Initial Environmental Examination

Project Number: 47243-005
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People's Republic of Bangladesh: Rural Connectivity Improvement Project-Additional Financing

Prepared by the Local Government Engineering Department, Ministry of Local Government for the Asian Development Bank (ADB).

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Executive Summary

A. Project Background

1. Bangladesh has a population of about 165 million (2018) and a land area of 147,610 square kilometers (km^2), is amongst the most densely populated countries in the world, and one of the most vulnerable in the world to climate risks. Two-thirds of the country is less than 5 meters above mean sea level and located in the world's largest tropical river deltas of the Ganges, Brahmaputra, and Meghna making it one of the most disaster-prone countries in the world with damages accounting for 1% of the gross domestic product annually. About 80% of the population live in rural areas with the agriculture sector contributing about 14% of the Bangladesh GDP in 2015 and comparable to the rest of South Asia and employs approximately 50% of the workforce. Agricultural development is critical to poverty reduction, as most of the poor in Bangladesh are in rural areas and depend on agriculture for their livelihood. The major challenges in agriculture in Bangladesh are the promotion of production technology, nutrition, value chains and maintaining food security. Insufficient rural transport, market infrastructure, and climate change impacts are significant constraints. Accordingly, the Seventh Five-Year Plan has put forward specific strategies to overcome the challenges and obstacles to agricultural development.

2. Road is the dominant mode of transportation in Bangladesh utilized by over 70% of passengers and 60% of freight traffic. Rural connectivity is a key component of rural development in Bangladesh. Rural roads contribute significantly to generating increased agricultural incomes and productive employment opportunities, alongside promoting access to economic and social services. Rural roads are the virtual lifelines for the vast multitude residing in rural areas. During the past decades, rural infrastructure in Bangladesh has significantly improved. Despite progress, rural connectivity in Bangladesh remains weak, impeding physical and economic access. About 40% of the rural population has access to all-weather roads. Only 28% of the roads are paved and in good or fair condition.

3. Under the Seventh Five-Year Plan will increase the percentage of "good and fair" conditioned rural roads in the country in a series of steps from 43% in 2016 to 80% in 2020. Aligned with this, the Asian Development Bank (ADB) approved $200 million for the Rural Connectivity Improvement Project (current project) on 5 November 2018.[1] The current project is currently upgrading about 1,700 km of 214 rural roads. Based on the satisfactory implementation progress of the current project, ADB is processing additional financing of $100 million to be provided in 2020. The proposed additional financing will upgrade an additional 930 km of 96 rural roads.

4. The roads will be improved to all-weather standards, serving the agriculture sector and 40.2 million people living in 16 districts located in five divisions. The project will support the government's agricultural strategy of increasing agricultural productivity, encouraging commercial agriculture and agribusiness development, increasing employment opportunities for rural poor people, and reducing the poverty level. All the roads have been selected from the rural road master plans through robust selection criteria, which include an objective assessment for prioritization. The selection criteria took into consideration the population size, each district's agricultural potential, the number of agricultural farms and commercial establishments, economic

[1] LGED has prepared $300 million project covering 310 roads, however, ADB only allocated $200 million to finance 214 roads (1,706.73 km) for the Rural Connectivity Improvement Project in 2018.

potential, access to education facilities, and flood-damaged roads, particularly those roads damaged in 2017.[2]

B. Characteristics of existing roads

5. In general, the project roads suffer from poor pavement conditions with many potholes, edge failures, and depressions. Several sections bounded by ponds on either both or one side has suffered from embankment side slope erosion. Several rain cuts and erosion have encroached the carriageway which needs urgent repair. Several drainage facilities are damaged, clogged or need cleaning, while other roads require additional balancing culverts to allow floodwaters to cross the road without causing damage. Roadside drains, particularly in urban stretches and bazaars are mostly choked with rubbish and silt which renders them non-functional. Overtopping of roads is not common, but waterlogging is very common particularly in built-up areas. Most of the roads have inadequate road safety provisions. Horizontal and vertical profiles are incoherent to applicable code provisions. The horizontal curve is mostly insufficient in built-up areas.

6. Existing roads have varying width and road conditions. Right-of-way is generally 20 m in most cases with reduced width in settlements varying from 3 to 4 m. Major part is 1-lane with or without the earthen shoulder. Riding condition is mostly poor to fair. Roadside drains are present in some urban stretches but mostly choked and non-functional. Overtopping of roads is not observed in general, but waterlogging is very common in built-up areas. Waterways are being crossed in most of the hilly roads.

C. Rural Connectivity Improvement Project

7. The additional financing builds on the experiences and successes of RCIP and other ADB-supported rural road programs in Nepal, India, and Sri Lanka particularly on: (i) strengthening institutional capacity, (ii) designing rural roads to all-weather standards with safety features and made climate-resilient, and (iii) improving road maintenance. Local Government Engineering Department (LGED) owns, improves, and maintains all rural roads of Bangladesh. The Ministry of Local Government, Rural Development and Co-operatives (MOLGRDC) through LGED will be the executing agency. A Dhaka-based project management unit established within LGED will support the implementation of the project. Five project implementation units will be established in Faridpur Cumilla, Jashore Rajshahi and Rangpur. Each PIU will be headed by a Deputy Project Director and will be responsible for the day-to-day management of the civil works contracts including environmental safeguards compliance while the 16 District Offices will be given the additional responsibility of implementing the environmental management plan and environmental monitoring plan through the District Environmental Specialist.

8. Under the proposed additional financing, key rural roads will be upgraded to all-weather, improve road safety, and enhance climate resilience. All upgrading works will be confined within the existing alignment and minimize if not avoiding land acquisition. Key improvement features include: i) upgrading of pavement from water-bound macadam (WBM) to a stronger and durable wet mix macadam (WMM) albeit at a higher cost; (ii) reconstruction of mostly earthen to hard shoulders on both sides of the road with minimum width of 1 m; (iii) crest width will be maintained at least 7.5 m and carriage width of 5.5 m; (iv) repair and upgrade protection works to include embankment toe protection, palisade, and palliwall or the installation of reinforced cement concrete (RCC) blocks; (v) structure improvement in terms of drainages structures such as box

[2] In 2017, successive heavy rains triggered flashfloods and damaged about 7,000 kilometers of rural roads.

culverts, and U-drains; and (vi) side slope will be 1.5:1 will be maintained with the option of bio-engineering to protect against erosion.

9. The additional financing will adopt key climate resilience road designs developed under the ADB's Bangladesh: Coastal Climate-Resilient Infrastructure Project[3]. This project is currently being implemented under the Government of Bangladesh's Strategic Program for Climate Resilience (SPCR), prepared under the Pilot Program for Climate Resilience (PPCR). The PPCR is a part of the Strategic Climate Fund (SCF) within the Climate Investment Funds (CIF), to pilot and demonstrate ways to mainstream climate resilience in development planning and management. This project, among others, attempts to mainstream climate resilient rural road connectivity in selected coastal areas of the country.

10. The fact-finding mission for the additional financing was held on 18–25 November 2019. The government and the Mission agreed on actions to be taken to mobilize the loan by June 2020.

D. Policy and Legal Framework

11. The Government of Bangladesh has various laws and regulations for the protection and conservation of the natural environment as it pertains to road development. However, a limited environmental laws and regulations are explicitly applicable to rural roads upgrading where the existing roads are outside environmentally protected areas including forest lands, construction activities are confined within the existing formation width and existing alignment, and with no or minor land acquisition limited only on curves and junctions to comply with road safety standards which characterizes the proposed roads under the additional financing. In addition to the clearances are permissions that includes the environmental clearance certificate (ECC) and site clearance certificate (SCC) and contractors are required to secure Consent to establish (CFE) and Consent to Operate (CFO) for all mix and batching plants, LGED will implement good environmental practices in constructing and upgrading rural roads first developed by the World Bank and emphasized in the environmental management and monitoring plans.

E. Environmental baseline

12. The project area under the additional financing is divided into administrative 5 divisions, and further into 16 districts. A total of 61 Upazilas will benefit from the 96 rural roads. The entire country is divided into 6 climatic regions based on average summer temperatures and annual rainfall, these are southeastern, northeastern, northern part of the northern region, northwestern, western, southwestern, and south-central. In general, rainfall increases from west to east and temperature from north to south. Higher temperatures and rainfall are observed in the southeastern region, while the western and southwestern region has higher temperatures and less rain. Rainfall varies from 1,598 mm in the west to 4,197 millimeters (mm) in the east with a rainfall gradient of about 7 mm/km. The average temperature ranges from 17°C to 20.6°C during winter which at times reduces to 7°C in some places and 26.9°C to 31.1°C during summer and in the northwest region reaches more than 45°C. The northwest region experiences the two extremities that are in clear contrast with the climatic conditions of the rest of the country. The average relative humidity for the whole year ranges from 78.1% to 70.5%, with maximum records occurring in September and minimum in March.

13. Bangladesh has two dominant land features; a vast expanse of deltaic plain produced by the world's largest rivers, and a small hilly region located on Chattogram and Cox's Bazar where swift rivers emanate. The total land area is 147,610 km^2 confined along a latitude of 820 km and

[3] ADB. Bangladesh: Coastal Climate-Resilient Infrastructure Project.

at its widest is 600 km. India bounds it on its west, north, and northeast and Myanmar on the southeast. The southern portion is the Bay Bengal and along its coast is a dynamic delta dissected by numerous rivers. Most of the country's territory is below 10 m above mean sea level except for the southeastern border districts of Khagrachhan, Rangamati, Bandarban, and sections of Chattogram and Cox's Bazaar; and the northwestern districts of Thakurgaon and Panchgarh. Bangladesh has virtually no stone to be utilized as aggregate or building materials. It does, however, have a plentiful supply of clay, leading to the making of bricks. Soils and clays are extracted through strip-mining and fired to make bricks in relatively small brickfields found throughout the study area. In broad terms, alluvium accounts for 77.2% of the country's total area and comprised mostly of alluvial silt and clay, alluvial silt, deltaic silt, March clay and peat, and young gravelly sand which formed during the Holocene or Recent period.

14. The country has a long history of earthquakes, and few were considered catastrophic, notably, events that occurred in 1762, 1782, 1897, and 1950. The project area lies within an active seismic zone and is mostly classified as medium risk except around Kurigram, which is classified as high risk. Bangladesh is in a low-lying delta, formed a dense network of the distributaries Ganges, Brahmaputra, and Meghna rivers and between the Himalayas and the Bay of Bengal. There are more than 230 major rivers and their tributaries and with 75% of the country, less than 10 m above mean sea level, 80% of the total land area is considered as flood plain. Flooding usually occurs during the monsoon season from June to September. Every year, nearly 26,000 km^2 or around 18% of the country is flooded. Floods have caused devastation and misery in Bangladesh throughout its history. Seasonal storms, popularly known as nor'westers *(Kalbaishakhi)* occur in the project area. Tornadoes can be associated with severe nor'westers. The frequency of nor'westers is highest in April and they most often occur in late afternoons. The majority of the cyclones follow the northeasterly directions confined between Khulna and Cox's Bazar.

15. The air quality monitoring conducted by LGED indicated that the average PM 2.5 concentration along 96 roads is 94 ug/m^3 with a minimum and maximum concentrations of 53 ug/m^3 and 197 ug/m^3 respectively. According to the USEPA air quality index (AQI),[4] and average of 94ug/m^3 is categorized unhealthy air quality, and the people with respiratory or heart disease, the elderly and children are the groups most at risk. Average noise level of 49 dB(A) across the selected project roads were noted with maximum and minimum observations at 66 and 32 dB(A), respectively. Around 230 rivers flow through the country including 53 international rivers. Rivers in the urban areas are rapidly deteriorating which includes: Buriganga, Karnaphully, Sangu, Bhairab, Pashur, Rupsha, Nabaganga, Mathavanga, Moyur, Kopotakkya, Shitalakkya, Turag, Baloo, Bongshee, Kaleeganga, Meghna, Brahmaputra, Jamuna, Dhaleshwaree, Tista, Padma, Karatoa, Kushiyara, Kirtankhola. in 1993 the Department of Public Health Engineering (DPHE) first detected arsenic in hand tube wells (HTW's) which has become one of the most pressing environmental issues in Bangladesh. The levels of arsenic in groundwater in Bangladesh are some of the highest in the world. At present, the occurrence of arsenic in drinking water has been identified in 272 Upazilas under 61 districts of the country (DPHE, 2009).

16. Bangladesh has an extensive network of environmentally protected areas; however, none of the project rural roads are in or near any of these areas.

17. The 16 project districts cover almost one-fourth of the land area of Bangladesh. In terms of population, the 16 districts represent more 28% of the total population of the country. The 2011 Census shows that 66% of households (HH) in the project area comprise four or more family

[4] Air Quality Index Calculator.

members. The majority of the population (over 65%) lives in kutcha houses which have walls of organic materials such as sticks, jute, straw, and earth while 10% live in pucka houses. Just over 36 % of total populations in the 16 districts are children ages up to 14 years and 58% are of working age. The literacy rate for the population of 7 years and above in the project area is 52.28 % which is slightly higher than the national literacy rate of 51.7 %. More than 15% of the population is extremely poor and additional 35% is under the upper poverty line. The 2011 census shows that less than 6% of the populations in the project area have reticulated tap water compared with over 10% for Bangladesh. More than 91% of the populations in the project area depend on tube well for water and 4% are reliant on other sources.

18. Most agricultural land in the project area tends to be intensively used with double or triple cropping patterns being common with rice as the main crop. Jute, maize, wheat, potatoes, and various vegetables are also grown depending on season and location.

F. Initial environmental examination

19. The additional financing will scale up the project's scope by upgrading an additional 96 rural roads (930 km) under the same implementation arrangements as for the current project. Impacts from all 96 roads were previously screened and assessed during the project preparation, using an environmental checklist adapted to local conditions and road designs. This initial environmental examination report for the additional financing is prepared based on these 96 individual rapid environmental transects, which were part of and detailed project reports for each road together with other secondary data.

20. The civil work components that are anticipated to have a potential substantial impact on the environment include road alignment and design, utility shifting, construction mobilization, and tree cutting and clearing during the pre-construction phase of the rural road upgrading. Most of the adverse impacts are anticipated to occur during construction phase that includes: road construction (earthworks, earth filling, sub-grade, aggregate sand sub-base; brick aggregates for base course; earthen shoulder construction in layers and converted to hard shoulder; bitumen surfacing), quarries and borrow area site management, construction plants operation for WMM mix and cement batching plants, site-restoration. Minimal environmental impacts are anticipated during the operation phase which involves road maintenance and vegetation control.

21. Mitigation measures were identified to reduce the adverse impacts including residual effects. During the pre-construction phase, potential adverse environmental impacts are related to road upgrading design to retain the original geometric shape, upgrading of the shoulders from soft to a paved surface, repair and strengthening of embankment slope and toe against erosion, and enhance road safety during the operation phase. Adverse environmental impacts are limited to the potential loss of trees that have encroached on the road embankment and increase risks of road crashes from inadequate road design and localized flooding from inadequate drainage design. During construction, major potential negative impacts from the project include the loss of productive soil from new borrow areas. Medium potential impacts from increase dust emissions, generation of noise, risks of accident from improper management of borrow areas, and inadequate clean-up operation, restoration and rehabilitation prior to decommissioning.

22. Between 2020–2040, almost coinciding with the project life, there is a predicted change in temperature anomaly (the difference between the average baseline and predicted value) in Bangladesh ranging from 0.68-1.8^{o}C based on General Circulation Model ensemble average of the low (10%) and high (90%), RCP 2.6 scenario. There is an increasing maximum temperature trend, departing from the historical average between 1.4^{o}C to 2.3^{o}C with the higher temperature occurring in the northwestern divisions of Rangpur, Rajshahi, and parts of Dhaka. The average

monthly rainfall is expected to increase by 67.8 mm with the models estimating departure from the historical average between 75-225 mm per year. Similarly, the predicted future rainfall is expected to maintain an increasing trend. The extreme northern sections of the Rangpur, Dhaka, and southern tip of the Chattogram Divisions are expected to experience the biggest change in rainfall distribution ranging from 350-400 mm annually. The implications of the projected increase in rainfall coupled with the existing natural hazards in the project divisions increase the vulnerability of the project roads to climate change variability and extremes. The most dominant natural hazards to the roads that can be exacerbated by climate change are flooding and storm surge. Of the 16 project districts, 9 districts are prone to flood with 25 -year return period with a depth of at least 1.8 m. One of the expected impacts of climate change is the increase in frequency and prolonged submergence of paved rural roads due to the increase in rainfall and flood inundation. Studies show that inundation for 45-days, the unit weight reduces by 4.6, 5.8 and 10.6 percent for compaction efforts of 56, 35 and 10 blows, respectively and CBR reductions of 16.7, 29.6 and 37.5 percent, respectively. For surface layer, stability and flow of flexible pavement are affected by the duration of inundation by water. The inundation for 30 days causes the flow value to increase by about 93 percent and stability reduces by 26 percent. The figures also imply that the longer the period of flooding, the more severe will be the deterioration although the rate of destruction may decrease. To address these risks from climate change, LGED adopted a wet mix macadam pavement construction as opposed to the traditional water-bound macadam (WBM), in addition to the climate-resilient rural road design observed in the project.

G. Consultations, Public Consultations and Disclosure

23. The public consultations were carried out between November 2017 to February 2018 as part of the field works and detailed project report (DPR) preparation for the overall project. The principal consultation method used is the transect walk. A transect walk requires both LGED District Engineers and stakeholders to “walk” or survey the entire stretch and identify issues pertaining to availability of land to accommodate needed engineering, road safety, and climate resilience measures; key sensitive resources like trees, utilities, physical cultural resources; road hazards; and other community requirements that should be considered by the project. It facilitates timely consultation that is early enough to influence the design, provides a venue to have a common understanding of the project, voluntary participation is promoted, and inclusive in terms of gender and vulnerable members of the community. There were 3,015 stakeholders who participated in the transect walks covering the 96 rural roads, and organized mainly by the district engineers through the Union Parishad representatives, community officers and the consultants during project preparation. Of the total number of participants, 924 were female comprising 24.30%. Inside habitation areas and in village sections where the road is narrow, the road width has been constricted to avoid damage to structures. Following impacts could also occur during civil works period which will cause public nuisance and were all addressed on the detailed project reports: temporary loss of access/disruption of traffic; shifting of utility supply lines causing disruption to the supply; damage to irrigation channels that have been placed across some of the selected roads; dust, noise and vibration impacts will be felt by the people living near road sections during construction works; high vibration levels may damage structures close to the road edge. The civil contracts should include appropriate measures to avoid/ manage the issues of dust, noise. Care should be taken to avoid any accidental damages to common properties such as Shrines, wells, water pipes, stand posts located close to the roads. An Environmental Specialist (ADB staff consultant) conducted a follow-up field visit to two districts in February 2020, during which discussions were also held with district officials and contractors.

24. Information was disclosed through a public consultation and more formally by making documents and other materials available in a form and at a location in which they can be easily

accessed by stakeholders. This involved making a summary of draft reports available (in the local language) at public locations/upazillas/unions and providing a mechanism for the receipt of comments and making documents available more widely. In this regard, ADB encourages LGED to disclose all documents onto their own website. This updated IEE report will be disclosed on the ADB's and LGED's websites and made available to the interested parties upon request.

25. The environmental management plan (EMP) contains the agreement between LGED and ADB detailing the implementation of mitigation measures, monitoring program, cost estimates, and institutional arrangement to ensure that no significant adverse impacts resulting from the project intervention. The total environmental management plan implementation of the additional financing is estimated at $0.59 million or 0.4% of the total civil works cost. The EMP costs, which includes environmental monitoring, is comprised of the following bill of quantities items: (i) providing and maintaining adequate potable water supply (Water Supply Tube well 01 No. each subproject) at locality to the entire satisfaction of the E-I-C; (ii) Sanitation Toilet 02 Nos.(01 for man and 01 for woman) each subproject; (iii) Dust Suppression measures (excluding watering for compaction) to the entire satisfaction of the E-I-C; (iv) Environmental Monitoring (a) Air quality, (b) Noise level, (c) Water quality, (d) Sediment at work site to the entire satisfaction of the E-I-C; (v) Prevention of spillage, leakage of polluting materials to the entire satisfaction of the E-I-C; and (vi) maintaining first aid box at site to the entire satisfaction of the E-I-C. Road-wise and package-wise EMP costs were prepared as part of the bid documents. The Local Government Engineering Department (LGED) in the Local Government Division of the Ministry of Local Government, Rural Development and Co-operatives (MOLGRDC) will be the executing agency and is responsible for the overall compliance to the ADB Safeguard Policy Statement, 2009 (SPS) environmental requirements; Government of Bangladesh environmental laws, regulations, and standards; and the EMP. A project management unit (PMU) will be organized supported by Division Environmental Specialists (DES)**,** and the contractor environment focal person (EFP).

