provided if required at the work site during nighttime.
- ▶ Potable water supplies to the workers and water supplied to areas of food preparation or for the purpose of personal hygiene (washing or bathing) shall meet drinking water quality standards.
- ▶ Induction training for the workers and subsequent training on safety aspects.
- ▶ Trained workers will be deployed at hot mix plants, batching plants, and wet Mix Macadam (WMM).
- ▶ Toolbox training for the workers.
- ▶ Workers working in the dusty area shall be provided with nose masks.
- ▶ Sufficient fresh air shall be supplied for construction camps/labor rooms and confined workspaces.
- ▶ Construction/labor camps must receive natural light and be supplemented with sufficient artificial illumination if required.
- ▶ Emergency lighting arrangement of proper illumination shall be installed at identified locations.
- ▶ Eating areas such as the canteen must be cleaned, and kitchen waste must be collected as suggested above.
- ▶ Hand, knee, and foot railings shall be provided on stairs, fixed ladders, platforms, ramps or loading bays etc.
- ▶ Covers should, if feasible, be installed to protect against falling items.
- ▶ First aid boxes shall be provided at identified locations.
- ▶ Tie-ups with local hospitals shall be maintained, and the ambulance facility shall be reserved for emergency purposes only.
- ▶ The contractor shall arrange OHS training for all new workers and refresher training for the old workers/drivers.
- ▶ Regular health check-ups will be undertaken at construction camps/labor camps, etc.
- ▶ Visitors such as CSC engineers or employer officials visiting the construction sites/camps shall wear helmets of approved color.
- ▶ Fire extinguishing devices shall be installed in the identified areas. Arrangements with the local firefighting department shall be made.
- ▶ The contractor shall prepare and approve an Emergency Response Plan and shall provide training to workers accordingly, as documented in **Annex 8, Volume-II**.
- ▶ The contractor shall prepare and approve a Labor Management Plan (LMP) to be implemented at the project site, as documented in **Annex 13, Volume-II**. The LMP includes measures for Labor, Materials, Equipment Handling, etc.
- ▶ The use of chemicals (e.g., paint, thinner, and solvents) in the fabrication and finishing of the Bridge may be carcinogenic or detrimental in other ways, e.g., the use of industrial solvents can cause anemia, liver and kidney damage, cardiovascular diseases and neurological disorder. Benzene, phenols, and carbon tetrachloride are examples of products widely used, but which are also dangerous to health. Other health problems can be caused by inhalation of exhaust gases from vehicles and machinery, which can impact the lungs, eyes, and skin, etc.
- ▶ Shaded area for workers' breaks/meals should be considered at the construction sites.
- ▶ The Contractor shall establish work zones to separate workers on foot from traffic and equipment, following the Traffic Signs Manual²⁸. The basic signs include *Road Works Sign*, *Road Narrow Sign*, *Keep left or Keep Right*, place a line of *Traffic Cones* to guide the pedestrian, using STOP/GO boards. The Sign plates size should be standard diameters according to Traffic Signs Manual.

7.4.19 GENDER-BASED VIOLENCE (GBV) (ESS-4)

382. The gender-based violence (GBV) and sexual exploitation and abuse/Sexual Harassment (SH) risks may increase to some extent within local communities when there are large influxes of male workers from outside the area. In addition, the new risks (outlined in the SEA/SH mitigation plan) with activities under the project may compound the broader contextual risks present at the community level. The gender disparity can be attributed to structural barriers, including women's domestic burden, employer discrimination, restricted mobility, limited access to training, lack of female-friendly facilities at sites, sexual harassment at work, and limited childcare provisions. Generally, female employment tends to be more concentrated in low-paid and low-productivity occupations. Increasing women's labor force participation and improving the quality of female employment will require more significant support for women's access to employment opportunities and high-quality skills development programs.

²⁸ Traffic signs Manual, Volume 1, Appendices, Bangladesh Road Transport Authority, Ministry of Communication

7. Environmental and Social Impacts, Risks and Mitigation Measures

383. Usually, the outsider workers come without their families and have large disposable incomes relative to the local community, and can pose a risk in terms of sexual harassment, violence, and exploitative transactional relationships. The risks will be higher when workers come into close contact with the local community, for example, on access routes or when living together in remote areas. During the construction phase, female workers are also vulnerable to various forms of harassment, discrimination of wage rate exploitation, and abuse, aggravated by traditionally male working environments. Mostly, labor hiring companies do not have proper training on the code of conduct and company policy regarding a GBV-free work environment for all workers, including skilled and non-skilled workers. Moreover, the contractors lack experience in the management of GBV issues, and there is currently limited awareness-raising programs on GBV/SEA/SH in the communication sector in Bangladesh.

384. In addition, gender-based violence may occur during payment of the compensation money and resettlement benefits of this project due to i) discrimination in sharing of compensated money between male and woman shareholders (usually brothers are continually depriving their sisters' parents' property), ii) widow of the PAP sometime will not get actual share of compensation cash and resettlement benefits, iii) Female HHs may get exploitation and harassment to get compensation by middleman / Brokers during collecting money from DD offices and RHD, etc.

Mitigation Measures

- ▶ The contractor, RHD-PD Office, PIU site offices, and concerned safety regulatory organizations shall maintain the implementation of a GBV-free work environment.
- ▶ A Gender-Based Violence Preventive Plan should be followed as presented in **Annex 12, Volume-II**. This action plan aims to identify the issues, stakeholders, and possible service providers, and assess their capacity to aid in accessing Grievance Redressal. The action plan has action, activities, indicators, responsibilities, and risk management, focusing on some corresponding mitigation measures; sensitizing the communities and other stakeholders, and strengthening the institutional capacities to mitigate project-related potential risk of GBV in the project-affected population.
- ▶ Gender-based discrimination should be strictly prohibited and monitored.
- ▶ Any sexual harassment shall be dealt with strictly as per the local law of the country, and the employee shall be terminated immediately from his duties.
- ▶ All workers, including skilled and non-skilled workers, shall receive training on the code of conduct and company policy on a GBV-free work environment.
- ▶ It shall be ensured that all workers, including managers/engineers and others, have attended the training mentioned above.
- ▶ Code of Conduct Preventing Gender-Based Violence and Violence against Children/Female Workers shall be signed by the workers/managers/other staff. A sample Labor Code of Conduct (CoC) of the contractor covering the GBV/SEA/SH-related risks during the construction period is presented in **Annex 12**.
- ▶ A signed copy of the code of conduct shall be documented physically, and a scanned version shall be stored in a computer.
- ▶ The company policy on a GBV-free work environment and the code of conduct signed by the worker shall be displayed at labor camps/canteens and other contractor facilities.
- ▶ During recruitment, the contractor's HSE Specialist must diligently check candidates' references with a documented history of prohibited conduct.
- ▶ A Labor Management Procedure (LMP) shall be followed at the site as presented in Chapter 8 of this ESIA to control the risks.
- ▶ Staff shall be encouraged to report suspected or actual GBV.
- ▶ A grievance redressal mechanism shall be established at the site to address the issues immediately for GBV related to getting the compensation money and resettlement benefits.
- ▶ During the construction period, the ESMP is expected to be effectively followed, which will ensure a low-risk environment for Gender-Based Violence (GBV) affecting community members, workers, service users, and any other relevant sections of the public following the guidelines of the GBV Plan documented in **Annex 12, Volume-II**.

7.4.20 TRAFFIC DIVERSION AND DETOURING (ESS-4)

385. Traffic generated by project-related activities can significantly inconvenience or disturb the local community who reside near the areas adjacent to construction works. The movement of heavy vehicles to carry construction materials and equipment will add congestion to existing traffic and increase the risk of traffic accidents. Disruption of access to infrastructure or social resources due to construction activity will cause nuisance. It will also pose a risk of accidents for drivers at night if these blockages and disruptions are not demarcated. In addition, there are serious accident risks for pedestrians crossing the road at sensitive receptors, like schools, mosques, temples, hospitals, etc., and other CPRs.

Mitigation Measures

- ▶ To avoid disruption of the existing traffic due to construction activities, a comprehensive Traffic Management Plan (TMP) will be drawn up by the contractor and submitted to the CSC for approval before the commencement of construction
- ▶ The traffic control plans shall contain details of diversions, traffic safety arrangements during construction, safety measures for nighttime traffic
- ▶ Temporary diversions shall be provided as per the requirement
- ▶ Detailed "Traffic and Road Safety Management Plans" shall be prepared by the Contractor and submitted to CSC for approval
- ▶ The traffic management and control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangements after cessation of work each day, Safety measures for night-time traffic and precautions for transportation of hazardous materials and arrangement of flagmen

7.5 IMPACTS AND MITIGATION DURING OPERATION PHASE

386. Periodic environmental monitoring of terrestrial ecology, water resources, water quality, air, noise, etc. shall be undertaken. The client will monitor and evaluate the effectiveness of the ESMP/RAP through PIU during the project tenure and onward through the Environmental and Social Division of RHD.

7.5.1 LAND USE PATTERN (ESS-1)

387. Additional land will be required to widen and strengthen the proposed road development, permanently impacting the existing land use pattern by changing it from agricultural or rural residential/commercial to paved roads. However, considering this, optimization is required in the design. In this project's road development, land acquisition has been reduced from 946 acres to 758 acres.

388. Road projects often lead to increased urbanization around the project area. This can result in converting agricultural or undeveloped land into residential, commercial, or industrial areas. Due to increased accessibility, land prices along the road will also soar in nearby places.

389. The mitigation measure to prevent ribbon development is to restrict land by placing concrete pillars by RHD, and master planning/zoning must be taken by the concerned authority. Integrated planning is crucial to address these impacts.⁴⁹ Coordinating land use and transportation planning is must to ensure that new developments are sustainable and beneficial to the community.

7.5.2 TERRESTRIAL ECOLOGY (ESS-6)

390. The shrubs and trees to be planted on the median and along the roadsides are to be maintained and trimmed regularly.

7.5.3 WATER RESOURCES AND WATER QUALITY (ESS-3)

391. Side drains will be regularly cleaned before the monsoon onset, and water quality will be monitored.

⁴⁹ Analyzing the Impact of Land Use and Roadside Informal Activity on Transportation System: A Case Study in Rajshahi City Corporation, Bangladesh. Mahmudul Hasan et al.

7. Environmental and Social Impacts, Risks and Mitigation Measures

7.5.4 IMPACTS ON AIR ENVIRONMENT (ESS-3)

392. During operation, the activity of the proposed development will be only vehicular movements on the newly developed flyover/bridge infrastructure. Vehicular emissions will be the principal source of pollution during the operation stage. However, this development will provide a mode to decongest traffic in the project area. As such, the proposed development is not envisaged to impact air quality during the operation adversely. Hence, the proposed development can be seen as a measure to help reduce pollution issues, and the corridor will help decongest existing traffic and provide better riding conditions for road users.

7.5.4.1 Air Pollution Modelling

393. Traffic analysis report shows that the Bhomra Land Port is one of the prominent ports for bilateral trade between India and Bangladesh, along with the Benapole Land Port. Bhomra Land Port typically experiences less truck congestion than Benapole Land Port, enabling faster processing of exports from Bangladesh to India and thus becoming a preferred alternate for trade moving along the Dhaka-Kolkata route. Therefore, with the improvement of the Bhomra-Satkhira-Navaron road section, there is a high possibility of traffic being diverted to the project road from the surrounding network.

394. The composition of traffic was worked out from the traffic volume count data collected from various locations in the road network. The share of passenger vehicles in all locations varies from 53% to 63%, while the share of goods vehicles varies from 10% to 16%. Furthermore, the share of non-motorized vehicles varies from 27% to 32%. Table 5 shows the mode-wise composition of total traffic for the survey locations on the project network. The traffic composition on the different survey location is presented in Table 7-14⁴⁰.

Table 7-14: Average Percentage Composition of Traffic (%)

Car / Jeep / Utility Van	TVC 1, Near Kazihat College, R780	TVC-2, Near Maa Durga Rice Mills, Alipur Bazar, Satkhira-Bhomra Highway	TVCS 1, Near Vairab Nagar Jame masjid, R760	TVCS 2, Gadkhali Bazar, N706
Car/ Jeep/ Utility Van	3%	1%	2%	7%
Auto Rickshaw	17%	16%	20%	7%
Motor Cycle	33%	36%	39%	35%
Mini Bus/Micro Bus	3%	0%	1%	3%
Large Bus	1%	0%	1%	2%
Small Truck	7%	3%	4%	4%
Medium Truck	8%	9%	5%	12%
Heavy Truck	1%	3%	1%	1%
MAV	0%	0%	0%	0%
Non-Motorised	27%	32%	27%	27%

395. Considering different traffic aspects, the feasibility and detailed design study for the proposed road section development has the recommended growth rates which are given in Table 7-15.

Table 7-15: Estimated and Recommended Growth Rate

Vehicle Category	Years					
	2022-2027	2027-2032	2032-2037	2037-2042	2042-2047	Beyond 2047
Car	7.00%	7.50%	8.00%	6.80%	5.50%	4.50%
Bus / Mini bus	3.20%	6.00%	6.50%	5.60%	4.50%	3.60%
Three Wheelers	5.00%	5.50%	6.00%	5.50%	4.00%	3.00%
Two Wheelers	7.00%	7.70%	8.00%	6.90%	5.60%	4.50%
Small Truck	6.00%	6.50%	7.00%	6.00%	4.80%	3.90%
2 Axle	6.00%	6.50%	7.00%	6.00%	4.80%	3.90%
> 3 Axle	7.00%	7.50%	8.00%	6.80%	5.50%	4.50%
MAV	7.00%	7.50%	8.00%	6.80%	5.50%	4.50%

396. The total motorized traffic in different years is presented as follows in Table 7-16⁴¹.

Table 7-16: Projected Traffic

⁴⁰ Feasibility Study, Detailed Design of Bhomra-Satkhira-Navaron Road Section (Phase - II), RHD, 2024

7. Environmental and Social Impacts, Risks and Mitigation Measures

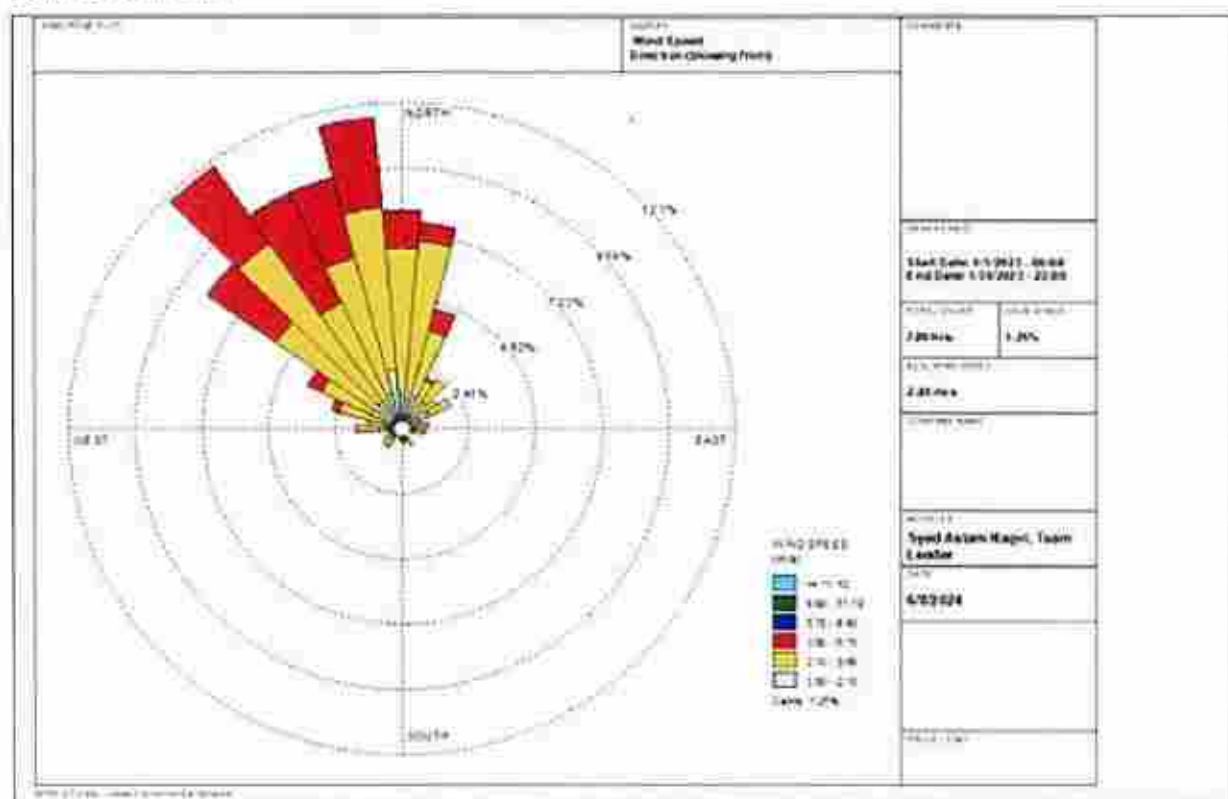
Base Year	Construction Period			Operation Year			
2022-2023	2023-2024	2024-2025	2025-2026	2030-2031	2037-2038	2047-2048	2052-2053
6508	6911	7341	7798	13328	21565	36778	44919

397. The CALPUFF View Version 9.0 model is used for air quality simulating the air quality along the road. This puff model can fully account for hour-by-hour and spatial variations in stability and wind. It performs well at downwind distances from a few kilometers. The current version can also work for Road Sources. Hence, it is applicable for simulating future scenarios, e.g., 2052 -53. Based on the chemistry of fuel, a review of different literature, e.g., literature UPEPA 42, CPCB-India, The emission factors criteria pollutant PM10, SO2, NOx, CO, etc., for 2052 traffic has been worked to be as follows given in Table 7-17.

Table 7-17: Emission Factors from Road

Description of source	Emission Rate of Criteria Pollutants in g/s				Coordinates in m (Start and End Point)			
	CO	NO2	PM10	SO2	X1	Y1	X2	Y2
Bhomra Navaron	0.001728	4.41E-05	3.85E-05	5.67E-05	705656.2	2551151	705656.2	2507321

398. The metrological data is collected for 2023 for the program area's center point (23.49916 N, 89.14893 E). Since the winter season is the most stable meteorological condition, the model is employed for this season wind data. The wind rose diagram for the winter season is presented in Figure 7-1. The predominant wind direction is Northwestern (NW).



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399. The simulation model is employed to determine the criteria pollutants, such as Carbon Monoxide (CO), Sulfur dioxide (SO₂), Nitrogen Dioxide (NO₂), PM₁₀, and PM_{2.5}, for road sources in 2052-53. The incremental values of the concentrations due to the increased traffic in 2052 and cumulative results are summarized in Table 7-18.

7. Environmental and Social Impacts, Risks and Mitigation Measures

Table 7-18: Air Quality Cumulative Results

Predicted Concentration of Pollutants						Baseline Value	Cumulative Value
Average Period	Rank	Peak	Year, Julian Day, Start Hour	X [km]	Y [km]		
CO - Concentration: [ppm]							
1-HOUR	1	0.75	2023, 013, 0500	704.248	2539.349	0.78	1.53
8-HOUR	1	0.14	2023, 013, 0000	704.248	2544.349	-	
NO2 - Concentration: [ug/m**3]							
24-HOUR	1	4.09	2023, 013, 0000	705.248	2546.349	13	17.09
PM10 - Concentration: [ug/m**3]							
24-HOUR	1	3.57	2023, 013, 0000	705.248	2546.349	55.7	59.27
PM2.5 - Concentration: [ug/m**3]							
24-HOUR	1	2.68	2023, 013, 0000	705.248	2546.349	49.1	51.78
SO2 - Concentration: [ug/m**3]							
24-HOUR	1	5.27	2023, 013, 0000	705.248	2546.349	178.3	183.57
CALPUFF View Version 11.0.0 by Lakes Environmental Software							

CALPUFF View Version 11.0.0 by Luke's Environmental Software

400. From the above table, it can be apprehended that all the values are within the prescribed limit except for the Sulfur dioxide because the baseline concentration exceeds the limits. The reason for exceeding limits in the baseline concentration is due to fossil fuel burning in rural areas. The results are shown in the following isopleths given in Figure 7-2.

Figure 7-2: Isopleths of Predicted Concentration of Criteria Pollutants in Ambient Air

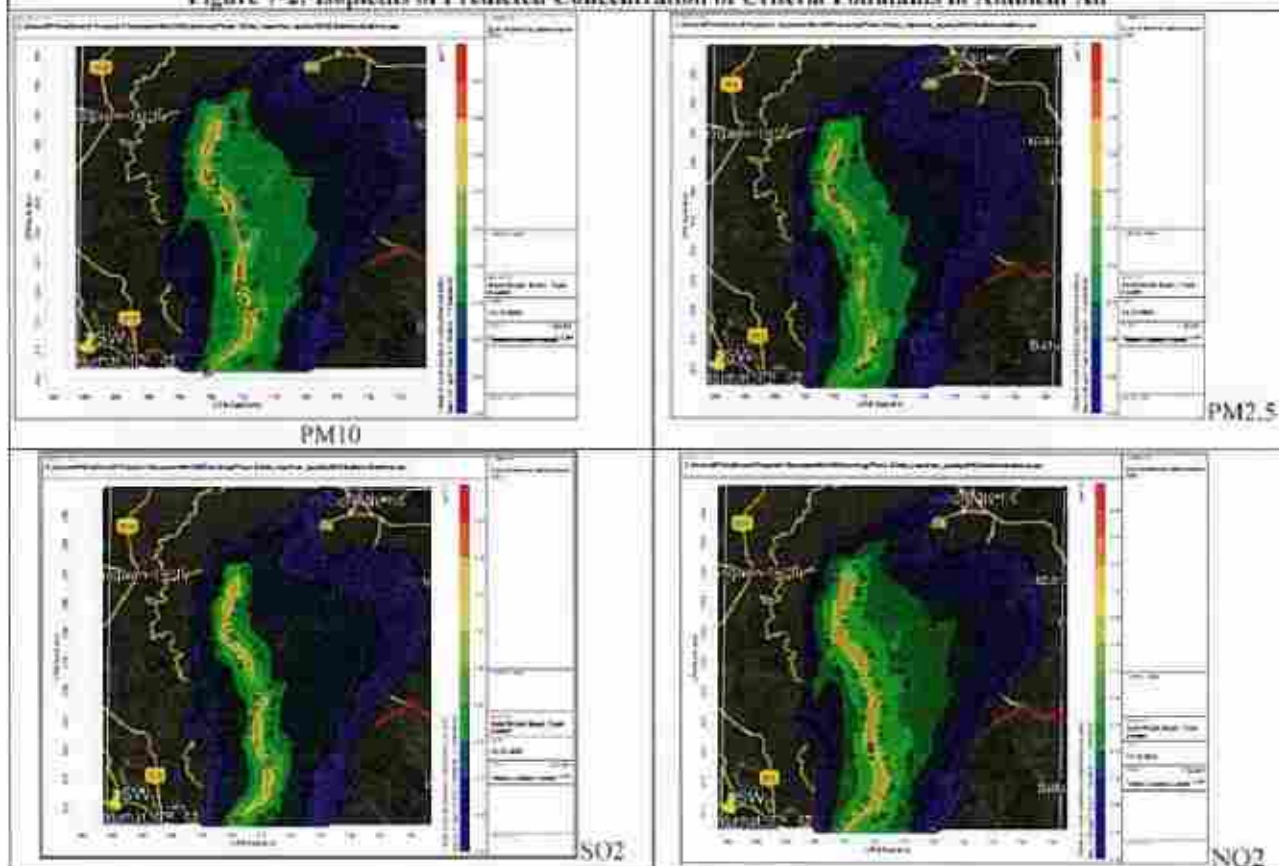
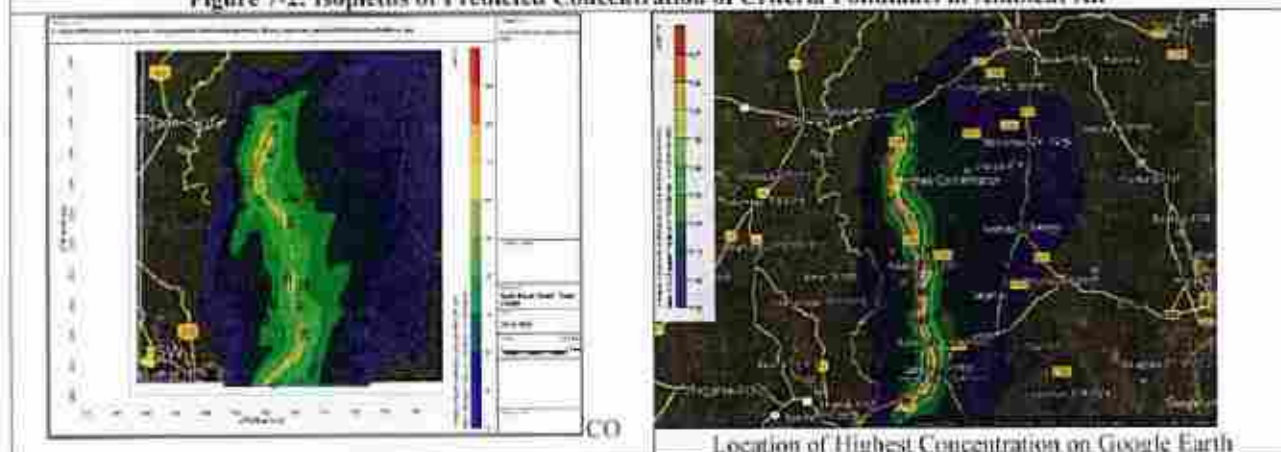


Figure 7-2: Isopleths of Predicted Concentration of Criteria Pollutants in Ambient Air



7.5.5 IMPACTS ON NOISE ENVIRONMENT DURING OPERATION PHASE

401. Motor vehicles are inherently noisy, and noise impacts are inevitable in any road development regardless of scale or character⁵¹. The noise sources during the operation of road projects are vehicle noise, friction between vehicles and road surface, driver behavior, and road maintenance. Vehicles noise⁵¹ is generated from engine, transmission, suspension, acceleration, stop-and-go traffic conditions, and rough roads. Poor vehicle conditions are also one contributing factor⁵¹.

402. During the operation stage, increased traffic will likely raise the noise level. However, this development will provide a mode to decongest traffic and thereby help reduce impacts due to increased noise levels.

403. Composition of Traffic and Growth: Based on the traffic survey, the traffic composition is Car / Jeep / Utility Van, Auto Rickshaw, Motorcycle, Minibus/Micro Bus, large bus, Small Truck, Medium Truck, Heavy Truck, and Non-Motorized. Their growth pattern in future years is given in Table 7-15. The traffic increase is given in Table 7-16.

404. Based on the traffic analysis report, peak-hour traffic has been worked out for 2052 (refer Table 7-19) and sound levels due to an increase have been simulated using the sound plan software 5.1.