H. Grievance Redress Mechanism

26. A three-level grievance redress mechanism will be instituted by LGED immediately. The first level and most accessible and immediate contact for the fastest resolve of grievances are the contractors, and design and supervision consultants on site. Prior to the construction of any works, the DES, District Engineers, and Contractor- EFP will ensure local community meetings are held to notify residents and businesses of any temporary disturbances and to inform them of the Project including all Union Parishads. The second level will be headed by the Executive Engineer-project implementation unit (PIU) respectively, and the third is by the Project Director-PMU. All grievances will be documented, and resolutions are time bound.

I. Conclusion

27. The findings of IEE roads indicate that impacts are mostly similar to the current project, and subprojects are unlikely to cause any significant environmental impacts. While some of the impacts are negative there are likely to occur during the construction stage, are temporary in nature, and can be mitigated with minor to negligible residual impacts. The additional project received immense support from local people, as they perceive that this project will improve the overall connectivity and bring various economic opportunities to the people of the project area. All 96 roads included under the additional financing were selected based, among others ecological and vulnerability to climate changes more particularly to floods and storm surge. Several rural roads under the LGED's authority were damaged by the 2017 floods and needs immediate attention beyond the regular road maintenance but to incorporate climate resilience design and practices. Accordingly, none of the roads passes through protected areas or encroaches precious

ecology (sensitive or protected areas) or any historical or archeologically protected areas. As per selection guidelines, none of the selected roads passes through reserved forests either. Few trees cutting though may be involved.

28. Of the total 96 roads under the additional financing, 72 were found to have sustained flood-damage. One road, which is already the part of current project was subject to cyclone-induced surge. Adequate engineering measures like cross drainage structures, slope stabilization, embankment toe protection, improved pavement, are proposed to make the roads more climate-resilient and enable to retain function during and after flood events. Three roads received further strengthening through pavement upgrade since these connect to cyclone-centers which are considered critical facilities in the event of natural calamities. All the 96 roads are aligned with existing rural roads. As such, land acquisition is nil or very minimal which is also acquired through donations from villagers.

29. Considering insignificant environmental sensitivity, the project is categorized as category B as per ADB SPS.

30. The impacts identified are mostly related to alignment selection, land clearing, borrowing earth, and cutting of avenue trees, shifting of utilities and community structures, the establishment of construction camp or material storage areas, transportation of material and operation of WMM plant. All identified impacts are either eliminated or minimized through design consideration and suitable mitigative measures. Environmental Management plan covering all stages of road construction (design, construction and operation) is prepared with defined responsibility for its implementation. The Environmental Monitoring Plan (EMoP) is also prepared to ensure the effective implementation of EMPs. LGED has defined institutional setup including specified responsibility for environmental management. The existing capacity of the LGED and PMU for implementing environmental safeguard issues needs substantial strengthening. An Environmental Specialist will be placed at the PMU and Division levels as part of the project implementation support consultant to provide the required expertise.

31. The IEE also indicates that rural road construction works do not warrant further environmental impact assistant (EIA) study for subsequent rural road construction works.

J. Key Recommendations

32. Any significant changes or any major additional work other than the proposed project activities will require preparation of another environmental assessment. This further assessment will have to be submitted to LGED, Concerned Government authorities (DoE) and ADB for concurrence before civil works commence.

33. The implementation of prescribed mitigation measures will minimize/avoid adverse impacts. Moreover, the impacts shall be monitored continually by implementing and updating the EMP and EMoP. Subproject specific EMP shall be improved as per the final provisions made under detailed project reports (DPRs). The updated EMP if there is any change shall also be sent to ADB for information.

34. The executing agency shall ensure that EMP and EMoP are included in the Bill of Quantity and forms part of the bid document and civil works contract. The contractor will specify the quantity and budget for various activities like rehabilitation of borrow earth pits, first aid and sanitation facilities at construction camp and temporary office/material storage place. The same shall be revised if necessary, during project implementation or if there is any change in the project design. Any such modification shall be reported to ADB as well.

I. INTRODUCTION

A. Project Background

1. Bangladesh has a population of about 165 million (2018) and a land area of 147,610 square kilometers, is amongst the most densely populated countries in the world, and also one of the most vulnerable in the world to climate risks. Two-thirds of the country is less than 5 meters above mean sea level and located in the world's largest tropical river deltas of the Ganges, Brahmaputra, and Meghna making it one of the most disaster-prone countries in the world with damages accounting for 1% of the GNP annually. Despite this, the economy is growing steadily at an average rate exceeding 6% since 2015 and is expected to continue at a slightly faster rate of 6.7% annually until 2020.

2. About 80% of the population live in rural areas with the agriculture sector contributing about 15.5 % of the Bangladesh GDP in 2015 and comparable to the rest of South Asia and employs approximately 50% of the workforce. Agricultural development is critical to poverty reduction, as most of the poor in Bangladesh are in rural areas and depend on agriculture for their livelihood. The country has achieved near self-sufficiency in rice production achieving a growth rate of 3.2% per year, which is well above the population growth. Agriculture development is necessary to reduce heavy reliance on imported food and other agricultural products, which absorb 29% of export earnings. The 7th Five-Year Plan (FYP) focuses on maintaining the self-sufficiency in cereal production and aiming to have crop diversification, increased productivity, and promoting agro-processing to increase rural income and economic development. The major challenges in agriculture in Bangladesh are the promotion of production technology, nutrition, value chains and maintaining food security. Insufficient rural transport, market infrastructure, and climate change impacts are significant constraints. Accordingly, the Seventh Five-Year Plan has put forward specific strategies to overcome the challenges and obstacles to agricultural development.

3. The road is the dominant mode of transportation in Bangladesh utilized by over 70% of passengers and 60% of freight traffic. Roads are classified according to government agency ownership: (i) highways, and district roads owned and maintained by Roads and Highways Department (RHD); and ii) rural roads owned and maintained by the Local Government Engineering Department (LGED). The total road network of Bangladesh covers 374,245 km, of which 352,943 km (94%) are rural roads.

4. Rural connectivity is a key component of rural development in Bangladesh. Rural roads contribute significantly to generating increased agricultural incomes and productive employment opportunities, alongside promoting access to economic and social services. Rural roads are the virtual lifelines for the vast multitude residing in rural areas. Bangladesh has a large network of rural roads, many of these roads were constructed between 1990–2010 on earthen embankments owned by Union Parishads or Zila Parishads and they are vital to the agricultural sector. Since 1995, the government, with the support of the international development community, has continued to expand and improve the rural roads network. During the past decades, rural infrastructure in Bangladesh has significantly improved. Despite progress, rural connectivity in Bangladesh remains weak, impeding physical and economic access. About 40% of the rural population has got access to all-weather roads. Only 28% of the roads are paved and in good or fair condition.

B. Rural Connectivity Improvement Project

5. The Seventh Five Year Plan strives to increase the percentage of "good and fair" conditioned rural roads in the country in a series of steps from 43% in 2016 to 80% in 2020. Aligned with this, the proposed additional financing will upgrade an additional 930 km of rural roads. Under additional financing, 96 rural roads will be improved to all-weather standards, serving the agriculture sector and 40.2 million rural people living in 16 districts located in five divisions. The additional financing will support the government's agricultural strategy of increasing agricultural productivity, encouraging commercial agriculture and agribusiness development, increasing employment opportunities for rural poor people, and reducing the poverty level. All the 96 rural roads have been selected from the rural road master plans through robust selection criteria which include an objective assessment for prioritization. The selection criteria took into consideration the population size, each district's agricultural potential, the number of agricultural farms and commercial establishments, economic potential, access to education facilities, and flood-damaged roads, particularly those roads damaged in 2017.[5]

6. The additional financing builds on the experiences and successes of the current project, and ADB-supported rural road programs in Nepal, India, and Sri Lanka particularly on: (i) strengthening institutional capacity, (ii) designing rural roads to all-weather standards with safety features and made climate-resilient, and (iii) improving road maintenance. LGED owns, improves, and maintains all rural roads of Bangladesh. However, many of the roads in the rural road network, though paved, are in poor condition, with some impassable during the rainy season. To address this issue, the project roads will be improved to all-weather standards and made climate resilient. This will significantly improve the maintainability of the rural road network. In addition, civil work contracts for the project roads will include post-completion maintenance for 5 years. It aims to assess the efficacy of adapting long-term maintenance by the private sector in Bangladesh and encourage its use where appropriate. The possible benefits include better quality assurance and greater efficiency, which can further enable the prioritization of budget allocation for rural road maintenance.

C. Rural Road Construction Proposal

7. LGED will be the executing agency. A Dhaka-based project management unit established within LGED will support the implementation of the project. Five project implementation units will be established in Faridpur, Cumilla, Jashore, Rajshahi, and Rangpur. Each PIU will be headed by a Deputy Project Director and will be responsible for the day-to-day management of the civil works contracts including environmental safeguards compliance while the thirty-four (34) District Offices will be given the additional responsibility of implementing the environmental management plan and environmental monitoring plan through the District Environmental Specialist (DES).

8. Under the proposed additional financing, key rural roads will be upgraded to all-weather, improve road safety, and enhance climate resilience. All upgrading works will be confined within the existing alignment and minimize if not totally avoiding land acquisition. Key improvement features include: (i) upgrading of pavement from water-bound macadam (WBM) to a more stronger and durable wet mix macadam (WMM) albeit at a higher cost; (ii) reconstruction of mostly earthen to hard shoulders on both sides of the road with minimum width of 1 m; (iii) crest width will be maintained at least 7.5 m and carriage width of 5.5 meters; (iv) repair and upgrade protection works to include embankment toe protection, palisade, and palliwall or the installation of reinforced cement concrete (RCC) blocks; (v) structure improvement in terms of drainages

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structures such as box culverts, and U-drains; and vi) side slope will be 1.5:1 will be maintained with the option of bio-engineering to protect against erosion.

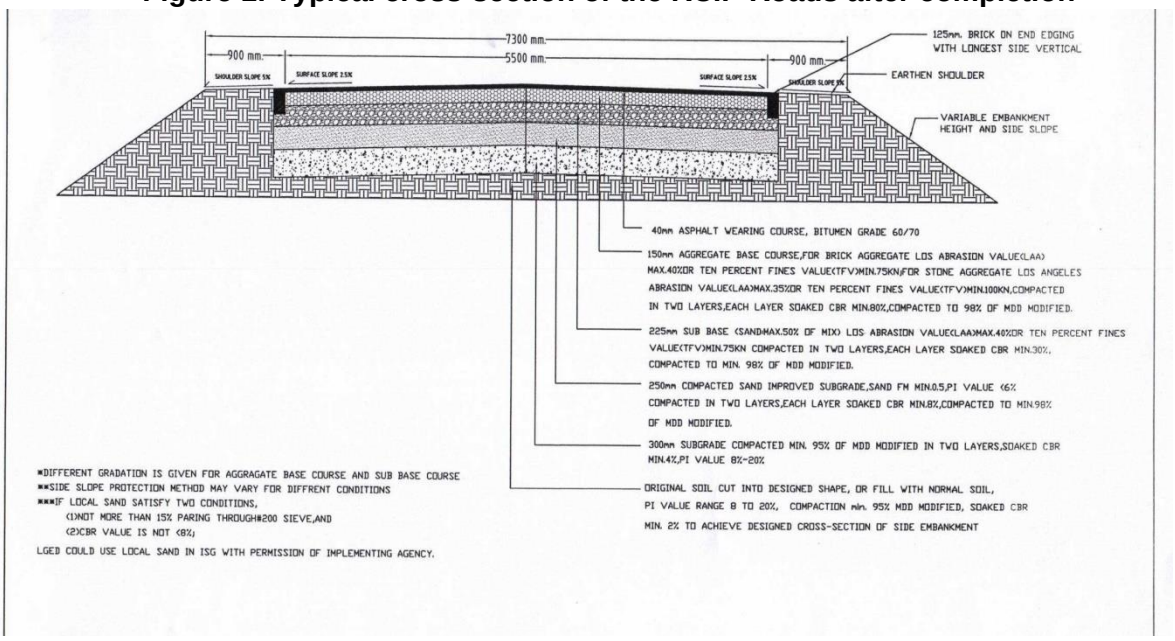
9. The current project has adopted key climate resilience road designs developed under the ADB's Bangladesh: Coastal Climate-Resilient Infrastructure Project.[6] This project is currently being implemented under the Government of Bangladesh's Strategic Program for Climate Resilience (SPCR), prepared under the Pilot Program for Climate Resilience (PPCR). The PPCR is a part of the Strategic Climate Fund (SCF) within the Climate Investment Funds (CIF), to pilot and demonstrate ways to mainstream climate resilience in development planning and management. This project, among others, attempts to mainstream climate resilient rural road connectivity in selected coastal areas of the country.

10. The proposed road upgrading activities included planning, construction, and maintenance. Planning includes level survey, soils, and materials survey, specification for coarse and fine aggregates, traffic survey, hydrologic survey, prescribed geometric standards, required construction equipment. Construction activities include preparation of earthwork, earth filling, sub- and base preparation, earthen shoulder construction and surfacing. During road maintenance, the activities include routine maintenance of sealed road pavement, footpaths, curbs and channels, storm drainage, and pavement markings. Associated facilities are limited to borrow area and WMM mix plants. No new borrow area will be established by the project and will only source materials from permitted operators. Most of the WMM mix plants will be operated by the contractors, however, if they elect to use third-party suppliers, the operator will show proof of compliance to environmental and local government regulations. Figure 1 presents the typical road cross-section after upgrading works.

11. The fact-finding mission for the additional financing was fielded on 18-25 November 2019. The government and the Mission agreed on actions to be taken with an aim to mobilize the additional financing of $100 million by June 2020.

[6] ADB. Bangladesh: Coastal Climate-Resilient Infrastructure Project.

Figure 1: Typical cross-section of the RCIP Roads after completion



D. Initial Environmental Examination Objectives

12. The additional financing is classified as environment category 'B' in accordance with ADB's SPS warranting the conduct of an initial environmental examination (IEE) and its documentation. An IEE identifies the environmental issues to be considered at the project planning and design stage. This IEE report covers the general environmental profile of the study area and includes an overview of the potential environmental impacts and their magnitude on physical, ecological, economic, and social and cultural resources within the project's influence area during design, construction, and operation stages. An environmental management plan (EMP) is also proposed as part of this report which includes mitigation measures for significant environmental impacts during the implementation of the project, environmental monitoring program, and the responsible entities for mitigation and monitoring. An IEE has four basic objectives; (i) identify the environmental issues that should be considered due to project interventions (ii) determine the magnitude of potential environmental concerns and to ensure that environmental considerations are given adequate weight at planning/design stage (iii) identify need for further environmental studies or environmental impact assessment (EIA) and (iv) suggest enhancement measures if any.

E. Extent of IEE

13. The extent of the IEE was based on all likely Impacts and risks analyzed in the context of the project's area of influence. It encompasses: (i) the primary project site(s) and related facilities (ii) associated facilities whose viability and existence depend exclusively on the project (iii) areas and communities potentially affected by cumulative impacts from further planned development of any existing project or condition, and other project-related developments that are realistically defined at the time of assessment; and (iv) areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The core zone of impact is taken as the existing road width measured from embankment toe-to-toe as the existing rural roads do not have a defined right-of-way and its immediate vicinity. The assessment also considers the areas and activities related to associate

facilities viz. quarry operation, borrow areas, construction camp, transportation/haulage routes, etc. The study area is considered up to 500 m on either side of road alignment for a larger analysis of land-use and other environmental features. Assessment is carried out for all components of the environment covering terrestrial and aquatic ecology, soil, water, noise, and socio-economic aspects.

F. Study Approach and Methodology

14. This IEE report has been prepared based on road-specific detailed project reports (DPRs) including a rapid environmental transect checklist for the 96 rural roads, and stakeholder consultations to meet the requirements for the environmental assessment process and documentation as per ADB's SPS. The IEE commenced with the preliminary review of legal requirements for the project. This was followed by gathering technical details, numerous technical meetings and discussions with the ADB missions, Department of Environment, Department of Forest, district engineers, Upazillas, and other representatives of the communities. Details are discussed in the succeeding sections.

1. Reconnaissance Survey and Initial Consultations

15. Reconnaissance survey and initial consultations facilitated in designing the nature of the environmental survey and extent of consultations to be carried out along the road alignment. It helped to identify data gaps, decide valued environment components, key stakeholders and key informants who can further substantiate the collected information.

2. Primary Data Collection

16. Environmental resource inventory was prepared of all environmental features viz. terrain, land-use, waterways/water bodies, roadside vegetation, sensitive receptors, common property resources, utilities, drainage, flooding/waterlogging, industries, accident-prone areas, etc. within the area of interest/core zone. Similarly, floral survey was also carried out. Baseline monitoring was conducted at the locations for which data was not available in an environmental assessment report conducted by the detailed design team.

3. Secondary Data Collection

17. Secondary sources included detail design reports, published government reports, environmental impact assessments conducted in a similar region, government websites, recognized institutions and relevant government departments (e.g. Disaster Management Department, Meteorology Department, forest, statistics).

4. Public Consultations

18. Meaningful consultations were organized with the government agencies, local people/beneficiary population to know the level of project acceptability, understand their concerns, apprehensions, and overall opinion. Information was gathered about existing baseline environmental condition viz. ambient levels and its effects on health, water resources, flora and fauna, socioeconomic standing of local people, impact due to loss of land other assets and common property resources, accident risk during construction and operation stage, perceived benefits and losses, etc. The information thus gathered was used to integrate it into project design and formulate mitigation measures and environmental management plan.

5. Other Tools, Additional Surveys and Studies

19. Climate risk screening identified flood as the major risk which may adversely impact the road components like, pavement, embankment and cross drainage structures during design life. To avoid flood induced impact on road components it is essential to incorporate various measures in design. Details of structures, history of floods, water logging/low lying areas, road stretches and bridge liable to submergence along the project road were collected during field visit and the same was corroborated with information available with the design team.

6. Assessment of Potential Impacts

20. The assessment of the type, nature, direct, indirect, cumulative or induced impacts and their significance to the physical, biological, and socio-economic components of the environment has been done to ascertain whether the project is environmentally sustainable or not. The nature of impacts has been classified as significant, insignificant, short-term, long-term, reversible, irreversible, etc. After identification of nature and extent of impacts, mitigation measures have been suggested.

7. Preparation of the Environment Management Plan

21. The subproject specific EMP has been formulated with an aim to avoid, reduce, mitigate, or compensate for adverse environmental impacts/risks and propose enhancement measures. This includes (i) mitigation of potentially adverse impacts (ii) monitoring of impacts and mitigation measures during project implementation and operation (iii) institutional capacity building and training (iii) compliance to statutory requirements (iv) integration of EMP with project planning, design, construction, and operation.

G. Structure of IEE Report

22. The IEE has been prepared based on the requirements of the Environment Protection Act (EPA), 1996 and Environment Protection Rules (EPR), 1997 of the Government of Bangladesh, and the ADB Safeguard Policy Statement (SPS), 2009. The content covers the following eight chapters, including this introduction chapter:

Chapter – 1: Introduction
Chapter – 2: Policy, Legal and Administrative Framework
Chapter – 3: Description of Project
Chapter – 4: Description of Environment
Chapter – 5: Anticipated Impacts and Mitigation Measures
Chapter – 6: Public Consultation and Information Disclosure
Chapter - 7: Environmental Management Plan
Chapter – 8: Grievance Redress Mechanism
Chapter – 9: Conclusion and Recommendation

II. DESCRIPTION OF THE PROJECT

A. Location of the Project

23. The additional financing will upgrade a total of 930 km of rural roads in 16 districts in 5 divisions. The division-wise road list along with the road length is shown in the following table. Of the 5 divisions in terms of length, Rangpur has the most with 29% while the Chattogram has the least 9%. In terms of district distribution, Rajshahi has the largest share with 114 km followed by Dinajpur and Jashore with 110 km and 106 km, respectively. These three districts combined already accounts for almost 35% of the total project road length.

Table 1: Division-wise Road List

Sl. No.	Name of the District	Length of Road (km)		Sl. No.	Name of the District	Length of Road (km)
Dhaka Division				Rajshahi Division		
1.	Gopalgonj	19.54		8.	Bogura	56.97
2.	Madaripur	74.13		9.	Naogaon	69.82
3.	Rajbari	45.56		10.	Natore	47.28
Sub-Total		139.23		11.	Rajshahi	114.34
				Sub-Total		288.41
Chattogram Division				Rangpur Division		
4.	Chattogram	45.01		12.	Dinajpur	109.89
5.	Cumilla	41.57		13.	Gaibandha	37.66
				14.	Nilphamari	50.30
				15.	Panchagarh	37.83
				16.	Thakurgaon	41.19
Sub-Total		86.58		Sub-Total		276.87
Khulna Division						
6.	Chuadanga	42.01				
7.	Jashore	106.43				
Sub-Total		148.44				
Grand Total						**939.53**

Figure 2: Location of Project Roads in Dhaka Division

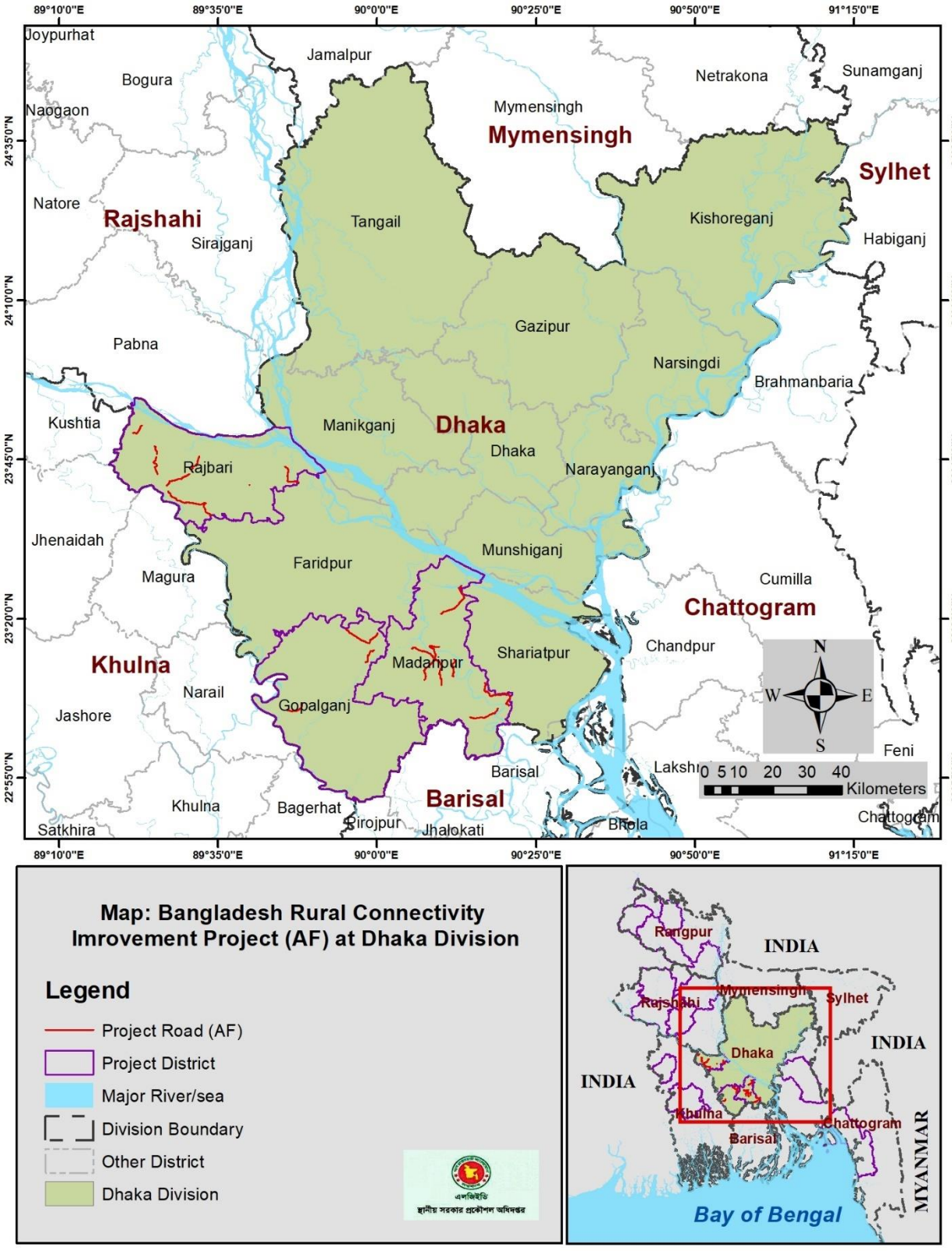
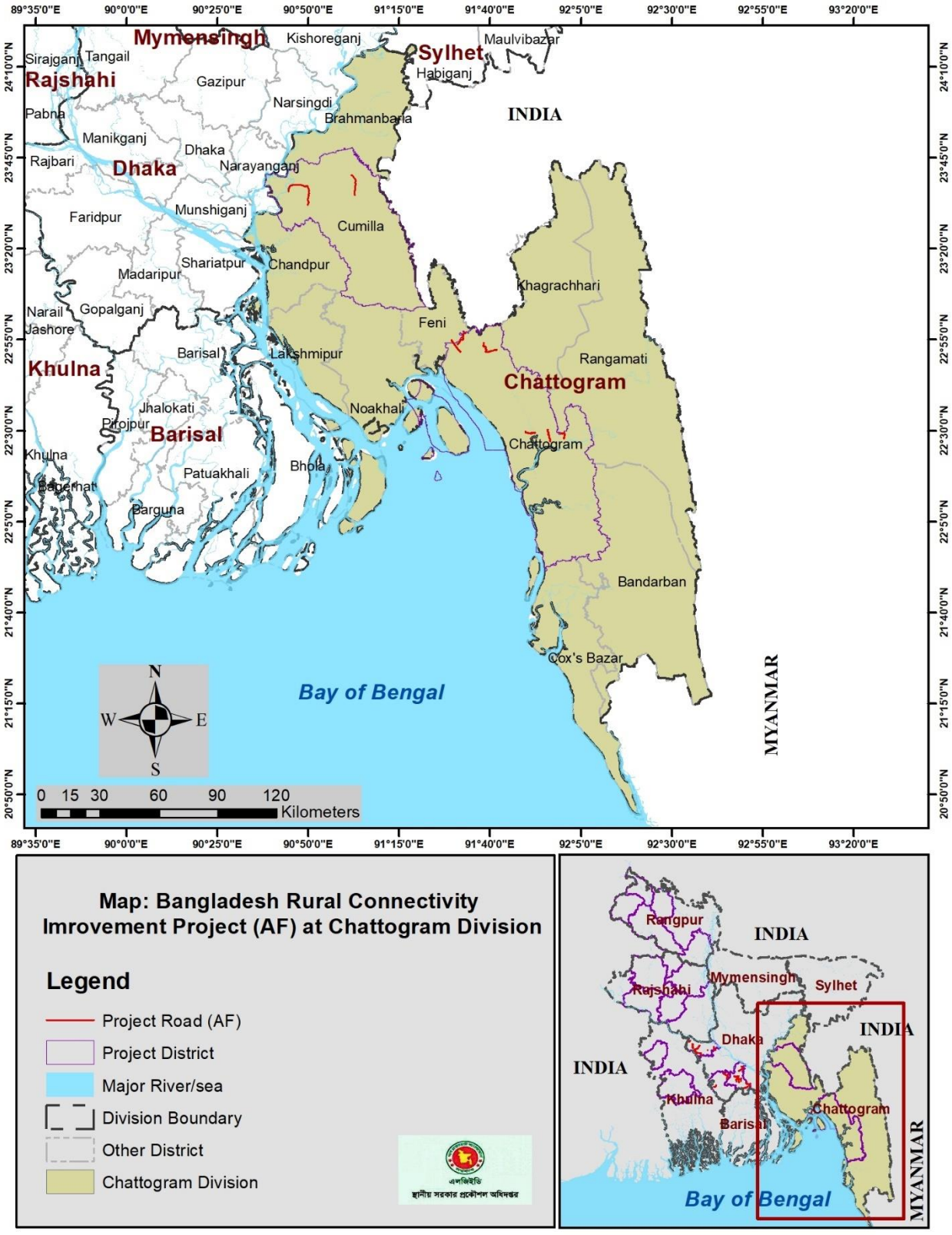


Figure 3: Location of Project Roads in Chattogram Division



Map: Bangladesh Rural Connectivity Imrovement Project (AF) at Chattogram Division

Legend

- Project Road (AF)
- Project District
- Major River/sea
- Division Boundary
- Other District
- Chattogram Division

Figure 4: Location of Project Roads in Khulna Division

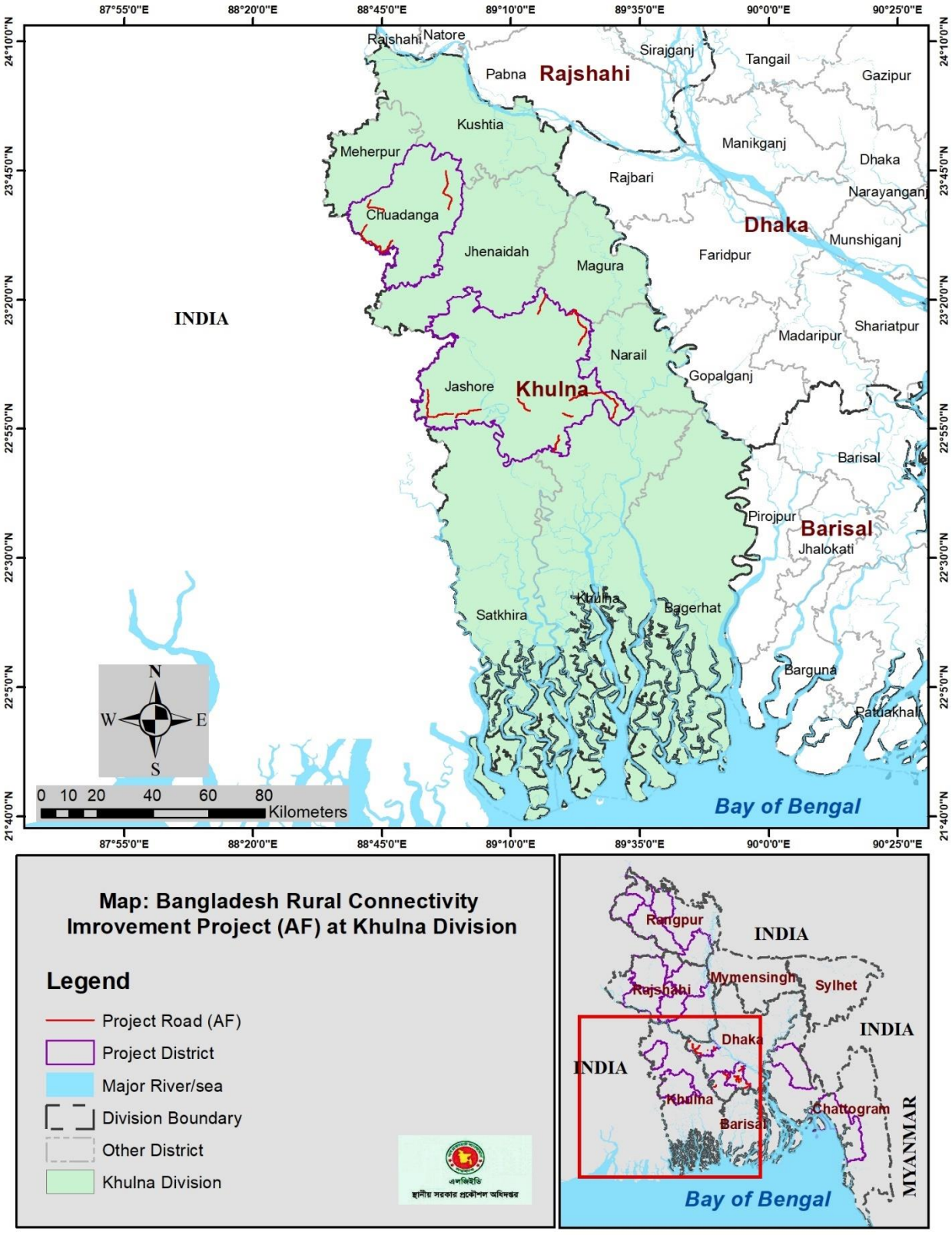


Figure 5: Location of Project Roads in Rajshahi Division

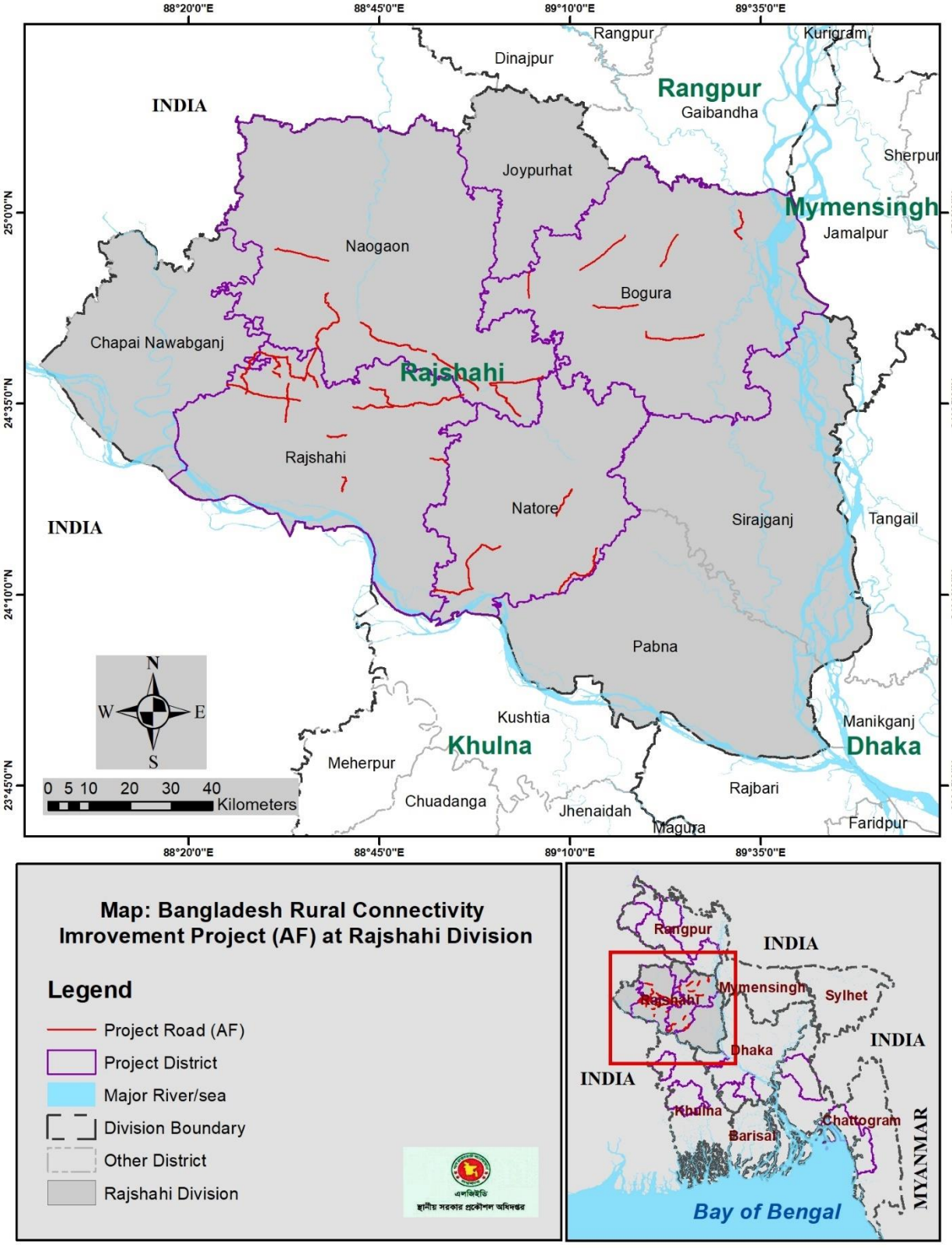
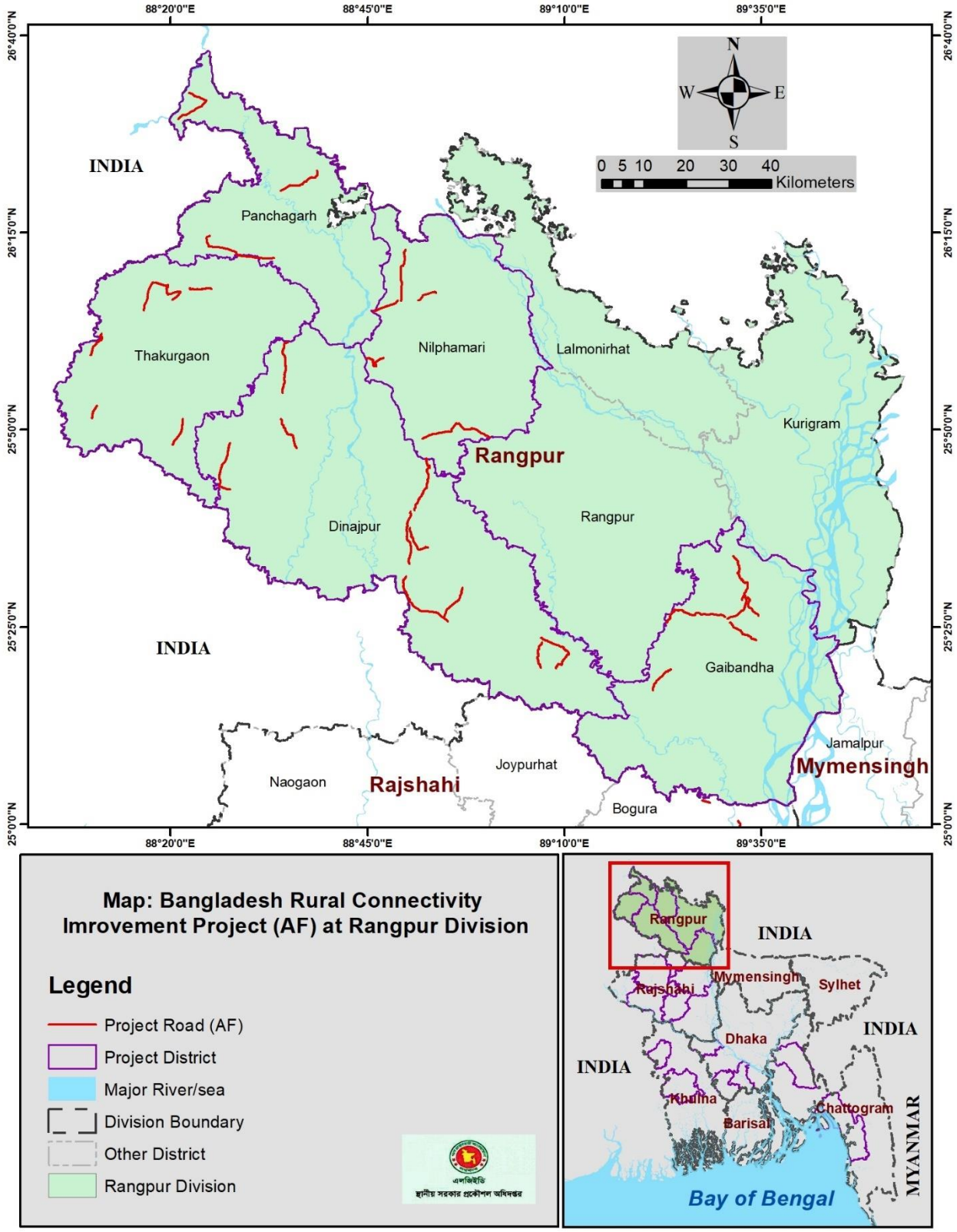