Table 7-19: Peak hour Traffic values (Year 2052)

Station	Vehicle name	day	night
		Veh/h	Veh/h
Navaron to Satkhira	Total	839	600
	Automobiles	440	359
	Medium trucks	39	56
	Heavy trucks	44	67
	Buses	209	58
	Motorcycles	107	60
Benapole to Jashore	Total	749	604
	Automobiles	378	323
	Medium trucks	32	50
	Heavy trucks	37	60
	Buses	168	53
	Motorcycles	134	118

405. SoundPLAN Noise Model: SoundPLAN is a compact noise model that simulates sound levels due to various sources such as roads, railways, industry, etc. Country noise modeling standards are input to simulate noise level impacts. For this study, the Traffic Noise Model (TNM2.5) of the US Federal Highway Authority (USFHWA) has been used to calculate the incremental noise levels.

⁵¹ Roads and Environment a Handbook, The World Bank, 1997.

7. Environmental and Social Impacts, Risks and Mitigation Measures

406. To assess the impacts on the ambient noise environment due to the operation phase of this state highway development, a simulation model (SoundPLAN essential 5.1) followed TNM 2.5 standards in the model. Different vehicle types produce different levels of noise. In general, heavy vehicles such as transport trucks make more noise than light cars; they tend to have more wheels in contact with the road and often use engine brakes while decelerating. The incremental noise levels at different distances from the road edge are presented in Figure 7-3.

407. The TNM 2.5 considers different vehicles, such as passenger cars, medium trucks, heavy trucks (multi-axes), Buses, and Motorcycles.

408. The following is US FHWA noise equation 1 as follows:

$$L_{eq}(h) = L_{eqi} + 10 \log [N/(S_i \times T)] + 10 \log (15/d)(1 + a) + S_{\alpha} \quad \text{Equation 1}$$

Where,

$L_{eq}(h)$ = L_{eq} at hour h for i^{th} vehicle type

L_{eqi} = The reference mean energy level for the i^{th} vehicle type

N = The number of i^{th} class vehicles passing during the time T

S_i = The average speed of the i^{th} class vehicles, km/hr

T = The duration for which L_{eq} is desired and must correspond to N, the count of vehicles during the time T. Normally, T has been considered one hour but it could be longer or shorter.

D = The perpendicular distance, in meters, from the centreline of the traffic lane to the location of the receptor, i.e., the location where the noise level is desired

a = The factor which relates to the absorption characteristics of the ground cover between the roadway and the receptor

S_{α} = The shielding factor provided by a noise barrier if present.

409. It is observed that incremental noise levels near the edge of the road, i.e., 60m to 80m, are more than nighttime noise level standards of ECR 23. However, the incremental noise levels are reducing as the distance from the road edge increases. It can be visualized from the noise level maps which are presented in Figure 7-4 for daytime and nighttime for the year project year 2051-2052. To study the impacts, the highest incremental noise levels have been added to the baseline testing results which has been discussed in the following subsections.

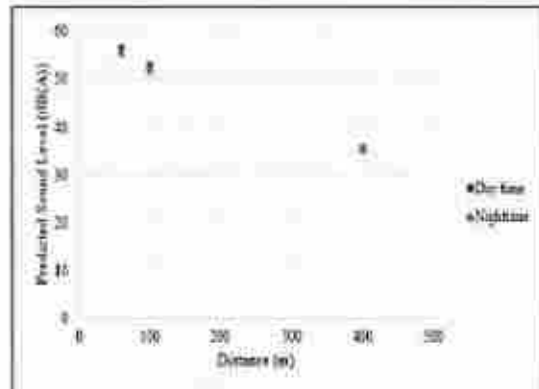
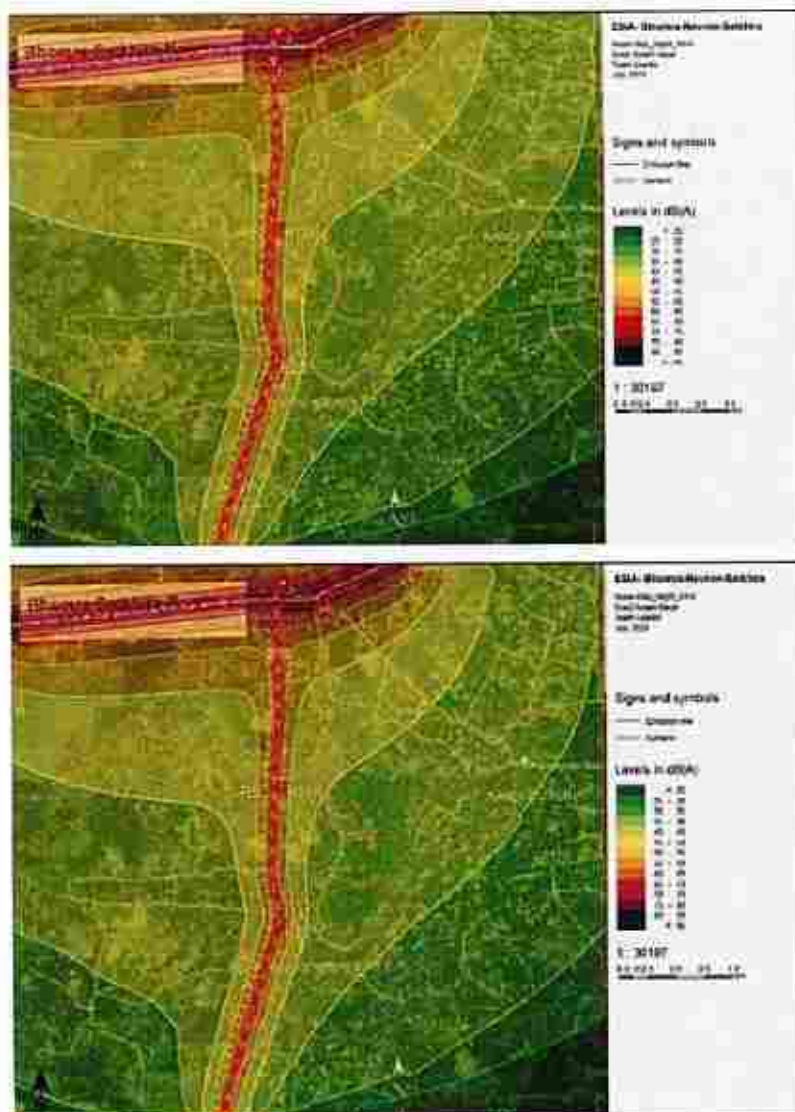


Figure 7-3: Incremental Noise Levels at Different Distances

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Figure 7-4: Incremental Noise Level



410. The predicted values are added to baseline values and resultant values are increasing the standards. For two noise quality measurement stations, the resultant values are as follows in Table 7-20: Cumulative Noise Levels

Station	Baseline Noise Levels		Incremental noise Levels		Cumulative Noise Levels at a 60m distance from road		Remarks
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	
ANL2	58.5	45.1	56.4	55.4	61	55	Noise levels increase by 2dB(A) during the daytime. Nighttime impacts are more due to increased traffic. Noise barriers along the boundary shall be provided as per ESMP.
ANL5	61.9	46.4	56.4	55.4	62	56	

Mitigation Measures

- ▶ Vehicular noise and horn use need to be controlled through law enforcement and public awareness. Vehicles should use proper horns per norms to keep noise within permissible limits,
- ▶ Pressure horns shall not be allowed.

7. Environmental and Social Impacts, Risks and Mitigation Measures

- ▶ Silence zones need to be demarcated, and road signs prohibiting horns honking will be displayed in residential areas, sensitive locations, and silence zones. No honking signboards shall be placed near the sensitive receptors
- ▶ Noise barriers shall be installed along the corridor using tree plantation, especially along sensitive receptor sections such as schools, hospitals, etc.
- ▶ The noise level will be monitored regularly, per the environmental monitoring plan suggested in Section ESMP of this report.
- ▶ It is recommended that an extruded acrylic (1.17 – 1.19 g/cm³ of density) sheet noise barrier of 6mm thick be provided on the loop, take-off, and landing sides of the Navaron junction to reduce the noise impact on the community nearby. This sheet should be fixed on both sides. This will attenuate the noise level by 20db (A). The cost is about 400 BDT per square foot. A 2m height for a total 5 km length (2.5km on each side) will cost approximately 4,00,00,000 (Four hundred million or Forty crore Bangladeshi taka).

7.5.6 SOIL AND SEDIMENTS (ESS-3)

411. Proposed highway's operation phase, impacts on soil and sediment include continued erosion and sediment delivery from road surfaces and ditches, leading to water quality degradation. The heavy metals and other pollutants from traffic accidents and spillage oil and lubricants contaminate roadside soils, potentially entering the food chain and soil compaction from traffic, changes in soil physical and chemical properties, and the risk of leaching into groundwater also occurs. Traffic releases heavy metals (like zinc, lead, cadmium, nickel, and chromium) from wear and tear of vehicle parts and from exhaust, which accumulate in roadside soils. Erosion from Surfaces, runoff from the road surface and drainage ditches continue to carry sediment and silt into nearby water bodies. In addition, roadside ditches can be a continuous source of sediment that flows into larger streams and rivers. Usually, the sediment entering streams carries pollutants and can also smother aquatic habitats, negatively impacting fish and other wildlife.

412. Mitigation Measures

- ▶ Roadside Planting and maintaining vegetation on slopes and in ditches help stabilize soil and reduce sediment yield.
- ▶ Runoff controls are crucial to intercept and treat pollutants before they reach water resources.
- ▶ Regularly monitoring soil and water quality around highways helps identify areas of high contamination or erosion.
- ▶ Proper maintenance of drainage systems and vegetated areas helps reduce ongoing sediment and pollutant transport.
- ▶ Any Spillages or Accidental Vehicles Shall be Removed Immediately.
- ▶ Maintenance of these issues necessitates ongoing management and the use of Best Management Practices (BMPs).

7.5.7 ROAD SAFETY (ESS-4)

- ▶ Road furniture, as provided in the operation phase, needs to be appropriately maintained.
 - ▶ Potholes or any other damages shall be rectified immediately after post-monsoon
- Highway Patrol/ Police deployment sufficiently at the project road in operation to oversee, monitor, and enforce traffic safety compliance on roads and highways as well as accident investigation and sexual misconduct, particularly women SH in the public buses during night.

7.6 CUMULATIVE IMPACT

413. During the SESA study for the WeCARE program, different existing, future, and current projects were identified. These projects include LGED projects in phase 3, ADB funded road project, Tourism, Land ports, Agriculture Industries, Shrimp farming, etc., which could be aligned with the project lifecycle, have been identified through literature review, stakeholder consultations, and field visits. The list of projects is summarized in Table 7-21.

414. As per the IFC guidelines, the project area of influence - PAI (Refer to section 1.8 of this report) to assess the Cumulative Impact Assessment (CIA) has been identified, and referring to the SESA study (Section 6.3 of the SESA).

7. Environmental and Social Impacts, Risks and Mitigation Measures

2024), the projects in the PAI have been narrowed down and listed in Table 7-21. The projects include completed till 2023, on-going 2024 – 2030, and future (2031 – 2041) ^{52, 53}

Table 7-21: List of Projects			
SU #	Completed -till 2023	On-going (2024-2030)/Future Commissioning	Future (2031-2041)
1	LGED Roads	WeCare project -Phase 3 (RHD)	Khulna- Dumuria Satkhira ADB funded
2	Bhomra Land port	WeCARE Project -Phase 3 (LGED)	WeCARE Phase 4
3	Agro-Processing and Storage and Shrimp farming	Growth Centers	Bhanga-Benapole Road project (LOC)
4	Brick Kilns, Rice Mills,	Bhomra Land Port Expansion	Future potential for industrial clustering
5	Benapole-Jashore Rail Project		Tourism and Shrimp Farming

415. To assess the cumulative impacts on social and environmental impacts and risks in the project area, a three-level scale (Low, Medium, and High) has been selected for this project, which was adopted from SESA, RHD, 2023. The color coding for working out the intensity of positive and negative impacts is given in Table 7-22.

Table 7-22: Intensity of Impacts						
NEGATIVE			Neutral	POSITIVE		
High	Medium	Low		Low	Medium	High

416. The cumulative impacts assessed using IFC guidelines are presented in Table 7-23.

Table 7-23: Assessment of Risks and Impacts on Environmental and Social parameters									
SL#	Parameters	RHD	LGED			Tourism Sector	Industry		
		Phase 3, ADBUP/Union Road Projects, Feeder Roads Junction Improvement (Phase 3, & 4)	Bridges/GCM	Other Facilities	Agro-based Industry		Shrimp and Fish Cultivation	Other Industry (Land ports)	
1. PHYSICAL PARAMETERS									
1.1	Land Use Pattern								
1.2	Air Quality								
1.3	Noise Quality								
1.4	Drainage Congestion/ Water Logging								
1.5	Erosion and Siltation								
1.6	Soil Quality								
1.7	Water Pollution								
1.8	Waste (Liquid/Solid) Generation								
1.9	Climate Change adaptation								
1.10	GHG emissions								
1.11	Carbon Emissions								
1.12	Loss of Top Soil of Agricultural Lands								
1.13	Safety								
2. ECOLOGY AND BIODIVERSITY									
2.1	Aquatic Ecology								
2.2	Terrestrial Ecology (Tree Cutting)								
2.3	Wildlife and Biodiversity								
2.4	Eutrophication/Pukur or Baor								
2.5	Tree Plantation								

⁵² Good Practice Handbook Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets, IFC, World Bank Group, 2013

⁵³ SESA, 2023, RHD Section 6.3.

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7. Environmental and Social Impacts, Risks and Mitigation Measures

Table 7-23: Assessment of Risks and Impacts on Environmental and Social parameters

Sl.#	Parameters	Assessment of risks with respect to environmental and social parameters								
		RHD Phase 3, ADB Road Projects junction Improvement	UP/Union Feeder Roads (Phase 3, & 4)	LGED Bridges	GCM	Other Facilities	Tourism Sector	Agro-based Industry	Shrimp and Fish Cultivation	Other Industry (Land ports)
3SOCIAL RISKS AND IMPACTS										
3.1	Population Growth									
3.2	Land Disputes									
3.3	Land Acquisition									
3.4	Loss of Agriculture Land									
3.5	Loss of Livelihood									
3.6	Loss of structures									
3.7	Social Dynamics and well being									
3.8	Out Migration Rate (Reduced)									
3.9	Health and Sanitation									
3.10	Poverty and Food Security									
3.11	Education/ Literacy									
3.12	Rural Development									
3.13	Gender Equality and Inclusiveness									
3.14	SEA/SI and Human Trafficking									
3.15	Marginalized/Special Ethnic Community									
4ECONOMICAL RISKS AND IMPACTS										
4.1	Growth									
4.2	Industry and Export									
4.3	Employment									
4.4	Infrastructure and Transport									
4.5	Connectivity and communication									
4.6	Tourism									
4.7	Agricultural Development									

417. To evaluate the cumulative impacts arising from the different projects using the assessment done above Table 7-23, the occurrence of impacts and risks on environmental and social parameters are summarized in Table 7-24.

Table 7-24: Occurrence of Risks and Impacts on ES Attributes in the Project Area (2023-2041)

SLNo	Parameters	Occurrence of Impacts						
		(+ve) High	(-ve) Medium	(-ve) Low	Neutra 1	(+ve) Low	(+ve) Medium	(+ve) High
1	PHYSICAL PARAMETERS							
1.1	Land Use Pattern	4	3	2				
1.2	Air Quality		4	2	1	1		
1.3	Noise Quality	1	3	3				
1.4	Drainage Congestion/ Water Logging		2	4		3		
1.5	Erosion and Siltation		2	2	1	2		
1.6	Soil Quality	2	1	3	3			
1.7	Water Pollution	2	1	4	2			
1.8	Waste (Liquid/Solid) Generation	3	3	3				
1.9	Climate Change		1	1	2	1	4	
1.10	GHG emissions			7	2			
1.11	Carbon Emissions		1	3	2		3	
1.12	Loss of Topsoil of Agricultural Lands	2	2	2	3			
1.13	Safety		1	3			3	2

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7. Environmental and Social Impacts, Risks and Mitigation Measures

Table 7-24: Occurrence of Risks and Impacts on ES Attributes in the Project Area (2023-2041)

Sl.No	Parameters	Occurrence of Impacts						
		(+ve) High	(-ve) Medium	(-ve) Low	Neutral 1	(+ve) Low	(+ve) Medium	(+ve) High
Total Occurrence of Impacts		14	24	39	16	7	10	2
2	ECOLOGY AND BIODIVERSITY							
2.1	Aquatic Ecology		1	4		1		
2.2	Terrestrial Ecology (Tree Cutting)		2	1	2			
2.3	Wildlife and Biodiversity			1	2			
2.4	Eutrophication of Water Body (Baor/Pukur)		1	3				
2.5	Tree Plantation					1	1	3
2.8								
Total Occurrence of Impacts			4	9	4	2	1	3
3	SOCIAL RISKS AND IMPACTS							
3.1	Population Growth					9		
3.2	Land Disputes	2	2	4				
3.3	Land Acquisition	2	4	2				
3.4	Loss of Agriculture Land	3	2	2				
3.5	Loss of Livelihood	1	2	4	1			
3.6	Loss of structures	1	1	4				
3.7	Social Dynamics and well being			1		1	6	1
3.8	Out Migration Rate (Reduced)			1		2	3	
3.9	Health and Sanitation			1			5	3
3.10	Poverty and Food Security			1		1	5	
3.11	Education/ Literacy			1			4	4
3.12	Rural Development					2	3	3
3.13	Gender Equality and Inclusiveness			1		2	5	1
3.14	SEA/SH and Human Trafficking		1	3	2	1		
3.15	Marginalized and Special Ethnic Community		2	7				
Total Occurrence of Impacts		9	14	32	3	9	31	12
4	ECONOMICAL RISKS AND IMPACTS							
4.1	Growth						2	5
4.2	Industry and Export						2	5
4.3	Employment						2	5
4.4	Infrastructure, transport, connectivity and communication						2	5
4.5	Tourism						2	5
4.6	Agricultural Development						2	5
Total Occurrence of Impacts							12	30

418. The above table demonstrates that the environmental parameter land use is severely impacted because it will permanently change from agriculture to paved roads or industrial units, resulting in urbanization, etc. Waste generation will also cause a high impact on the environment, followed by loss of topsoil/soil quality. The social risks and impacts will be severe due to land acquisition and land disputes. The occurrence of impacts is summarized in Table 7-25.

Table 7-25: Sum of occurrence of Impacts								
Parameter	Negative			Neutral	Positive			A sum of Positive and Negative Impacts
	High	Medium	Low		Low	Medium	High	
Environmental and Natural Resources	14	28	51	21	9	12	6	-66
Socio-economic s	12	17	40	3	10	48	48	37

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7. Environmental and Social Impacts, Risks and Mitigation Measures

Total Occurrence of Impacts	-162	24	+133	
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419. Cumulative environmental impacts must be mitigated by adopting this report's suggested Environmental and Social Management Plan (ESMP). As seen above, social impacts will mainly be due to land acquisition (LA), and the Resettlement Action Plan (RAP) is being prepared as a standalone document separately to mitigate the impacts. Considering social factors, the project's road development will have positive sustainability.


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8 LABOR MANAGEMENT PROCEDURE

420. This Labor-Management Procedure (LMP) has been prepared for the project. The LMP is to ensure that the project complied with the Bangladesh Labor Act of 2006, as well as the World Bank's Environmental and Social Framework (ESF), Environmental and Social Standard 2: Labor and Working Conditions (ESS2), and Environmental and Social Standard 4: Community Health and Safety (ESS4). In Bangladesh, the LMP considered using nationally adopted health and safety norms. The project will require direct and contractual employees for civil and construction work. The LMP applies to all direct, contracted, and major supplier workers working on the project.

421. This section explains the labor-management approach for project aspects while considering national and international norms. The labor laws are governed by the Bangladesh Labour Act 2006, amended in 2010 and 2013, and Labour Rules 2015. Some of the national and international laws regarding occupational health and safety that are relevant to this project are presented below in Table 8-1.

Table 8-1: Summary of National and International Laws		
Sl. No.	Acts	Objectives/Description
1.	Bangladesh Labor Act 2006 (Amendment 2013)	Provides safety for the workforce during the construction period. The act guides the employer's extent of responsibility and the workmen's right to compensation in case of injury caused by an accident while working.
2.	Bangladesh Labor Rules 2015	Guidelines on Employment Policy, Manpower Registration, Organogram, Appointment Letters, Registers, Misconduct, Punishment, Bonuses, Provident Fund, Holiday, Safety, and Wages.
3.	Water Supply and Sewerage Authority Act 1996	The act calls for ensuring the public's access to a water supply and sewerage system, preserving the system, and providing other related health and environmental facilities for the community.
4.	Labor Relations Under Labor Laws, 1996 (revision to scattered Acts and Ordinances to formulate the unified code)	The general concern during the project implementation state that the project manager must recognize labor unions.
5.	Public Health Emergency Provisions Ordinance, 1994	Calls for special provisions regarding public health. In emergencies, it is vital to prevent disease spread, safeguard public health, and ensure adequate medical and essential services for communities and workers during construction.
6.	Bangladesh Factory Act, 1979	Workplace provisions require medical facilities, first aid, and emergency arrangements, as well as child care services for women workers.
7.	The Employees' State Insurance Act 1948	Health, injury, and sickness benefits should be paid.
8.	The Employees' Liability Act, 1938	Covers accidents, risks, and damages concerning employment injuries.
9.	Maternity Benefit Act 1950	Framed rules for female employees, who are entitled to various benefits for maternity.
10.	The Equator Principles (III) 2013	Provide guidelines on environmental and social standards with considering project manpower and other stakeholders.
11.	International Labor Organization Rules and Guidelines:	
12.	Convention 029 (1930)	Guidelines on Forced or Compulsory Labor;
	Convention 098 (1949)	The Application of the Right to Organize and Bargain Collectively;
	Convention 100 (1951)	Equal Pay for Equal Work for men and women
	Convention 111 (1958)	Discrimination in Respect of Employment and Occupation;
	Convention 138 (1973)	Minimum Age for Admission to Employment;
	Convention 182 (1999)	The Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labor

422. To address the following points, the contractor will take necessary steps during the construction period according to the national laws relating to the labor-management procedures (occupational health and safety-relevant) as well as World Bank's (WB) Environmental and Social Framework (ESF), specifically Environmental and Social Standard (ESS2) and Community Health and Safety (ESS4) is presented respectively.

8.1 SELECTION AND LAYOUT OF CONSTRUCTION CAMP

423. The selection of labor and construction camps for road construction depends on size, dimensions, and project length. The contractor will choose a location near the project area, considering available government land, barren land, riverbanks, and areas without environmental or social impacts. It's advisable to avoid lands that are socially or environmentally sensitive. A tentative layout for the construction camp specifies the temporary infrastructure. (Figure 8-1). Hot mixed plant, stockyard, stone crusher, batch plant, maintenance workshop, and laboratory will be positioned opposite the maximum yearly wind flow. Temporary infrastructure will be established and maintained after agreement with the landowner, along with original photographs site. The contractor will comply with the tentative layout properly. The selection criteria for construction camps are outlined below:

- **Land Selection:** Barren land, government-free land, khas land, char land, etc. Avoid agricultural land, private land, vegetation areas, public places, recreational areas, forests, and sensitive areas.
 - **Layout Placement:** Place environmentally or socially corrosive infrastructure (hot mixed plant, stockyard, stone crusher, batch plant, maintenance workshop, laboratory, etc.) far from the residential area, labor camps, office area, etc.
1. When selecting or drawing the construction camps in a certain place, a few things should be considered to maximize productivity, reduce areas needed for temporary construction, and maximize utilization, such as safety, Site Accessibility, Security, Environmental Soundness, and social risks. Economically Sustainable.

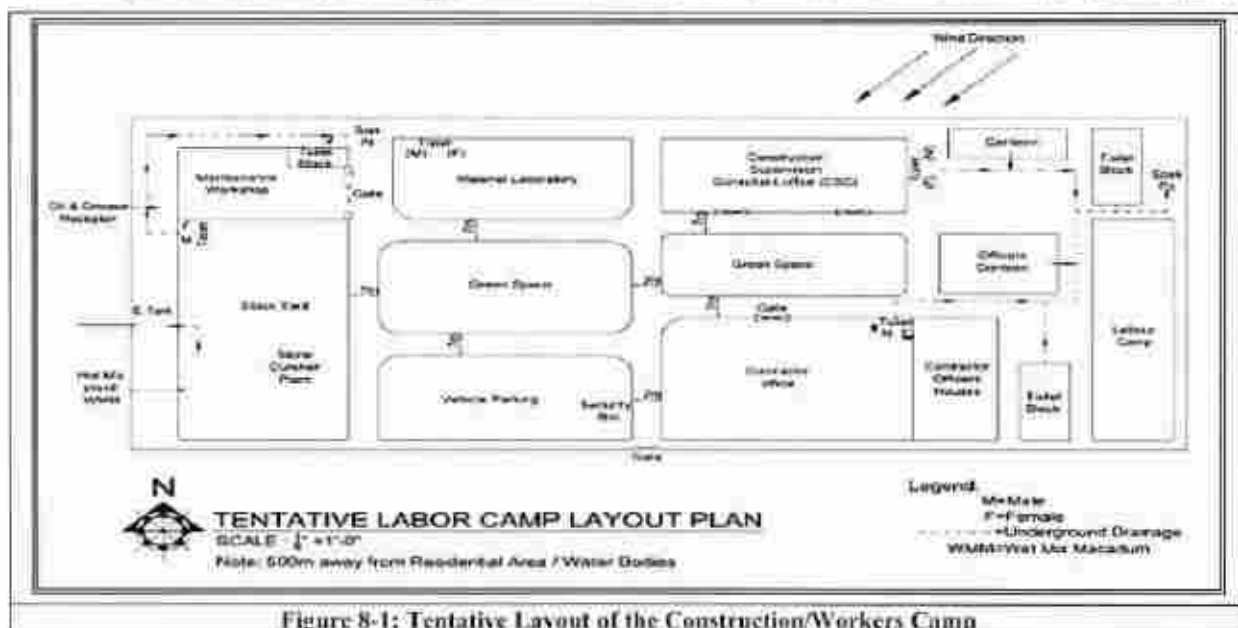


Figure 8-1: Tentative Layout of the Construction/Workers Camp

8.2 HIRING AND RECRUITMENT PROCEDURE

424. Hiring workers will depend on the project size and timeline. According to the WeCARE program, the contractor will recruit direct, contracted, primary supply, and migrant workers based on expertise needs. The process follows the Bangladesh Labor Act 2006, Labor Rules 2015, ILO Convention, and the World Bank's ESS2 and ESS4.

425. Project workers will receive clear information regarding their employment terms and conditions. This includes their rights under national labor law and documentation such as contracts including terms and conditions, code of conduct (CoC), probation details, wage adjustments, work hours, bonuses, overtime, compensation, Leaves including paternity leaves, and benefits, in line with ESS 2 and LMP. This information will be provided at the start of employment and with any significant changes to terms. Procedures will follow the contractors' CoC, detailed in Annex 13, Volume-II.