Figure 6: Location of Project Roads in Rangpur Division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Kilometers
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Panchagarh
Thakurgaon
Nilphamari
Lalmonirhat
Kurigram
Rangpur
Rangpur
Dinajpur
INDIA
Gaibandha
Jamalpur
Mymensingh
Joypurhat
Naogaon
Rajshahi
Bogura
Map: Bangladesh Rural Connectivity
Imrovement Project (AF) at Rangpur Division
Legend
Project Road (AF)
Project District
Major River/sea
Division Boundary
Other District
Rangpur Division
Rangpur
INDIA
Mymensingh
Sylhet
Rajshahi
INDIA
Dhaka
INDIA
Khulna
Chattogram
Barisal
MYANMAR
Bay of Bengal

Table 2: Rural Connectivity Improvement Project - Additional Financing Detailed Proposed Roads (Improvement and Flood Damaged)

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Length (km)	2017 Flood Damaged ? (Y/N)
1	Gopalganj	Kasiani	Nizam kandi-Gohala Road	3.055	
2	Gopalganj	Muksudpur	Bonogram GC-Bhamondanga Bazar-Dignagar R&H	3.055	
3	Gopalganj	Muksudpur	Gohala UP office (Monirkandi)-Jalirpar GC Road	11.268	
Sub Total for District				**19.54**	
4	Madaripur	Madaripur-S	Khagdi R&H-Char Muguria-Sreenadi Hat GC	17.250	
5	Madaripur	Madaripur-S	NHW-Tribhagdi Hat GC.	17.250	
6	Madaripur	Madaripur-S	Trivagdi GC-Mithapur Hat-Habiganj hat-Mollahat-Shekhpur RHD	5.031	
7	Madaripur	Madaripur-S	Madaripur Puran Bazar-Bangla Bazar-Hosnabad Bazar-Kalikapur UP Road.	6.300	
8	Madaripur	Kalkini	Kalkini Upazila HQ to Khasherhat GC Road via Shomitirhat Bazar.	10.977	
9	Madaripur	Kalkini	Khoajpur Takerhat R & H to Khasherhat GC Road via Laxmipur UP Office & Shurjamoni hat.	17.28	
10	Madaripur	Kalkini	Khasherhat GC to Shariatpur R & H Road (Kalkini Part)	15.138	
11	Madaripur	Shibchar	R&H Bypass road to Kathalbari ferry ghat via Kutubpur growth center & bangla bazar	2.100	
Sub Total for District				**74.13**	
12	Rajbari	Baliakandi	Baliakandi-Mrigi GC. Rd. Via Narua GC.	12.300	
13	Rajbari	Baliakandi	Baliakanndi GC-Modhukhali RHW. via Maghchami. Road	4.535	
14	Rajbari	Goalanda	Uttar Ujanchar at NHW-Khalil mondoler Hat G.C via Ujanchar G.C.	16.835	
15	Rajbari	Kalukhali	Mrigi G.C-Sonapur G.C. Road	7.320	
16	Rajbari	Kalukhali	Belgachi G.C.-Sonapur G.C. Road	7.320	
17	Rajbari	Pangsha	Jasai UP-Joygram-Machpara UP. Road	2.875	
18	Rajbari	Pangsha	Pangsa HQ-Mrigi G.C. Road	3.355	
Sub Total for District				**45.56**	
19	Cumilla	Titas	Raypur NHW-Batakandi GC road via Masimpur	10.91	
20	Cumilla	Daudkandi	Roypur NHW - Batakandi G.C via Masimpur Road (Daudkandi part).	3.35	
21	Cumilla	Debidwar	Jafargonj GC to Barashalghar RHD via Yousufpur UPC Road.	15.82	
22	Cumilla	Titas	Batakandi GC-DaudkandiGC Via Mohanpur Launch Ghat road (Titas Upazila Portion)	11.50	
Sub Total for District				**41.57**	

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Length (km)	2017 Flood Damaged ? (Y/N)
23	Chattagram	Mirsharai	Zorargonj UP R & H to -Burburia ghat Bazar road Via Dhum UP, Bangla Bazar & Golokerhat	5.100	
24	Chattagram	Mirsharai	Habilder Basa R&H to Santir Hat GC Road via Azamnagar (Karerhat UP-Santirhat GC)	8.650	
25	Chattagram	Fatikchari	Dantmara U.P.HQ.to Balutila Bazar via Ziltoli bazar Road	13.160	
26	Chattagram	Hathazari	Mekhol up to Gorduara UP Road (Sarang Road)	2.770	
27	Chattagram	Raojan	Ramjan Ali Hat GC - Nayahat RHD via Andermanik Natun Bazar Road.	9.926	
28	Chattagram	Rangunia	Santirhat GC- Malirhat - Sahery Bazar GC Road (Baraulia Road) (Rangunia Part)	5.400	
Sub Total for District				**45.01**	
29	Jashore	Monirampur	Lawri (Madrasha) RHD-Khedapara GC Road	14.850	
30	Jashore	Abhoynagar	Nowapara Upazila H/Q-Monirampur via Moshiahati,Nehalpur Road.	7.300	
31	Jashore	Abhoynagar	Nowapara Upazila H/Q (Shankarpasha Bazar Ghat) - Narail-Fultala RHD at Sukpara more Road.	4.789	
32	Jashore	Abhoynagar	Jashore Khulna RHD Bhangagate (Badamtala) - Amtala GC via Moricha, Nawly Bazar Road	20.909	
33	Jashore	Jhikorgacha	Bakra GC- Baganchara GC via Sankarpur UPC	10.515	
34	Jashore	Sarsha	Benapole - Baganchra GC via Goga UP H/Q Road	9.855	
35	Jashore	Bagherpara	Khajura-Chaturbaria road.	8.275	
36	Jashore	Bagherpara	Jashore-Narail RHD at Dhalgrammore to Narikelbaria via Dhalgram Bazar	19.010	
37	Jashore	Monirampur	Nehalpur GC-Payria GC via Takerghat Road	3.727	Y
38	Jashore	Keshobpur	Chuknagar-Katakhali Road	7.200	Y
Sub Total for District				**106.43**	
39	Chuadanga	Alamdanga	Alamdanga-Sorajgong G.C (Alamdanga Portion) [Alamdanga]	18.000	Y
40	Chuadanga	Damurhuda	Memnagar RHD-Karpashdanga G.C via Buichitala	13.106	Y
41	Chuadanga	Damurhuda	Damurhuda G.C-Bhogiratpur G.C	10.900	Y
Sub Total for District				**42.01**	
42	Rajshahi	Tanore	Tanore-Amnura via Mundumala Hat	16.991	
43	Rajshahi	Paba	Mollikpur Bipass (Kukhundipur Bazar) - Parila UP Road	4.400	
44	Rajshahi	Tanore	Talanda FRB to Nizampur via Dargadanga Hat,Billi Hat Road	17.000	
45	Rajshahi	Tanore	Talanda to Keshor Hat (from Hatishail)Tanore Part	5.440	

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Length (km)	2017 Flood Damaged ? (Y/N)
46	Rajshahi	Tanore	Tanore-Chowbaria road	10.140	
47	Rajshahi	Tanore	Saranjai Pacca Road More - Mundumala Hat Via DebipurMore,Elamdohi hat and Prokash Nagar Hat.	17.221	
48	Rajshahi	Tanore	Elamdohi Hat to Kalma Hat Via Valukakandor Hat.	2.300	
49	Rajshahi	Tanore	Mundumala Hat (Start from Ayrarmore) to Hat bakoil (GCM) road ViaUchadanga Narayanpur (Tanore part).	13.850	
50	Rajshahi	Mohonpur	Bazorpur Trimohini to Dhupaghata hat	4.500	
51	Rajshahi	Bagmara	Bhawanigonj-Ahsangonj	4.200	
52	Rajshahi	Bagmara	Bhabanigong-Kesorhat	13.300	
53	Rajshahi	Bagmara	Bhobanigong-Hatgangopara (from Mathabhanga)	5.000	
Sub Total				**114.34**	
54	Naogaon	Atrai	Ahashanganj GC-Bandaikhara GC.	8.575	Y
55	Naogaon	Manda	Nurullabad GPS R&H - Jothbazar - Bandaikhara GC Road.	8.405	Y
56	Naogaon	Niamatpur	Chhatra GC - Shibpur GC.	12.300	
57	Naogaon	Manda	Chowbaria GC - R&H Santa bridge More.	19.000	
58	Naogaon	Atrai	Kashiabari GC - Smaspara GC Via Islamgati hat	9.655	
59	Naogaon	Atrai	Kashiabari GC - Kaliganj GC	11.882	
Sub Total				**69.82**	
60	Natore	Baraigram	Rajapur GC - Zonail GC Road	18.180	Y
61	Natore	Gurudaspur	Nazirpur GC - Moukra GC Road	9.000	
62	Natore	Lalpur	Bagatipara-Dayarampur-Abdulpur-Lalpur Road (Lalpur Part)	16.460	
63	Natore	Lalpur	Lalpur-Bilmaria-Durduria Road	3.640	
Sub Total for District				**47.28**	
64	Bogura	Shajahanpur	Sonahata GC(Dhunot) - Tangramagur RHD via Amrul UP - Naimile	8.870	Y
65	Bogura	Sonatola	Horikhali GC-Hatsharpur GC via Charpara hat (Sonatola)	10.010	Y
66	Bogura	Bogura Sadar	Matidali NHW-Peergacha GCM (From RHD #331)	9.052	
67	Bogura	Adamdighi	Nasratpur-Murail-Raykali-Beragram (Tilokpur) Road	6.610	
68	Bogura	Kahaloo	Dupchachia-Namoja via Tindighi GC Road (Kahaloo)	11.750	Y
69	Bogura	Kahaloo	Ranirhat-Durgapur Road.	10.675	Y
Sub Total for District				**56.97**	

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Length (km)	2017 Flood Damaged ? (Y/N)
70	Gaibandha	Sadullapur	Madargonj GC-Laxmipur G.C Road via Kantanagar.	10.443	
71	Gaibandha	Sadullapur	Kunjo Mohipur Uttarpara - Pollasbari Border via Idulpur U.P office	5.370	
72	Gaibandha	Sadar	Dariapur-Laxmipur	7.254	
73	Gaibandha	Sundarganj	Sundargonj-Materhat G.C (FRA)	14.588	
Sub Total for District				**37.66**	
74	Dinajpur	Phulbari	Phulbari UZHQ-Madilahat GC Road.	10.500	
75	Dinajpur	Parpatipur	Mominpur UP Office Jashai (Bot tree more) - Pan Bazar road via Jurai hat & faridpur hat.	8.960	
76	Dinajpur	Phulbari	Madilahat GC (Chintamon Moor)-Ambarihat GC Road.	18.060	
77	Dinajpur	Nawabgonj	Doudpur (Laugari) to Bajitpur R&H	7.200	Y
78	Dinajpur	Nawabgonj	Doudpur GC-Bhaduria GC via Daria	13.200	Y
79	Dinajpur	Parpatipur	Ambari GC - Jashai more RHD road	14.264	
80	Dinajpur	Birgonj	Bottoli (NHW)-Goreya GC via Shibrampur UP Rd (Bir Muktijoddha Shahid Motilal Barman Road)	16.040	Y
81	Dinajpur	Kaharol	Kaharol Upazila HQ-Boleyahat RHD Road	9.265	
82	Dinajpur	Bochagonj	Setabgonj Sugar Mill-Meherpur Hat via Nawavita hat Road.	12.400	Y
Sub Total for District				**109.89**	
83	Thakurgaon	Baliadangi	Baliadangi-Lahiri G.C. Road	7.063	Y
84	Thakurgaon	Baliadangi	Charol UP Office(Lahiri GC)-Dogachi hat via Patilabhasha Road	8.365	
85	Thakurgaon	Haripur	Jadurani GC-Dangipara UP Office Road.	4.280	
86	Thakurgaon	Thakurgaon-S	Thakurgaon-Farabari GC Road.	8.500	Y
87	Thakurgaon	Pirganj	Pirganj-Nasibganj G.C Road	7.180	Y
88	Thakurgaon	Ranisankail	Baliadangi GC - Dhirganj (Horipur) via Dharmogarh Check Post Road.	5.803	
Sub Total for District				**41.19**	
89	Panchagarh	Atwari	Fakirgonj hat GC - Shathkhamar R&H Road	17.575	Y
90	Panchagarh	Tetulia	Tetulia Gobra Bridge - Shalbahan GC Road	9.700	Y
91	Panchagarh	Panchagarh-S	Panchagarh - Harivasha Road.	10.550	
Sub Total for District				**37.83**	
92	Nilphamari	Domar	Domar Bazar G.C-Basunia Hat GC.road	6.700	
93	Nilphamari	Domar	Domar GC to Ambari Alsiar Bazar RHD road GC via Azizarerhat	13.460	Y
94	Nilphamari	Domar	Boragarihat at RHD road to Baburhat GC via Motukpur UPC at Sayllar ghat (Domar Part)	4.250	

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Length (km)	2017 Flood Damaged ? (Y/N)
95	Nilphamari	Nilphamari-S	Goregram U.P. to Bhabanigonj G.C via Majhpara Madrasha.	8.140	
96	Nilphamari	Sayedpur	Taraganj G.C.-Porarhat G.C. Via Hazarihat G.C	17.750	Y
Sub Total for District				**50.30**	
Total Length RCIP-AF				**939.53**	

B. Project's environmental category

24. The ADB's-Roads and Highways-Rapid Environmental Assessment (REA) Checklist along with the Project/Site Description were prepared as bases for the categorization. The REA checklist is a summary of the individual rapid environmental assessments conducted on each road based on a checklist developed and successfully used in similar projects in India, Sri Lanka, and Nepal[7].

25. The project is classified as environment Category B based on the ADB's SPS. RCIP will upgrade the roads that are existing, with no change in the alignment, no by-passes, and no or minimal land acquisition mainly to occur on curves or junction sections in conformance to LGED road safety guidelines. None of the 96 rural roads proposed to be upgraded under the additional financing is located or near cultural heritage, protected areas including buffer zones, or special areas for protecting biodiversity. No historical places or religious structures will be affected, no bridges will be improved and therefore no alteration of local hydrology is anticipated. All anticipated impacts are site-specific and mitigation measures are readily designed and easily implemented. Anticipated environmental impacts are typical to road maintenance such as the generation of dust, noise, exhausts from haul trucks and mix plants, and waste from construction and worker camps; water contamination; and occupational health and safety hazards. LGED's first large-scale foray to wet mix macadam (WMM) pavement construction to build stronger and durable roads avoided adverse impacts usually[8] attributed to rural road development.

C. Characteristics of existing roads

26. In general, the project roads suffer from poor pavement conditions with many potholes, edge failures, and depressions. Several sections bounded by ponds on either both or one side has suffered from embankment side slope erosion. Several rain cuts and erosion have encroached the carriageway which needs urgent repair. Several drainage facilities are damaged or clogged or need cleaning, while other roads require additional balancing culverts to allow floodwaters to cross the road without causing damage. Roadside drains particularly in urban stretches and bazaars are mostly choked with rubbish and silt which renders them non-functional. Overtopping of roads is not common but water-logging is very common particularly in built-up areas.

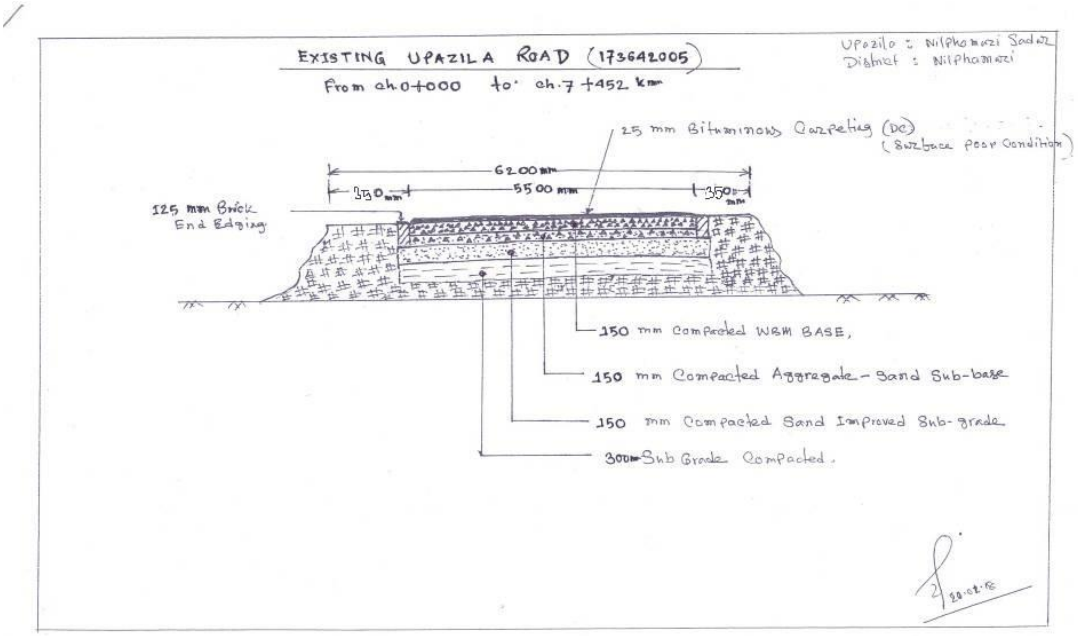
[7] See various Environmental Assessment and Review Frameworks and Project Administration Manual:
i) https://www.adb.org/sites/default/files/project-document/61272/40423-013-ind-earf.pdf
ii) https://www.adb.org/sites/default/files/project-document/81030/47273-002-earf.pdf , and
iii) https://www.adb.org/sites/default/files/project-documents/48218/48218-003-pam-en.pdf

[8] Water based macadam pavement, which requires phased construction sequence

27. Most of the roads have inadequate road safety provisions. Horizontal and vertical profiles are incoherent to applicable code provisions. The horizontal curve is mostly insufficient in built-up areas. Vertical curves are deficient throughout the stretches of all sub-projects. Land-uses along the project roads are mainly agricultural and settlement accounting for 48% and 37% of the total length, followed by water bodies such as ponds with 14%.

28. Existing roads have varying width and road conditions. ROW is generally 20 m in most cases with reduced width in settlements varying from 3 to 4 m. The major part is 1-lane with or without the earthen shoulder. Riding condition is mostly poor to fair. Roadside drains are present in some urban stretches but mostly choked and non-functional. Overtopping of roads is not observed in general but water-logging is very common in built-up areas. Waterways are being crossed in most of the hilly roads. The figure below illustrates a typical cross-section of the existing roads.

Figure 7: Typical Existing Rural Road Cross-Section.



D. Improvement/Strengthening Proposal

29. Key road characteristics and proposed improvements of all 96 existing rods are described in the IEE. More specifically, the information compiled provides each road's location by district, upazilla, road name, and unique identification number assigned by the LGED. Details of the existing road's salient features are provided to include: length, settlement names start and endpoints, major settlements traversed, existing road land width, general terrain, road configuration expressed in the length of carriage width and shoulders, number and location of culverts and u-drains. Finally, recommended upgrading on the salient features are provided.

E. Design and Construction Method

30. The following details the planning, design, and construction method adopted by LGED for the additional financing project.

(i) **Survey.** The level survey is undertaken on all roads true to ground reality to determine the required earthworks. The level survey used level instruments and cross-sections are plotted based on survey data. LGED standards, specifications, design standards, and manuals were observed. Temporary benchmarks were established at the beginning of each road and assigned an arbitrary value of 10.00 m. Cross-sections were taken at 50 m intervals and closer in curved portions. Survey data processing was accomplished as specified in the survey book and X- and L-sections were prepared using LGED standard software.

(ii) **Soils and Materials Survey.** Guided by LGED Quality Control Manual, soil samples were collected along the road and tested based on LGED's Laboratory Test Frequency. Soil tests and analysis conducted include Atterberg's limit, standard Proctor, California bearing ratio,

(iii) **Coarse and Fine Aggregates.** For road construction and protection works the materials to be used are brick, stone chips, fine and coarse sand, cement, and reinforcement. Several sources of these materials exist within 2-10 km from the roads. These materials will be collected for testing to certify the quality. Borrow earth shall be obtained from locations identified by the contractor, and approved from the PIU with permission from the landowner and in alignment with national legislation. There will be clear understanding for its rehabilitation prior to its use. Stone and sand aggregates will be sourced from existing licensed quarries, and bricks will be procured from licensed brick kiln in the vicinity.

(iv) **Traffic Survey.** Classified Traffic Count Survey on each road was conducted by trained enumerators for each road. The survey covered two days from 6 am to 10 pm (16 hours), one on a hat-day and one on a non-hat day at two suitable unbiased opposite points of the selected road where traffic counts were tallied. Traffic counts were classified into the following vehicle categories: i) Motorized vehicle comprising of Auto-rickshaw/Tempo/Nasimon, Jeep/Car Taxi, Microbus/Pickup, Motorcycle, Bus/Minibus, which are passenger-vehicles, and cargo vehicles composed of Truck, Tractor with Trailer, and Covered van/ (Light Truck) with goods; and ii) Non- motorized vehicles comprising of Rickshaw, Rickshaw-van, Bicycle, Bullock Cart and Pushcart. Corresponding equivalent single axle road was computed.

(v) **Hydrological Survey.** Rainfall data, catchment area, time of concentration, and existing cross-drainage structures were collected or computed.

(vi) **Adopted geometric design standards**. LGED Rural Road Design Standards, 2005 was applied in the additional financing project which provides, among others:

- (a) LGED design standards of Upazila Roads (UZR) and Union Roads (UNR) with crest widths of 7.50 m and 5.5 m, respectively, and carriage/pavement width of 5.5 m and 3.70 m respectively on the existing road embankment;
- (b) Design Speed of 20 km/hr for carriage width of 3.7 m and 40 km/hr for 5.5-6.7 m;
- (c) Right of Way (ROW) interpretation of the horizontal distance between toes on either side of the existing road. It varies depending upon the crest width and embankment height. Any additional space, beyond the toes required for the road improvement, will have to be acquired either by donation or purchase;
- (d) Crest width of 7.3 m for plain and rolling terrain;
- (e) Carriageway width of 5.50 m will be retained and may be revised based on PCU/hr;
- (f) Shoulders of 0.9 m are earthen on both sides;

(g) Crest width at cross-drainage structures is 7.3 m and then tapered to match with the width of the culvert, which is 5.5 m total;
(h) Stopping and passing sight distances according to design speed;
(i) Widening of pavement at horizontal curves depending of carriageway width subject to availability of land or regulated speed;
(j) Camber based on road surface type ranging from 3-5%; xii) vertical alignment minimum gradient of 0.3% for drainage purpose;
(k) Side slope of 1.5:1;
(l) Alignment Design to follow existing;
(m) Design of junctions;
(n) Pavement Design based on sub-grade strength, projected traffic, and 10 years design life, for RCIP is WMM;
(o) Embankment design;
(p) Cross drainage design;
(q) Protective Works & Drainage (side drains, RCC wall) Utility shifting / relocation;
(r) Traffic Management and Road Safety Measures (road furniture; road markings, and cautionary, mandatory and information signs; km stones and 200m stones; delineators and object markers guard posts; guard posts, crash barriers, rumble strips, and speed breakers.

(vii) **Construction Equipment.** For handling of bulk materials like spreading of aggregates in sub-base & base courses by mix-in-place method, use of motor grader & tractor-towed rotator may be done. The compaction of earth layer shall be done by an ordinary smooth wheeled roller. But for granular layers both vibratory and smooth wheeled rollers will be applied. It is also considered that a mix plant of medium type & capacity with separate dryer arrangement for aggregate shall be used for bituminous surfacing work that can be easily shifted. A self-propelled or towed bitumen pressure sprayer shall be used for spraying the materials in narrow strips with a pressure hand sprayer. For structural works, concrete shall be mixed in a mechanical mixer and laid manually. The excavation shall be done manually or mechanically using suitable medium size excavators.

(viii) Construction methods include:
(a) Preparation for earthwork to restore the design geometric shape. Earthwork is necessary to maintain the design side slope, earthen shoulder.
(b) Earth filling with specified soil having earth layers not more than 150 mm in each layer is undertaken and during reshaping of side slopes, benching not more than 30 cm in vertical and 60 cm in horizontal steps along the sides is maintained. Embankment work layer of the earth shall be laid in not more than 150 mm thick layers & compacted each layer of the soil at OMC to meet not less than 85% of Standard Proctor Density (As per LGED standard).
(c) Sub-grade, earthwork in box cutting on-road crest up to 450 mm depth will be used for the construction of top 250 mm as sub-grade. In general, soil in the existing embankment sections is quite good for road construction as those were selected fill. Top 250 mm of the subgrade surface shall be compacted at OMC to meet 98% of Standard Proctor Density by proper control of moisture and by required compaction with a smooth wheeled roller.

(d) Sub-base. Aggregate Sand Sub-base material in the form of 38 mm down crusher run 1st class bricks/picked chips and sand (FM 0.50) mixed in proportion 1:1 in the area to be used in sub-base.

(e) Base. Brick aggregates will be used in the base course according to the LGED standard specification.

(f) Shoulder. Earthen shoulder shall be constructed in layers and compacted to 85% of Proctor's Density. The first layer of the shoulder shall be laid after the sub-base layer. Thereafter earth layer shall be laid with a base layer of pavement and compacted. The hard shoulder will be constructed as per the LGED standards.

(g) Surfacing. The prime coat consists of cut back bitumen prepared by cutting back 60/70 or 80/100 penetration grade and will be applied as a primer on Wet Mix Macadam (WMM) layer. The prime coat shall be sprayed on surface with the pressure distributor. For Tack coat the binder shall be a penetration grade bitumen applied hot immediately prior to laying of 40 mm pre-mixed dense bituminous wearing surface.

F. Climate Resilient Rural Road Design

31. Bangladesh is considered one of the most vulnerable countries in the world to climate risks.[9] Two-thirds of the country is less than 5 m above mean sea level and located in the world's largest tropical river deltas—the Ganges, Brahmaputra, and Meghna making it one of the most flood-prone countries in the world. Natural disasters, like cyclones and floods, cost Bangladesh an average of 1 percent of GDP each year (World Bank 2010).

32. In 2017, heavy rains in March and April triggered flash floods in the northeastern haor and low lying districts damaging public infrastructure particularly roads in Sylhet, Moulvibazar, Sunamganj, Habiganj, Netrokona, and Kishoreganj. Heavy rains in June and July again triggered monsoon flash floods in the northeast when flood levels exceeded existing embankment protection levels causing heavy damage in Sylhet, Moulvibazar, Rangourm Kurigam, Sirajganj, Bogura, Lalmionihat, Gaibandha, and Nilphamari. August heavy rains affected 31 of the 64 districts located north of Bangladesh10. These successive floods have damaged about 7,000 kilometers of rural roads11. In 2018, the Executive Committee of the National Economic Council has approved Tk 8,152 Cr to repair damaged rural roads, bridges, and drainage in Rangpur, Rajshahi, and Mymensingh regions.

33. Based on General Circulation Models (GCM), Bangladesh will be 1.5°C warmer and 4 percent wetter by 2050 with stronger seasonal variations. Precipitation is expected to increase by up to 20 percent during the monsoon months July to September that would lead to up to 18 percent higher discharges in the rivers during these months and higher associated flood levels. Severe cyclones are expected to occur more frequently, exacerbated by a potential sea-level rise of over 27 cm by 2050 (World Bank 2010). In addition to that, the delta area is subject to land subsidence that aggravates the impacts of sea-level rise.

34. The additional financing will have the same key climate-resilient road designs as the current project, which is adopted from the ADB's BAN: 45084 Coastal Climate-Resilient Infrastructure Project. This will ensure the proposed road upgrading systematically takes into

[9] Verisk Maplecroft 2014

[10] https://reliefweb.int/report/bangladesh/giews-update-bangladesh-severe-floods-2017-affected-large-numbers-people -and

[11] http://www.atimes.com/article/bangladesh-devastated-third-flood-incurs-severe-losses/

consideration lessons learned from pilot projects on climate change adaptation. The following tables present the climate-resilient rural road design parameters adopted in the RCIP. These tables illustrate the RCIP road design has either equaled or exceeded the CCRIP's design values on normal freeboard, slope protection, geotextile side slope, improve subgrade, cement concrete base, use of geotextiles on the road sub-base, RCC pavement works, reinforced bars, and carpeting. Further, all project roads that pass cyclone shelters will be upgraded to the rigid pavement to provide reliable connections with the nearest habitations.

Table 3. Comparison of design parameters between the Coastal Climate Resilient Infrastructure Project (CCRIP) and the proposed Rural Connectivity Improvement Project (RCIP): UPAZILLA ROAD

Description	Climate Resilient Upazila Road (At drain) (Outside the polder)	Climate Resilient Upazila Road without subgrade drain (Outside the polder)	Climate Resilient Upazila Road (At drain) (Inside the polder)	Climate Resilient Upazila Road without subgrade drain (Inside the polder)	Climate Resilient Upazila Road (Rigid Pavement)	Flexible Pavement design of 5.5m wide Road in RCIP	Rigid Pavement 5.5m wide road (Two lane) in RCIP	Equal or Exceeded (Y or N)
Crest width	5.5m	5.5m	5.5m	5.5m	5.5m	7.3m	8.0m – 9.7m	**Y**
Carriage way width	3.7m	3.7m	3.7m	3.7m	3.7m	5.5m	5.5m	**Y**
Earthen Shoulder	0.9m	0.9m	0.9m	0.9m	0.9m	0.9m	1.0m - 1.85m	**Y**
Edging	125mm	125mm	125mm	125mm	125mm	125mm	250mm guide wall	**Y**
Normal Free Board	600mm	600mm	600mm	600mm	600mm	600mm	600mm	**Y**
Adaptive Free Board	200mm	200mm	No	No	200mm	No	No	**N**
Side slope	1:1.5	1:1.5	1:1.5	1:1.5	1:1.5	1:1.5 – 1:2 depending upon the soil type	1:1.5 – 1:2 depending upon the soil type	**Y**
Special Type of Slope protection by special grass/shrub/herb	Yes	Yes	Yes	Yes	Yes	Turfing in normal condition and embankment slope protection structures, or masonry retaining walls are provided where required	Turfing in normal condition and embankment slope protection structures, or masonry retaining walls are provided where required	**Y**
Geotextile on the side slopes	Yes	-	Yes	-	-	Geotextile is provided in the	Geotextile is provided in the	**Y**

Description	Climate Resilient Upazila Road (At drain) (Outside the polder)	Climate Resilient Upazila Road without subgrade drain (Outside the polder)	Climate Resilient Upazila Road (At drain) (Inside the polder)	Climate Resilient Upazila Road without subgrade drain (Inside the polder)	Climate Resilient Upazila Road (Rigid Pavement)	Flexible Pavement design of 5.5m wide Road in RCIP	Rigid Pavement 5.5m wide road (Two lane) in RCIP	Equal or Exceeded (Y or N)
						side slope protection	side slope protection	
Subgrade drain @ 6m staggered	Yes	No	Yes	-	-	-	-	**N**
Improved subgrade (sand)	300mm	300mm	300mm	300mm	200mm	250mm	300mm	**Y**
Subbase	150mm	150mm	150mm	150mm	150mm	225mm	No	**Y**
Jute geo-textile	-	-	-	-	-	-	Yes	**Y**
0.18mm thick polyethylene sheet one layer	-	-	-	-	Yes	-	Yes	**Y**
Cement concrete base	-	-	-	-	-	-	100mm	**Y**
RCC Pavement Work	-	-	-	-	200mm	-	200mm	**Y**
12mm dia MS bar@200mmc/c in both direction	-	-	-	-	Yes	-	Yes	**Y**
500mm long, 24mm-36mm dia dowel bar @300mm c/c	-	-	-	-	-	-	Yes	**Y**
Base	150mm	150mm	150mm	150mm	-	150mm	-	**Y**
Carpeting	25mm	25mm	25mm	25mm	-	40mm	-	**Y/No need**
Seal Coat	7mm	7mm	7mm	7mm	-	-	-	**Y/No need**
Pavement camber	3%	3%	3%	3%	3%	3%	3%	**Y**
Shoulder camber	5%	5%	5%	5%	5%	5%	5%	**Y**

Table 4. Comparison of design parameters between the Coastal Climate Resilient Infrastructure Project (CCRIP) and the proposed Rural Connectivity Improvement Project (RCIP): UNION ROAD

Description	CCRIP Design					Design adopted in RCIP[12]		Remarks
	Climate Resilient Union Road (At drain) (Outside the polder)	Climate Resilient Union Road without subgrade drain (Outside the polder)	Climate Resilient Union Road (At drain) (Inside the polder)	Climate Resilient Union Road without subgrade drain (Inside the polder)	Climate Resilient Union Road (Rigid Pavement)	Flexible Pavement design of 3.7m wide Road (Union road) in RCIP	Rigid Pavement 3.7m wide road (Single lane) in RCIP	Equal or Exceeded (Y or N)
Crest width	5.5m	5.5m	5.5m	5.5m	5.5m	5.7m	6.2m – 7.9m	**Y/Y**
Carriage way width	3.0m	3.0m	3.0m	3.0m	3.0m	3.7m	3.7m	**Y/Y**
Earthen Shoulder	1.25m	1.25m	1.25m	1.25m	1.25m	1.0m	1.0m – 1.85m	**N/Y**
Edging	125mm	125mm	125mm	125mm	125mm	125mm	250mm guide wall	**Equal/Y**
Normal Free Board	600mm	600mm	600mm	600mm	600mm	600mm	600mm	**Equal**
Adaptive Free Board	200mm	200mm	-	-	-	-	-	**N**
Side slope	1:1.5	1:1.5	1:1.5	1:1.5	1:1.5	1:1.5 – 1:3 depending upon the soil type	1:1.5 – 1:2 depending upon the soil type	**Equal**
Special Type of Slope protection by special grass/shrub/herb	Yes	Yes	Yes	Yes	Yes	Turfing in normal condition and embankment slope protection structures, or masonry retaining walls	Turfing in normal condition and embankment slope protection structures, or masonry retaining walls	**Equal**

[12] LGED standard designs are being revised newly by third party and are in process of approval. For RCIP the revised designs have been customized and approved by LGED design Unit. The new designs do not specify upazila roads (UZR) or union roads (UNR), but specify the width. However, for the purpose of these comparisons carriageway of UZR is considered 5.5m and UNR 3.7m.

Description	CCRIP Design					Design adopted in RCIP[12]		Remarks
	Climate Resilient Union Road (At drain) (Outside the polder)	Climate Resilient Union Road without subgrade drain (Outside the polder)	Climate Resilient Union Road (At drain) (Inside the polder)	Climate Resilient Union Road without subgrade drain (Inside the polder)	Climate Resilient Union Road (Rigid Pavement)	Flexible Pavement design of 3.7m wide Road (Union road) in RCIP	Rigid Pavement 3.7m wide road (Single lane) in RCIP	Equal or Exceeded (Y or N)
						are provided where required	are provided where required	
Geotextile on the side slopes	Yes	-	Yes	-	-	Geotextile is provided in the side slope protection	Geotextile is provided in the side slope protection	**Y/ Exceeded**
Subgrade drain @ 6m staggered	Yes	-	Yes	-	-	-	-	**No need**
Improved subgrade (sand)	300mm	300mm	300mm	300mm	200mm	250mm	250mm	**N**
Subbase	150mm	150mm	150mm	150mm	150mm	200mm	-	**Y**
Jute geo-textile	-	-	-	-	-	-	Yes	**Y**
0.18mm thick polyethylene sheet one layer	-	-	-	-	Yes	-	Yes	**Y**
Cement concrete base	-	-	-	-	-	-	100mm	**Y**
RCC Pavement Work	-	-	-	-	125mm	-	200mm	**Y**
12mm dia MS bar@200mmc/c in both direction	-	-	-	-	Yes	-	Yes	**Y**
500mm long, 24mm-36mm dia dowel bar @300mm c/c	-	-	-	-	-	-	Yes	**Y**
Base	150mm	150mm	150mm	150mm	No	150mm	-	**Y**

Description	CCRIP Design					Design adopted in RCIP[12]		Remarks
	Climate Resilient Union Road (At drain) (Outside the polder)	Climate Resilient Union Road without subgrade drain (Outside the polder)	Climate Resilient Union Road (At drain) (Inside the polder)	Climate Resilient Union Road without subgrade drain (Inside the polder)	Climate Resilient Union Road (Rigid Pavement)	Flexible Pavement design of 3.7m wide Road (Union road) in RCIP	Rigid Pavement 3.7m wide road (Single lane) in RCIP	Equal or Exceeded (Y or N)
Carpeting	25mm	25mm	25mm	25mm	No	40mm	-	**Exceeded**
Seal Coat	7mm	7mm	7mm	7mm	No	No	-	**N/A**
Pavement camber	3%	3%	3%	3%	3%	3%	3%	**Y**
Shoulder camber	5%	5%	5%	5%	5%	5%	5%	**Y**

G. Traffic

35. The following tables present the annual average daily traffic for each district and the projected periodic growth rates. Rural roads proposed to be upgraded in the districts of B. Baria, Jashore, Naogaon, Natore, Lalmonirhat, and Panchgarh have the most road users with at least 2,100 AADT while roads with the least traffic are Bogura and Cumilla with about 500 AADT. CNG or 3-wheeler rickshaws are the dominant traffic on the project roads accounting for about 43% and followed by motorcycles with 36%. The projection of traffic growth on the 96 roads indicates that there will be an average 92% increase by 2032 compared to 2019. The increase in traffic volume was forecasted for each of the 96 roads. The percentage change in the traffic volume in 2032 compared to 2019 was then computed for each of the roads.

Table 5: Averaged District Annual Average Daily Traffic, 2017

District	Heavy Truck	Medium Truck/ covered van	Light Truck/Tractor with Trailer	Minibus	Micro Bus	Car van taxi	Motor Cycle	3-Wheeler/ CNG	Total
Gopalganj	55	19	66	17	42	51	280	429	959
Madaripur	41	14	50	13	32	38	212	324	725
Rajbari	43	19	35	12	40	31	203	273	656
Cumilla	37	16	30	11	34	27	174	235	563
Chattogram	55	25	45	16	52	41	264	356	854
Jashore	106	61	81	36	79	63	986	840	2,251
Chuadanga	84	48	65	29	63	50	787	670	1,796
Rajshahi	69	24	84	22	54	65	355	544	1,217
Naogaon	123	70	94	42	91	73	1,143	974	2,610
Natore	101	58	77	34	75	60	938	799	2,142
Bogura	30	13	25	9	28	22	144	194	466
Gaibandha	39	17	32	11	37	29	186	251	602
Dinajpur	49	22	40	14	46	36	234	316	758
Thakurgaon	64	22	77	20	49	59	326	499	1,117
Panchgarh	103	59	79	35	76	61	957	815	2,186
Nilphamari	89	51	68	30	67	53	833	709	1,901

Source: RCIP Economic Analysis, 2018

Table 6: RCIP Projected Traffic Growth Rates, in %

Vehicle Type	2017-22	2022-27	2027-32	Beyond 2032
Car/ Van/ Jeep	5	5	4	4
2-Wheel	9	7.5	6	5
Bus	5	4	3	3
Goods Vehicle	6	5	4	3
Auto rickshaw	5	5	4	4

Source: RCIP Economic Analysis, 2018

H. Construction Material

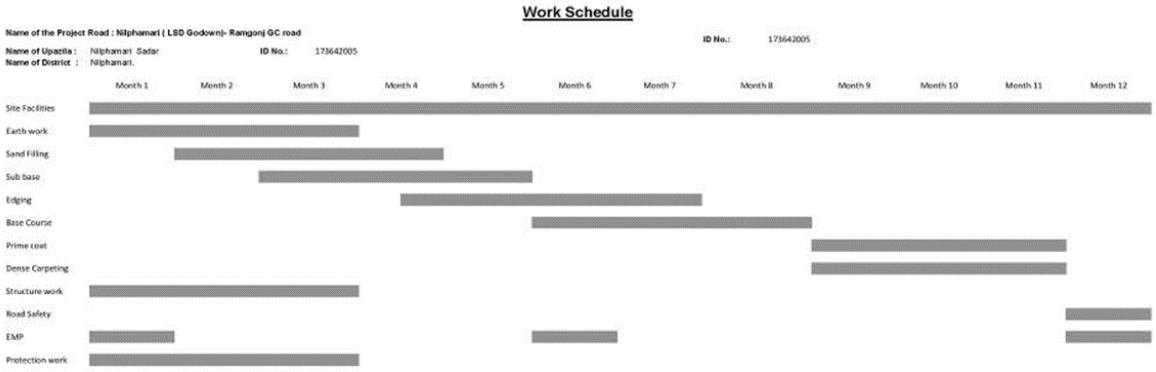
36. Materials such as soil, cement, coarse and fine aggregates, and re-enforcement bars will be procured with 2-10 kilometers vicinity from the project roads. The filling soil is procured from existing borrow pits. The borrow area will be excavated from lands that can be used for aquaculture. For road construction and protection works the materials to be used are brick, stone chips, fine and coarse sand, cement, and reinforcement. The aggregates will be sourced from existing licensed quarries and brick kilns. These materials will be collected for testing to certify the quality.