426. The LMP applies to all project workers, whether full-time, part-time, temporary, seasonal, or migrant. Provisions prevent child labor and forced labor. The main procedures for hiring and recruiting workers are outlined below.

- ▶ **Sexual Exploitation and Abuse (SEA)/Sexual Harassment (SH):** The project prohibits all types of SEA/SH and will take appropriate measures to promote a harmonious work environment and protect personnel from prohibited conduct through prevention and effective remedies. During recruitment, the HR Specialist must check candidates' references to ensure those with a history of prohibited conduct are not hired.
 - ▶ **Non-Discrimination and Equal Opportunity:** Employees must be treated equally regarding gender, age, race, religion, disability, nationality, political beliefs, union membership, ethnic origin, and sexual orientation. Equality in employment means no direct or indirect discrimination for these reasons. The Project's equal opportunity policy ensures fairness in all employment aspects, including hiring, training, evaluation, performance, compensation, benefits, and termination.
 - ▶ **Compensation for Damage:** The law requires that an employee who damages equipment or the employer's assets pay compensation. The contractor can deduct the monthly salary to cover the loss. If an employee damages company equipment or assets, an investigation will be conducted.
 - ▶ **Occupational Health and Safety:** The details are referred to in the ESMP of this report.
2. The contractor should follow the code of conduct or terms of reference for hiring or recruiting the workforce for the project. Since the contractor will be employing different types of labour, it is prudent to define child and forced labour.
- ▶ **Child Labor:** In keeping with internationally recognized standards, the project will distinguish between child labor and young workers. The project will not tolerate child labor under any circumstances. The employment of young workers, i.e., minors aged from 15 years to under 18 years who have reached the minimum age of employment and completed compulsory schooling, will be allowed under strict conditions and in compliance with requirements of internationally recognized standards and local relevant laws and regulations.
 - ▶ **Forced Labor:** The Project defines forced labor in line with the ILO Convention as any work or service extracted from a person under threat or penalty, which includes penal sanctions and the loss of rights and privileges, that the person has not offered him or herself voluntarily. It includes slavery and abduction, misuse of public and prison works, forced recruitment, debt bondage, domestic workers under forced labor situations, and internal or international human trafficking.

8.3 FACILITIES AT WORKERS' CAMPS

427. According to the national and international labor laws, the contractor will ensure numerous facilities in the labor camps for good practices of environmental and social norms. A list of facilities in the workers' camps includes, Lodging Facilities, Drinking-Water Supply, Sanitation and Waste Disposal, Fuel Use, Fire Prevention Facilities, Medical Services, Construction Safety Personnel Protection Equipment, Food Supply/Kitchen or Dining Facilities, Information Signs, Security, Offices;

8.4 RECORD KEEPING AND MAINTENANCE

428. The contractor and subcontractors will keep essential documents, including employee information, internal regulations, collective bargaining agreements (CBA), and various trade union records, such as labor conference minutes and activity logs. They will also maintain labor contracts, wage scales, pay slips, documents on occupational accidents, grievance records, training logs, and discipline records. Additionally, they will compile monthly, quarterly, and semi-annual self-audit reports on contractor and supplier performance, along with monthly performance reports of subcontractors and suppliers. Reports regarding labor management, non-local worker utilization, and an annual labor compliance self-assessment will also be prepared quarterly and semi-annually.

429. Documents must be filed for five years or as stricter regulations require and securely stored for authorized personnel only. Records shall be available for inspection and audit by the contractor, project owner, or agents.

8.5 GRIEVANCE REDRESS MECHANISM

430. The contractor will assist and take necessary steps for collecting written complaints on behalf of the PIU and coordinate responses to all complaints. Both verbal and written complaints are to be entered into a Grievance Complaint Log. When receiving a complaint, all employees shall refer the complainant to the PIU or the resident engineer. The process of GRM is sorted out below-

- ▶ The person receiving a complaint shall ensure that the Grievance Complaint Log is completed.
 - ▶ The form shall then be forwarded to the PIU expert, who will assign it a number.
 - ▶ The PIU experts shall ensure all actions are taken to close the complaint.
 - ▶ Information on proposed corrective action sent to the complainant (if appropriate), the date the complaint was closed out, and the response date sent to the complainant.
 - ▶ All complaints shall be responded to in writing, though a verbal response will also be provided if this is more appropriate in the circumstances (e.g., where the complainant cannot read).
 - ▶ All complaints must be responded to within two weeks of being received, even if the response is just a summary of what is planned and when it is likely to be implemented.
 - ▶ Further correspondence should be given once the complaint is closed out.
 - ▶ The PIU expert, through the contractor, will be responsible for providing a monthly report detailing the level of complaints and any outstanding issues to be addressed.
 - ▶ Monthly reports will analyze the type of complaints, their levels, and the actions taken to reduce them.
3. The PIU expert shall file all documentation related to complaints in a file in his office.

8.6 AVAILABILITY OF LABOUR MANAGEMENT PROCEDURES ON WEB

431. The details of LMP may be referred to in the detailed version, which is available on [Labor-Management-Procedures-Western-Economic-Corridor-and-Regional-Enhancement-Program-P169880.pdf](#)


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9 EMERGENCY RESPONSE PLAN AND DISASTER MANAGEMENT

9.1 INTRODUCTION

432. This Emergency Response Plan (ERP) follows the same procedures as the Jhenaidah-Jashore Road Section (Phase-I) for WE CARE, since it is an improvement proposal of the junction as a variation to the Phase I study, because it is an endpoint of the Phase I road. Therefore, the ERP discussed in this chapter concisely outlines the procedures to be followed during the emergency. It provides guidelines for the Management Team and Site Construction Team to address any emergencies or crises related to company activities.

433. This ERP applies to all workers (including Direct/indirect or Supply Chain laborers, sub-contractors), employees, project staff, and visitors, including Construction Supervision Consultant (CSC) and RHD staff involved in the road construction site, camp location, or other contractors' facilities within the project boundary.

9.1.1 REGULATORY FRAMEWORKS AND SAFEGUARDS

434. The implementation of the ERP is governed by the national labor laws, including the Bangladesh Labour Act 2006 and the Bangladesh Labour Rules 2015.

9.2 POTENTIAL RISKS

435. This section presents potential risks during the construction phase. The emergency contact number, agency, equipment, training, etc., are presented in **Annex 8, Volume-II**.

9.2.1 FALL FROM HEIGHT

436. Falls from height are one of the most serious risks at construction sites and can lead to severe injuries or fatalities. Per OSHA, if the workers are working at heights of 1.8m or above for general construction activities and 3m for scaffolding, they are required to use mandatory personal protective equipment such as safety belts, helmets, harnesses, lanyards, etc., and the contractor must provide guard rails.

9.2.2 FIRE

437. Fires at construction sites and camps can be caused by various factors, often due to flammable materials, electrical hazards, and human error. Electrical hazards include damaged wiring, overloaded circuits, and improper electrical installations, leading to sparks and fires. Other activities include welding, cutting, grinding, or careless smoking near the prohibited areas where the fuels and chemicals are stored. The following measures are suggested to prevent untoward incidents at sites/camps.

- ▶ Placing warning signs or information about flammable material.
- ▶ The authorized person shall only be allowed to enter the prohibited areas.
- ▶ In any fire, the person who notices it shall activate the nearest fire alarm or inform their line managers to pass the information to the Hazard Safety Environment (HSE) officer.
- ▶ Apart from the trained firefighters, no other personnel will be allowed at the place of the incident. The firefighters must ensure that they wear essential PPE such as the safety suit, safety helmet, and self-contained breathing apparatus (SCBA) based on the requirement and magnitude of the fire.
- ▶ Disconnect utilities and equipment unless doing so jeopardizes site safety.
- ▶ The fire will be isolated by removing the surrounding inflammable material. This will be done without compromising the safety of the firefighters to the extent possible.
- ▶ The small fires will be extinguished by using an appropriate fire extinguisher (based on the class of the fire);
- ▶ The fire hydrant system and on-site fire tenders will extinguish the big fires. Rescue, attend to the injured personnel, and call the medical emergency number, if required.

438. The fire extinguishers to be used based on the types of fire have been enumerated in **Table 9-1**.

Table 9-1: Types of Fire Extinguisher

Sl. No	Causing Agent	Classification of Fire	Type of Extinguisher
1.	Combustible Packing Material	Class "A" Fires	Dry Chemical Powder & Water

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9. Emergency Response Plan And Disaster Management

2.	Petroleum oil	Class "B" Fires	Foam Type
3.	Gas	Class "C" Fires	CO ₂
4.	Metal	Class "D" Fires	Dry Chemical Powder
5.	Electrical Panel	Class "E" Fires	Dry Chemical Powder
6.	Cooking Fire	Class "K" Fires	Wet Chemical Type

9.2.3 FUEL AND CHEMICAL SPILLAGE

439. In the event of a large chemical spill:

- ▶ Immediately notify the designated official, such as the construction Area Supervisor and SERT.
- ▶ The SERT member must wear adequate PPE before starting the spill management procedure.
- ▶ Secure the area and alert other personnel. If needed, start an evacuation process.
- ▶ No person will be allowed to be involved in a spill containing activity unless they are trained to do so.
- ▶ Contain the spill using equipment (e.g., pads, booms, absorbent powder). For acid spills, spray diluted sodium carbonate and water. For caustic spills, use diluted citric acid and water. For oil spills, stop the flow, close the storage tank valve, or isolate the pipeline. Collect the spilled chemical with a spill kit.
- ▶ Do not allow spilled chemicals to flow into the stormwater drain. Dispose of the contaminated material at the identified locations or consult with the DOE.
- ▶ Attend to the injured personnel and call the medical emergency number, if required.

9.2.4 LEAKAGE OF GAS

440. Gas leakage at road construction sites could be hazardous, posing fire, explosion, and health risks due to asphyxiation, burns, etc. The following procedure will be followed in case of a gas:

- ▶ Anyone smelling gas or identifying a leak must inform the construction Area Supervisor or HSE.
- ▶ The emergency preparedness plan shall be followed as per the direction of HSE or SERT, considering the level of emergency at the site.

9.2.5 MEDICAL EMERGENCY

441. The following measures shall be taken in case of any medical emergency:

- ▶ **Immediate Actions:** If someone cannot walk, call emergency services, inform the Construction Manager, and provide key details (nature, location, and victim identity).
- ▶ **Trained Assistance:** Call Cardiopulmonary Resuscitation (CPR) and First Aid personnel to assist before medical help arrives. Use PPE if dealing with hazardous material exposure.
- ▶ **Burns Treatment:** Cool first—and second-degree burns with water (15–20 mins), avoid chemicals like toothpaste, and do not wear synthetic clothing. Do not use water for water-reactive chemicals.
- ▶ **Electrocution Response:** De-energize the source before assisting. Avoid touching the victim until it is safe. Conduct a physical assessment, check for fractures or neurological issues, and provide respiratory support if needed. CPR should be performed only by trained personnel.
- ▶ **Hospital Transfer:** Based on injury severity, ensure priority transport to the nearest hospital.

9.2.6 TERRORIST ATTACK OR BOMB THREAT

442. For a terrorist attack and a bomb threat

4. Call emergency services immediately and inform the IC and HSE.
5. **Strengthen site security,** restrict access, and instruct personnel to avoid interaction with suspicious individuals or objects.
6. **Follow evacuation protocols** based on the location of the threat.

9.2.6.1 Workers and Local Community Agitation

- ▶ The person who discovers the unrest should dial the emergency contact number and notify the IC or SEC;

- ▶ IC must warn the site personnel of the unrest and mobilize SERT.
- ▶ The SERT will ensure the safety of labor and site personnel in the immediate vicinity.
- ▶ IC will instruct to seal off the affected area, if possible.
- ▶ The IC will instruct the site security personnel to isolate the agitated workers.
- ▶ In case the local community causes agitation, security will close all the camp's entry gates and cordon the construction site until the local administration arrives.

9.2.6.2 Malicious Act such as Theft and Vandalism

- ▶ If there is any information about worker misconduct or vandalism, the responsible individuals will be identified, and site security, area supervisors, HSE, and contractor agencies will be informed. A show-cause notice will be issued, followed by a formal hearing.
- ▶ Emergency services must be contacted if someone is suspected of carrying a weapon, and the Incident Controller (IC), HSE, and Security personnel must be notified. Security will attempt to disarm the suspect if feasible, but no one should engage the individual directly.
- ▶ In case of worker conflicts or physical altercations, the IC will activate emergency protocols, deploying SERT and security to contain the situation, seal off affected areas, and document the incident. If the issue escalates, law enforcement will be involved, and the responsible individuals may be handed over to authorities.

9.2.7 EARTHQUAKE

443. Earthquakes strike without warning, making preparedness and quick response essential to minimize risks and protect lives. During an Earthquake event

- ▶ Stay calm and await instructions from the Emergency Coordinator or designated official.
- ▶ Keep away from overhead fixtures, windows, and electrical power.
- ▶ Assist individuals with disabilities.
- ▶ Protect your head.
- ▶ Evacuate as instructed by the Emergency Coordinator or official.
- ▶ After the Earthquake Event:
 - ▶ Inspect structures like buildings and storage tanks for cracks. Identify critical areas and organize support to prevent collapse.
 - ▶ Isolate the electrical supply if needed.
 - ▶ Empty unstable tanks.
 - ▶ Check hazardous chemicals storage for safety compliance. Inspect and restore secondary containment as needed.
 - ▶ Inspect firefighting equipment on site.
 - ▶ Check the electrical panel and ignition sources for faults.
 - ▶ Store flammable liquids like petrol and diesel under secondary containment with precautions.

444. After such inspection, notify the top management about the damage that has been identified.

9.2.8 FLOODS

445. In case of any flood, the incident flood alert communication procedure will be initiated as discussed below:

- ▶ Regular interaction with the Bangladesh Inland Water Transport Authority (BIWAT) and BMD
 - ▶ Red Alert will be triggered when the floodwater level rises within 1 foot of the working site level. ;
 - ▶ Providing adequate notice for evacuation before flooding, particularly for those working near rivers, bridges, or culverts.
 - ▶ Initiate protection of raw materials, finished goods, critical equipment, records, and electronic equipment.
 - ▶ Take everyday actions for building evacuation and proceed to a safe location;
 - ▶ **Orange Alert:** This will be triggered when the floodwater level rises within 2 feet of the working site level.
- During red alert:

- ▶ Evacuate all affected spaces immediately;
- ▶ Relocate to a safe place on the upper floors of the building.
- ▶ Prevent personnel from wading through flood waters of any depth;
- ▶ Do NOT try to leave the building in a car. If anyone needs to evacuate, he/she must wear life jackets or similar flotation devices.

9.2.9 CYCLONE

446. Cyclones can pose serious risks to construction sites, including structural damage, flooding, and worker safety hazards. The following prevention measures are suggested:

- ▶ Installation of weather monitoring, regular follow-up with Bangladesh Meteorological Department
- ▶ Once a cyclone alert has been issued
- ▶ Stay calm and await instructions from the Emergency Controller or the designated official
- ▶ Continue to monitor local weather stations and radio stations for instructions.
- ▶ Stay away from the riverside.
- ▶ Collect drinking water in appropriate containers.
- ▶ Once the storm has arrived
- ▶ Remain indoors, specifically in small interior rooms on the lowest floor and without windows.
- ▶ Stay away from doors and windows and potential falling objects such as electrical poles, scaffolding, cable trays, etc.
- ▶ After the cyclone inform the Emergency Management Team to investigate the property loss for further action.
- ▶ Immediately notify the SERT of any missing personnel

9.3 EMERGENCY PREPAREDNESS AND DISASTER MANAGEMENT

9.4 EMERGENCY CLASSIFICATION

447. The project will differentiate the types of on-site emergency scenarios based on the magnitude and severity of the emergencies considered in the earlier section. The site has categorized three broad levels of emergency scenarios, namely:

- ▶ Level 1: The emergency is contained in the occurrence area and can be managed effectively with emergency equipment and resources; SERT will be active during this time.
- ▶ Level 2: The emergency has spread to a small area but can be managed with on-site equipment and resources. Head office management will be involved in this level 2 emergency.
- ▶ Level 3: This is an emergency or an incident which:
 - ▶ Cannot be safely managed at the location with the available resources and equipment.
 - ▶ Additional support is needed as it can have catastrophic effects beyond the site boundary.
 - ▶ This incident level will likely impact nearby populations, industries, property, and environmental boundaries.
 - ▶ Managing this emergency requires support from the country and district administrations.
- ▶ The external agency will be involved during this level 3 emergency. See Annex 8, Volume-II for team information 9-3.

9.5 LEVEL OF PRIORITY

448. The level of response required shall depend upon the seriousness of the incident. For any crisis or emergency occurrence, response priorities shall ensure the protection of:

- ▶ First-Priority: People
- ▶ Second Priority: Environment
- ▶ Third Priority: Assets
- ▶ Fourth Priority: Contractual and/or commercial arrangements
- ▶ Fifth Priority: Project and Partner Reputation

7. The Incident Commander (IC) and Site Emergency Controller (SEC) will decide upon the level of emergency and deployment of external emergency responders during the emergency scenario. The external agencies, as identified by the site, are:

- ▶ Fire Service & Civil Defense Station, Jashore
- ▶ Rapid Action Battalion (RAB) unit – 06;
- ▶ Jashore Police Station;
- ▶ Jashore General Hospital.

9.6 EMERGENCY NOTIFICATION AND EVACUATION PROCESS

9.6.1 NOTIFICATION

449. The HSE must be informed of any incidents on site immediately. He will tell the Project Manager (Incident Controller during the emergency), who will notify the Project Director of RHD within 12 hours of any incident with actual or potential significant off-site impacts on people or the environment. The Project Director may require additional measures to address the cause or impact of any incident reported under this condition. Annex 8, Volume-II provide the emergency contact numbers. Bers.

9.6.2 EVACUATION PROCESS

8. If any emergency requires evacuation, the flow chart to be followed at the site is suggested in Figure 9-1.



Figure 9-1: Evacuation Process Flow Chart

9.6.3 PUBLIC COMMUNICATION DURING AN EMERGENCY

450. Public communication plays a crucial role in managing emergencies at construction sites, ensuring swift response and safety. Key measures include:

- ▶ **Road access control** – Blocking nearby roads for emergency vehicles prevents congestion and facilitates rapid intervention.
- ▶ **Community alerts** – Using microphones to announce evacuation procedures keeps nearby residents informed if the situation worsens.
- ▶ **Government coordination** – Working with fire services, civil defense, and police ensures order and compliance with emergency protocols.

9.6.4 ASSEMBLY POINTS

451. The assembly points shall be predetermined and accommodate about 300 persons. The assembly point should be identified with suitable signage, which is presented in Figure 9-2.

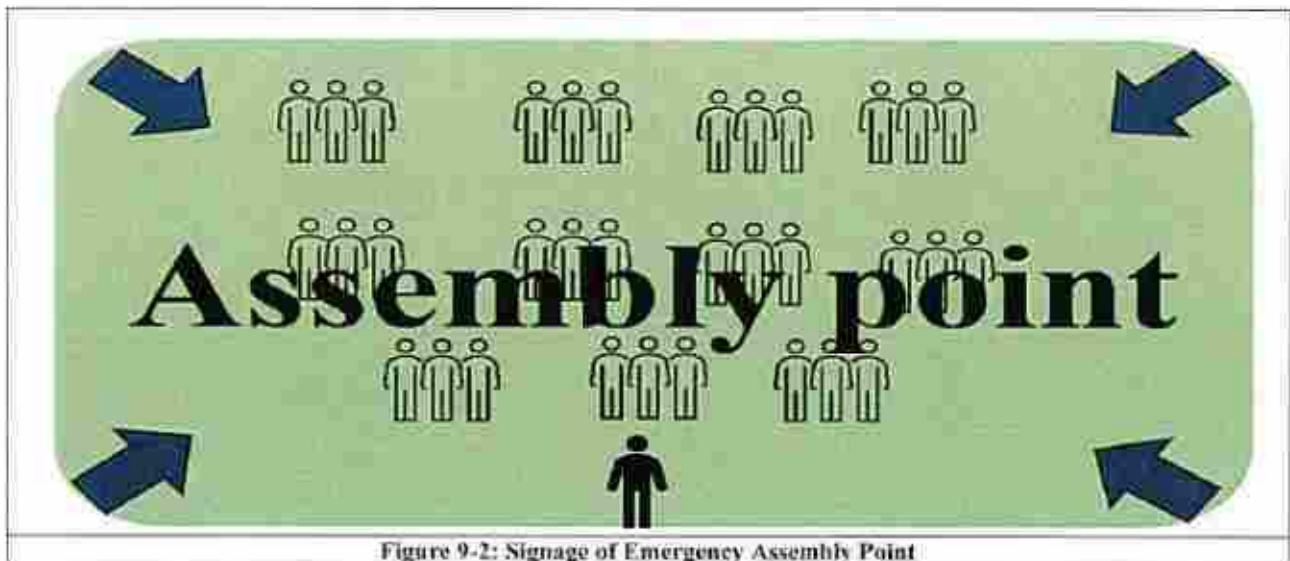


Figure 9-2: Signage of Emergency Assembly Point

9.7 EMERGENCY RESPONSE EQUIPMENT

452. The following emergency response equipment shall be readily available, namely:

- ▶ Firefighting Equipment: The firefighting equipment includes:
- ▶ Fire extinguishers.
- ▶ Hose reel and fire hydrant boxes.
- ▶ Fire water tank, Fire pumps, Fire tenders.
- ▶ Personal Protective Equipment (PPE)
- ▶ Self-contained breathing apparatus.
- ▶ Safety helmet, safety goggles, safety vest, Fire retardant suits
- ▶ Medical Aids, First Aid Box, Ambulance.
- ▶ Spill Control kit.

453. Annex 8, Volume-II lists the emergency equipment, which shall be regularly checked and validated.

9.8 EMERGENCY RESPONSE TRAINING

454. Emergency response training aims to build project employees' capacity and improve preparedness and response before, during, and after emergencies. It focuses on enhancing participants' technical skills and personnel and team management, coordinating emergency response, and increasing management tools and equipment availability.

455. Per the relevant provision of the Bangladesh Labour Act, 2006 and Bangladesh Labour Rules, 2015, at least 18% of the workers employed shall be trained on the following emergency response aspects:

- ▶ Firefighting.
- ▶ Emergency rescue operation.
- ▶ First aid and Portable fire-fighting equipment usage.

9.9 DISASTER MANAGEMENT PLAN

9. The disaster management plan (DMP) outlines preventive measures, emergency response protocols, and long-term recovery strategies to enhance resilience.

9.9.1 EMERGENCY RESPONSE TEAM

456. It is proposed that the Site Emergency Response Team (SERT) will be formed at the site, a dedicated group that will include the incident manager, construction manager, safety advisor (HSE officer), site engineers, and a trained workers team. This team will manage emergencies at the workplace and the construction site, and a trained team of workers will be in full action during an on-site emergency incident. The role of the SERT is to:

9 Emergency Response Plan And Disaster Management

- ▶ Provide immediate response and assess the emergency level.
 - ▶ Make the initial notifications.
 - ▶ Secure and contain the site.
 - ▶ Coordinate with the HSE and off-site emergency response personnel.
 - ▶ Respond to distress calls and assist in rescue and evacuation.
 - ▶ Administer first aid and, if necessary, arrange medical evacuation and backup.
 - ▶ Keep an accurate log of all treatments given and times; and
 - ▶ Maintain the response until the situation is resolved.
- ▶ An organogram for the emergency response team is suggested in **Figure 9-3**.

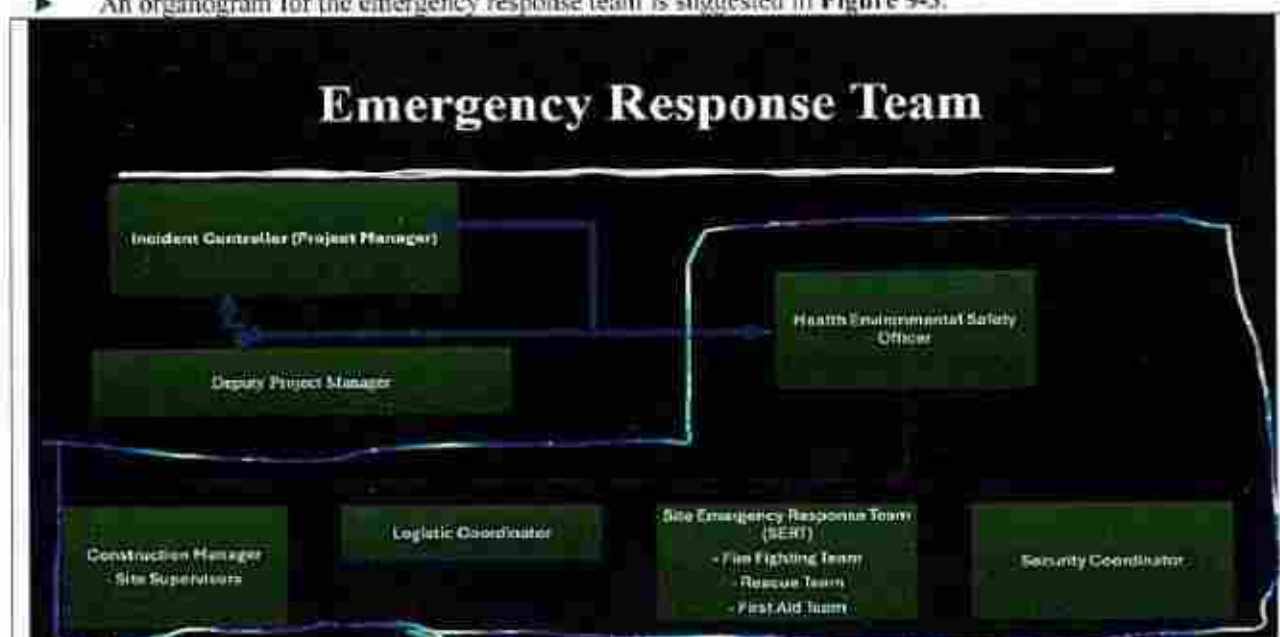


Figure 9-3: Organogram for the Emergency Response Team

9.9.2 INCIDENT CONTROLLER – PROJECT MANAGER

457. The Incident Controller, who also serves as the Project Manager, is primarily responsible for ensuring project safety and overseeing the Contractor's safety efforts during emergencies. His role is crucial in managing and directing safety protocols, providing swift and effective responses to emergencies.

9.9.3 PUBLIC RELATIONS SPOKESPERSON -DEPUTY PROJECT MANAGER

458. The deputy project manager will be the spokesperson and control the media, personnel, and resources. During the emergency, his responsibilities include supporting and advising the Site Emergency Response Team (SERT) as necessary.

9.9.4 SAFETY ADVISOR- HEALTH, SAFETY, AND ENVIRONMENT OFFICER

459. The Health, Safety, and Environmental (HSE) Specialist will collaborate with the Project Manager and serve as the Safety Advisor during emergencies. His primary role is establishing, overseeing, and ensuring the effective implementation of the Health and Safety Management Plan, fostering a safe and compliant work environment. Key Responsibilities include:

- ▶ **Emergency Site Leadership:** Directing and managing health and safety efforts at the incident site during emergencies.
- ▶ **Employee Training & Preparedness:** Organizing and mobilizing training programs to equip personnel with essential safety and emergency response skills.
- ▶ **Safety Initiatives & Compliance:** Implement proactive safety strategies and ensure adherence to occupational health regulations.
- ▶ **Safety Management Plan Oversight:** Compiling, reviewing, and continuously improving the Safety

9. Emergency Response Plan And Disaster Management

Management Plan to enhance workplace safety standards.

- ▶ **Reporting & Inspections:** Preparing detailed monthly safety reports and conducting routine inspections to maintain compliance and risk management.
- ▶ **Incident Investigation & Resolution:** Investigating health and safety incidents, identifying root causes, and implementing corrective measures to prevent recurrence.

9.9.5 CONSTRUCTIONS MANAGER

- ▶ To provide support to IC and SERT;
- ▶ To manage and assign additional resources to support the construction team.
- ▶ Designate site engineers to coordinate SERT.

9.9.5.1 Trained workers team

460. The trained workers shall be divided into firefighting, rescue, and first aid teams (6% members in each team), and records related to these shall be preserved following Form 22 (Annex 8, Volume-II) of the previously mentioned Rules. The members of the firefighting team, rescue team, and first aid team shall wear the prescribed uniform, which the contractor will provide. The uniform code is as follows:

- ▶ Firefighting team: yellow apron with 'FIRE' printed in red on the back.
- ▶ Rescue team: yellow apron with 'RESCUE' printed in red on the back.
- ▶ First aid team: white apron with 'FIRST AID' printed in red on the back.

9.9.5.2 Security Coordinator

461. The role involves ensuring the safety of onsite personnel by monitoring risks, adapting procedures to evolving situations, controlling access, and providing regular security briefings. These measures help maintain efficiency, prevent unauthorized movement, and foster a culture of awareness and preparedness.

9.9.5.3 Logistics Coordinator

462. The logistics coordinator will manage material requests, follow SERT's advice on logistical challenges, plan transportation needs, and arrange domestic requirements such as food and refreshments. These responsibilities ensure smooth operations, efficient resource allocation, and seamless coordination during emergencies or routine situations activities.

9.10 EMERGENCY DRILLS/EXERCISES

463. Fire and emergency evacuation drills shall be arranged at least once every six months, and records of such drills shall be maintained in Form 22 in Annex 8, Volume-II. In addition, the concerned Inspector and nearby Fire Service Station shall be informed at least 15 days before such drills are held.

9.11 EMERGENCY COMMUNICATION

464. Clear communication is essential during an emergency. Multiple methods are necessary, as one method may not adequately inform site personnel and off-site agencies on time. The Site has provided emergency and warning signage at key locations to alert personnel the:

- ▶ Potential hazards and risks of their operation and activities;
- ▶ Pertinent risks present in a particular area;
- ▶ Emergency escape route.

9.12 AUDIT AND EMERGENCY RESPONSE PLAN REVIEW

10. IC will annually review this Plan with the other HSE and other ERT members. In addition, IC will also be involved in monitoring the following performance indicators to assess the effective implementation of the procedure:

- ▶ Emergency drill records; and Training records.

465. **Audit:** A periodic audit will assess the integrity of the emergency management system. HSE, in consultation with IC (Project Manager), will resolve audit issues and implement corrective action.

10 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

10.1 OBJECTIVE

466. The objective of the environmental and social management plan (ESMP) is to implement the mitigation measures effectively. It is also a key to the project's sustainable development. The desired result for achieving sustainable development is difficult to achieve without a management plan.

467. The proposed ESMP covers the potential impacts identified during the study, mitigation measures to reduce/mitigate the intensity of the impacts, a responsibility matrix for mitigations, and budgetary cost estimates for the project construction and operation phase. The different agencies identified are for the proper implementation of the ESMP.

468. The PIU of RHD will be the central coordination body for implementing the ESMP during the preconstruction, construction, and operation period (Table 10-1). The individual departments will carry out different tasks such as tree cutting, tree planting, utility shifting, waste management, etc.

Table 10-1: Different Agencies for Implementation of ESMP		
Agencies Name	Responsibility	Period
Road and Highways Department	Overall implementation of Project	Overall Pre-construction and Construction Phase
Forest Department	Permission for tree cutting and tree plantation under social forestry	Pre-construction and Construction Phase
Department of Environment (DoE)	For No Objection Certificate as per the requirement and renewal of ECC	Pre-construction and Construction Phase
Satkhira Palli Biddut Samity (SPBS), Jashore Palli Biddut Samity (JPBS), West Zone Power Distribution Company Limited, Bangladesh Telecommunications Company Limited (BTCL), Power Grid Company of Bangladesh (PGCB)	About 900 Electric Poles and Telephone Cables Shifting	Pre-construction
District Administration	For taking up joint verification	Pre-construction and construction phase
Zila Parishad	Tree cutting	Pre-construction stage
Municipalities	Solid Waste Management	Construction phase
Union Parishad	Solid Waste Management	Construction phase
Bangladesh Water Development Board (BWDB)	Permissions for sourcing of water for construction activities (Surface Water or groundwater), if required joint verification	Construction phase
Inland Water Transport Authority, Bangladesh	No Objection for the construction of Bridges for maintaining clearance	Pre-construction stage

10.2 DESCRIPTION OF PHASES OF PROJECT

469. The environmental and social risk clauses emphasize the requirements for environmentally responsible construction and specify the need for the contractor to apply the mitigation and monitoring measures as defined in the ESMP. The proposed plan covers the following phase project:

- Design/pre-construction phase
- Construction phase
- Operation phase

470. **Design/Preconstruction phase:** The design stage requires most surveys/field investigations/meetings/stakeholder consultations, and desktop work for designing the project; there will not be any major impacts on the existing environment. Similarly, the pre-construction stage pertains to the mobilization of the contractor, Construction Supervision Consultant (CSC), and NGO engagement to support RHD in implementing Resettlement, Rehabilitation, and Land acquisition work. However, before mobilization of the contractor, RHD needs to undertake various activities to provide encumbrance-free alignment, which involves the demolition of structures.

tree cutting, utility shifting, compensation to be paid to the project-affected persons (PAPs), etc. Some activities do not require specific mitigation, but activities like tree cutting and utility shifting require mitigation measures, as discussed in the proposed ESMP.

471. **Construction Phase:** Construction stage activities require careful management to avoid environmental impacts. Activities that trigger the need for environmental measures to be followed include:

- ▶ Implementation of site-specific mitigation/management measures
- ▶ Monitoring the quality of the environment along the construction sites (e.g., air, noise, water, soil, and sediment).

472. Several other environmental issues have been addressed as part of good engineering practices, the costs of which have been accounted for in the engineering costs. They include improving major and minor junctions, roadside drainage, providing additional cross drainage structures or raising the road height in low-lying stretches, providing bus stops, providing soil erosion prevention measures, etc.

473. Therefore, these mitigation measures shall be included in the contract document of the contractor for its implementation by the contractor and the sustainable development of the project.

474. To implement it properly, it is suggested that non-compliance should be considered as a major lapse from the contractor for which they need to be penalized. All lapses in the clearances/NOCs obtained by the contractor shall be deemed as major non-compliance. They must ensure all these approval/NOCs are valid throughout the construction stage/liability/maintenance period. The contractor needs to follow the conditions stipulated in the environmental clearance (EC), consent to establish (CTE), and consent to operate (CTO), as well as other approvals given by the regulatory authorities.

475. **The Operation/Post Construction Phase** includes monitoring and evaluating the ESMP measures on land use, water resource and quality, air and noise pollution, soil and sediment and road safety and maintaining replanted shrubs and trees.

10.3 POSSIBLE MITIGATION MEASURES AND RESPONSIBLE PARTIES

476. The details on possible mitigation measures and responsible parties are presented in the Environmental and Social Management Plan for the pre-construction, construction, and operation/postconstruction phases of this study as shown in **Table 10-2**. It is noted that contractors' responsibility for planning and execution of various mitigation measures, and the monitoring and supervision will be done by CSC and PIU.


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10. Environmental and Social Management Plan

Table 10-2: Environmental and Social Management Plan						
Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
A	Design stage/Pre-construction Stage					
A-1	Design Consideration	- Regular interaction with the design team - Considering the area's hydrology, new culverts are proposed, and the size of culverts has also been increased to meet the cross-drainage requirement. - Issues on Pedestrian safety and road safety measures have been addressed by providing vehicular underpasses, pedestrian overpasses (POP), Flyovers, etc. - Culverts of adequate spans have been provided to meet the requirements of animal crossing. - Ensure road design, embankment height, Pavement design to comply with the relevant international and national approved design manual of RHD Geometric Design Standards Manual (Revised-2005); AASHTO "A Policy on Geometric Design of Highway and Streets" 2001, etc. - The Bangladesh National Building Code (BNBC) 2020 should be considered for designing road infrastructures, particularly all buildings and building	Design consultant/ E&S	PIU	Design stage/Pre-construction Phase	Geometric Design Standards Manual (Revised-2005); Bangladesh National Building Code 2020; Master Plan; National Road Design Standard and Manual
A-2	Land Acquisition of Private lands and Govt lands in acres and Clearance of Private Structure	- Approximately, 907.60 acres of land will be acquired for widening and strengthening of the proposed highway improvement. Among them, 635.64 acres are private land, 124.36 acres are RHD lands, and 147.60 acres are other Government lands. - Compensation payment to all PAPs consistent with ARIPA 2017 and ESS5 - A livelihood restoration plan will be prepared to mitigate the impacts of the Resettlement Action Plan (RAP) along with its budget. - The Skill Development Plan has also been included in LRP. - Special support for the disadvantaged/marginalized groups has been kept in the RAP. - Provision for compensation for squatters and encroachers have been made in the RAP. - Payment of cash compensation under law (CCL) by DC to compensate for the impacts of the loss of land as per RAP. - As per RAP, payment of Top UP (Replacement Value (RV)/Cost minus CCL, where RV is higher than CCL) by RHD with assistance from I-NGO.	INGO	PIU	Design stage/Pre-construction Phase	National Land Use Policy 2001; The Acquisition and Requisition of Immovable Property Act, 2017 (ARIPA); Khas Land Policy 1997; Vested Property (Repeal) Act 2013
	Lot-1=54.73, Lot-2=192.28, Lot-3=221.27, Lot-4=162.44, All Lots = 630.72 acres					
	Lot-1=1.16, Lot-2=2.01, Lot-3=0.78, Lot-4=0.97, All Lots=4.92 acres					
	Lot-1=62.15, Lot-2=21.68, Lot-3=37.39, Lot-4=3.14, All Lots=124.36 acres					
	Lot-1=17.07, Lot-2=42.24, Lot-3=21.82, Lot-4=64.36, All Lots=145.49 acres					

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BCL Associates Limited, Bangladesh

10. Environmental and Social Management Plan

Table 10-2: Environmental and Social Management Plan

Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
A-3	Lot-1=0.37, Lot-2=0.51 Lot-3=0.55; Lot-4=0.68 ALL Lots=2.11 Lot-1=135.48, Lot-2=258.72, Lot-3=281.8 Lot-4=231.59, All Lots=907.6	▲ The participants agreed to the project, provided that proper compensation would be given to them for their land, etc. ▲ Fair and hassle-free compensation shall be paid as per RAP. ▲ A non-governmental organization, namely "INGO," has facilitated the implementation of RAP and LAP. ▲ Notice has been kept for 3-4 months ▲ Participant agreed to remove the trees since they are very old and could pose a risk/injury/causality by falling tree branches during the cyclone. ▲ Consultations and stakeholder engagement will be a continuous process and feedback will be incorporated in the project design to implementation arrangements. ▲ The design includes VOI's, POPIs, flyovers, ROBs, and service roads, as stakeholders requested. ▲ Side drains have been provided about 50km in length in urban or rural residential areas. ▲ Bridges and culverts of adequate capacity have been provided in the design. ▲ Road safety measures, along with necessary road furniture, are provided in the design. ▲ Compensation shall be paid; livelihood restoration measures are suggested in RAP. ▲ A total of 124 CPRs such as mosques/schools/temples/clubs, etc., falling within the corridor of impact, which need to be shifted.	NGO/RIID	PIU		Feedback from the consultations included in design
A-4	Issues of the CPRs Lot-1= Mosque, 12, School or other		NGO	PIU	Design stage/Proc	

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Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
A-5	9. institution Graveyards 11 Lot-2= Mosque 5, Graveyards 5, Temple 1 Lot-3= Mosque 15, School or other institution 12, Graveyards 11, Eidgah 1, Temple 2 Lot-4= Mosque 10, School or other institution 13, Graveyards 18, Temple 1	▲ A non-governmental organization, namely "NGO," has been engaged to facilitate the shift in CPRs. ▲ Payment of Cash Compensation under Law (CCL) for affected structures by DC for relocation of the structures as per RAP ▲ RHD will pay Top-up (Replacement Value/Cost minus CCL where RV is higher than CCL) for structures with assistance from an NGO as per the RAP. ▲ If there is any loss of the water body, proper compensation will be given by DC/RHD with assistance from the NGO as per RAP			construction Phase	
	Tree-cutting i. The total of private and government trees likely to be cut down is around 101,660 trees. ii. Private Tree: Of them, 80,424 trees in privately owned land, 8671 trees within affected CPRs and other entities Lot-wise as follows Lot-1=2260 Lot-2=17441 Lot-3=40817 Lot-4=28577	▲ Necessary permission from the concerned agency shall be obtained before cutting the trees. ▲ Identified/Marked trees shall be removed ▲ No trees will be cut beyond the toe lines ▲ The tree plantation will be undertaken during the construction phase in place of the avenue of tree removal. It will be carried out in a 1:3 ratio, i.e., three (3) saplings for one tree cutting. Trees are to be planted under the project as given in subsection ▲ For private trees, DC will compensate titleholders, and RHD will disburse to non-titleholders as per the RAP. ▲ A 95% survival rate shall be considered for the release of tree plantation. ▲ The contractor shall be responsible for six (6) years of maintenance of tree plantations. ▲ Shrub plantation on medians, maintained by Khilana Zone. ▲ Shrub Plantation and grass carpeting in embankment slopes, including maintenance of trees. ▲ The Forest Department, under Social Forestry and the Arboriculture Department RHD, will carry out 60% of Tree plantation (refer to Section 10.3). The contractor will undertake 40% of the tree plantation in the project. ▲ Necessary tree guards shall be provided to protect saplings.	FD/Zila Parishad	PIU	Pre-construction Phase	National Environmental Policy 1992; The Forest Act 2000; National Forest Policy 1994; The Private Forests Ordinance 1959; Bangladesh Wildlife (Conservation & Security) Act, 2012
	iii. Govt Trees 12,565 were RHD roadside avenue trees.					

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Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
	Lot-1-909 Lot-2-4160 Lot-3-4806 Lot-4-2690					
	Loss of common species such as Rain tree, Mahagoni, babul, neem, mango jack fruit, dehdar, dela, dumar, gumari, ipilipit, jalpai, jam, kholjura etc.	▶ The same contractor will carry out the maintenance of trees under the supervision of Khulna Zone. ▶ Watering of the tree plantation will be ensured. ▶ Cluster plantations need to be considered on community lands, such as ponds/mosques, or at other locations desired by the community. ▶ All realignments shall be enhanced with the tree plantation. ▶ Trees will be planted as an enhancement measure around the ponds or LGED link roads and vegetative noise barriers along the sensitive receptors in consultation with the stakeholders as per the requirement by the contractor. ▶ Tree plantation around the monuments, along with other enhancement measures, shall be undertaken in the project. ▶ Fast-growing native trees will be planted to improve the carbon sequestration. ▶ The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora and fauna. ▶ While clearing vegetation, it must be ensured that no faunal species, such as mongooses, foxes, squirrels, etc., are injured and/or die. ▶ While removing the tree, if any endangered or endemic species is found immediately, the work shall be stopped. The species' name, etc., must be reported to the nearest forest department through RHD. ▶ Sourced trees (banyan, etc.) will be cut as per the stakeholder consultations. ▶ The responsible agency (Forest department, Zilla parishad, etc.) must prepare a tree-cutting plan showing the schedule of tree cutting, locations of dumping and transportation of logs within their jurisdiction, and trees to be numbered/marked before cutting. ▶ The contractors must ensure proper OHS measures during tree cutting by arranging appropriate PPE (Helmet, gloves, eye shield, boots, etc.) for the workers. If any electrical or other types of saws are used, necessary safety measures must be taken to prevent accidents. ▶ The trees should be cut so that fallen branches/logs do not damage pavement, nearby structures, utility lines, road furniture, etc. Local electric lines may be disconnected for a short period with prior intimation to the local authority/people if needed. ▶ Tree-cutting to be coordinated with the local authority and Police for traffic control and to ensure CHS. ▶ Pits/holes created due to the removal of trees must be filled up to avoid accidents.				
	No endangered/threatened species are to be affected. Loss of habitat of birds as temporarily Decrease in carbon sequestration					

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10. Environmental and Social Management Plan

Table 10-2: Environmental and Social Management Plan

Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
A-6	Utilities Shifting -Power poles 2131, underground power line 106, substation 01 and 137 power related boxes -Increase in ambient air quality due to operation of heavy equipment Increase in Ambient Noise Levels due to operation of excavator, concrete mix, traction of electric lines Short-term impacts are due to temporary power cuts during the shifting of utilities like electric poles.	Logs/chopped trees are to be kept away from the shoulder and roadside so that they don't hinder the smooth traffic flow. The contractors need to ensure adequate safety measures once these logs are loaded into vehicles and during transportation. First aid/medical facilities to be arranged by the contractors to deal with any accident/injury. RHD to regularly monitor the tree-cutting activities and submit monthly progress reports to the WB A greenbelt (of 15m to 30m wide and 4m to 5m tall plant) along with shrubs having dense foliage will be an effective measure for noise level attenuation. To plant a dense tree plantation in three (3) rows along the school's boundary wall shall be undertaken to reduce the noise levels' intensity and enhance the affected school's landscape. Tree plantation contributes very little to actual noise barriers but confers a psychological benefit in reducing the perceived nuisance of traffic noise				
	Utilities Shifting -Power poles 2131, underground power line 106, substation 01 and 137 power related boxes -Increase in ambient air quality due to operation of heavy equipment Increase in Ambient Noise Levels due to operation of excavator, concrete mix, traction of electric lines Short-term impacts are due to temporary power cuts during the shifting of utilities like electric poles.	A utility shifting plan will be prepared by the design team in consultation with the responsible agencies like - Sakthira Palli Biddat Sanity (SPBS), Jashore Palli Biddat Sanity (JPBS), and Bangladesh Telecommunication Company (BTCL) for relocation of the utilities Well-maintained and in good working condition machines and equipment meeting the pollution board requirement shall be deployed at the site during the erection of electric poles. Warning signboards shall be placed at visibility locations. Proper safety measures should be adopted during the implementation of the utility shifting so that accidents of workers, technicians, and local people can be avoided. All workers and project personnel should use PPE at the site. Utility shifting shall be done as per the agreed Utility shifting plan The contractor, in consultation with the responsible agencies and RHD, will inform the local people about the schedule of the utility shifting prior to the start of the work Any grievance/complaint shall be recorded and resolved by the competent authority as soon as possible. To reduce the impacts, shifting shall be carried out in phases	Sakthira Palli Biddat Sanity (SPBS), Jashore Palli Biddat Sanity (JPBS), West Zone Power Distribution Company Limited, Bangladesh Telecommunications Company Limited (BTCL)	PIU	Design stage/Pre-construction Phase	

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10. Environmental and Social Management Plan

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Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
	For a few days, there may be problems of street lighting, residential, commercial, and bazar areas Shifting of underground cable fault may be anticipated Generally, shifting of Optical Fiber Cables may create communication problems due to damage during relocation.	Excavation/concreting for erecting the electric poles shall be planned so that it shall not disturb the movement of the local people and traffic. Installation of the electric poles and cable holders shall not be done in such a way that it shall not disturb or concern of safety the children playing in the park or going to schools Shifting shall not disturb access to religious places, community halls, municipal services, local water sources, etc., as well as tourist locations/spots. No material shall be so placed/stored that it may pose a risk or cause inconvenience to any person or the public. Safety to the community while working near the residential/commercial areas Proper access to the community/public shall be provided. Shifting of utilities may block access to houses, business centers, and health centers. Erection of electric poles may cause inconvenience and block access to the Public/Community. Storage of construction material on the road may pose risks. Safety issues of the workers, technicians, and residents				
A-7	Cross-drainage Structures and drainage	Contract-wise cross-drainage structures and side drains 82.6Km in the urban areas have been provided.	Design Consultant	PIU	Design stage/Pre-construction phase	The Embankment and Drainage Act 1952
A-8	Environmental quality parameters Measurement	The measurement of air, noise, soil, and water qualities have been carried out at different locations along the project corridor. This will serve as a benchmark for monitoring during construction and operational phases.	E&S consultant	PIU	Design stage	Environmental Conservation Act 1995; Environment Conservation Rules 1997; Environmental Courts Act 2000.
A-9	Road safety issues, Poor road geometry Mixed Traffic (fast-moving and Slow-moving)	The design engineer has incorporated geometric improvement. Slow-moving vehicular traffic lanes, Bus bays, Vehicular Overpasses (VOP), Foot over bridges (FOB), pedestrian overpasses) numbers, One Rail over the Bridge cum fly, and an elevated section.	Design Consultant	PIU	Design stage/Pre-construction phase	National Land Transport Policy; RHD's Road Master Plan; National Road Design Standard

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10. Environmental and Social Management Plan

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Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
A-10	Permission and Clearances	▶ Compliance with International highway for curvature and grading and safety curve at all Grade U-Turn and bridge approaches ▶ Sidewalks/pedestrian zones along the road near habitat areas, schools, hospitals, and religious places need to be included in the design, which the EPC contractor will further review; ▶ The contractor shall follow the Environmental Clearance Certification (ECC) requirement and mitigation measures suggested in ESMP while establishing the construction campsites, crusher units, hot mix plants, concrete batch mix plants, WMM plants, and workforce camps. ▶ Layout approval for construction camps/labor camps other than CSC ▶ Permissions for sourcing of water for construction activities (Surface Water), if required ▶ Extraction of Groundwater, if required ▶ Contractor shall follow standard procedures as per Bangladesh Labor Act 2006 for labor recruitment	Contractor	CSC/PIU	Design stage/Pre-construction Phase	Environment Conservation Rules 1997; Environmental Courts Act 2000; Bangladesh Labor Act 2006; Bangladesh Labor Rules and 2015; Occupational Health and Safety Policies 2013
A-11	Orientation to contractors	▶ Orientation program for the contractor to meet this ESMP and WB's ESS requirements. The salient features of the program are as follows: ▶ Obligations under contract to submit and prepare of Contractor Environmental and Social Management Plan ▶ Regulatory compliance requirements, if there are any. ▶ Grievance redress mechanisms for both social and environmental issues shall be developed to address the problem at the site. ▶ Various plans required under C-ESMP related to standalone Contractors' Occupations Health & safety (C-OHS), standalone Contractors' Traffic Management Plan (C-Traffic Management Plan) V, community health and safety, hazardous and non-hazardous waste, campsite management, emergency response, blasting, borrow area, muck disposal, restoration, etc. ▶ These C-OHS and C-Traffic Management Plans will be approved before commencement and reviewed by the WB. ▶ Labor management procedures to be adopted ▶ Community health & safety aspects at the workplace and Reporting requirements, etc., under the project.	Contractor	PIU/CSC	Pre-construction Phase	Bangladesh Labor Act 2006; Bangladesh Labor Rules and 2015; Occupational Health and Safety Policies 2013

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B		▶ The Contractor shall appoint one Environmental safety, Social-cum-Community Liaison Officer, and one Health and Safety Officer, who shall solely be responsible for implementing all ESMP provisions in close coordination/consultation with the Environmental and Social Specialist in the RHD/CSC. ▶ Contractor policy on Gender/violent free environment at the construction site or contractor's facilities. ▶ Provision to prevent any form of sexual harassment (SH) or sexual exploitation and abuse (SEA) as per RAP. ▶ Company policy on labor employment.				
	Construction Phase		Contractor	CSC/ PIU	Construction Phase before installing the plants	Environment Conservation Rules 1997; Environmental Courts Act 2000; Bangladesh Labor Act 2006; Bangladesh Labor Rules 2015; Occupational Health and Safety Policies 2013
B-1	Hot mix plant/WMM/Batching Plant/crushers	▶ The hot mix plant shall be installed on the downwind side and 500m away from the residential area.				
	▶ Air pollution/ Dust	▶ Batching plants/WMM shall be installed 500m from the residential area on the downwind side.				
	▶ Fugitive Emission	▶ These plants shall be 500m from the water bodies or rivers/canals.				
	▶ Noise Pollution	▶ No batching plant/labor camp/construction camps shall be allowed to be established on the banks of the river/canal.				
	▶ Water pollution/waterlogging	▶ Drainage and a sump, which shall be cleaned regularly, shall be provided to prevent waterlogging in the batching plant.				
	▶ Safety Hazards	▶ Hot mix plants shall be fitted with pollution control devices, Bag filters, etc.				
		▶ The stack height shall be at least 10m above ground.				
		▶ The premises shall be enclosed, and trespassing shall not be allowed.				
		▶ The contractor shall submit the detailed layout plan for approval to the CSC before entering into a formal agreement with landowners to set up such a site.				
		▶ Actions by the CSC and PIU against any non-compliance shall be borne by the Contractor at his own cost.				
		▶ These plants need to be operated by skilled and trained staff, which the CSC will ensure.				
		▶ Regular maintenance of construction vehicles and equipment/plants shall be undertaken.				
		▶ The construction vehicles/machinery/equipment shall use only designated routes.				
		▶ DG sets shall comply with the requirements of the Department of Environment.				