I. Cost and Implementation Schedule

37. Road construction will be completed within 2 years. Construction activities include earthwork, structural and protective works, followed by sand filling, sub-base, edging, base course, prime coat, and finally dense carpeting.

38. Total civil works for the 96 rural roads under RCIP-AF is $139.4 million to be implemented from 2020-2023.

Figure 8: Typical Work Schedule for rural road Upgrading



III. POLICY AND LEGAL FRAMEWORK

A. Regulatory Requirements for the Rural Road Upgrading

39. The Government of Bangladesh has various laws and regulations for the protection and conservation of the natural environment as it pertains to road development. However, a limited environmental laws and regulations are specifically applicable to rural roads upgrading where the existing roads are outside environmentally protected areas including forest land, construction activities confined within the existing formation width and existing alignment, and with no or minor land acquisition limited on curves and junctions to comply with road safety standards which characterizes the proposed roads under additional financing. These legislations and applicability to the project are summarized in the following table.

Table 7: Applicable Key Environmental Legislations to RCIP

Act/Rule/Law/Ordinance	Responsible Agency/ Ministry/Authority	Key Features-Potential Applicability
Bangladesh Environmental Conservation Act, 1995 (ECA, 1995) and Environment Conservation Rules 1997 (ECR, 1997) the amendment years of Environmental Conservation Rules (2002, 2005, 2010 and 2017) and amendment years for ECA (2000, 2002 and 2010).	Ministry of Environment and Forest	Includes categorization of development projects into green, amber A, Amber B, and red. Details procedures for securing environmental clearances for projects that are under the red category. Also details procedures for obtaining site clearance for projects.
The National Water Policy, 1999	Ministry of Water Resources	Protection, restoration, and enhancement of water resources; Protection of water quality, including strengthening regulations concerning agrochemicals and industrial effluent; Sanitation and potable water; Fish and fisheries; and Participation of local communities in all water sector development.
Water Pollution Control Ordinance 1970	Ministry of Water Resources	Prevents water pollution
National Policy for Arsenic Mitigation, 2004	Department of Public Health Engineering	Provides a framework for the provision of water supply for areas/aquifers with high arsenic levels. Roles of agencies are specified for the development of water supply systems, certification of arsenic removal technology, and disposal of treated sludge. Also, arsenic-prone upazila are identified.
Bangladesh Labour Law, 2006	Ministry of Labor	This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable working environment and reasonable working conditions.
Land Acquisition Act 1894, Acquisition and Requisition of	Ministry of Land	Outlines procedures and rules for acquiring land and immovable property

Act/Rule/Law/Ordinance	Responsible Agency/ Ministry/Authority	Key Features-Potential Applicability
Immovable Property Ordinance, 1982		
Bangladesh Climate Change Strategy and Action Plan (2008)	MOEF	Establishment of six strategic pillars for action, including (1) food security, social protection, and health, (2) disaster management, (3) protective infrastructure, (4) research and knowledge management, (5) decreased carbon development, and (6) capacity building and institutional strengthening.
The Protection and Conservation of Fish Act, 1950 and The Protection and Conservation of Fish Rules, 1985	MOFL	Prohibits and regulates the construction of temporary or permanent of weirs, dams, bunds, embankment and other structures
Wetland Protection Act 2000	Ministry of Water Resources	Advocates protection against degradation and resuscitation of natural water-bodies such as lakes, ponds, beels, khals, tanks, etc. affected by man-made interventions or other causes. Prevents the filling of publicly-owned water bodies and depressions in urban areas for the preservation of the natural aquifers and environment. Prevents unplanned construction on riverbanks and indiscriminate clearance of vegetation on newly accreted land.
Embankment & drainage Act,	MOWR	An Act to consolidate the law relating to emb. & drainage
Vehicle Act 1927 & Motor vehicle ordinance 1983	BRTA	Road/traffic safety Vehicular air & noise pollutions Fitness of vehicles& registration

40. During construction, the project will conform to the occupational and health-related rules as outlined in the following table.

Table 8: Labor Laws of Bangladesh

Title of Laws and Rules	Descriptions
Social Security under the Act, 1923 and an amendment in 1980	According to the Act social impact assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions.
Bangladesh Labor Law of 2006	- Compliance to the provisions on employment standards, occupational safety and health, welfare and social protection, labor relations and social dialogue, and enforcement

Title of Laws and Rules	Descriptions
	- Prohibition of employment of children and adolescent
The Employer's Liability Act, 1938	The Act declares that the doctrine of common employment and of assumed risk shall not be raised as a defense in suits for damages in respect of employment injuries. Under the Maternity Benefit Act, 1939, the Maternity Benefit Act, 1950, the Mines Maternity Benefit Act, 1941, and finally, the rules framed thereunder, female employees are entitled to various benefits for maternity, but in practice they enjoy leave of 6 weeks before and 6 weeks after delivery.
Public Health (Emergency Provisions) Ordinance, 1994	The ordinance calls for special provisions with regard to public health. Whereas an emergency has arisen, it is necessary to make special provisions for preventing the spread of human disease, safeguarding public health and providing them adequate medical service and other services essential to the health of respective communities and workers in particular during the construction-related work.
The Employees State Insurance Act, 1948	It has to be noted that health, injury, and sickness benefit should be paid to people, particularly respective workers at workplace under the Act.
Bangladesh Factory Act, 1979	The Act requires every workplace including small or large scale construction where women are employed to have an arrangement of childcare services. Based on this Act and Labor Laws - medical facilities, first aid and accident, and emergency arrangements are to be provided by the authority to the workers at workplaces.
Water Supply and Sewerage Authority Act, 1996	The Act specifies WASA's responsibility to develop and manage water supply and sewerage systems for public health and environmental conservation.

Table 9: International Environmental Conventions relevant to the project activities

International Environmental Conventions	Details	Relevance
Rio Declaration 1992	United Nations Conference on Environment and Development (UNCED) adopted the global action program for sustainable development called 'Rio Declaration' and 'Agenda 21 'Principle 4 of the Rio Declaration', 1992, to which Bangladesh is a signatory along with a total of 178 countries	No sensitive species are located in the sub-project area. There is no threat to the conservation of flora or fauna.
Convention on Wetland of International Importance Especially as Waterfowl Habitats, Ramsar (1972)	The Ramsar Convention was adopted on 2 February 1971 and entered into force on 21 December 1975. Bangladesh ratified the Convention on 20 April 2002. Bangladesh has two Ramsar Sites (i) parts of Sundarban Reserved Forest (Southwest of Bangladesh); and Tanguar Haour (Northeast of Bangladesh)	The subproject is far away from the Ramsar Site

B. Permissions and Clearance Required for the Project

41. List of required clearances/permissions related to the environment are as follows:

(i) Pre-Construction: The environmental clearance certificate (ECC) and site clearance certificate (SCC) from the Department of Environment for all the 96 roads included in the additional financing have been renewed up to 20 May 2020. The construction, reconstruction, and extension of feeder or local roads are classified as Orange-B Category under the Bangladesh Environment Conservation Act, 1995 as implemented under Environment Conservation Rule, 1997 and guided by the Environment Clearance Procedure, 2010. All Orange-B category projects are required to submit the following list of requirements to the Department of Environment. LGED is responsible to secure the environmental clearance and all No Objection Clearances (NOC) from Union Parishads traversed by each project road. The procedure to secure the environmental clearance for rural road upgrading are as follows:

(ii) File application through prescribed form-3 under Environment Conservation Rules 1997

(iii) Pay prescribed fees under schedule-13 under Environment Conservation Rules 1997 (Amended 2002)

(iv) Submit a report on the feasibility of the project

(v) Submit a report on the Initial Environmental Examination of the project

(vi) Secure No objection certificate (Prescribed Form) from the local authority;

(vii) Submit Emergency plan relating adverse environmental impact and plan for mitigation of the effect of pollution;

(viii) Submit an Outline of the relocation, rehabilitation plan (where applicable); and other necessary information (where applicable).

(ix) Other clearances and permits required before construction includes No Objection Clearance from the local authority or Union Parishad, and tree cutting permit from jurisdictional District Forest Office

(x) During construction: Contractors are required to secure Consent to establish (CFE) and Consent to Operate (CFO) for all mix and batching plants.

C. ADB Safeguard Policy (ADB Safeguards Policy Statement, 2009)

42. ADB SPS stipulates addressing environmental concerns, if any, of a proposed activity in the initial stages of project preparation. For this, the SPS categorizes proposed components into categories (A, B, or C) to determine the level of environmental assessment required to address potential impacts. All three safeguard policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. The safeguard policies require the following:

(i) Impacts are identified and assessed early in the project cycle;

(ii) Plans to avoid, minimize, mitigate, or compensate for potential adverse impacts are developed and implemented; and

(iii) Affected people are informed and consulted during project preparation and implementation.

43. These policies apply to all ADB-financed projects, including private sector operations, and to all project components. The internal procedural requirements are detailed in the Operations manual sections and involve similar implementation processes as follows:

(i) Screening and scoping of the main issues start as soon as potential projects for ADB financing are identified and continue throughout the project cycle;
(ii) Impacts are assessed, safeguard plans summarizing mitigation measures, monitoring program, and institutional arrangements are prepared, and arrangements are made to integrate safeguards into project design and implementation;
(iii) Affected people are consulted during project preparation and implementation and information is disclosed in a form, manner, and language accessible to them, and
(iv) Safeguard plans are disclosed to the general public and the information is updated at various stages in the project cycle. ADB's safeguard policies require that ADB's safeguard requirements are complied with.

44. The ADB screened the projects into the categories as presented in the following table:

Table 10: ADB Projects Environmental Classification

Category	Category A	Category B	Category C	Category FI
Description	The project is likely to have significant Adverse Environmental Impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.	The project has potential adverse environmental impacts on human populations or environmentally important areas - including wetlands, forests, grasslands, and other natural habitats - are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigating measures can be designed more readily than for Category A projects.	The project is likely to have minimal or no adverse environmental impacts	The project Involves investment of IFC funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.
EA Requirements	For a Category A the project, the project sponsor isresponsible for preparing a report, normally an EIA	EA is narrower than that of Category A EA. Like a Category A EA, it examines the project's potential negative and positive environmental impacts and	Beyond screening, no further EA action is required for a Category C project.	For the FI category subproject sponsors requires to carry out appropriate EA for each

Category	Category A	Category B	Category C	Category FI
		recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.		subproject

D. Good Environmental Management Practices under RCIP-AF

45. The additional financing will require implementing agencies to implement good environmental practices in constructing and upgrading rural roads. The additional financing will adopt the good practices that were first developed by the World Bank for India's Pradhan Mantri Gram Sadak Yojana (PMGSY) or Prime Ministers Rural Road Program which "details the factors to be considered during project preparation to avoid/address environmental concerns through modifications in project design and incorporation of mitigation measures.[13]" These practices are to be implemented in conjunction with applicable road construction standards. Good practices cover the entire range of rural road construction activities, these are project planning and design; site preparation; construction camps; alternate materials for construction; borrow areas; topsoil salvage, storage and replacement; quarry management; water for construction; slope stability and erosion control; waste management; water bodies; drainage; construction plant and equipment management; public and worker's safety and health; cultural properties; tree plantation; managing induced development; natural habitat and biodiversity; consultation for environmental aspects.

46. The current project has adopted some of these good practices in environmental management and incorporated them into the general environmental management plan and monitoring forms, and the same will also be applied to the additional financing (see Appendix C). The general environmental management plan provides requirements for the following rural road development stages and activities: finalization of alignment; land transfer; land clearing operations; establishment of temporary office and storage area; construction campsites; mobilization of construction materials - stone aggregates, earth and construction water; transportation of construction materials; diversion of traffic; cut and fill; preparation of embankment and road base; cross drainage structures; tree planting; hot mix plants and laying of bitumen; cleanup of construction worksites and disposal of waste; equipment/ vehicles deployed for construction works; and occupational safety and health hazards at work and campsites.

47. In cases where national environmental standards and regulations do not exist internationally acceptable levels will be adopted, such as the one published by the World Health Organization, or the Environment, Health, and Safety Guidelines of the International Finance Corporation- the World Bank Group. Further, when national regulations differ from the

[13]http://documents.worldbank.org/curated/en/854951468044369026/pdf/E25790V30EA0Re1actice010August02010.pdf

performance levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. On occasions, if less stringent levels or measures are appropriate in view of specific project circumstances, full and detailed justification of the applied standard or guideline should be presented in the environmental assessment. For this project key monitoring parameters, where IFC guide values take precedence over national standards are provided in the following table.

Table 11: Comparison of RCIP Environmental Quality Monitoring Parameters Standard and IFC Guide Values

Monitoring Parameters	GoB Standards	IFC Guide Values
Air Quality		
Suspended Particulate Matter (SPM)	20 ug/m3 (annual) 150 ug/m3 (24-hr)	20 ug/m3(annual) 50 ug/m3 (24-hour)
Particulate matter =<10u		
Water Quality		
Turbidity	10 NTU (drinking water)	50 mg TSS/li (surface water)
Oil and Grease	0.01 mg/li (drinking water)	10 mg/li (surface water)
Noise		
Residential Area	50 dB(A) (daytime) 40 dB(A) (nighttime)	55 dB(A) (daytime) 45 dB(A) (nighttime)

IV. DESCRIPTION OF ENVIRONMENT

48. The project area, as previously mentioned, is divided into administrative 5 divisions, and further into 16 districts. A total of 61 Upazilas will be benefited from the 96 rural roads that will be upgraded with a total length of 930 km. The following map presents the locations of the proposed roads in each of the project districts.

Figure 9: RCIP-AF Location Map Showing the Roads and Districts

A. Administrative Boundary and Geography

49. The 96 roads of the project area cover 9 out of 20 LGED regions and 16 out of 64 districts of Bangladesh. Geographically the regions are southeastern and northwestern of the country. The benefits of the additional financing work will comprise maintenance and rehabilitation of existing Upazila and Union road of rural areas; existing users will benefit all season movement by using these roads.

B. Physical Environment

8. Climate and Meteorology

50. The entire country is divided into 6 climatic regions based on average summer temperatures and annual rainfall, these are southeastern, northeastern, northern part of the northern region, northwestern, western, southwestern, and south-central as depicted Figure 9. In general, the rainfall increases from west to east and temperature from north to south. Higher temperatures and rainfall are observed in the southeastern region, while the western and southwestern regions have higher temperatures and less rainfall.

51. Geographically, Bangladesh extends from 20°34'N to 26°38'N latitude and from 88°01'E to 92°41'E longitude and climatically it is a tropical country. Monsoon dominates throughout the year in most parts of the country. Bangladesh has four distinct climatic seasons: (i) the dry winter season from November to February, (ii) the pre-monsoon hot summer season from March to May, (iii) the rainy monsoon season from June to October, and (iv) the post-monsoon season from October to November.

a. Rainfall

52. Mean annual precipitation in Bangladesh is presented in the following table depicting the spatial distribution of rain. Rainfall in Bangladesh varies from 1,598 mm in the west to 4,197 mm in the east with a rainfall gradient of about 7 mm/km. The following figure presents the monthly distribution of rainfall in the country which shows that a highly seasonal distribution with almost 80% of the annual rainfall occurring during monsoon.

53. Tropical depressions or monsoon depressions in the Bay of Bengal defines the summer monsoon season rainfall in Bangladesh. The monsoon depressions move from the Bay of Bengal toward the monsoon trough and produce enormous amounts of rainfall. Most of the rainfall in Bangladesh occur in monsoon. The monsoon depressions enter Bangladesh from the Bay of Bengal with south-to-north trajectory and then turn toward the northwest and west being deflected by the Meghalaya Plateau. As these depressions move farther and farther inland, their moisture content decreases, resulting in decreasing rainfall toward the northwest and west of Bangladesh. On the other hand, the additional uplifting effect of the Meghalaya plateau increased the rainfall in the northeast of Bangladesh.

54. There is also a wide variation in rainfall distribution across the project area. Chuadanga and Rajshahi districts are located inland along the Indian border and have a lower annual average rainfall of 1,496.5 mm and 1,542.1 mm, respectively. Chattogram station located along the southern coast recorded the higher rainfall of 2,919 mm.

Table 12: Average Monthly Rainfall (mm) in the Project Area

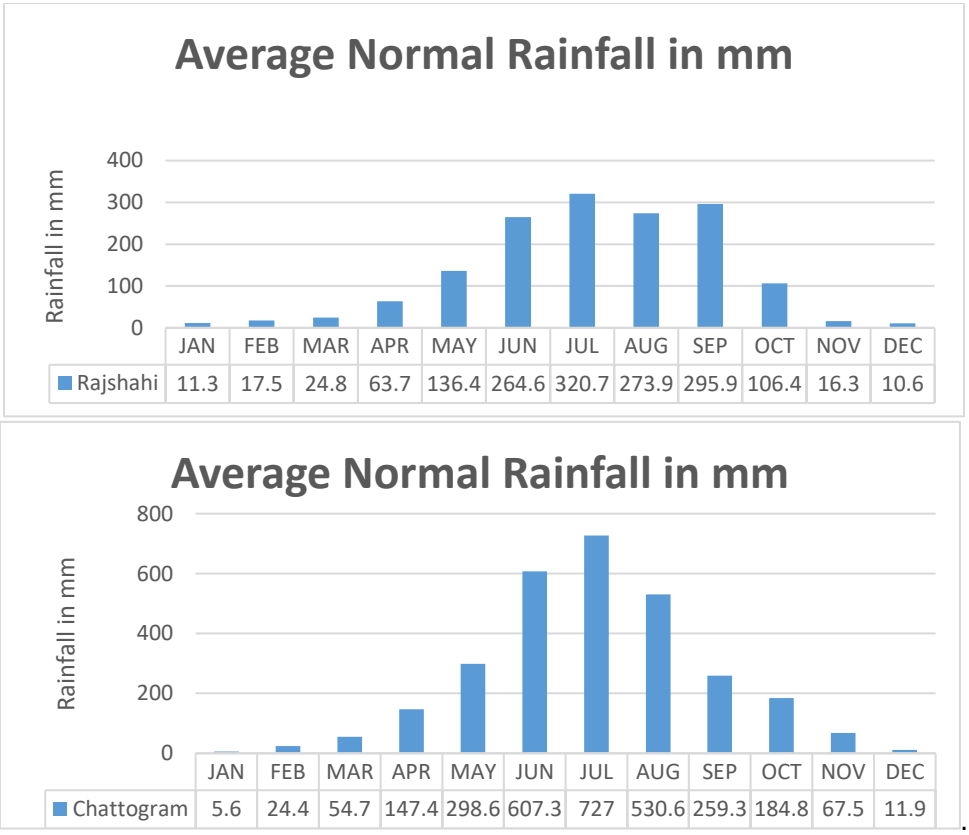
Station	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Bogura	8.70	15.20	20.10	80.50	222.00	343.80	406.10	285.30	310.10	126.90	13.10	11.30	1,843.10
Chattogram	5.60	24.40	54.70	147.40	298.60	607.30	727.00	530.60	259.30	184.80	67.50	11.90	2,919.00

Station	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Chuadanga	14.80	26.60	20.20	39.80	142.80	235.40	351.70	232.80	297.10	101.30	21.00	13.00	1,496.50
Cumilla	7.50	28.80	66.20	153.90	329.60	329.80	415.50	316.00	226.60	141.60	41.60	8.60	2,066.00
Dinajpur	12.30	10.50	11.30	67.10	232.50	335.30	433.60	387.70	383.80	115.10	7.00	10.20	2,006.40
Jashore	14.80	26.10	44.60	75.40	169.90	298.70	304.10	291.80	236.90	107.90	29.00	5.80	1,615.00
Madaripur	9.70	34.20	60.90	154.30	264.30	384.30	401.50	351.50	246.50	149.60	32.30	5.40	2,094.00
Rajshahi	11.30	17.50	24.80	63.70	136.40	264.60	320.70	273.90	295.90	106.40	16.30	10.60	1,542.10
Rangpur	9.30	11.80	24.50	104.00	294.40	417.40	464.80	376.10	383.00	132.10	10.50	7.90	2,235.80

Source: BMD Station data

55. Figure 10 and **Error! Reference source not found.** chart Rajshahi and Coxsbazar stations showing the difference between the drier summer weather inland at Rajshahi in comparison to Coxsbazar where approximately twice as much rain falls during the summer monsoon months. Rajshahi has the lowest rainfall of all stations in Bangladesh.