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10. Environmental and Social Management Plan

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Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
B-2	Labor Camp/construction camps	▲ The camps siting should be designed in line with the IFC/EBRD Guidelines on Workers' Accommodation as well as Bangladesh National Building Code (BNBC) 2020 ▲ Ensure that processes and Standards, including minimum spacing, sanitation, water supply, waste management, and provisions for worker welfare ▲ Labor camps shall be located at least 500m away from residential areas/waterbodies, such as the Betna river and other waterbodies. ▲ A detailed layout plan for all such sites shall be submitted and get approval from the CSC. ▲ Contractor shall prefer to the non-productive lands which has access to the existing roads. ▲ Contractor must make an agreement with the land parcel owner along with the photographs of original land. ▲ Rooms of the labor camps must be properly ventilated. ▲ Hygienic conditions must be ensured in the labor camps ▲ To prevent soil erosion, the construction/labor camps shall not be established on the banks or river or waterbodies. ▲ No timber or wood shall be used for cooking purpose ▲ No illegal tree cutting shall be allowed. ▲ Mobile toilets or toilets with septic tanks shall be provided. ▲ Separate facilities for women workers shall be provided as suggested in B-23. ▲ Either canteen facility or cooking gas shall be provided. ▲ Labor/construction camps shall be properly fenced, and an information board and project details shall be displayed at the entrance and exit of the camp. ▲ Water logging shall not be allowed at construction camps/batching plants/WMM plants, etc. ▲ Contractor shall display company policy to prevent Sexual Harassment and Exploitation at the workplace or construction camp/site/labor camps. ▲ Gender-based violence-free environments shall be maintained at site/labor camps/construction camps. ▲ Code of conduct (COC), along with other terms and conditions of employment, shall be provided to the workers in clear and vernacular language.	Contractor	CSC/RHD	Construction Phase while establishing the camps	Bangladesh Labor Act 2006; Bangladesh Labor Rules 2015; Occupational Health and Safety Policies 2013

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Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks																												
B-3	Potable water	▶ The contractor shall provide potable water that meets the World Health Organization (WHO) standards in the construction camps, labor camps, and construction sites. ▶ Drinking water quality shall be tested to check its potability to meet the requirements of the WHO standards.	Contractor	CSC/PIU	Construction phase (entire period)	National Water Policy 1999; Water Reservoir Conservation Act 2000; The Water Act 2013																												
B-4	Sanitation Facilities	▶ Drains shall be provided. ▶ Proper lavatory facilities for male and female workers shall be provided. ▶ Proper hygienic condition must prevail in such facilities. ▶ The mobile toilet shall be provided at construction camps/labor camps of adequate capacity. ▶ These, if mobile toilets are provided, shall be periodically replenished with fresh water for ablution purposes and wastewater shall be emptied through suction tankers and carried to the nearest municipal sewage treatment facilities or soak pits shall be provided. ▶ Untreated liquid waste shall not be allowed to be discharged into surface water bodies. <table><tr><th>Sl. No.</th><th>Sanitary Unit</th><th>For Male Personnel</th><th>For female Personnel</th></tr><tr><td>1.</td><td>Water Closet</td><td>1 for every ten persons</td><td>1 for every 1-10 persons</td></tr><tr><td>2.</td><td>Ablution Taps</td><td>One in each W.C.</td><td>One in each W.C.</td></tr><tr><td>3.</td><td>Urinals</td><td>1 for 6-20 persons 2 for 21-45 persons 3 for 46-70 persons 4 for 71-100 persons</td><td>—</td></tr><tr><td>4.</td><td>Washing Taps with the draining arrangement</td><td>One for every ten persons or part thereof</td><td>—</td></tr><tr><td>5.</td><td>Drinking Water Fountains</td><td>One for every 30 persons</td><td>—</td></tr><tr><td>6.</td><td>Baths, Showers and preferably and ablution</td><td>As required</td><td>—</td></tr></table>	Sl. No.	Sanitary Unit	For Male Personnel	For female Personnel	1.	Water Closet	1 for every ten persons	1 for every 1-10 persons	2.	Ablution Taps	One in each W.C.	One in each W.C.	3.	Urinals	1 for 6-20 persons 2 for 21-45 persons 3 for 46-70 persons 4 for 71-100 persons	—	4.	Washing Taps with the draining arrangement	One for every ten persons or part thereof	—	5.	Drinking Water Fountains	One for every 30 persons	—	6.	Baths, Showers and preferably and ablution	As required	—	Contractor	CSC/PIU	Construction phase (entire period)	Bangladesh Labor Act 2006; Bangladesh Labor Rules and Regulations 2015; Occupational Health and Safety Policies 2013
Sl. No.	Sanitary Unit	For Male Personnel	For female Personnel																															
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SL No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		Note: i) One water tap with the draining arrangement shall be provided for every 50 persons or part thereof in the vicinity of the water closet and urinal or part thereof ii) Crèches, where provided, shall be fitted with water closets. (One for ten persons or part thereof), wash basins (1 for 15 persons or part thereof), and drinking water taps with drinking arrangements for every 50 persons or part thereof. iii) Toilets must have a ventilation system and proper lighting arrangements. iv) Male and female toilets shall be clearly demarcated as "For Men Only" or "For Women Only" along with symbols etc. Source: National Building Code, India				
B-5	Solid Waste Management	- Contractor shall segregate waste at source. - Biological waste from labor camps, construction camps, or other contractor facilities shall be collected for composting and gardening. - Intermingling of waste shall not be allowed. - Municipal waste shall be disposed of at the approved landfill sites only, or the contractor shall make necessary arrangements with the municipalities/Zila Parishad. - Construction and demolition (C&D) waste shall be disposed to identified and approved locations. - C&D waste shall not be dumped into the water bodies. - It is envisaged that about 40% of the C&D waste material will be reused in the sub-base preparation. The rest of the material will be disposed of in the approved landfill in consultation with the Zila Parishad, etc. The contractor shall store the usable material properly on an impervious platform to prevent it from mixing with the earth. - Contractor shall prepare a waste management plan - Open burning of solid wastes, whether hazardous or nonhazardous, shall not be allowed. - Contractor shall maintain a register for record-keeping of waste generated by type, amount, transportation, and final disposal site approved by RHD. - E-waste shall be collected and disposed to approved vendors only. - Contractor shall maintain a register for record-keeping of waste generated by type, amount, transportation, and final disposal site approved by RHD.	Contractor	CSC/PIU	Construction Phase (entire period)	Bangladesh Solid Waste Management Rules 2021

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Table 10-2: Environmental and Social Management Plan						
Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
B-6	Hazardous Material Management	- Oil/fuel shall be stored as approved design and safety protocol applicable in the country. - Entry of unauthorized persons shall be prohibited in Hazardous Waste Management areas. - If there is any spillage of hazardous waste, the contractor will remove it immediately. - An area shall be assigned for storing the oil/oily waste or any flammable material. - Smoking shall be prohibited in such areas. - Drip trays shall be provided at DG sets/below the nozzles to fuel the construction vehicles and equipment. - Used oil or hazardous material/flammable material shall be collected in drums and stored on the impervious platform, sloped or bermed to contain a minimum of 25 percent of the total storage volume. - It shall be disposed to the authorized/approved vendors per the DOE norms. - Tires shall be appropriately stored under the shed and disposed to approved vendors. - Hazardous materials from vehicle tanks to storage shall be transferred in areas with impervious surfaces to avoid environmental loss and sloped to a collection or containment structure. This shall not be connected to the municipal wastewater/stormwater collection system. - To the extent feasible, secondary containment for components (tanks, pipes) of the hazardous material storage system shall be provided. - Periodic (e.g., daily or weekly) reconciliation of tank contents and inspection of visible portions of tanks and piping for leaks shall be undertaken. - Inform the employees about the hazards. - Warning signboards shall be displayed at such locations. - Awareness training shall be given to workers by the contractor's environmental safety health officer. - Material Safety Data Sheets (MSDS) shall be compiled. - Standard operating procedures (SOPs) for fueling/storing or other hazardous material operations shall be prepared. - Contractor shall prepare a hazardous waste management plan.	Contractor	CSC/PIU	Construction Phase (entire period)	Bangladesh Solid Waste Management Rules 2021; NR Strategy

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Table 10-2: Environmental and Social Management Plan						
SL No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
B-7	Water Resources and Water Quality	- Water quality was monitored during the baseline survey. - Contractor shall undertake the water quality monitoring as per environmental monitoring program. - Contractors shall ensure that construction materials like earth, stone, and ash do not block water flow. - Construction camps/facilities shall be kept away as per B2. - If a water body is lost, DC/PIU will provide proper compensation with assistance from an NGO. - Workers shall not be allowed to pollute the water body. - No illegal excavation shall be allowed from the banks of water bodies. - The water flow will be restored soon after completion of the work. - No waste will be dumped into the water bodies. - Oil and grease separators shall be provided near the vehicle washing area/maintenance workshop. - Drains shall be provided in labor camps/construction camps/workshops and other contractors facilities along with soak pits. - Silt fencing at the mouth of water body shall be provided. - Side drains have been provided in urban areas - River protection works are provided in the design	Contractor	CSC/PIU	Construction Phase	National Water Policy 1999; Water Resource Conservation Act, 2000; The Water Act, 2013; Environment Conservation Rules 1997
B-8	Clearing and grabbing	- Clearing and grabbing shall be restricted to the working area within the toe line. - Further activities must be planned/ started immediately to prevent fugitive dust emission and soil erosion during monsoon. - The top (15cm) soil shall be preserved to redevelop the areas as required. - Revegetation/turfing shall be started immediately after completion of the work	Contractor	CSC/PIU	Construction Phase during clearing and grabbing operation	The Forest Act 2000; National Agriculture Policy 1999
B-9	Borrow Areas	- Borrowing of earth from the cultivable land shall not be preferred. - Only identified and approved contractors shall use borrow areas - When borrowing earth from cultivable lands, the depth of borrowed earth shall not be more than 45cm. - The top 15cm of soil shall be removed and stored separately. Thereafter, excavation shall not exceed 30cm, and topsoil shall be spread over the land. - Borrow areas shall be dug at least 800m from the habitation. If unavoidable, the depth should not be more than 30cm and should be properly drained.	Contractor	CSC/PIU	Construction Phase during earthworks	National Land Use Policy, 2001

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10. Environmental and Social Management Plan

Table 10-2: Environmental and Social Management Plan

Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
B-10	Loss of topsoil	▲ Borrow pits shall not be dug continuously. ▲ The borrowing of the earth shall be used only after an agreement between the contractor and land parcel owner and must include the photographs of the original land. ▲ Haulage of borrowed materials will be maintained dust-free by the sprinkling of water. ▲ The borrow areas shall be 500m away from the toe line of the road. ▲ To reduce the earth requirement, about 40% of the scarified material will be reutilized in the subbase material. ▲ If trees are there, it should be protected by providing slopes in 1:2 around them while borrowing the earth. ▲ Side slopes of 1:4 shall be maintained in the borrow areas. ▲ A redevelopment plan shall also be prepared and agreed upon by the land parcel owner, which needs to be approved by the CSC. ▲ The topsoil (15cm) shall be removed and preserved for reuse for redevelopment purposes. ▲ Topsoil shall be preserved outside drainage lines, and stockpiles will be protected from erosion by silt fencing and diversion channels. ▲ Use stripped topsoil to cover all disturbed areas along the proposed tree plantation sites. ▲ Limit equipment and vehicular movements to within the approved construction zone. ▲ Topsoil shall be distributed free to local people who need it for their purposes. ▲ The residuals shall be reused to form the ground around the interchanges, the areas along the road within the acquired land, or recover the vegetation in some affected areas due to the road project. ▲ The material stockpile sites shall be 500m away from surface water bodies and areas prone to surface run-off. ▲ An open ditch shall be built around the stockpile sites to intercept wastewater. ▲ If necessary, retarding basins shall be constructed to remove sands and other solids in the stormwater before it reaches the downstream rivers. ▲ During rainstorms, open stockpiles of construction materials (e.g., aggregates, sand, and fill material) of more than 50 m³ shall be covered with tarpaulin or similar fabric.	Contractor	CSCAPU	Construction Phase	

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Table 10-2: Environmental and Social Management Plan						
Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		- Measures shall be taken to prevent the washing away of construction materials, soil, silt, or debris into any drainage system. - At the start of site establishment, perimeter cut-off drains to direct off-site water around the site shall be constructed, and internal temporary drainage works and erosion and sediment control facilities shall be implemented.				
13-11	Soil Erosion	- The Contractor shall reuse the excavated soil as much as possible unless the soil is considered unsuitable for filling. - The Contractor shall plan his works to minimize surface excavation works during the rainy season where practicable - Immediately after work on bridges or high embankments is completed, slope stabilization measures such as turfing, etc., shall be taken. - Excavation or similar activities shall not be undertaken during the monsoon period. - Construction and demolition waste shall not be stored near the bridge construction sites; it shall be disposed of at approved landfill sites. - Loose materials shall be bagged and covered. - Ground clearance area shall be minimum - Approach roads shall be provided in construction facilities to reduce soil erosion. - All exposed earth areas shall be completed and revegetated as soon as possible after earthworks have been completed. - If soil excavation is unavoidable during the rainy season or at any time of year when rainstorms are likely, exposed slope surfaces shall be protected by temporary drainage measures. - The working area shall be marked to restrain the activity within the demarcation area only.	Contractor	CSC/PIU	Construction Phase	
13-12	Soil Quality	- Fuel or other petroleum products shall be stored on the impervious platform. - The movement of construction vehicles, machinery, and equipment shall be restricted to the corridor or identified route. - Soil contamination by bitumen, fuel, and chemical storage shall be stored on an impervious base - Any spillage of hazardous material shall be removed and disposed of to identified and approved sites. - Soil quality monitoring shall be undertaken as per Section 10.2	Contractor	CSC/PIU	Construction Phase	

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Table 10-2: Environmental and Social Management Plan

Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
B-13	Movement of construction vehicles (Air Pollution)	- Water sprinkling using sprays shall be done on the unpaved haul roads. - Water sprinkling shall also be carried out on construction sites where the earthwork is unattended for four (4) days, especially in the summer season. - Construction vehicles/equipment shall comply with national standards. - Routine maintenance of pollution to control the emission. - Low-emission construction equipment, vehicles, and generator sets shall be used at the site. - Only those construction vehicles shall be used that shall be used. - Vehicles transporting construction material shall be covered by tarpaulin. - Construction vehicle speeds will be in the contractors' ESMP, subject to CSC approval.	Contractor	CSC/PIU	Construction Phase	Environmental Conservation Act 2023; and Bangladesh National Ambient Air Quality Standards 2005
B-14	Noise Environment	- The Contractor shall abide by the provisions of the Specifications of Contract regarding environmental protection and DoE regulations (≤60 dB levels at mosques, schools, populated areas, and other sensitive sites). - Noise-generating equipment/plants shall be provided with dampeners. - Diesel Generating must be enclosed with soundproof acoustic enclosures to meet the Noise standards. - Construction vehicles/equipment must be fitted with silencers. - Routine maintenance of equipment and construction vehicles shall be carried out. - Low noise-generating equipment/construction vehicles shall be used. - Noise monitoring shall be undertaken as per the Environmental Monitoring Program. - Workers working in noisy areas shall receive PPEs and wear earplugs. - Contractors' facilities will be sited away from the residential areas/sensitive receptors as mentioned above. - Near the sensitive receptors such as schools, mosques, hospitals, noise generating activities shall be carried out after consultation with the management committee or low noise generating equipment shall be used only. - In Residential areas, hospitals etc. noise generating activities shall be prohibited and work shall be scheduled in consultation with neighborhood champions. - Reducing construction vehicles through the residential area in consultation with the local champions.	Contractor	CSC/PIU	Construction Phase	Environmental Conservation Act 2023; and Noise Pollution Control Rules 2006

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Table 10-2: Environmental and Social Management Plan						
Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
B-15	Terrestrial Ecology (Flora and Fauna)	▶ Vegetative noise barriers in the sensitive receptor ▶ Any issue shall be resolved through a grievance redressal mechanism (GRM) developed by the contractor. ▶ About 40% of the trees will be planted by the PIU through a contractor, and 60% of the trees will be by the forest department under social forestry immediately during the implementation phase. ▶ At least 1:3 Replantation should be followed according to GOB's normal practice. Trees shall be planted in the available space in between as per CSC directions. ▶ Limit the construction works within the designated sites allocated to the contractors. ▶ No illegal tree felling shall be allowed at construction sites/borrow areas/construction camps/ labor camps. (Refer to B-8 and B-9 above) ▶ The construction activity shall be restricted to only identified areas. ▶ Hot mix plant/construction camps/labor camps/stockyards shall be located at a safe distance (500m away from the water bodies) ▶ No untreated waste shall be allowed to discharge into the water bodies. ▶ Construction camps/labor camps, etc., shall have a proper drainage system	Contractor	CSC/PIU	Construction Phase	National Environmental Policy 1992; National Environmental Management Action Plan 1995; Environmental Conservation Act 2023 Bangladesh Wildlife (Conservation & Security) Act, 2012; National Fisheries Policy, 1998; Protection and Conservation of Fish Act 1950
B-16	Aquatic resources particularly fish and aquatic ecosystem during construction of four (04) bridges and 118 culverts	▶ Passage to the free water flow shall be provided. ▶ The contractor shall clear the site immediately after the construction activity is over. ▶ Water Quality and sediment quality testing shall be undertaken as per the monitoring plan. ▶ Bentonite slurry, if it is proposed to be used, shall not be allowed to the dispose, or dumped into the waterbody or agricultural land. ▶ Bentonite slurry shall be stored in container and need to be disposed to identified/approved sites in consultation with the Zilla Parishad or Local Government office. ▶ Washing of construction vehicles/equipment shall not be allowed near the waterbodies. ▶ To protect Fish resources:-	Contractor	CSC/PIU	Construction Phase	Environment Conservation Rules 2023; Bangladesh Wildlife (Conservation & Security) Act, 2012; National Fisheries Policy, 1998; Protection and Conservation of Fish Act 1950

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Table 10-2: Environmental and Social Management Plan

Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		Isolation of Work Area: Using cofferdams and sediment curtains during construction to completely isolate the work zone from the flowing water. Maintaining fish passage: all the holes along the banks of the rivers should be checked, and ensure the safe passage and exits of fish. - Bridges and culverts should be made to maintain the proper water flow. The flow of water through the river/canals shouldn't be blocked completely. - Ensure culverts are sized and installed to allow natural fish movement. - Use embedded culverts, open-bottom arches, or natural streambed materials. - Match natural stream slope, width, and substrate and avoid perched culverts that block movement. - Provide escape routes during dewatering. Timing: Scheduling construction activities to avoid critical fish life stages like spawning, egg incubation, or peak migration periods. Minimizing noise & vibration: such as use low-noise equipment where possible. Avoid pile-driving during sensitive fish periods or use vibratory hammers instead of impact hammers. Using proper machinery practices: such as keep heavy machinery out of the water when possible. Use biodegradable hydraulic fluids. Maintain machinery to prevent leaks and operate from the bank or spans rather than in the channel. Monitoring: Monitoring water quality such as turbidity, pH, suspended sediments, Protecting water quality and restoring habitat. Fish mortality monitoring during in-water works, if requires.				
Socioeconomic Environment						
B-17	Influx of Labor Lot-1=Skilled labor 100, Semi-skilled labor 110 and Unskilled Labor 110 Lot-2=Skilled labor 113, Semi-skilled labor 125 and Unskilled Labor 125 Lot-3=Skilled labor 120, Semi-skilled labor 130 and	- Trespassing to the contractors' facilities such as construction camp/labor camps shall be strictly prohibited. - Contractor facilities shall be located 500m away from residential areas. - Any issue shall be resolved through labor grievance redressal mechanism (GRM) developed by the PIU and run with assistance from the contractor. - Contractors shall be encouraged to recruit local skilled/unskilled workers. - Minimum 10-15% of female workers shall be given preference in the employment. - Separate lodging arrangement for women workers along with appropriate facilities as mentioned above in B1, B2, B3, B4. - The CoC will be strictly enforced by the contractor	Contractor	CSC/PIU	Construction Phase	Bangladesh Labor Act 2006; Bangladesh Labor Rules and 2015; Occupational Health and Safety Policies 2013.

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Table 10-2: Environmental and Social Management Plan						
Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
	Unskilled Labor 130 Lot-4-Skilled labor 110, Semi-skilled labor 125 and Unskilled Labor 125					
B-18	Child Labor	▲ Bangladesh labor Act 2006 section 34 prohibits the engagement of the child labor in any of activity of project. ▲ According to Section 44, anyone under 14 years is considered a child & between 14 and 18 years of age is considered as adolescent. ▲ It is recommended that people under 16 years of age should not be employed in any type of work and shall be encouraged to go to schools. ▲ Between 16- and 18-year of age persons can be employed for lighter works/office works for 6 hours only with prior approvals from the Engineer ▲ Company policy on the labor engagement rules shall be displayed at prominent locations such as contractor camps/labor camps/contractor office etc. ▲ People between 16- and 18-year of age persons shall not be deployed at any hazardous works such as painting/other construction activity. ▲ To ensure the age, contractor must refer to 'Certification of laborers' age/National Identification Card/Birth Certificate etc.	Contractor	CSC/PIU	Construction Phase while recruiting the labor	Bangladesh Labor Act 2006; Bangladesh Labor Rules 2015
B-19	Community Health and Safety	▲ The contractor shall plan activities in residential areas after having discussion with the community. ▲ Locals shall be kept informed about the activities which the contractor is taking up in the residential areas. ▲ Trained drivers having valid license shall be allowed to drive construction vehicles/heavy equipment/plants. ▲ Speed of the construction vehicles/equipment shall be defined by the contractor in the contractors' ESMP. ▲ Excavated areas shall be properly barricaded. ▲ Trespassing of construction site shall be prohibited. ▲ Traffic management plan shall be prepared as per the activity schedules which will be approved CSC/PIU. ▲ Regular Consultation with the Community to know the effectiveness of implementation of mitigation measures at construction sites/camps	Contractor	CSC/PIU	Construction Phase	Bangladesh Labor Act 2006; Bangladesh Labor Rules 2015; Occupational Health and Safety Policies 2013

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Table 10-2: Environmental and Social Management Plan

Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		▲ Ensure implementation of mitigation measures suggested in B4 through B6 and B13 through B-15 at site to control the environmental pollution. ▲ Compensation for impacts on infrastructure shall be provided in accordance with the Resettlement Action Plan (RAP). ▲ Water logging shall not be allowed at construction site and minimize areas of standing water by providing effective drainage in construction areas to prevent vector borne disease such as malaria etc. ▲ Access to public shall be provided as per measures suggested in B-21. ▲ The prevention and management of HIV/AIDS and other STIs as suggested below in B-22. ▲ Vehicles/construction equipment need to be maintained and inspected/tested regularly. ▲ Drivers must have appropriate government licensing or certification and be provided with proper training. ▲ During the operation of construction equipment, a minimum safety distance from this equipment must be ensured for the movement of the local community to avoid any accident. ▲ Contractor shall take all precautionary measures to prevent community exposure to water-borne, water-based, water-related, and vector-borne diseases, and communicable and non-communicable diseases that could result from project activities.				
B-20	Access to the Public	▲ The contractor shall provide adequate warning signboards in the local and English languages with messages in pictures or drawings so that those who cannot read will be able to understand. ▲ Flagmen shall be deployed to control the traffic during tree felling or removal/erection of electric poles. ▲ The contractor shall provide temporary access to the local religious places, schools, or nursing home in consultation with the local champions. ▲ A grievance redressal mechanism shall be adopted at the site, which needs to be approved by the CSC to address the issue at the site.	Contractor	CSC/PIU	Construction Phase	Bangladesh Labor Act 2006; Bangladesh Labor Rules 2015
B-21	HIV and STDs ⁹	▲ Awareness campaigns on HIV/AIDS/STD ▲ HIV/STD voluntary counseling, testing, and treatment. ▲ Ensuring that construction workers have access to condoms ▲ Provision of vending machines at the identified location	Contractor	CSC/PIU	Construction Phase	Occupational Health and Safety Policies 2013

⁹ FIPIC HIV/AIDS in the Construction Sector | International Federation of Consulting Engineers

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10. Environmental and Social Management Plan

Table 10-2: Environmental and Social Management Plan						
SL No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		Monitoring of outcomes in collaboration with National HIV/AIDS Authorities				
B-22	Labor Management	- Contractors shall follow the national legislation. - Condition stipulated the contractor on labor management, workplace safety, and health, and protection shall follow labor-management procedures. - Pooled transportation facilities, as may be required, shall be provided by the contractor. - Contractors' company policies on the prohibition of Child Labor shall be displayed at the construction camps, labor camps, contractors' offices, etc. - All basic facilities, such as water supply, cooking gas, sanitation facilities, and a mobile toilet (of adequate capacity for men and women separately), shall be provided within the labor camp. - Creche facilities for women workers to be made with separate toilets, washing, and cleaning (if possible) 1-2 caregivers for creche shall be employed. - Women security guards at the labor shade shall be deployed. - Feeding corner for lactating mothers, if required to be provided. - Separate labor shade for men and women shall be provided. - Contractor shall prepare a Labor Management Plan in its C-ESMP as per the procedures stipulated in Chapter 8 of this ESIA	Contractor	CSC/PIU	Construction Phase	Bangladesh Labor Act 2006; Bangladesh Labor Rules 2015
B-23	Occupational Health and Safety Aspects Personnel Safety Measures for Labor, Material, handling, Painting, etc.	- The contractor will prepare a standalone Contractor OHS plan, which needs to be approved by the CSC before activities commence. - Contractor shall update the OHS plan regularly as and when required or as directed by the CSC. - Contractors shall plan the activities to prevent untoward accidents at the site. - Induction training to the workers and subsequent training on safety aspects. - Trained workers will be deployed at hot mix plants, batching plants, and wet Mix Macadam (WMM). - Toolbox (including its maintenance) training for the workers. Shall be adopted, such as job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc. - The contractor shall follow safe work systems and administrative or institutional control measures. - No employee shall be exposed to a noise level greater than 85 dB(A) for more than 8 hours per day without hearing protection.	Contractor	CSC/PIU	Construction Phase	Occupational Health and Safety Policies 2013

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Table 10-2: Environmental and Social Management Plan

Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		▶ In addition, no unprotected ear shall be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C). ▶ Exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc., shall be provided per CSC's direction. ▶ The Contractor shall always take all reasonable precautions to maintain the health and safety of the contractor's personnel. ▶ The contractor shall ensure that medical staff, first aid facilities, and ambulance service are always available at the site in collaboration with local health authorities. ▶ If necessary, Pandemic Response Plan (COVID 19) following the Annex-9, Volume-II should be implemented at sites and camps. ▶ Workers shall wear protective footwear such as safety boots/gumboots, helmets, and protective goggles. ▶ Welders shall use protective eye shields or safety goggles. ▶ All electric wire must have proper insulation ▶ The workers and flagmen shall use lifesaving jackets. ▶ Workers working in noisy areas shall be provided earmuffs. ▶ Fall prevention and protection measures shall be implemented for the workers working at more than 2m height. ▶ Safety belts along with connectors and anchorage shall be provided and used by the workers working at heights (more than 2m). ▶ Ladder and scaffold shall be provided with guardrails system and safety net system shall be provided when activities are going on at height more than 2m. ▶ Proper use of ladders and scaffolds by the trained workers. ▶ Necessary lightening having proper illumination shall be provided if required to work site during nighttime. ▶ Potable water supplies to the workers. ▶ Water supplied to areas of food preparation or for the purpose of personal hygiene (washing or bathing) shall meet drinking water quality standards. ▶ Workers working in the dusty area shall be provided with nose mask. ▶ Sufficient fresh air shall be supplied for construction camps/labor rooms and confined workspaces. ▶ Construction/labor camps must receive natural light and be supplemented with sufficient artificial illumination, if required.				

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Table 10-2: Environmental and Social Management Plan						
Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		- Emergency lightning arrangement of proper illumination shall be installed at identified locations. - Sufficient lightening arrangement shall be provided in toilets having doors along with locks. - Eating areas such as canteen must be cleaned, and kitchen, toilet/ human waste must be segregated at source and collected separately as per measure suggested above. - Hand, knee, and foot railings shall be provided on stairs, fixed ladders, platforms, ramps or loading bays etc. - Covers should, if feasible, be installed to protect against falling items. - First aid boxes shall be provided at identified locations. - First Aid training to at least 25% of female and male workers. - Tie-ups with local hospitals shall be maintained, and ambulance facilities shall be reserved for emergencies. - The contractor shall arrange OHS training for all new workers and refresher training for the old workers/drivers. - Regular health check-ups shall be undertaken at construction camps/labor camps, etc. - Visitors such as CSC engineers or employer officials visiting the construction sites/camps shall wear helmets of approved color. - Fire extinguishing devices shall be installed at the identified areas. - Arrangements with the local firefighting department shall be made. - Contractor shall prepare and get approved an emergency response plan, including an evacuation plan, in consultation with the Fire Service & Civil Defense Department (FSCD) and provide training to workers accordingly. - The Contractor shall establish work zones to separate workers on foot from traffic and equipment, following the Traffic Signs Manual⁴⁶. - The basic signs include <i>Road Works Sign, Road Narrow Sign, Keep Left or Keep Right</i>, place a line of <i>Traffic Cones</i> to guide the pedestrian, using STOP/GO boards. The Sign plates size should be standard diameters according to Traffic Signs Manual.				

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⁴⁶ Traffic signs Manual, Volume 1, Appendices, Bangladesh Road Transport Authority, Ministry of Communication

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Table 10-2: Environmental and Social Management Plan

Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
B-24	SEA-SH	- Implementation of a GBV-free work environment shall be maintained at the project, assisted by the PIU - PIU will have gender specialists to monitor the GBV-free environment; Gender-based discrimination shall be strictly prohibited and monitored. - Any type of sexual harassment, including homophobic slurs or using social media against a colleague, shall be dealt with strictly as per local law of the country, and the employee shall be terminated immediately from their duties. - All workers, including skilled and non-skilled workers, shall be trained on the code of conduct and company policy on the SEA-SH-free work environment. - It shall be ensured that all, including managers/engineers and other workers, have attended the training as mentioned above. - The contractor shall frame the Code of Conduct (COC) with minimum standards of behavior with which project actors agree to comply individually. - COC Preventing SEA-SH and Violence against Children/female workers shall be rolled out among the individual and signed by each worker/manager/other staff. - Each worker needs to sign the COC every six months. - A signed copy of the COC shall be documented physically, and a scanned version will be stored digitally. - The company policy on a GBV-free work environment and COC shall be displayed at labor camps/canteens and other contractor facilities. - Staff shall be encouraged to report suspected or actual GBV. - A grievance redressal mechanism (GRM) shall be established at the site to address the issues immediately. - Provision of separate, safe, and easily accessible facilities (e.g., toilets, sleeping areas) for male and female users, which can be locked from the inside¹⁰. - Provision of Safe, accessible, well-lit waiting areas and other public spaces (such as parking lots, and construction sites). - Visibly displaying signs around the project site that signal to workers and the community that the site is an area where SEA-SH is prohibited or a safe, SEA-SH-free zone.	PIU/Contractor/SC	PIU	Construction Phase	Bangladesh Labor Act 2006; Bangladesh Labor Rules 2015, SEA.

¹⁰ Good Practices Note on addressing Sexual Exploitation and Abuse and Sexual Harassment (SEA-SH) in Investment Project Financing Involving Major Civil Works Second Edition, the World Bank

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10. Environmental and Social Management Plan

Table 10-2: Environmental and Social Management Plan						
Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		▶ The PIU has hired a Gender Specialist to monitor indicators: (a) the number of training courses related to SEA/SH delivered; (b) percentage of staff who have agreed to a CoC; (c) the percentage of project actors who have attended CoC or SEA/SH trainings; or (d) percentage of SEA/SH cases handled in line with quality requirements/established protocols.				
B-25	Traffic Diversion and Detouring Plan	▶ Detailed "Traffic and Road Safety Management Plans" shall be prepared by the Contractor and submitted to CSC for approval. The traffic diversion plan shall contain, but not be limited to, the following: - Traffic safety arrangements for carrying out construction activities in congested urban areas. - Arrangement of the Signaling system and warning Signs system. - Traffic routes for construction vehicles/equipment - Construction vehicles/equipment speed - Traffic control Arrangements at site - Parking of construction vehicles/equipment/trucks - Temporary Traffic diversion and detouring arrangement - Traffic arrangement after cessation of work each day. - Safety measures for night-time traffic - Precaution for transportation of hazardous materials - Arrangement of flagmen/walkie-talkie/mobile phones etc. - Temporary diversions shall be provided at rural/urban settlements. ▶ The Contractor must prepare a C-Traffic Management Plan, which is to be approved by CSC. ▶ A guideline for Developing a C-Traffic Management Plan is given in Annex 10, Volume-II. The Contractor shall establish work zones to separate workers on foot from traffic and equipment, following the Traffic Signs Manual⁵⁷. The basic signs include <i>Road Works Sign, Road Narrow Sign, Keep Left or Keep Right</i>, place a line of <i>Traffic Cones</i> to guide the pedestrian, using STOP/GO boards. The Sign plates size should be standard diameters according to Traffic Signs Manual.	Contractor	CSC/PIU	Construction Phase	Bangladesh Road Manual, Bangladesh Road Transport Authority Ministry of Communication, March 2000
B-26	Archaeology and cultural heritage management	▶ Contractor shall ensure that all archaeological and cultural heritage sites are protected from construction activities.	Contractor	CSC	Construction Phase	The Antiques Law of 1968;

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Table 10-2: Environmental and Social Management Plan						
Sl. No.	Impacts/Issues	Mitigation/Enhancement Measures	Implementation Agency	Supervision Agency	Timelines	Remarks
		▶ PIU shall advise DOE to implement Schedule 4: Standards for Emission from Motor Vehicles of Environmental Conservation Rules 2017 (Draft).				Environment Conservation Rules 1997; and Bangladesh National Ambient Air Quality Standards 2005
C-6	Noise and Vibration	▶ Noise and Vibration Monitoring shall be undertaken as suggested in the Environmental Monitoring Plan.	Monitoring agency	Khulna Zone	Operational Phase	ECA Act 1995; ECR 2023; and Noise Pollution Control Rules 2006
C-7	Soil and Sediments	▶ Any spillages or accidental vehicles shall be removed immediately.	Monitoring agency	Khulna Zone	Operational Phase	
C-8	Road Safety	▶ Road furniture, as provided in the operation phase, needs to be maintained properly. ▶ Potholes or any other damage shall be rectified immediately after post-monsoon. ▶ Road safety audits should be undertaken regularly. ▶ Public awareness campaign shall be regularly conducted using various Information, Education, and Communication (IEC) techniques such as Media (Television, newspaper), Display boards, safety weeks and event organization, etc.	Monitoring agency Khulna Zone	Khulna Zone	Operational Phase	National Land Transport Policy; RHD's Road Plan; Master National Road Design Standard

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10.4 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

477. To evaluate the effectiveness of the mitigation measures to reduce the environmental impacts, it is necessary to monitor the environmental parameters during the project construction and operation phase. The proposed monitoring plan provides information to ensure that the development initiative of this national highway is complying with the regulatory standards and helps define the thresholds that would signal the need for immediate corrective actions.

478. From the environmental monitoring point of view, ambient air quality with respect to noise, water quality, and soil and sediment quality is proposed to be monitored during the project's construction and operation. The contractor can collect the meteorology data from the nearest meteorology station in Jashore, or it can be monitored at the site by installing the equipment.

479. The following subsections present an environmental monitoring plan covering the parameters to be monitored, sampling locations, and frequency.

10.4.1 AMBIENT AIR QUALITY

480. The ambient air quality is proposed to be carried out at three (3) locations in addition to villages near the construction camps/Hot mix plants/stockyards and borrow areas and near sensitive receptors such as schools/hospitals/mosques during construction. In total, the contractor must carry out ambient air quality at seven (7) locations. However, during the operation phase, the ambient air quality monitoring will be carried out at three (3) locations in consultation with the Department of Environment (DOE). The ambient air quality monitoring details are given in **Table 10-3**.

Table 10-3: Ambient Air Quality Monitoring Details

Sl. No.	Items	Description of Items
1.	Monitoring Parameters	Particulate Matter (PM10 and PM2.5), Sulphur Dioxide, Nitrogen Oxide, Carbon Monoxide (CO) and Ozone (O ₃). The parameters to be monitored are PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ (24 hrs), CO, O ₃ (8 hrs)
2.	Monitoring Locations	One in each contract (Bhomra, Satkhira, Navaron) plus three (3) locations as per the suggestion of the Environmental Engineer of CSC/RHD
3.	Monitoring Frequency	Continuous 24-hourly monitoring twice a week for summer, winter, and post-monsoon season
4.	Total number of samples	4-locations x 1-days per week x 4-week x 3-season x 2.5 years The total number of samples is 120 During the construction phase per the contract. The total number of samples during the operation phase is 36 per annum.

10.4.2 AMBIENT NOISE AND VIBRATION MONITORING

481. Similarly, noise shall be monitored at three (3) locations in addition to villages near construction camps/Hot mix plants/stockyards and borrow areas and near sensitive receptors such as schools/hospitals/mosques during the construction phase. In a total of nine locations, the contractor will carry out noise monitoring during the construction phase. In contrast, the noise monitoring will be carried out at four (4) locations near sensitive receptors in consultation with DOE officials during the operation phase of the project. The noise quality monitoring details are presented in **Table 10-4**.

Table 10-4: Noise Monitoring Details

Sl. No.	Items	Description of Items
1.	Monitoring Parameters	Noise and Vibration quality monitoring (Leq, L _{max} , L _{min} , L ₁₀ , L ₅₀ , L ₉₀ and L _{max})
2.	Monitoring Locations	Bhomra, Satkhira, Navaron, plus three locations such as construction camps/maintenance workshops/labor camps and one (1) location in sensitive receptors/residential areas near the construction site, per the suggestion of the Environmental Engineer of CSC/RHD. During the operation phase, near the four (4) sensitive receptors in consultation with the DOE officials.
3.	Monitoring Frequency	Continuous 24-hour monitoring using an Integrated Sound level meter with a data logger.
4.	Total number of samples	Throughout the construction period

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Table 10-4: Noise Monitoring Details

Sl. No.	Items	Description of Items
		A total number of samples = 6 locations x 12 months x 2.5-years=180 per contract. The total number of samples during the operation phase is 72 per annum.

10.4.3 SURFACE WATER QUALITY

482. As presented in the Table 10-5; surface water samples will be collected from the four (4) bodies during construction and operation. The sampling will be done once a season except during the monsoon season.

Table 10-5: Surface Water Quality Monitoring Details

Sl. No.	Items	Description of Items
1.	Monitoring Parameters	pH, DO, BOD5, Temperature TSS, Oil and grease, free ammonia, etc. Total Coliforms, and E-coli form per 100ml
2.	Monitoring Locations	Two surface water bodies (river/canal)
3.	Monitoring Frequency	Once in a season except monsoon season
4.	Total number of samples	Throughout the construction period Total number of samples = 2-locations x 1-sample per season x3-season x 2.5-years=15 samples Total number of samples during operation phase 12 per annum.

10.4.4 GROUNDWATER QUALITY

483. The groundwater samples will be collected from the four (2) locations during the project's construction phase. The samples will be collected and analyzed every season except monsoon season, as presented in Table 10-6.

Table 10-6: Groundwater Monitoring Details

Sl. No.	Items	Description of Items
1.	Monitoring Parameters	pH, EC, TDS, Temperature, Taste, TSS, Oil and grease, Heavy metals
2.	Monitoring Locations	2 Groundwater samples, Construction Camps Labor camps
3.	Monitoring Frequency	Every season, one sample from each location except for the monsoon season
4.	Total number of samples	Total number of samples = 2-locations x 1-sample per season x3-season x 2.5-years=15 samples per contract Total number of samples during operation phase 6 per annum in consultation of DOE officials.

10.4.5 SOIL AND SEDIMENT QUALITY

484. The soil samples will be collected from the three (3) locations during the construction phase of the project. The samples will be collected and analyzed every season except monsoon season, as presented in Table 10-7.

Table 10-7: Soil Monitoring Details

Sl. No.	Items	Description of Items
1.	Monitoring Parameters	pH, electrical conductivity, organic matter (%), nitrogen (mg/1000g), potassium (mg/1000g), phosphorous (mg/1000g), sulfates and sodium sulfates and oil & grease
2.	Monitoring Locations	3 Soil samples Construction Camps Labor camps Maintenance workshop
3.	Monitoring Frequency	Every season, one sample from each location except for the monsoon season
4.	Total number of samples	Total number of samples = 3-locations x 1-sample per season x3-season x 2.5-years=22 samples

485. The sediment samples will be collected and analyzed every season except the monsoon season from the four (2) sediment samples near the bridges of river/canal, as presented in Table 10-8.

Table 10-8: Sediment Monitoring Details

Sl. No.	Items	Description of Items
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1.	Monitoring Parameters	pH, electrical conductivity, organic matter (%), oil & grease, Heavy metals
2.	Monitoring Locations	2 Sediment samples from the river
3.	Monitoring Frequency	Every season, one sample from each location except for the monsoon season
4.	Total number of samples	Total number of samples = 2-locations x 1-sample per season x 3-season x 2.5-years=15 samples per contract

10.4.6 SOCIAL RISK MONITORING

486. The main objectives of the monitoring are to ensure that adequate mitigation measures are established (and modified as needed) and implemented on time, and that the mitigation measures are achieving their objectives. The following performance indicators for monitoring social risks are summarized. However, a standalone Resettlement Action Plan (RAP) is prepared where details are discussed.

- ▶ Has the site's Grievance Redressal Mechanism (GRM) been established?
- ▶ Has the contractors' social expert been on board to address the grievances received?
- ▶ Each record of grievances received and addressed shall be documented and reported to the World Bank.

10.4.7 ENVIRONMENTAL MONITORING BUDGETARY COST ESTIMATES

487. To carry out the monitoring along project alignment during the construction and operation phase, the contract-wise environmental monitoring budgetary cost estimates have been worked out and is presented in the following Table 10-9.

Table 10-9: Environmental Monitoring Budgetary Cost Estimates per Lot				
Sl. No.	Environmental Parameters	Number of samples	Unit Cost (BDT)	Amount (BDT)
1.	Ambient Air Quality	120	35000	4,200,000
2.	Ambient noise and Vibration	180	5000	900,000
3.	Surface Water Quality	15	30000	450,000
4.	Groundwater Quality	15	30000	450,000
5.	Soil Quality	22	32000	704,000
6.	Sediment Quality	15	32000	704,000
Subtotal of Construction Phase Environmental Monitoring Cost				7,408,000 Say 7,400,000

488. The construction phase environmental monitoring cost is 7,400,000 BDT (Bangladesh Taka).

489. In addition to the above-discussed environment monitoring plan, it is proposed that the contractor will purchase, under an obligatory requirement of the contractor to implement ESMP, a set of portable equipment for PIU and CSC staff carrying out the monitoring as an emergency/ad hoc or when there is any grievance from the community. Thus, it is not included in the BOQ item of the bidding document. The budgetary cost estimate for the following equipment is as follows in Table 10-10. Environmental Monitoring Budgetary Cost Estimates for Operation Phase is given in Table 10-11.

Table 10-10: Budgetary Cost Estimates for Environmental Monitoring Equipment per contract	
Name of Equipment	Approximate Cost
Portable Handheld Integrated Noise level meter with data logger measuring range of 30dB(A) – 140 dB(A)	4,00,000
Vibration Monitor with Data Logger (Measuring Range: 30 – 120 dB)	5,90,000
Water quality monitoring kit has a pH meter, EC, temperature, DO pen, etc.	400,000
Portable Air Quality Meter (PM10 and PM2.5) with data logger and sensor heads to monitor gaseous pollutants (CO, NOx, and SO2).	4,00,000
Total	1,790,000

Table 10-11: Environmental Monitoring Budgetary Cost Estimates for Operation Phase					
Sl. No.	Environmental Parameters	Period	Number of samples	Unit Cost (BDT)	Amount (BDT)
1.	Ambient Air Quality	Operation	9	40000	360,000
2.	Noise and Vibration Quality	Operation	9	10000	90,000
3.	Surface Water Quality	Operation	4	35000	140,000
4.	Groundwater Quality	Operation	2	35000	70,000
Subtotal of Operation Phase Environmental Monitoring					660,000

490. The summary of environmental and social monitoring is presented Table 10-12.

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Table 10-12: Summary Matrix of Environmental Monitoring during Construction and Operation Phase					
Environmental Factors		Monitoring Locations		Sample Strategy	
Attribute	Pollutants			Quality	Frequency
Construction Phase Environmental Monitoring					
Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO	One in each contract (Bhomra, Salkhira, Navaron) plus three (3) locations		120	Twice in a week for 6 seasons, excluding monsoon
Noise Quality	L ₉₀ (day) and L ₉₀ (night), L ₁₀ , L ₉₀ , L _{max} , and L _{min}	Bhomra, Salkhira, Navaron, plus three locations such as construction camps/maintenance workshops/labor camps and one (1) location in sensitive receptors/residential areas near the construction site.		180	At five locations each month for two years, or as needed based on the advice of CSC.
Vibration Measurements	L _v /10, L _{max} , in Vdb	Bhomra, Salkhira, Navaron, plus three locations such as construction camps/maintenance workshops/labor camps and one (1) location in sensitive receptors/residential areas near the construction site.		100	At five locations each month for two years, or as needed based on the advice of CSC.
Ground water	pH, EC, TDS, Temperature, Taste, TSS, Oil and grease, Heavy metals	2 Groundwater samples (One sample each is from construction or labor camps, and a groundwater source of baseline stage monitoring)		15	Once a month for 7 seasons, excluding monsoon
Surface Water	pH, DO, BOD5, Temperature TSS, Oil and grease, free ammonia, etc. Total Coliforms, and E-coli form per 100ml	Two (02) surface water bodies		15	Once in a season for 2 years, excluding monsoon for 2 years
Soil Quality	pH, electrical conductivity, organic matter (%), nitrogen (mg/1000g), potassium (mg/1000g), phosphorous (mg/1000g), sulfates and sodium sulfates, and oil & grease	Total (03) locations (Construction Camps, Labor camps Maintenance workshop)		22	Once in a month during construction.
Sediment Quality	pH, electrical conductivity, organic	2 Betbai River (Upstream/downstream) from the baseline stage monitoring locations		12	Once in a season for 2 years, excluding monsoon for 2 years

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Table 10-12: Summary Matrix of Environmental Monitoring during Construction and Operation Phase

Environmental Factors		Monitoring Locations		Sample Strategy		Implementation and Monitoring	
Attribute	Pollutants			Quality	Frequency	Implementation	Supervision
Social	matter (%), oil & grease, Heavy metals				Every month	Contractor	CSC/PIU
Performance Indicator	Social impacts from construction work	Construction camp/maintenance workshops/labor camps within the RoW			Every month	Contractor	CSC/PIU
Community health and safety	Social impacts from construction work	Construction sites near sensitive receptors, GPR, and Residential areas			Regular interaction with the community	Contractor	CSC/PIU
Conflict and complaint	Social impacts from construction work	Construction camp/maintenance workshops/labor camps, Construction sites			Regular interaction with the community, Regular GRM meeting redressal	Contractor	CSC/PIU
Child labour	Social impacts from construction work	Construction camp/maintenance workshops/labor camps, Construction sites - Implementation of labour management procedures			Regular interaction with the community, Regular GRM meeting redressal	Contractor	CSC/PIU
SEA/SH	Social impacts from construction activities and labour influx	Construction camp/maintenance workshops/labor camps, Construction sites - Implementation of labour management procedures			Regular interaction with the community, Regular GRM meeting redressal	Contractor	CSC/PIU

Operation Phase Environmental Monitoring per Annum

Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO	Bhonra, Satkhira, Navaron, plus three locations such as construction camps/maintenance workshops/labor camps and one (1) location in sensitive receptors/residential areas near the construction site,	3	Every season for two days except the monsoon	Contractor through approved Lab	Khulna Division
Noise Quality	L _{eq} (day) and L _{eq} (night), L ₁₀ , L ₉₀ , L _{max} , and L _{min}	Bhonra, Satkhira, Navaron, plus three locations such as construction camps/maintenance workshops/labor camps and one (1) location in sensitive receptors/residential areas near the construction site,	3	Every season for two days except monsoon	Through approved Lab	Khulna Division
Vibration Measurements	L _{v10} , L _{max} , in Vdb		4	Every season for two days except monsoon	Through approved Lab	Khulna Division
Groundwater	pH, EC, TDS, Temperature, Taste, TSS, Oil and grease, Heavy metals	2 Groundwater samples	2	Once in each season except the monsoon season	Through approved Lab	Khulna Division

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Table 10-12: Summary Matrix of Environmental Monitoring during Construction and Operation Phase					
Environmental Factors		Monitoring Locations		Sample Strategy	
Attribute	Pollutants		Quality	Frequency	Implementation and Monitoring
Surface Water	pH, EC, TDS, Temperature, Taste, TSS, Oil and grease, Heavy metals	surface water body (Berna River)	2	Once in each season except the monsoon season	Through the approved Lab
Sediments	pH, electrical conductivity, organic matter (%), oil & grease, Heavy metals	One location (Mukteshwari River)	1	Once in each season except the monsoon season	Through the approved Lab
Soil Quality	pH, EC, TDS, Temperature, Taste, TSS, Oil and grease, Heavy metals	Total at 2 locations (agricultural fields)	2	Once in each season except the monsoon season	Through approved Lab
					Khulna Division
					Khulna Division
					Khulna Division

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10.4.8 TREE PLANTATION ALONG THE ROAD ALIGNMENT

491. To make the project's development sustainable, a tradeoff approach has been adopted: planting at least three saplings for each tree to be removed to widen and strengthen the road. Tree plantation is the most economical, effective, and useful mitigation measure to control pollution and provides shade to the user, especially during summer. Since it is unavoidable to safeguard these trees, it is suggested that local, fast-growing trees be planted instead of trees removed for the project road development.

492. The project's development requires removing about 12,565 roadside avenue trees. Some are very old/sacred trees that have also outlived their lives.

493. Large trees are proposed to be planted in the available road space. In addition, biological noise barriers have been considered near sensitive receptors such as schools/institutions and temples to meet the tree plantation target. It is also proposed that landscaping be carried out on two monuments, including an informative signboard about the legend. These biological measures will be taken only after consulting with the stakeholders through an NGO. This will also help meet the target of tree plantation requirements along the alignment.

494. **Shrubs Plantation on Medians:** It is also proposed that shrubs be provided on the medians to reduce the glare of the road. While planting the shrubs on the medians, the following considerations have been made for all three contracts.

- ▶ The shrubs will be planted in 2 rows.
- ▶ The spacing will be 1m apart.
- ▶ To maintain a height of 2m of a shrub, it is recommended to trim these proposed shrubs at least once in the year before the monsoon period under the maintenance item during the operation phase.

495. The suggested shrub plantation on the median for each contract is as follows in Table 10-13.

Lot	Length of space available (m)	Spacing/Row Details	Number of shrubs to be planted	Species
1	10300	1m spacing and in 2-rows	20600	Korobi <i>Nerium oleander</i>
2	10880		21760	Radhachura <i>Caesalpinia pulcherrima</i>
3	10460		20920	Konokchapa <i>Ocimum squarrosa</i>
4	10400		20800	Akondo <i>Calotropis gigantea</i>
				Dad mordon <i>Cassia alata</i>
				Dhai tul <i>Woodfordia fruticosa</i>
				Dut ranga <i>malabar melastome</i>
				Alamanda <i>Allamanda schottii</i>
				Hasqa hena <i>Cestrum nocturnum</i>
				Rangan <i>Isora coccinea</i>
				Arhar <i>Cajanus cajan</i>

496. **Biological Barriers:** It is worth mentioning that the predominant land use pattern along the road is mixed areas comprising residential cum commercial areas. The standard noise levels for this land pattern are 60dB(A). These schools/mosques are in the mixed land use pattern and are partially affected due to the loss of the boundary wall. Compensation for constructing the boundary wall along the schools has been provided in RAP. The boundary wall of brick masonry of approximately 1.5m height will help break the line of sight between the receiver and source.⁵⁸ It is also reported that breaking the line of sight will reduce the noise of 5dB(A) and the material weight of a 4.5-inch brick wall is more than 4 pounds per square foot.⁵⁹ It is also reported that a greenbelt (of 15m to 30m wide and 4m to 5m tall plant)⁶⁰ along with shrubs having dense foliage is an effective measure for noise level attenuation. Thus, it is suggested that they be planted along the boundary wall of the schools. Thus, it is proposed to plant a dense tree plantation in three (3) rows along the school's boundary wall, which shall be undertaken to reduce the noise levels' intensity and enhance the affected school's landscape. However, it is reported tree plantation contributes very little to actual noise reduction but confers a psychological benefit in reducing the perceived nuisance of traffic noise.⁶¹ Other options, such as constructing earthen mounds, require land, which is not available on school premises, and concrete barriers are very costly. Thus, only tree plantation along boundary walls has been considered to reduce noise intensity. A 30 meter of dense vegetation can reduce

⁵⁸ Transit Noise and Vibration Impact Assessment, FTA

⁵⁹ Noise walls & barriers: WSDOT

⁶⁰ A guide to the Reduction of Traffic Noise, VietRoad, 2003

⁶¹ Roads and the Environment: A Handbook, World Bank Technical Paper No. 376, 1997

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noise by five decibels.⁶² The details are discussed in Section 7, and the plan for the plantation of the trees is shown in Annex II, Volume-II. The tree plantation along the boundary wall is presented as follows in Table 10-14.

Table 10-14: Biological Noise Barriers in the Form of Tree Plantation details

Lot	Number of institutions	Spacing/Row Details	Number of Trees to be planted	Suggested Species	
1	20	3m spacing between 3 rows	1000	Jarul	<i>Lagerstroemia speciosa</i>
2	15		900	Aam	<i>Mangifera indica</i>
3	9		450	Nageshwar	<i>Melia nagesarum</i>
4	20		1000	Kalojam	<i>Syzygium cumini</i>
				Kathal	<i>Artocarpus heterophyllus</i>
				Hijal	<i>Barringtonia acutangula</i>
				Lichu	<i>Litchi chinensis</i>
				Chatim	<i>Alstonia scholaris</i>
				Menda	<i>Litsea glutinosa</i>
				Koroch	<i>Pongamia pinnata</i>
				Dewa	<i>Artocarpus lacucha</i>

497. **Enhancement Measures:** One big pond in lot one and one monument in Contract 3 have been selected for enhancement measures by taking up tree plantation. To ensure the implementation of the proposed plan, the NGO engaged by the RHD shall be assigned to conduct stakeholder consultation for taking up this enhancement measure with them. The details are as follows in Table 10-15.