Figure 10: Monthly Average Rainy Days, Rajshahi and Cox's Bazar Meteorological Station



56. The spatial variation of rain days in the project area reflects that of the country. From October to April there are few days when rain is recorded and in December not one of meteorological stations in the project area registered more than 1 rainy day. During the pre-monsoon, rainfall increases from June to September to about 15 days. Weather stations located along or near the coast have more than half the month with rainy days. Rajshahi has fewest rainy days while Feni located along the coast of Chattogram has the most rain days.

b. Temperature and Relative Humidity

57. The average temperature in Bangladesh ranges from 17°C to 20.6°C during winter which at times reduces to 7°C in some places and 26.9°C to 31.1°C during summer and in the northwest region reaches more than 45°C. The northwest region experiences the two extremities that are in clear contrast with the climatic conditions of the rest of the country.

58. The average minimum and maximum temperatures recorded in the meteorological stations located in the project area is provided in the succeeding Tables. The average minimum and maximum temperatures in the summer and the winter months are consistent across the stations with temperatures well above freezing even in the coldest. The highest average maximum temperature occurs during the pre-monsoon months between April and May and recorded in Chuadanga at 36.3ºC. The lowest temperatures of just r 10ºC were recorded in Chuadanga and Dinajpur.

Figure 11: Climate Map of Bangladesh

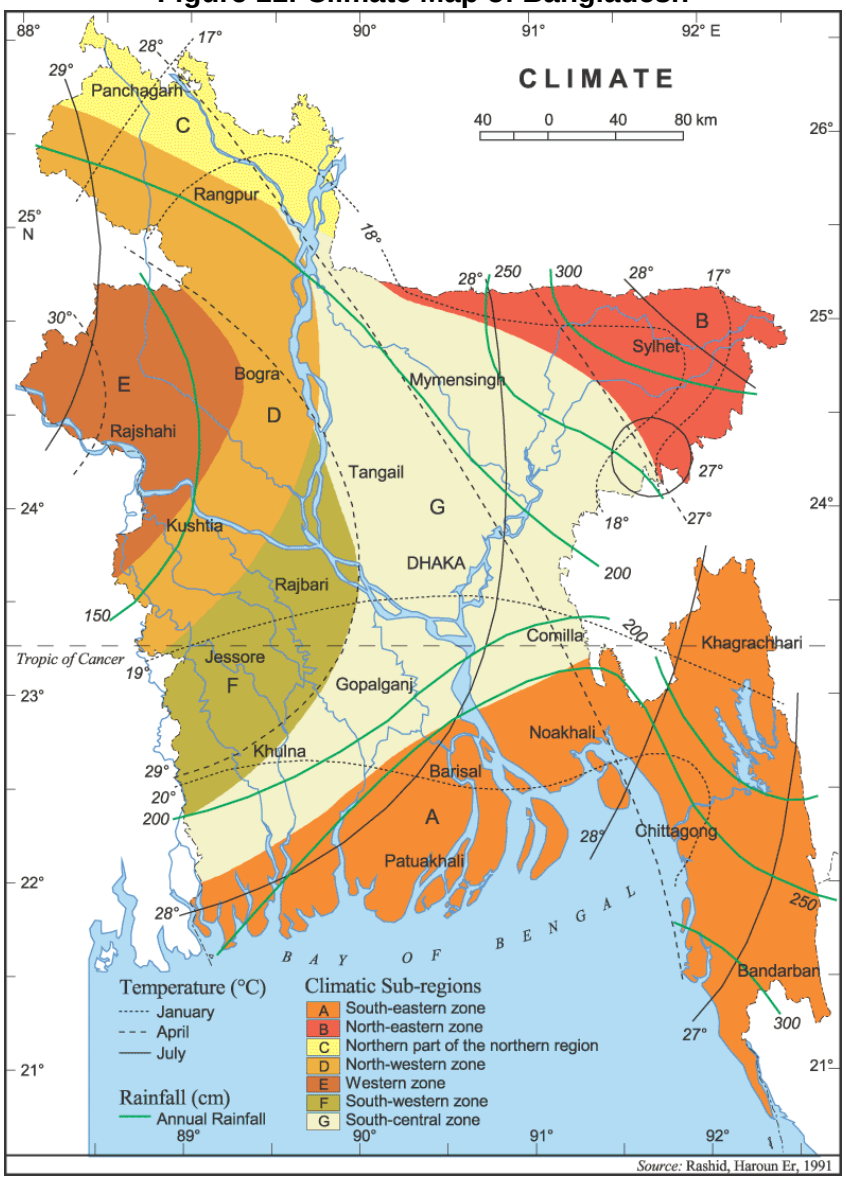


Table 13: Average Minimum Temperature

St_name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Bogura	11.7	14	18.4	22.6	23.9	25.8	26	26.2	25.5	23.2	18.3	13.4
Chattogram	13.9	16.2	20.3	23.4	24.7	25.2	25.1	25.1	25.1	24	20.3	15.6
Chuadanga	10.6	14.1	18.8	23.4	25.2	26.1	26.2	26.2	25.6	23.5	18.1	12.5
Cumilla	12.1	15.2	19.7	22.8	24.2	25.3	25.4	25.4	25.2	23.4	18.7	13.3
Dinajpur	10.4	12.5	16.9	20.8	23	25.5	25.5	26	25.1	22.2	16.5	11.9
Madaripur	11.9	14.8	19.7	23.1	24.3	25.7	25.7	26.1	25.7	23.9	19.2	13.8
Rajshahi	11	13.1	17.8	22.7	24.3	25.8	26	26.1	25.6	23.2	17.9	12.6
Rangpur	10.7	12.7	16.6	20.7	22.9	25	25.7	26.2	25	22.4	17.3	12.7

Source: BMD Station data

Table 14: Average Maximum Temperature

St_name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Bogura	24.9	27.4	31.8	34.3	33.1	32.6	31.7	32.1	31.8	31.7	30	26.5
Chattogram	26	28	30.6	31.8	32.3	31.5	30.9	31.1	31.6	31.5	29.8	27
Chuadanga	24.6	28.1	33.2	36.3	35.8	34.1	32.7	33	32.8	32.4	30.1	26.4
Cumilla	25.4	27.7	31	32.2	32.2	31.6	30.9	31.3	31.6	31.4	29.6	26.6
Dinajpur	23.4	26.4	31.1	33.3	32.6	32.7	31.8	32.1	31.5	31.1	28.9	25.5
Madaripur	25.4	28.3	32.6	34.1	33.6	32.5	31.7	31.9	32.2	32.2	30	26.7
Rajshahi	24.5	27.7	33.1	35.7	34.5	33.4	32.1	32.3	32.2	31.7	29.3	25.8
Rangpur	23.4	26	30.4	32.2	31.9	32.1	31.7	31.9	31.3	30.8	28.6	25.1

Source: BMD Station data

59. The average relative humidity in Bangladesh for the whole year ranges from 78.1% to 70.5%, with maximum records occurring in September and a minimum in March. In the project area, humidity follows the same pattern with maximum readings between June and September coinciding with the monsoon rains. Spatial variation indicated the highest humidity of 87% in Cumilla, Rajshahi, and Rangpur. In contrast, the lowest recorded average monthly humidity at 63 % occurs during March in Dinajpur and Rajshahi.

Table 15: Monthly Normal Humidity (%) in the Project Area

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bogura	77	70	66	72	78	84	86	85	86	82	77	77
Chattogram	73	70	74	77	79	83	85	85	83	81	78	75
Chuadanga	78	72	65	68	74	83	86	86	86	83	78	78
Cumilla	77	75	77	81	82	86	87	86	86	84	80	79
Dinajpur	79	70	63	68	76	82	84	84	85	82	78	78
Madaripur	77	72	70	74	79	84	86	85	85	82	78	78
Rajshahi	78	71	63	65	75	83	87	86	86	83	78	78
Rangpur	82	75	68	74	81	85	86	85	87	84	80	81

Source: BMD Station data

c. Wind Speed

60. The following table presents the basic wind speed map of Bangladesh. Basic wind speed is defined as site-specific wind speed that is used in the determination of design wind loads for buildings and other structures. In general, increase to the southeast from 41.4 m/s in Thakurgaon, C. Nawabganj, and Dinajpur to 80.0 m/s in Patuakali, Barguna, and coastal areas of Chattogram and Cox's Bazar. Dinajpur the slowest monthly average wind speed with just 1.32 while the fastest was recorded in coastal Chattogram. The following tables show the wind speed records for stations of Dinajpur and Chattogram. The two stations exhibit extremes of low and high wind speeds respectively. The Tables show similar seasonal variation with lowest winds registered in

November and December and highest in the monsoon period. The strength of winds throughout the year is two or three times stronger in Chattogram than in Dinajpur.

61. The temporal wind speed pattern follows the cycle of gusty winds during the pre-monsoon period and sustained during the summer monsoon. The wind starts to lose speed until November when calms are recorded across all stations in the project area.

Table 16: Normal Wind Speeds (m/s)

Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Bogura	1.3	1.6	2.2	3.1	3.1	2.9	2.7	2.4	1.9	1.2	1	1.1	2.02
Chattogram	2.5	3.3	5	7.5	7.4	8.8	8.9	7.9	5.6	3.1	2.1	2.1	5.37
Chuadanga	0.8	1	1.6	2.5	2.4	2.3	2	1.7	1.6	0.9	0.6	0.7	1.5
Cumilla	1.2	1.6	2.8	4.3	4.4	4.6	4.7	4.1	2.7	1.4	0.9	0.9	2.82
Dinajpur	1	1.2	1.7	2	1.8	1.7	1.6	1.4	1.2	0.8	0.7	0.7	1.32
Madaripur	0.8	0.9	1.5	2.4	2.2	2	2.2	2.1	1.4	0.8	0.6	0.6	1.47
Rajshahi	1.6	1.8	2.3	3.4	3.7	3.6	3.2	2.9	2.5	1.5	1.5	1.7	2.46
Rangpur	1.3	1.6	2.5	3.4	3	2.9	2.8	2.6	2.1	1.6	1.5	1.3	2.22

Source: BMD Station data

Figure 12: Average Wind Speed, Dinajpur Weather Station

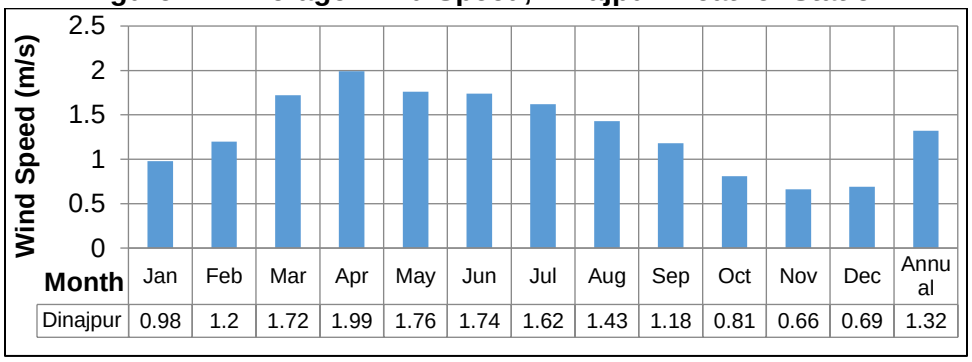


Figure 13: Wind Speed at Chattogram

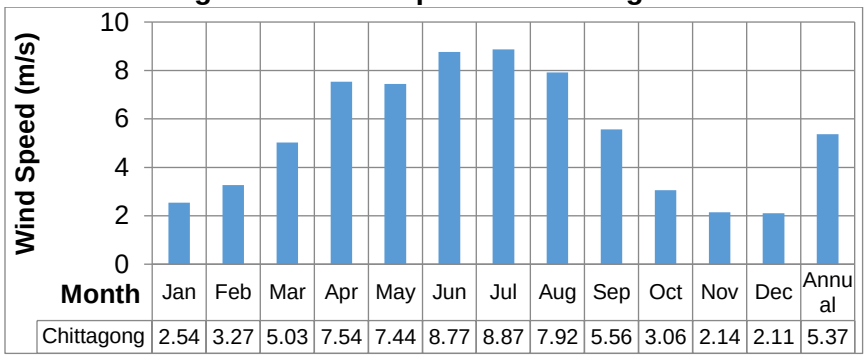
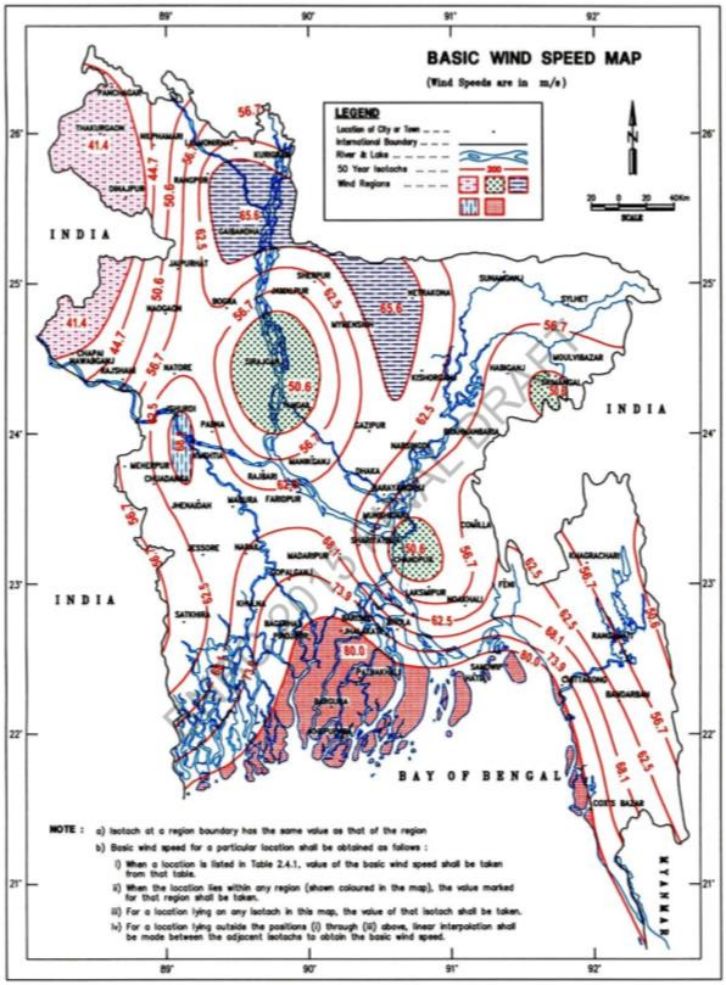


Figure 14: Basic Wind Speed Map, Bangladesh



9. Physical Geography

62. Bangladesh has two dominant land features; a vast expanse of deltaic plain produced by the world's biggest rivers, and a small hilly region located on Chattogram and Coxsbazar where swift rivers emanate. The total land area is 147,610 km^2 confined along a latitude of 820 kilometers and at its widest is 600 kilometers. It is bounded by India on its west, north, and northeast and on the southeast by Myanmar. The southern portion is the Bay Bengal and along its coast is a dynamic delta dissected by numerous rivers.

a. Elevation

63. **Error! Reference source not found.** presents a digital elevation model (DEM) of Bangladesh based on a 300m grid. A DEM is a computerized virtual representation of a continuous surface of the earth in a specified area. This map illustrates most of the country's territory is below 10 m above mean sea level except for the southeastern border districts of Khagrachari, Rangamati, Bandarban, and sections of Chattogram and Coxsbazar; and the northwestern districts of Thakurgaon and Panchagarh. The Chattogram Hills rise steeply to 600 to 900 meters, and at 1,052 meters altitude, the highest elevation in Bangladesh in Saka Haphong

also in the southeastern region. In the northwest, the monotonous plains of Rajshahi and Rangpur Division are broken by hills rising 100m from old alluvial deposits of the Barind tracts.

b. Slope

64.

65. Figure 16 presents the slope map of Bangladesh with the project area highlighted. The northwestern districts belonging to Rangpur and Rajshahi division have a slope range between 3-6º, while the districts in Dhaka, Khulna, and the northern districts of Chattogram Divisions have a slope between 0-3º. Chattogram division gradually rises to 6-8º and then rises to as steep as 35o and higher along the Myanmar and India borders.

c. Geology

66. Bangladesh has virtually no stone to be utilized for use as aggregate or building materials. It does, however, have a plentiful supply of clay, leading to the making of bricks. Soils and clays are extracted through strip-mining and fired to make bricks in relatively small brickfields found throughout the study area. In broad terms, alluvium accounts for 77.2% of the country's total area and comprised mostly of alluvial silt and clay, alluvial silt, deltaic silt, march clay and peat, and young gravelly sand which formed during the Holocene or Recent period. This formation is found along the districts along the Padma and Jamuna rivers; Panchgarh, Thakurgaon, Nilphamari, and Rangpur for gravelly sand; Rajshahi, Natore, Bogura, and Sirajganj for Delatic Silt; Noakhali, Feni, and Laximpur for Chandina Alluvium; and the coastal areas of Chattogram division for valley alluvium and co-alluvium. In the Chattogram division, older formations are found to include St Martin Limestones formed during the Pleistocene age, Tipam sandstone during the Pliocene age, and Bokabil formation during of the Surma group during the Miocene age. Figure 17 presents the geologic map of Bangladesh.

d. Soil

67. The predominant soil groups in the project area are calcareous dark gray flood plain and calcareous brown flood plain soils which are found mostly in Rasjhahi, and parts of Rangpur Districts. More specifically in Natore, Chuadanga, Jhenaidah, and Jashore districts. Grey and red-brown terrace soils, which make up about 17 percent of the soils in the country, are generally flood-free and poor in organic matter. In contrast, the vast majority of the country of the soil types is highly fertile.