Table 10-15: Enhancement Measures in the Form of Tree Plantation details

Lot	Length of Structure	Spacing/Row Details	Number of Trees to be planted	Suggested Species	
1/4	300	3m spacing between 1-row	100	Khejur	<i>Phoenix dactylifera</i>
2	120		40	Tal	<i>Borassus flabellifer</i>
3	50		17	Barun	<i>Crataeva nurvala</i>
				Koroch	<i>Pongamia pinnata</i>
				Hijal	<i>Barringtonia acutangula</i>
				Jarul	<i>Lagerstroemia speciosa</i>
				Narikel	<i>Cocos nucifera</i>
	120		40		

498. **Plantation Works:** The contractor will take the following steps to plant shrubs and trees.

499. **Site preparation:** This activity needs to be undertaken well before the monsoon for rainy season species and during October-November for winter species. Thorny bushes and weeds need to be removed entirely from the site. It should be followed by soil and water conservation work using physical measures, such as surface rainwater harvesting, trenches, and stone bunds; engineering structures, such as small check dams; and biological devices, such as planting of fast-spreading grass and leguminous species, and bushy materials. For planting seedlings/saplings, pits of appropriate size (1×1×1m for tree species, 0.5×0.5×0.5 m for shrub species) need to be prepared well in advance. The topsoil of 30 cm depth needs to be kept aside for mixing with Farmyard Manure (FYM) to promote microbial growth for nutrient recycling.

500. **Seeding and Transplanting:** For grass and leguminous species plantation, direct seeding could be practiced, establishing a surface cover to check soil loss and grass growth for herbivores and nesting sites for birds. The plantation should be done in rows as per IRC guideline both row to row and plant to plant using healthy seedling/sapling. While planting, the poly bag should be moistened first. The poly bag should not be removed completely; only the bottom part of it should be removed by cutting it with a sharp blade without disturbing the planting material. The planted material should be watered slowly to avoid soil disturbances.

501. Multi-purpose tree plants and shrub species have a special significance in fulfilling the objectives of improving the environment as well as the needs of the people. During lean periods of spring and summer, trees come to the rescue of livestock. The young, leafy, succulent material is highly nutritious and rich in crude protein and minerals. The tree species can be planted along the boundaries and in rows in the grassland. The trees must be planted as per the above schedule during monsoon. The fodder from the trees is available after 4-5 years. Three guards shall be provided during the initial growth period.

⁶² Highway Traffic Noise Barriers at a Glance - Design Construction - Noise Barriers - Noise - Environment - FHWA (dot.gov)

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502. It is suggested that leguminous species, pollution-tolerant plants, soil-stabilizing species, multipurpose plants, and fruit-bearing trees be planted.

503. **Plantation cost Break-up:** It is proposed that a total of 56,387 trees, including shrubs (13,800 in Lot 1, 15,420 in Lot 2, 13,227 in Lot 3, and 13,840 in Lot 4) to be planted. Out of the total tree plantation, about 40% of the tree plantation will be undertaken by RHD through contractors in the project, and the remaining 60% of the trees will be planted through the Forest Department under the social forestry program and the Arboriculture Department of RHD. A budgetary breakup for the tree plantation plan during the construction phase is given in Table 10-16.

504. It is noted that a total of 56,387 trees will be replanted at a 1:4.5 ratio of the cut-down roadside 12,565 trees, instead of a 1:3 ratio. Removal of private affected tree are not considered in the ESMP budget, since the affected households will be compensated for their cutdown trees according to the RAP budget of the Phase-3, in addition to this compensation for the affected private trees, an extra 10-12 saplings would be given to each affected titled and non-titled household at free of cost as the resettlement benefits.


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Table 10-16: Budgetary Cost Estimates in BDT for Tree and Shrub Plantation

Sl#	Description	Rate (BDT)	Lot 1		Lot 2		Lot 3		Lot 4		Total Amount in BDT	Remark
			Units	Amount	Units	Amount	Units	Amount	Units	Amount		
1.	Plantation of trees & including pit, watering, mulching fertilizer, planting the saplings and fencing).	700	2400	1,680,000	3600	2,520,000	2400	1,680,000	2400	1,680,000	7,560,000	Project BOQ item
2.	Shrubs Plantation on median including pit, watering, mulching fertilizer, planting the saplings and	30	10300	309,000	10880	326,400	10460	313,800	10400	312,000	1,261,200	Project BOQ item
3.	Biological Noise Barrier	660	1000	660,000	900	594,000	450	297,000	1000	297,000	1,848,000	Project BOQ item
4.	Enhancement Measures	660	100	66,000	40	26,400	17	11,220	40	11,220	114,840	Project BOQ item
5.	Grass plantation						The cost has been considered in engineering BOQ					
6.	Plantation of trees & including pit, watering, mulching fertilizer, planting the saplings and fencing)	700	3600	2,520,000	5400	3,780,000	3600	2,520,000	3600	2,520,000	11,340,000	Project BOQ item & Forest Department (Social Forestry)
Total number of tree plantations + Noise Barriers + Enhancement Measures			Maintenance cost 10,000BDT per km per month for 2 years			30547			Tree plantation in Project BOQ item			
						12,000,000			Will be done by the contractor under the supervision of Khulna Zone			
						Total Tree Plantation cost by RHD through Contractor in the project BOQ item = 8,850,288						
						A total of 56387 no of trees would be replanted as 4.49 % of the affected roadside 12565 trees.						
						Note:						
						About 40% of tree plantation will be taken up by the RHD as a Project BOQ item; noise Barriers and Enhancement measures will be undertaken by RHD through the Contractor in the Project BOQ item;						
						Remainding 60% will be done by the Social Forestry scheme of Forest Department, and Arboriculture Department of RHD under social forestry immediately during the implementation phase, this cost also included in as Project BOQ item.						
						The direct Memorandum of Understanding (MOU) signed between the Roads and Highways Department (RHD) and Forest department will be done for this 60% tree plantation task. The MOU will include a specific responsibilities of the both parties.						
						Shrubs Plantation in the median will be taken up by the Contractor.						

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10.4.9 INSTITUTIONAL RESPONSIBILITY AND ARRANGEMENT FOR ESMP IMPLEMENTATION

505. The RHD has established a PIU to oversee the implementation and management of project-related activities. An organogram for the implementation of environmental and social management is presented in Figure 10-1.

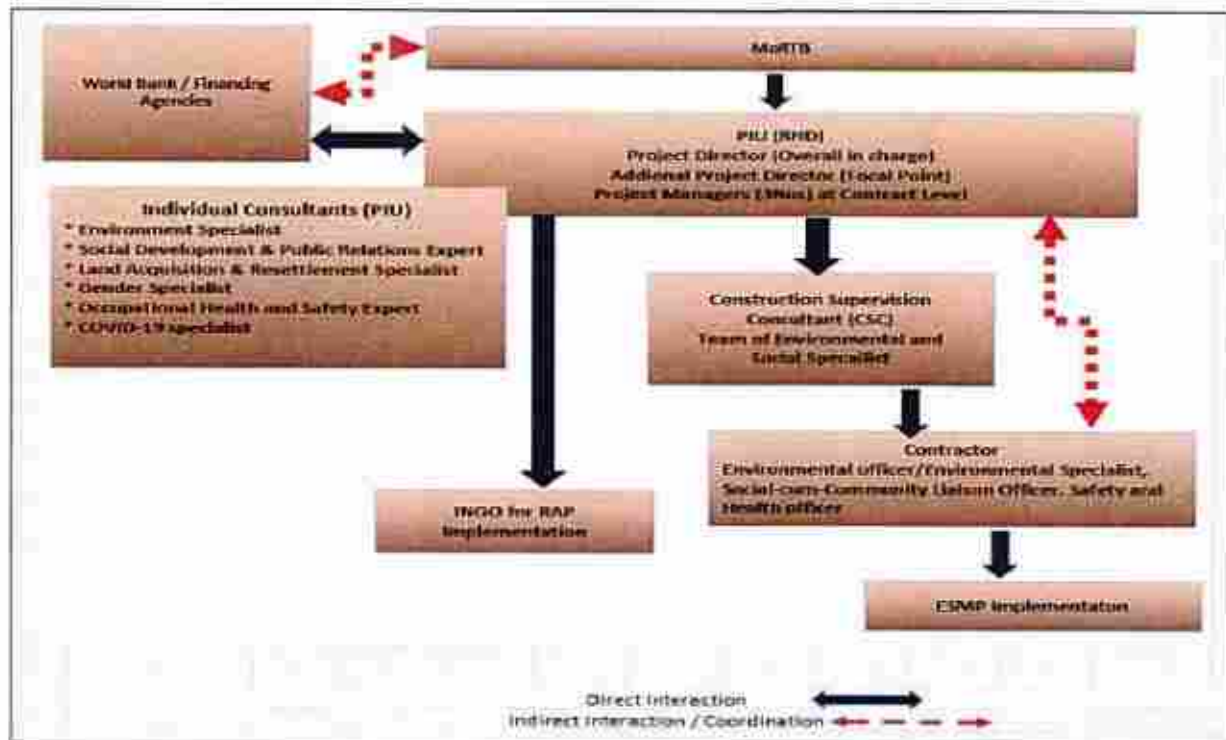


Figure 10-1: Organogram for the Implementation

506. The proposed institutional setup will be as follows:

507. The environmental officer/Environmental Specialist, Social-cum-Community Liaison Officer, and safety and Health officer of the Contractors will be responsible for implementing the ESMP at the site.

508. CSC will be the project engineer and report to the PIU. He will be responsible for contract administration and day-to-day project supervision, including implementing environmental and social management plans. The CSC will consist of an environmental and social expert. It is suggested that a team of environmental and social experts at the national level for each contract will be comprised of a senior environmental specialist, a Public Health Specialist, a Gender specialist, a senior Resettlement, and a rehabilitation specialist/ senior social development specialist, the CSC team.

509. The Project Implementation Unit (PIU) of RHD is the responsible agency for the overall implementation of project activities. Since the project road has been divided into four lots, Project Managers at the contract level have been assigned to implement the project activities, including ESMP. Thus, there is a total of four (4) Project Managers in the PIU. PIU has hired Subject Matter Experts, namely, Environment Specialist, Social Development and Public Relations Expert, Land Acquisition/Resettlement & Rehabilitation Specialist, Gender Specialist, Occupation Health and Safety Specialist to assist the PIU in the implementation of ESMP and RAP. In PIU, an Additional Project Director (APD) has been deployed, who will be a focal point for the implementation of ESMP and the supervisor of the Project Managers. The head of PIU is the Project Director.

510. RHD is responsible for constructing and maintaining Bangladesh's major road and bridge networks. RHD has established a Project Implementation Unit (PIU) to implement this project.

511. MoRTB is an umbrella agency responsible for ensuring the project is developed sustainably and meets the World Bank's environmental and social safeguards.

512. The roles and responsibilities of different designated staff at the project are given in Table 10-17.

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Table 10-17: Roles and Responsibilities of Different Designated Staff

Institution	Designation	Role and Responsibility
MoRTB	-	- Ensure that the project, regardless of financing source, complies with the provisions of the ESMP, World Bank ESS and GoB laws and policies - Ensure that project implementation complies with government environmental policies and regulations. - Ensure that project environmental and social management is implemented and reported to the Steering Committee and the financing agency as required.
	Project Director, PIU of RHD	- Overall implementation of the project - Coordination among the high-level committees to obtain regulatory clearance/permissions. - Participate in high-level meetings. - Review of the progress of the project and ESMP. - Approved to release the funds.
	APD, PIU of RHD	- Updating the PD on various aspects of the project - Coordination with the World Bank and regulatory authorities on ESMP implementation with assistance from PIU - Recommendation to PD for release of funds - Responsible for regulatory obligations for the project. - Review the monthly progress of the contractor - Grievance redressal at the project level
	Project Manager (PM) - PIU	- Overall implementation of the project at the site - Check and verify Interim Payment Certificates (IPCs) for contractors' payment - Coordinate the different district level committees to obtain regulatory clearance/permissions. - Participate in district level meeting - Monthly review of progress - Grievance Redressal at field level
PIU	Environment Specialist (PIU)	- Planning and implementation of ESMP - Review the monthly progress of the contractor on ESMP implementation - Reviewing the periodic progress reports on ESMP - Assisting PIU on Environmental Safeguards issues and ESMP implementation - Conducting field visits as and when required - Assisting PIU in coordinating with the regulatory authorities. - Supervision and monitoring of the progress of activities of the consultants and contractors for the implementation of different components of ESMP
		- Guide PIU, CSC, and contractors in conducting subsequent monitoring and reporting and in undertaking corrective options - Imparting training for the field staff and contractors on ESMP. - Ensuring that the CSC commits and retains dedicated staff as social and environmental managers to oversee ESMP implementation - Ensuring that periodical environmental and social management and monitoring reports are submitted to the steering committee and co-financiers through RHD.
		Preparation and submission of semi-annual monitoring reports on ESMP implementation for the WB review through RHD

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Table 10-17: Roles and Responsibilities of Different Designated Staff

Institution	Designation	Role and Responsibility
Construction Supervision Consultant (CSC)	Social Development and Public Relations Expert	Implementation of environmental monitoring measures (such as environmental quality monitoring, tree plantation, landscaping, and wildlife monitoring) during the O/M stage of the Project.
		Grievance Redressal
	Land Acquisition/Resettlement & Rehabilitation Specialist (PIU)	- Liaison with district administration (DC) to support land acquisition and RAP implementation activities. - Assist the PIU on RAP implementing (NGO) and setting up a baseline and monitoring system. - Review and finalize RAP additions when necessary and Monitor activities of the NGO (INGO). - Conduct internal monitoring of the resettlement process to ensure smooth implementation. - Ensure timely compensation payments and other entitlements as per the RAP are made before physical relocation or civil work commencement. - Participate, record, and address grievances at the project level. - Coordinate with the project cell to ensure the availability of funds for all R&R activities. - Monitor the effectiveness of entitlement contracts and payment modality. - Promote improved social and environmental performance through the effective use of management systems. - Ensure that proper implementation of Livelihood restoration plan and gender action plan including Grievance Redressal
		Liaison with relevant government authorities for protecting archeological and cultural heritage sites.
		Review and prepare the project Gender Action Plan (GIAP) & support PIU for its implementation.
		Coordination with the WB task team and PIU
		Organize/facilitate initial training of PIU staff on GBV & support the PIU with the development of the GBV action plan
		Develop or adapt standard operating procedures for GRM
		Assess the need for and support the implementation of community consultations and stakeholders' engagement during upcoming implementation support missions.
		Support the adaptation of a code of conduct (CoC) for workers.
	Occupation health and Safety (OHS) expert (PIU)	Carrying out advocacy for promoting equal rights for women in skilled and unskilled labor force, day-care centers at work sites, etc.
		- Review and prepare the project OHS plans - Review the progress of OHS implementation at site and safety arrangements made by the contractor to prevent untoward incident. - To interact with regulatory agencies on the environmental, social, occupational, and safety issues, including safety aspects - Review the Contractor's OHS plan and its updates
Environmental Engineer/Specialist	Environmental Engineer/Specialist	- Responsible for ensuring that effective measures of implementation of ESMP are being taken at the construction site. - Before construction, review and approve CESMPs/method statements prepared by the contractors - Inspection and reporting of Contractor activities to ensure effective implementation of the ESMP. - Suggesting mitigation measures or action, followed by inspections and evaluation. - Ensuring that the social and environmental mitigation measures are incorporated in the Contractors Environmental and Social Management Plan (CESMP), etc. - Monitor the implementation of the CESMP and review the environmental management and monitoring reports prepared by the contractor - Review of progress reports and periodic reporting to PIU - Interaction with Environment and R&R Specialist (PIU) - Overall, CSC is responsible for ensuring the proper and timely implementation of all their tasks specified in the ESMP

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Special Team Leader - STUP-2021

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Signature

Special Team Leader - STUP-2021

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10. Environmental and Social Management Plan

Table 10-17: Roles and Responsibilities of Different Designated Staff

Institution	Designation	Role and Responsibility
	Social Team (Social Development Specialist/Resettlement and Rehabilitation (R&R) Expert/Gender Specialist, Public Health Expert)	▲ Inspection and reporting of Contractor activities to ensure effective implementation of the ESMP (social aspects) ▲ Implementation of RAP, interaction with INGO, and reporting of progress of LAP/RAP ▲ Audits of Construction camps/labor camps and other facilities to monitor health/hygiene issues including HIV/AIDS ▲ Monitoring report
	1- Environmental officer/Environmental Specialist	▲ Responsible for the preparation of the Contractor's site-specific Construction Environmental and Social Management Plan (CESMP) based on the ESMP of the Project. The CESMP will have but not limited to the following: - Labor Management Plan, - Waste Management Plan
	2- Social-cum-Community Liaison Officer	- GBV Action Plan, - Construction and Demolition waste, and Liquid Waste Management Plan Hazardous Waste Management Plan, - Workers' Camp Management Plan, - Construction Materials Sourcing Plan
	3- Safety and Health officer	- Community Health and Safety Plan - Chance finds procedures - Training schedule of staff
Contractor		▲ Responsible for preparing a Standalone C-OHS, which needs work to be approved before commencement of work at the site. However, it may be modified as per the site's requirements. ▲ To prepare a standalone C-Traffic Management Plan that met the Bangladesh Traffic Rules Manual's 2008 requirement. (Guidelines for Developing Traffic Management Plan is given in Annex 11, Volume-II). The Flow Chart and Reporting Mechanism of Incidents for developing an emergency response action plan are presented in Annex 8, Volume-II. Direct Reporting to the Project Manager of the contractor. ▲ Assisting in ensuring that environmentally sound practices are adopted at the construction site. ▲ To prepare a redevelopment plan in consultation with CSC and land parcel owner for all the sites of identified project-related ancillary facilities like (i) construction camp, (ii) labor camp, (iii) stone crusher unit, (iv) borrow area and (v) waste including debris disposal site. ▲ Ensure that all valid permits and approvals are in place ▲ To have regular interaction with CSC and provide data on the implementation of ESMP. ▲ To ensure that all the waste is managed per the DOE rules and regulations. ▲ To ensure that Hazardous waste or chemicals are managed at construction sites/construction camps as per the DOE rules and regulations. ▲ To ensure that traffic management plans and road safety issues are attended to at the site. ▲ To interact with regulatory agencies on environmental, social, occupational, and safety issues, including safety aspects. ▲ Imparting training for the staff on environmental safety and health issues and ESMP measures. ▲ An environmental monitoring plan is being implemented at the site. ▲ Taking corrective action measures at the site. ▲ Ensuring that all the permits/approvals are valid. ▲ Prepare and submit monthly ESMP implementation progress reports per the format in Annex 7, Volume-II. ▲ The contractor will report to CSC within 24 hours of any incident fatalities, injuries, gender-based violence, etc., including measures taken at the site. Prepare a monthly progress report on ESMP, OHS, etc., and submit it in the first week of every month.

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Table 10-17: Roles and Responsibilities of Different Designated Staff

Institution	Designation	Role and Responsibility
INGO	4- Deployment of security personnel	- Only security personnel employed through licensed agencies (e.g., Bangladesh Ansar) - Each firearm must be individually licensed under the Arms Act with the regulatory ministry. - All personnel must carry valid IDs, licenses, and authorization letters when on duty. - Firearms are strictly for self-defense or defense of property in response to a credible and immediate threat. - Use of force must follow the principle of proportionality and the Bangladesh Police Use of Force Guidelines. - Discharge of firearms requires mandatory reporting to the nearest police station. - Weapons must be cleaned and inspected before and after each shift. - Any malfunction must be reported and logged, and the firearm should be pulled from service until repaired by authorized personnel. - Ammunition levels should be verified daily and stored separately when not in use. - On-site, firearms must be stored in a double-lock armory box with restricted access. - Outside duty hours, all firearms and ammunition should be returned to the central arms room of the licensed agency. - Every issuance/return must be recorded in a logbook, signed by both the armorer and the guard. - The site's firearm protocols should undergo quarterly audits. - Monthly, Regular audit reports should be reported to law enforcement or Home Ministry officials through PIU/RHD. - For details, refer to the International Code of Conduct for Private Security Providers, 9 November 2010 (icoc_english3.pdf)
	1- Team Leader	develop a resettlement-related Computerized Management Information System (CMIS) to manage the land acquisition and resettlement data
	2- Social Development Specialist	maintain records of consultations and register and address the grievances/complaints of the Project Displaced Persons (PDPs) Project Displaced Households (PDHs), and Project Displaced Entities (PDEs).
	3- Land Acquisition Specialist	Prepare a Monthly Progress Report (MPR) highlighting progress of RAP implementation, issues & constraints in RAP implementation, targets of resettlement activities for the next month, etc., Details are covered in standalone RAP for the project.

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a) Environmental Engineer/Specialist:

513. CSC's Environmental engineer/specialist shall be well-experienced and qualified. The qualifications and experience of the Environmental Engineer shall be as follows:

514. **Qualification and Experience:** Bachelor of Engineering in Civil Engineering or Environmental Engineering, with 10 years of experience in the same field, or Master of Science in Environmental discipline, with 15 years of experience. He/she should have experience with two (2) Environmental Impact Assessment studies for Highway projects and should know about Policy, Legal, and administrative frameworks of the Environment.

b) Environmental Health and Safety officer – Contractor

515. To ensure the effective implementation of the Environmental and Social Management Plan (ESMP) at construction sites, camps, borrow areas, or other contractor facilities, it is essential for the contractor to engage a full-time Environmental and Safety Engineer. The qualifications for this role are quite specific:

516. A Bachelor of Engineering in Civil Engineering or Environmental Engineering or a master's in environmental science.

- ▶ A minimum of 7 years of experience in the construction industry, with a preference for road construction projects.
- ▶ Candidates who possess a diploma in safety aspects from a recognized institute, in addition to their Master's degree, will receive additional preference.

517. This role is crucial for overseeing the implementation of site-specific mitigation and management measures, monitoring environmental quality, and ensuring compliance with all necessary environmental and safety regulations.

10.4.10 GRIEVANCE REDRESS MECHANISM (GRM)

518. The objective of the GRM is to resolve/redress complaints/grievances concerning any irregularities in the application of guidelines for assessment and mitigation of social and environmental risks and impacts. GRM saves the aggrieved party's from resorting to expensive and time consuming legal actions.

519. There are two separate GRM for resolving different grievances and complaints of Migrant laborers, contracted workers, woman workers, community workers, etc. through one Grievance Redress Committees (GRC) related to SEA/SH and another GRC related to labor, health and safety at Field Level. The later GRC will be concerned for promoting safety and health at work along with fair treatment, nondiscrimination and equal opportunity of project workers.

520. The Project GRM the established two-tier grievance redress mechanism (GRM). The PIU- RHD will establish two separate GRMs, such as GRCs, related to (i) Sexual Exploitation and Abuse/Sexual Harassment (SH) and (ii) Labor Health Safety.

10.4.10.1 GRC Related to GBV/SEA/SH

521. This project will require migrant laborers, contracted workers, woman workers, community workers, etc., through contract suppliers, for construction works. As a result, labor influx may be occurred in the project area. The contractor(s) will need to set up labor camps for the potential labor influx. In Bangladesh there are risks of sexual exploitation and abuse (SEA) and sexual harassment (SH) due to multiple reasons including misconduct of migrant workers and/or contractor's people (e.g., manifested through increased incidences of eve-teasing, illicit sex/rape), spread of STDs, mentality and mindset of patriarchal society. Thus, this project may aggravate the said status due to migrant labor influx to some extent. Women workers and women and adolescent girls in the adjacent communities may be exploited & abused and sexually harassed. These factors underscore the requirement of mitigation measures including establishment and effective functioning of GRC related to SEA/SH. Besides, Contractors will have a grievance mechanism to deal with GBV issues. In case of minor GBV (Eve Teasing, bad touch, etc.) the Contractor GRC will hear and resolve the issue. In case of Major GBV (Rape, Acid Throw, etc.), the Service Provider will facilitate the victim to bring her/him to One-stop Crisis Cell (OCC), Police Station, Hospital and report to the PIU immediately. Focal person of GRC related to GBV/SEA/SH will be assigned to assist & facilitate the GRM. Details are presented in the RAP, Phase-3. The GRC of SEA/SH has been presented in the following Table 10-18.

Table 10-18: GRC Members Related to SEA/SH

Sl. No.	GRC Composition at the Field Level	Members of the GRC
1.	Concern Project Manager (PM), WeCARE: Phase-3	Convener
2.	Resident Engineer of the construction supervision consultant	Member
3.	Gender and SEA/SH Specialist in the PIU	Member Secretary
4.	Project Manager of the contractor	Member
5.	Concern Deputy Project Manager, WeCARE: Phase-3	Member

522. The are scope of works and TOR for the GRC on SEA/SH accommodate grievance handling at both field and project levels. It is important to note that the grievance redress flowchart for SEA/SH related grievances presented in Figure 10-2 for the Bhomra-Sutkhira-Navarra Road Section Improvement Project outlines the integrated process for managing SEA/SH-related grievances the first tier at the local GRC at the field level and the second tier at the project level for SEA/SH issues.

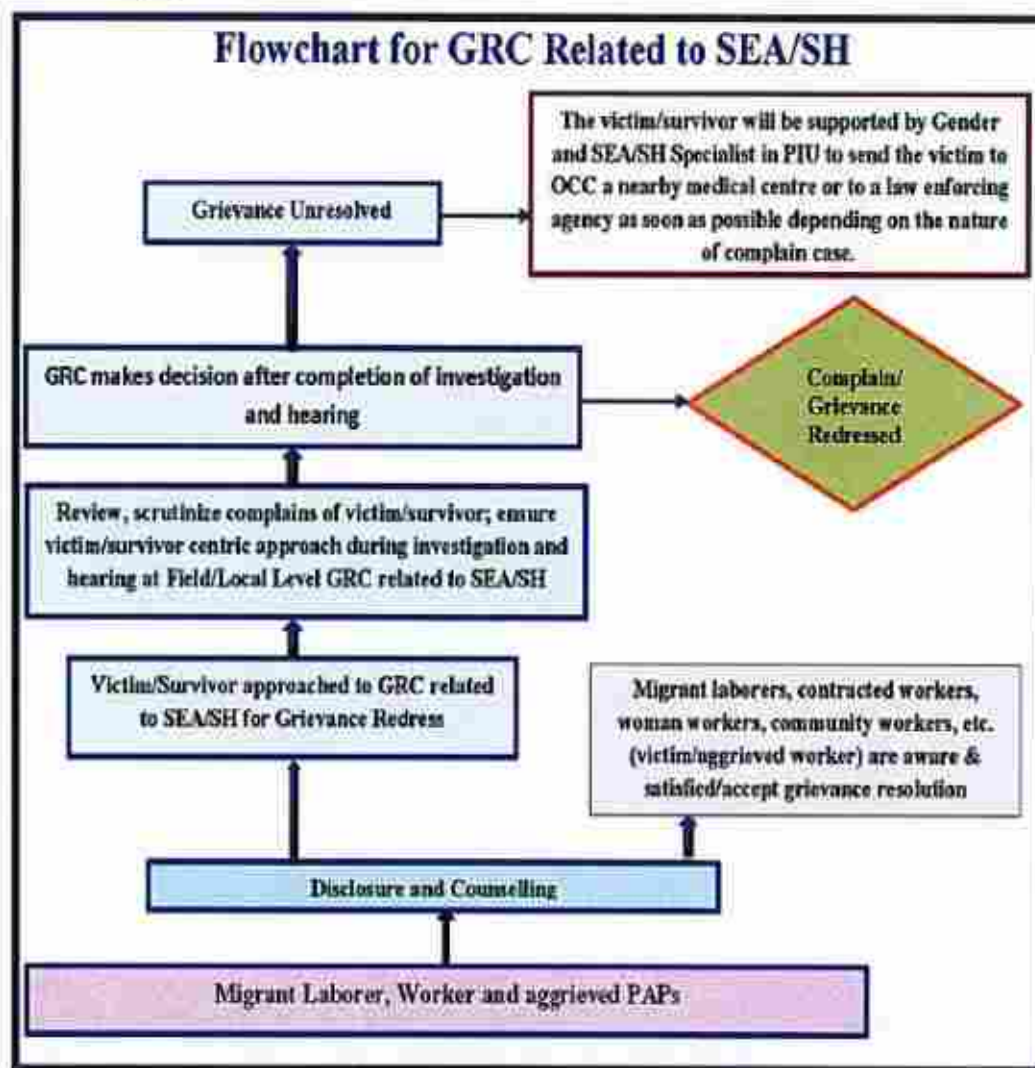


Figure 10-2: Grievance Redress Mechanism flowchart for SEA/SH related grievances for the project
Source: RAP for the Bhomra-Sutkhira-Navarra Road Section Improvement Project, WeCARE

523. The Scope of Work and the Terms of Reference (TOR) for the GRC Related to SEA/SH

- ▶ The GRC shall review, consider, and resolve grievances related to SEA/SH issues received from the various stakeholders of WeCARE, Phase-3, and ensure confidentiality
- ▶ Pay attention to the grievance of the victim
- ▶ Register his/her allegation
- ▶ Ensure the victim that GRC is the right place to get a remedy
- ▶ The GRC will attend cases where the perpetrator and the victim are associated with the project work. In other cases, they will be advised/assisted to complain to the competent authority concerned.

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- ▶ All complaints will be resolved following the “survivor-centric approach,” giving priority to the victim’s opinions
- ▶ The RHD/PIU will ensure strict confidentiality of the victim’s identity and related information
- ▶ The GRC/PIU will designate a SEA/SH focal person, and all related grievances will be received by him/her. The focal person will (i) verify and investigate the matter, (ii) provide support to the survivor, if necessary, by drawing support from external sources such as police, qualified NGOs for psycho-social counseling, specialized health experts/establishments for treatment of SEA/SH victims, etc. (iii) investigate the genuine of the allegation (iv) implement sanction to the perpetrator (v) And finally solve the matter
- ▶ GRC will monitor and evaluate the total scenario and report it to the PIU
- ▶ Steps to be followed
 - Allegations may be received from the survivor/Kin/others orally, over the phone, or in writing.
 - Follow the “survivor-centric approach,” giving priority to the opinions of the victims.
 - Maintain strict confidentiality of the identity and other related information of the victims
 - Register the allegation/case with detailed information
 - Ranking the case as major or minor
 - Depending on the case, send the victim to a local medical center or law enforcement agency promptly
 - Assistance should be reached by the victim/s within 24 hours
 - Decision should be taken up within 7 days, through an internal committee meeting
 - Collection of necessary evidence within 10 days
 - Legal assistance if required
 - Final settlement of the case within 15 days.

10.4.10.2 GRC Related to Labor Health Safety

524. Migrant workers, women workers, contracted workers, and community workers to be engaged through contract suppliers for civil construction works under the project. ESS2 on labor and working conditions requires the setting up of a complaints and grievance mechanism for project workers separate from the project wide-grievance redress mechanism (GRM). The ESMP summarizes potential risk of labor health and safety issues and corresponding mitigation measures. To ensure quality of implementation of mitigation measures through the project wide grievance redress mechanism related to labor health and safety also requires effective role of GRC related to labor health and safety. Members of GRC related to labor health and safety and objectives and scope of GRC related to labor health and safety are presented below Table 10-19.

Sl. No	GRC Composition at the Field Level	Members of the GRC
1	Concern Project Manager (PM), Bhomra-Satkhira-Navaron Road Section Project, Phase 3	Convener
2	Resident Engineer of construction supervision consultant	Member
3	Individual Labor Safety & Health Expert/nominated representative from RHD-PIU	Member
4	Project Manager of the construction contractor	Member
5	Concern Deputy Project Manager, WeCARE: Phase-I	Member Secretary

525. It is important to note that Section 6.1, Details of the Grievance Mechanism Structure, in the Stakeholder Engagement Plan (SEP) specifies that all gender-based violence (GBV)-related complaints will be handled in a survivor-centric manner. Such GBV-related complaints, grievances, or matters will be addressed with strict confidentiality and in accordance with the wishes of the survivor. In this context, it is appreciated that the SEA/SH and Labor Grievance Redress Committees (GRCs) accept anonymous grievances. Grievance Redress flowchart for health and safety related grievances for the project is given Figure 10-3.


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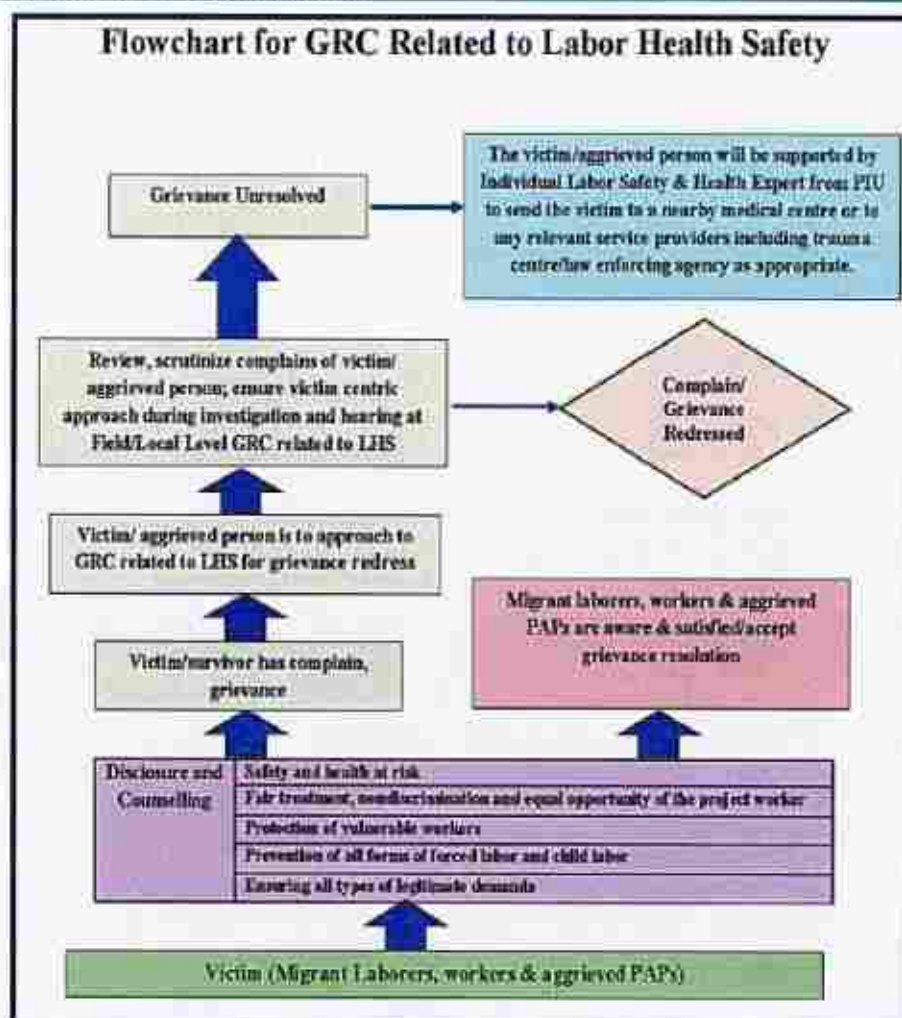


Figure 10-3: Grievance Redress flowchart for health and safety related grievances for the project

526. However, it is important to note that two separate GRCs—one for SEA/SH and another for Labor Health and Safety—have already been established through a gazette notification issued by the Ministry of Road Transport and Bridges. Although there is no explicit distinction in these two GRCs between the tiers, the roles and functions, effectively encompass both the field level and the project level without specific mentioning of the same. The composition of GRCs at RHD has two levels, such as field level and the project level as mentioned before. Members of Project Level GRC is presented in Table 10-20, and are expected to ensure that GBV and Labor Health and Safety related complaints and grievances will be addressed efficiently and sensitively across second tier.

Table 10-20: Members of the Project-Level GRC for GBV/SEA/SH and Labor Health and Safety

Sl. No.	GRC Composition at the Project Level for	Members of the GRC
1.	Additional Project Director (APD) of WeCARE, Phase-1	Convener
2.	Concern Project Manager (PM) of WeCARE, Phase-1	Member
3.	Individual Social Development and Public Relations Expert of the Project	Member
4.	Deputy Project Director (DPD) of WeCARE, Phase-1	Member Secretary

527. The GRM structure, including these two GRCs, established under WeCARE Phase 1, has been replicated in WeCARE Phase 3.

528. RHD is required to maintain and operate a Grievance Redress Mechanism (GRM) during the operation and maintenance phase of the road, but which will be implemented by mainstream of the RHD after completion of the project.

529. Contact information is not available. Presumably, contact information will be available after when WeCARE Phase 3 will be implemented.

10.5 REPORTING

530. The Contractor will submit the monthly progress report on ESMP implementation to CSC according to the checklist in Section 10.6.

531. The CSC will validate the report based on the observation/audit carried out by the Environmental Engineer/Specialist on the implementation of ESMP. The CSC will submit monthly progress reports and quarterly progress to the PIU. The PIU will regularly transmit the monthly progress report and quarterly progress report to the World Bank as stipulated in the Environmental and Social Commitment Plan (ESCP). Additionally, a quarterly report on monitoring the ESHS performance of the PIU will be submitted regularly to the WB by the PIU, as per the requirements of ESCP.

10.6 CAPACITY BUILDING

532. To strengthen the capacity of Staff, the following training of target groups such as PIU staff, stakeholders, community, project workers, consultants, contractors, and sub-contractors is suggested as per the Environmental and Social Commitment Plan (ESCP). The proposed capacity-building training of different target groups will be carried out by an Individual Consultant of PIU. The total training budgetary cost for capacity building for each contract has been worked out to be BDT 2, 50,000 in Table 10-21. The learning center of BUET may be considered for imparting these training.

Table 10-21: Training Schedule and Training Cost for 2 days

Target Group	Subject(s)	Method	Time Frame	Cost (BDT)
All concerned PIU /project staff (6 Numbers) in Dhaka	- Environmental and Social Standards Overview - Environmental regulations and national standards - Process of impact assessment and identification of mitigation measures - Importance of ESMP & its monitoring - Occupation Health and Safety (OHS) - Community Health and safety (CHS) - Road Safety and Traffic Management at the construction site	Lectures	Before the beginning of the implementation of the project	50,000
Project Workers, Environmental Engineers, field officers, contractors, Sub-contractors' stakeholders, community, supervision consultants (50 Number at Jashore/Jhenaidah)	- Basic features of an ESMP, planning, Implementation of ESMPs - Occupational Health and Safety (OHS) - Community Health and Safety (CHS) - designing and execution of social and environmental mitigation (SEA/SH, GBV, COC) - Road Safety and Traffic Management at the construction site - Enhancement measures - monitoring and evaluation of environmental conditions - during construction and operation	Workshops and Seminars	Before the construction	1,25,000
Project staff field officers, contractors, Sub-contractors' stakeholders, community, dealing in social/lands matters (30Number in Jashore/Jhenaidah)	Social awareness; Monitoring consultants/organizations, Land acquisition and compensation related Grievance Redressal Mechanism (GRM) and SEA/SH related GRM, Redressal Mechanism	Lectures, Workshops and Seminars	Before the implementation of R&R and LA	75,000
Total training budgetary cost for capacity building for each contract				2,50,000

10.7 CHECKLIST FOR MONITORING ESMP

533. To effectively implement ESMP provisions, checklists for different parameter monitoring and reporting formats for various activities (EC-1 to EC-9) and Environmental management formats (EMI through EM 13) are presented in Annex 7, Volume-II. These are summarized as follows:

- ▶ EC-1: pollution monitoring (construction)
- ▶ EC-2: arrangement of temporary land
- ▶ EC-3: establishment of hot mix plant /batching plant
- ▶ EC-4: safety (construction) checklist

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|---|---|
| <ul style="list-style-type: none"> ▶ EC-5: road safety ▶ EC-6: accident Reporting ▶ EC-7: details of machinery in operations ▶ EC-8: restoration of construction sites ▶ EC-9: format for register of sites opened and closed, and its reporting ▶ EM-1: Identification of dumping site locations ▶ EM-2: Identification of water storage location ▶ EM-3: setting up of the labour camp ▶ EM-4: topsoil and earthwork management ▶ EM-5: tree cutting /stump removal | <ul style="list-style-type: none"> ▶ EM-6: Borrow area identification ▶ EM-7: Aggregate quarry identification ▶ EM-8: setting up of the construction camp ▶ EM-9: Monitoring of Construction Camp ▶ EM-10: Monitoring of Labor Camp ▶ EM-11: Monitoring of Stone Crusher Management ▶ EM-12: Monitoring of Redevelopment of Borrow Area ▶ EM-13: Monitoring of Redevelopment of Disposal Site |
|---|---|

10.8 ENVIRONMENTAL AND SOCIAL MANAGEMENT COST

534. The budgetary cost estimates for the implementation of the construction and operation phase ESMP is presented in **Table 10-22**. The total budgetary cost of the Environmental Management Plan (EMP) is approximately BDT 138,155,675 (**One hundred thirty-eight million, one hundred fifty-five thousand, six hundred seventy-five BDT**). This includes environmental monitoring costs and tree and shrub plantations per the Greenbelt development plan. The estimates also include a 2-day training cost of BDT 250,000 (Two Hundred Fifty Thousand) per lot. This will be conducted before the project's implementation phase. The ESMP budgetary cost estimates in the construction phase are BDT

535. The estimated ESMP cost during the construction phase is of BDT 70,396,700 for Lot-1, 26,880 for Lot-2, 25,071,225 for Lot-3 and 15,807,250 for Lot-4. The operation phase ESMP budget estimate for the total road is BDT 6,760,000 (Six Million Seven Hundred Sixty Thousand).

536. It is recommended (if funds are available) that an extruded acrylic (1.17 – 1.19 g/cm³ of density) sheet, a noise barrier of 6mm thick) be provided on the loop, take-off, and landing sides of the Navaron junction to reduce the noise impact on the community nearby. This sheet should be fixed on both sides. This will attenuate the noise level by 20db (A). The cost is about 400 BDT per square foot. A 2m height for a total 5 km length (2.5km on each side) will cost approximately 40,000,000 (Forty million or Four crore Bangladeshi taka).


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10. Environmental and Social Management Plan

Table 10-22: Budgetary Cost Estimates for ESMP Provisions in BDT

Component	Items	Estimated Rate	Lot 1	Lot 2	Lot 3	Lot 4	Remarks
A) Preconstruction Phase							
Two (02) days Training in Dhaka/Jashore/Sakshira Budget for PIU staff Cost will be borne RHD for target group (Refer Table 10-17)							
	Lumpsum		250,000	250,000	250,000	250,000	RHD
B) Construction Phase ESMP Cost							
Environmental Health and Safety Training							
	Lumpsum		1,000,000	1,000,000	1,000,000	1,000,000	Obligatory requirement of contractor to implement ESMP
Monitoring of air, water, soil, and noise (Refer to Table 10-9)							
	Lumpsum		660,000	660,000	660,000	660,000	Project BOQ Cost
Provision of portable Environmental monitoring Equipment for ad hoc use by PIU and CSC staff							
	Refer Table 10-10		1,790,000	1,790,000	1,790,000	1,790,000	Obligatory requirement of contractor to implement ESMP
Dust Suppression at construction sites/stockyard/construction camps/hauls							
	Lumpsum		440,000	440,000	440,000	440,000	Obligatory requirement of contractor to implement ESMP
Plantation, including 6 years maintenance cost							
	Refer Table 10-16		309,000	326,400	313,800	312,000	Project BOQ Cost
Tree plantation, including 6 years of maintenance cost							
	Refer Table 10-16		1,680,000	2,520,000	1,680,000	1,680,000	Project BOQ Cost
Tree plantation, including 6 years of maintenance cost							
	Refer Table 10-16		660,000	594,000	297,000	297,000	Project BOQ Cost
Tree Plantation							
	Refer Table 10-16		66,000	26,400	11,220	11,220	Project BOQ Cost
Maintenance of trees and plantation for 2 years @ 10,000 per km per month							
	Refer Table 10-16		2,520,000	1,920,000	1,440,000	1,440,000	Will be done by the contractor through Khulna zone
Plantation of trees & including pit, watering, mulching fertilizer, planting the saplings and fencing							
	Refer Table 10-16		2,520,000	3,780,000	2,520,000	2,520,000	Included in Project cost (Forest Department's Social Forestry and Arboriculture Department of RHD will be involved in trees plantation scheme)
Demarcation of borrow area clearly, using fencing if needed							
	Lumpsum		5,00,000	500,000	500,000	500,000	
Traffic Management Plan including Pedestrian Crossing							
	Lumpsum		1,500,000	1,500,000	1,500,000	1,500,000	Obligatory requirement of contractor to implement ESMP
Provision of Hoarding/Posters at construction camps and provision of health checkup at construction sites							
	Lumpsum		800,000	800,000	800,000	800,000	

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10. Environmental and Social Management Plan

Table 10-22: Budgetary Cost Estimates for ESMP Provisions in BDT

Component	Items	Estimated Rate	Lot 1	Lot 2	Lot 3	Lot 4	Remarks
Construction Camps	Provision for PPEs, such as helmet, gumboos, jackets, goggles etc. to labors	Lumpsum	600,000	600,000	600,000	600,000	
	Sanitary Facilities	Lumpsum	1,500,000	1,500,000	1,500,000	1,500,000	Obligatory requirement of contractor to implement ESMP
	Waste Management	Lumpsum	1,000,000	1,000,000	1,000,000	1,000,000	Obligatory requirement of contractor to implement ESMP
Noise Barrier	Extruded acrylic (1.17 – 1.19 g/cm ³ of density) sheet, a noise barrier of 6mm thick) be provided on the loop, take-off, and landing sides of the Navarone junction to reduce the noise impact on the community nearby.	Refer Section 10-8	40,000,000				
	Total for construction phase for contractor		63,997,000	24,436,801	22,792,022	14,370,223	
	Contingency @ 10%		63,997,000	24,436,801	22,792,022	14,370,223	
Say	Total construction phase for contractor		70,396,700	26,880,481	25,071,224	15,807,345	The total construction phase ESMP budgetary cost estimate is BDT 138,155,675.
D) Tree plantation through the forest department under social forestry as per Section 10.3							
E) Operation Phase Cost of ESMP per Annum for 61.184 Km Road length							
Environmental Pollution Monitoring Refer to Table 10-11	Shrubs and Trees Maintenance of trees and shrubs, including trimming of shrubs, watering, and clearing of weeds @ BDT 10,000 per Km per month			660,000			
	Sanitation and sanitary facilities, including waste (liquid and solid) as per DoE requirement	LS		5,500,000			Operation and maintenance will be taken up Khulna zone through GoB funding.
	Operation Phase Cost of ESMP per Annum			6,160,000			

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11 CONCLUSIONS AND RECOMMENDATIONS

537. The Bhomra—Sathkira—Navaron road project is two-lane highway in the western part of the country and is proposed for development under Phase 3 of the WeCARE program. The road segment is regionally significant as it connects the Bhomra land port to the hinterland. Under the program, the existing two-lane highway will be upgraded to a safer, climate-resilient four-lane road.

538. The proposed development of this highway covers a total length of 61.184km, including a portion of Jashore-Benapole Highway (3.3 Km), Navaron-Bhomra (55.632 Km) and Bhomra Loop (2.58 Km). The designed speed has been proposed 80 km/h. The project road alignment will comprise Dual 2 lane with Service Road on both sides. Four flyover bridges, 09 Vehicular overpasses, 04 Bridges, and 118 culverts, one Railway overpass cum flyover, one Underpass, Service roads, drains, and three bypass or realignments. The project has been divided into four lots. The ESIA for the proposed project has been carried out through the following methodologies: screening of the significant environmental impacts, establishing baseline conditions, formulation of the mitigation measures against the negative impacts due to the proposed project intervention during, pre-construction, construction, and operational phases. The implementation of the project will have a potential impact on the environment, society, and economy in both positive and negative ways.

539. During the preconstruction Phase, the environmental quality will remain intact, as there will not be any physical activity, while land acquisition and resettlement issues have a significant impact on the social and human quality. About 907.60 acres of land will be acquired for the widening and strengthening of the proposed highway improvement. Among them, 635.64 acres are private land, 124.36 acres are RHD lands, and the rest are owned by other Government organizations. The total affected persons within RoW was 16,126. The maximum APs were identified in Lot 2 (4867), followed by Lot 1 (4711), Lot 4 (4480), and Lot 3 (2068) during the IOL survey. The affected THHs, THHs, and Encroached households were 2256, 575, and 725, respectively. Around 126 sensitive receptors are partially and fully affected. Of them, 42 mosques, 34 schools, madrasahs, and college, graveyards and 46 Eidgah, and 4 temples and mazars. In addition, other entities are 118. There are no indigenous people/ethnic groups in the project-affected area. To reduce these impacts, the mitigation measures are to implement the LAP and RAP of the Project following ARIPA, 2017, and the World Bank's ESS5. The DC will pay CCL to the PAPs to compensate the impact due to the loss of lands, structures, ponds, trees, standing crops, etc. The payment of compensation to Titled and Non-Titled households should be carried out according to the entitlement matrix defined in the RAP by the RAP Implementing Non-Government Organization (INGO) on behalf of RHD.

540. A total of 108,025 nos. of trees are going to be affected due to the project. This loss can be mitigated by planting tree saplings. It is proposed that a total of 56,387 trees, including shrubs (13,800 in Lot 1, 15,420 in Lot 2, 13,227 in Lot 3, and 13,840 in Lot 4) to be planted within the project site. Out of the total tree plantation, about 40% of the tree plantation will be undertaken by RHD through contractors in the project, and the remaining 60% of the trees will be planted through the Forest Department under the social forestry program and the Arboriculture Department of RHD. Replantation within ROW and on slopes of ramp and intersection, embankments, and other vacant lands, which will enhance the environmental condition of the area. It is noted that a total of 56,387 trees will be replanted at a 1:4.5 ratio of the cut-down roadside 12,565 trees. According to the RAP, in addition to the compensation for the affected private trees, an extra 10-12 saplings would be given to each affected titled and non-titled household at free cost as the resettlement benefits.

541. Based on the impact assessment, it is observed that the project has positive impacts mainly on commercial facilities, industrial activities, job opportunities, landscape and professional diversity, and some negative impacts mainly on noise, erosion and siltation, housing and commercial structures loss as well as community split.

542. No highly significant negative environmental impacts are expected during the construction period, except for the normal construction hazards. The major activities, which can be envisaged are material transportation, labor camps, construction yards, activities related to construction etc. The construction activities can be listed out as piling, cutting, and filling with material for the foundation, mainly for the bridges and culverts may generate loose mud and soil, which will increase the turbidity of the water body. Solid waste and effluents generated from the construction yards and labor camps may contribute to environmental degradation. Mitigation measures were defined that mainly focus on inspection of contractor work areas, their waste disposal sites, rehabilitation/re-vegetation, proper landscaping, re-establishment of local access, and debris clearance from reconstructed culverts. The impacts during construction can easily be mitigated by taking adequate advance precautions and some additional measures appropriate to the construction. An Environment and Social Management Plan has been formulated to

11. Conclusions And Recommendations

control/mitigate the negative impacts arising from construction-related activities. The impacts after construction of the project, unless regulatory measures are taken in time, will be uncontrolled settlement, environmental pollution from industries, and innumerable places of possible access to the road, leading to traffic congestion and hazards. It will, therefore, be desirable to institutionalize some form of effective control on the growth of settlements on the ROW land.

543. Environmental and climate change-related risk and disaster assessment has been conducted for the Project. It was found that all the measures needed to protect the bridge and approach road from the impact of Climate change and disasters have been incorporated in the design, hence the impact of the environmental risk and disasters was found to be low in nature.

544. Contractors will be directed to follow the ESMP, which will be part of the contractor's contract document. The PIU- RHD and Supervision consultants will check and ensure that ESMP is working well according to the plan. An institutional arrangement has to be ensured for conducting an effective and meaningful environmental and social monitoring. An ESMoP is prepared to monitor the contractors' activities in compliance with the ESMP. An Environmental and Resettlement Unit (ERU) instituted within PIU-RHD will be overall responsible for conducting environmental monitoring. A two-tier bottom-up joint GRC system will be established in this project for both social and environmental conflict mitigation.

545. Therefore, it can be concluded that the proposed Project is environmentally sound and sustainable and can be confirmed that the aggregate positive impacts outweigh the negative impacts due to the recommended mitigation measures.

546. Based on the findings of the ESIA, the following recommendations are made:

- The ESMP needed to be included in the Bidding Documents as environmental specifications and BoQ items in the Tender Document.
- The Contractor must comply with applicable national rules and legislation and World Bank' ESF safeguards through implementation of their Construction Environmental Social Management Plan in compliance of the Project's Safeguard requirements following the ESMP of the Project.

547. Tree plantation must be considered as the biological noise barriers and enhancement measures in addition to proposed roadside replantation. It is proposed that plant local, fast-growing trees to be planted instead of trees removed for the project road development, and a dense tree plantation along the school's boundary walls, which shall be undertaken to reduce the noise levels and enhance the affected school's landscape. A 30-meter-long dense vegetation can reduce noise by five decibels. An extruded acrylic (1.17 – 1.19 g/cm³ of density) sheet noise barrier of 6mm thick) to be provided on the loop, take-off, and landing sides of the Navaron junction to reduce the noise impact on the community nearby. This sheet should be fixed on both sides. This will attenuate the noise level by 20db (A).


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