Figure 15: Digital Elevation Model, Bangladesh

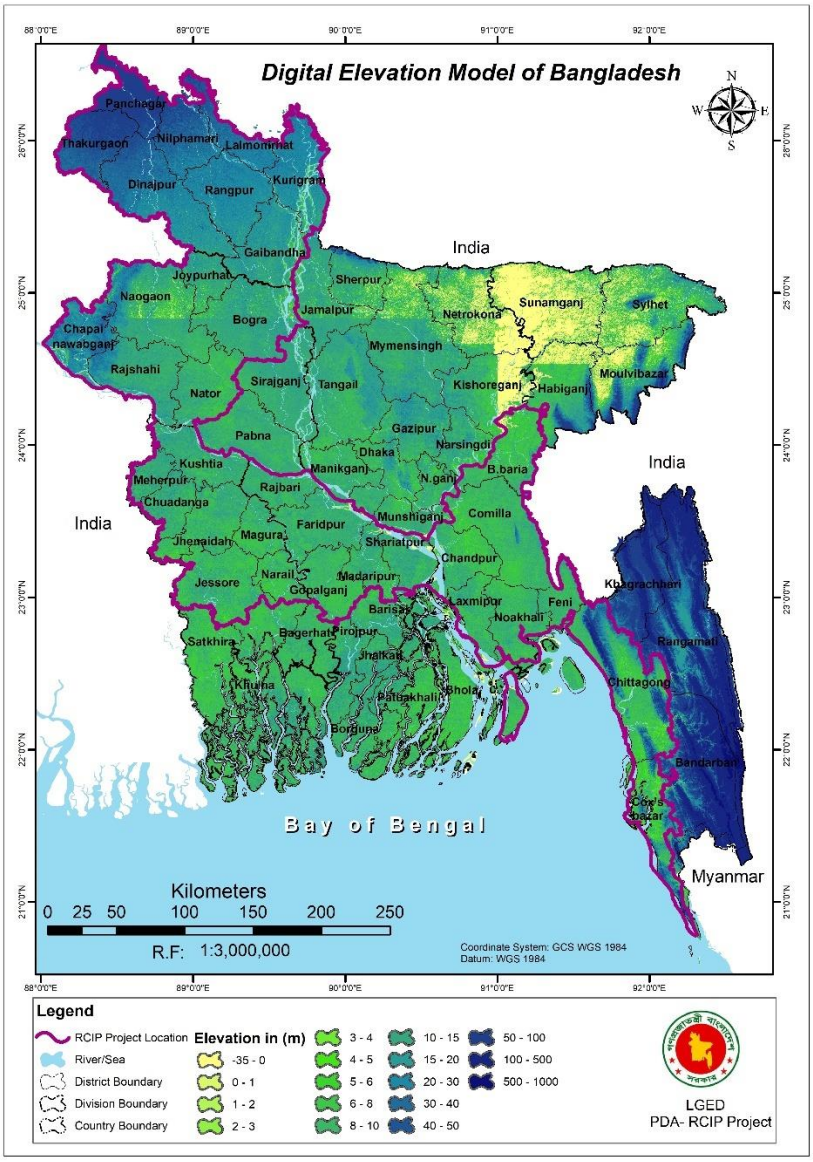


Figure 16: Classified Slope Map of Bangladesh

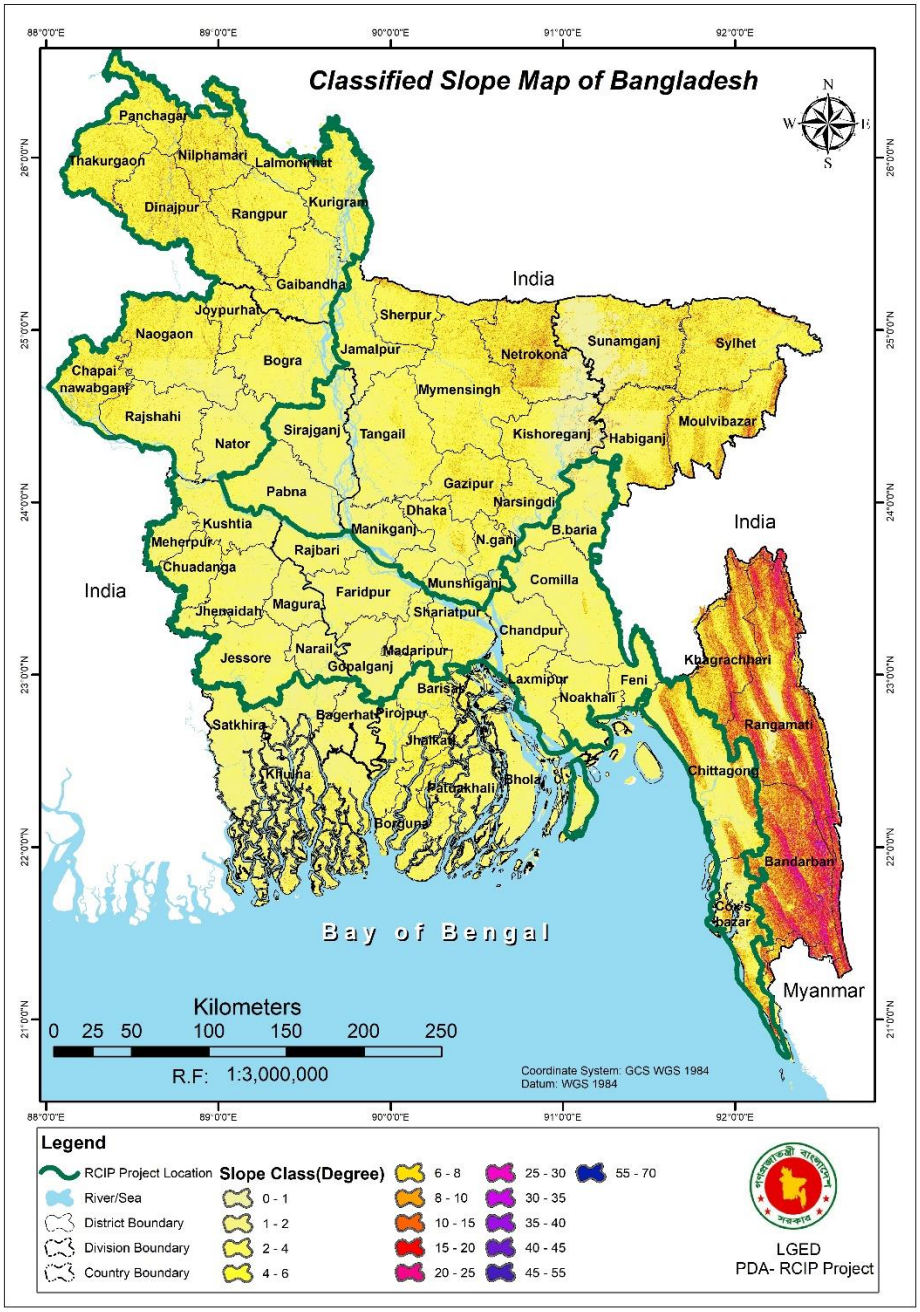
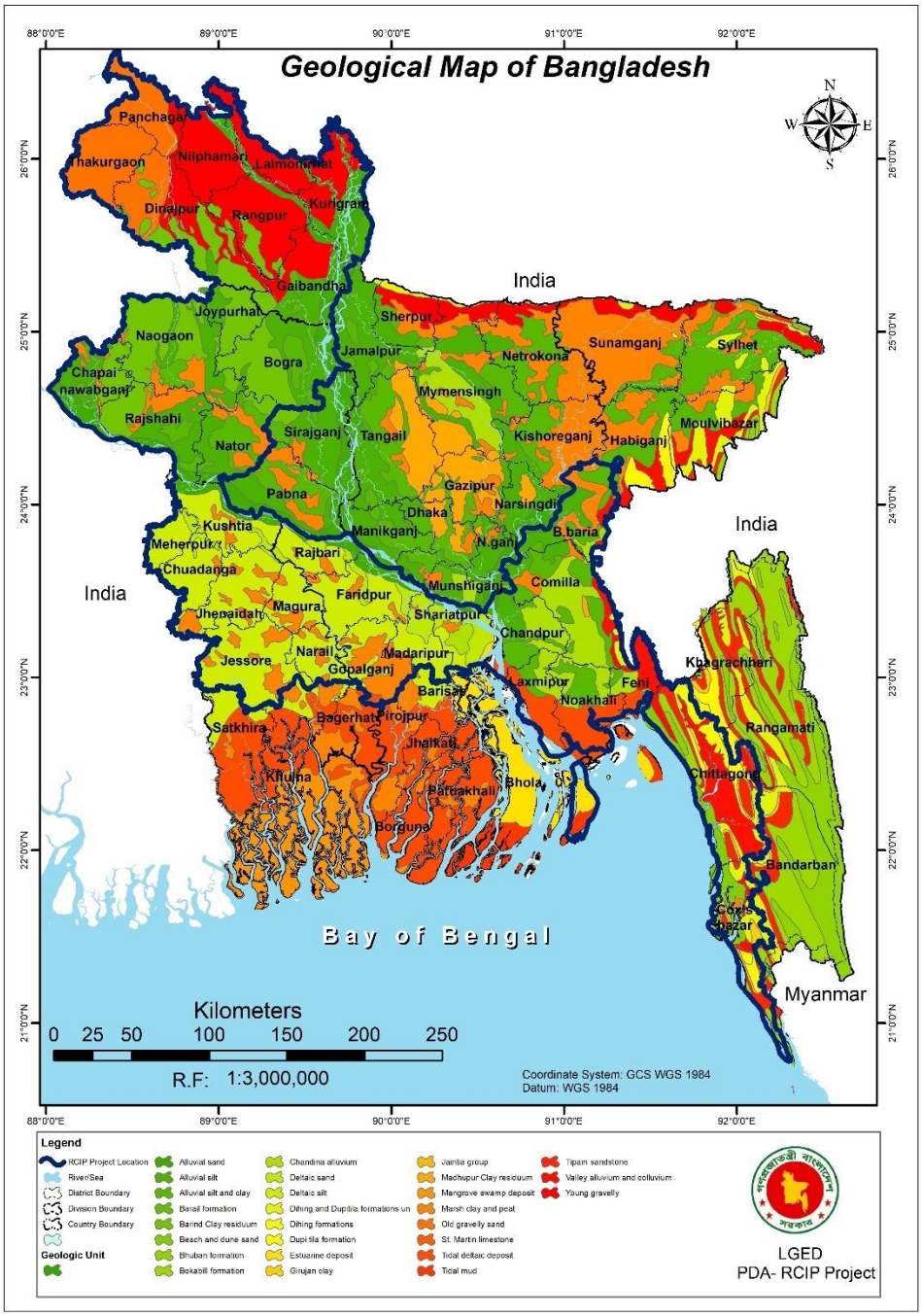


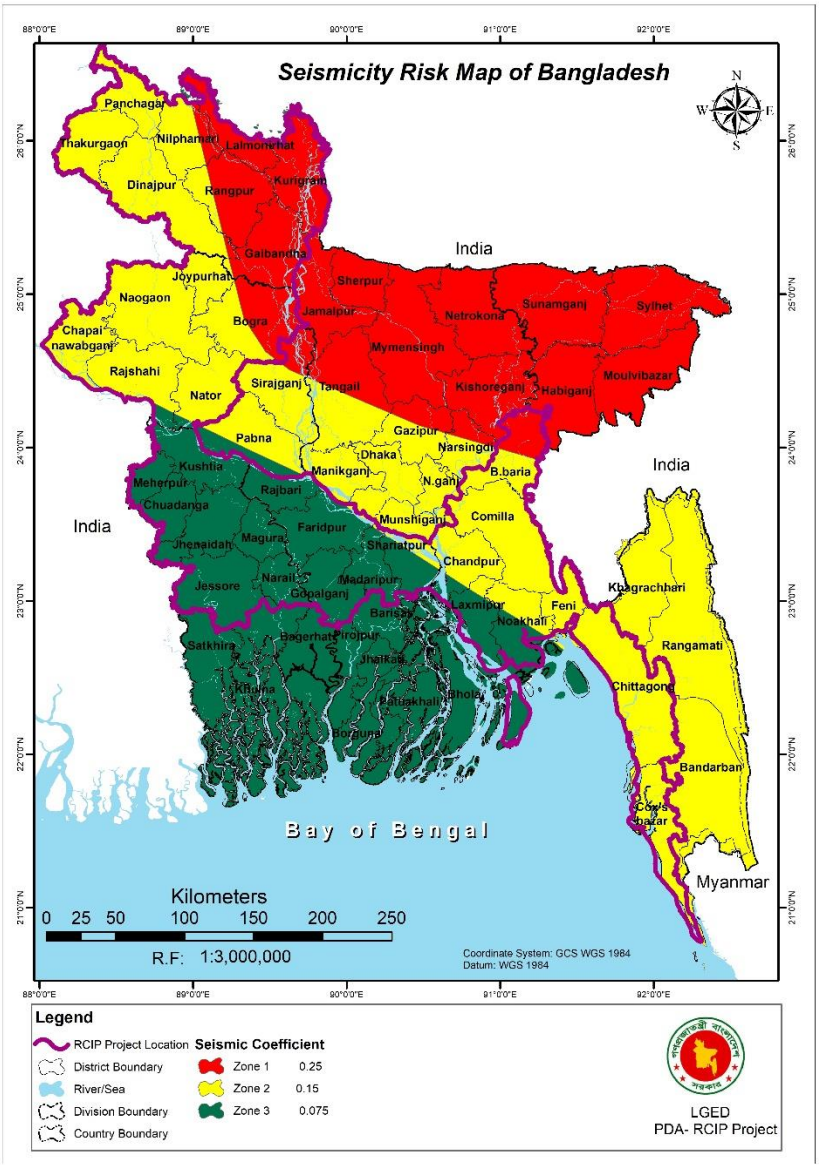
Figure 17: Geologic Map of Bangladesh



e. Seismicity

68. Historical earthquakes had not caused landslides compared to the neighboring countries of India and Myanmar. The country has a long history of earthquakes and few were considered catastrophic; notably, events that occurred in 1762, 1782, 1897, and 1950. Bangladesh is classified into three seismic zones as presented in Figure 18. The project area lies within an active seismic zone and is mostly classified as medium risk.

Figure 18: Earthquake Prone Area of Bangladesh



f. Hydrology

69. Rivers and their impact upon the land are the defining features of Bangladesh. The outflow of water from Bangladesh is the third largest in the world, after the Amazon and the Congo systems. Its rivers are young and migratory. Many small lakes and ponds are scattered around the country are created when branches of meandering rivers are cut off. Recent deforestation in Bangladesh and its neighbors has caused rivers to carry a larger amount of silt through already burdened river systems, leading to faster, shallower rivers and more prone to flooding. Major floods occur every 2 to 3 years with flash floods in the north occurring regularly between August and October. Several rivers govern the overall hydrology of the project area. The Brahmaputra/Jamuna and the Ganges/Padma system are in the project area. The Brahmaputra/Jamuna and lower Meghna are the widest rivers, with the latter expanding to almost 8 kilometers in the wet season. The Ganges/Padma, which begins in the Indian state of Uttar Pradesh, enters Bangladesh from the northwest through the Rajshahi Division. It joins the Brahmaputra/Jamuna in the center of the country, northwest of Dhaka, at which point the system fingers into many branches, all heading south to drain into the Bay of Bengal. LGED does not have jurisdiction on the bridges and the proposed project will not upgrade or repair any. Almost all roads are constructed on embankments and elevated from surrounding land. No direct adverse impacts on the river water quality and flow are anticipated. The following table enumerates the rivers that cross or bounds the roads in each district.

Table 17: Details of Rivers that Cross or Bounds the Project Roads

District	Rivers/Streams
Gopalganj	Madhumati river and several irrigation canal
Madaripur	No large rivers lie in this district, some roads cross and pass adjacent to irrigation canals
Rajbari	Some of the proposed road crosses Ganges and Pursali River
Cumilla	There are 12 small and large natural drainages within the proposed project alignment i.e. Gomti, Buri, Titas, Meghna, Marjora khal,Bara khal,Ramprasader khal, Dakatia, Dhunagoda and Kurzon khal
Chattogram	There are 12 small and large natural drainages at different proposed project alignment, among them Feni, Sangu, Karnafuli and Kutubdia Channel are major rivers.
Jashore	There are 10 small and large natural drainages including seasonal stream within the proposed project alignment. The major river that crosses some of the road alignment are: Bhairab,Kapotakshi,Chitra,Betna, Harihar and Afra khal
Chuadanga	Bhairab, Nabaganga, Chitra and Ichamati
Rajshahi	Fokirni, Baral and Sib are the major river that the proposed project road alignment crosses
Naogaon	The proposed project road alignment crosses Atrai and Fokirni river. There are several small irrigation canal running adjacent to the proposed project road.
Natore	The two major river that the proposed project road alignment crosses are Atrai and Baral river
Bogura	Karatoya, Bangali and Charakdaha are the major natural drainages that the proposed project road alignment crosses and There are lots of small irrigation canal that running adjacent to the proposed road alignment.
Gaibandha	Ghagat is the only major river that the proposed project road alignment crosses.
Dinajpur	There are 12 small and large natural drainages within the proposed project alignment. The major river that crosses the road alignment are as follow Little Jumuna, Atrai, Punarbhaba, Ichamati, dhepa and Tangan
Thakurgaon	The proposed road alignment crosses Tirnai, Nagar and Tangan River
Panchagarh	The proposed road crosses Pathraj , Bulli ,Talma and Tangan River

District	Rivers/Streams
Nilphamari	The road alignment crosses Jamuneswari, Charalkata, Karatoya, Nautara and Chikli Rivers.

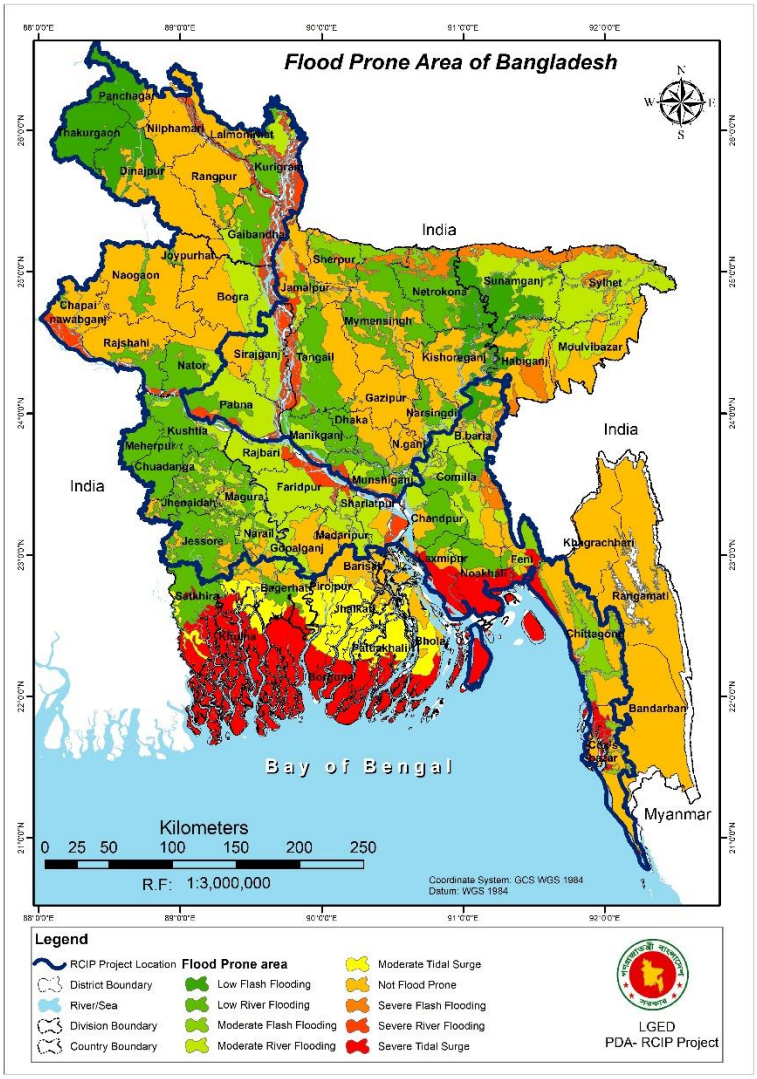
Source: LGED (2018)

g. Flood Risks

70. Four types of flooding occur in Bangladesh which includes normal and flash floods, as well as storm surges in coastal areas. Bangladesh is in a low-lying delta, formed a dense network of the distributaries Ganges, Brahmaputra, and Meghna rivers and between the Himalayas and the Bay of Bengal. As previously mentioned, the territory is mostly low and flat land, with some hilly areas in the northeast and southeast. There are more than 230 major rivers and their tributaries and with 75% of the country, less than 10 m above mean sea level, 80% of the total land area is considered as a flood plain. Flooding normally occurs during the monsoon season from June to September. Every year, nearly 26,000 km^2 or around 18% of the country is flooded. Floods have caused devastation and misery in Bangladesh throughout its history. The 1988 great flood resulted in 60% of the country being under floodwater for more than a month, while the flood in 1998 caused 75% of the country‟s area to be underwater. There were also severe floods in 1966, 1987 and 2007. Floods are annual phenomena that occur from July and August. Records show that severe floods occur about every 7 years, and catastrophic floods every 33-50 years. The annual rise in river water levels from Padma, Bhramaputra and Meghna Rivers combine to pass through a restricted outlet and into the Bay of Bengal causes vast backwater effect. The tidal levels in the Bay affect the discharge capacity of the lower Meghna. The effects of these high river water levels extend over to most of the country and are main determinant of the drainage condition and capacity. The surface drainage by gravity is limited, but roads in the project area are mostly above prevailing flood levels.

71. According to the Bangladesh Department of Disaster Management, regular river floods affect 20% of the country increasing up to 68% in extreme years. The floods of 1988, 1998 and 2004 were particularly catastrophic, resulting in large-scale destruction and loss of lives. Approximately 37%, 43%, 52% and 68% of the country is inundated with floods of return periods of 10, 20, 50 and 100 years respectively. In their study, the percentage of the country inundated due to floods (excluding eastern hilly area, Hatiya, Sandwip and estuary areas around them) for return periods of 25, 50, 100 and 150 years is 57.1%, 61.1%, 80.6% and 81.2% respectively. This indicates that the area subjected to flooding has increased from 52% to 61.1% for 50 years and 68% to 80.6% for the 100-year return period.

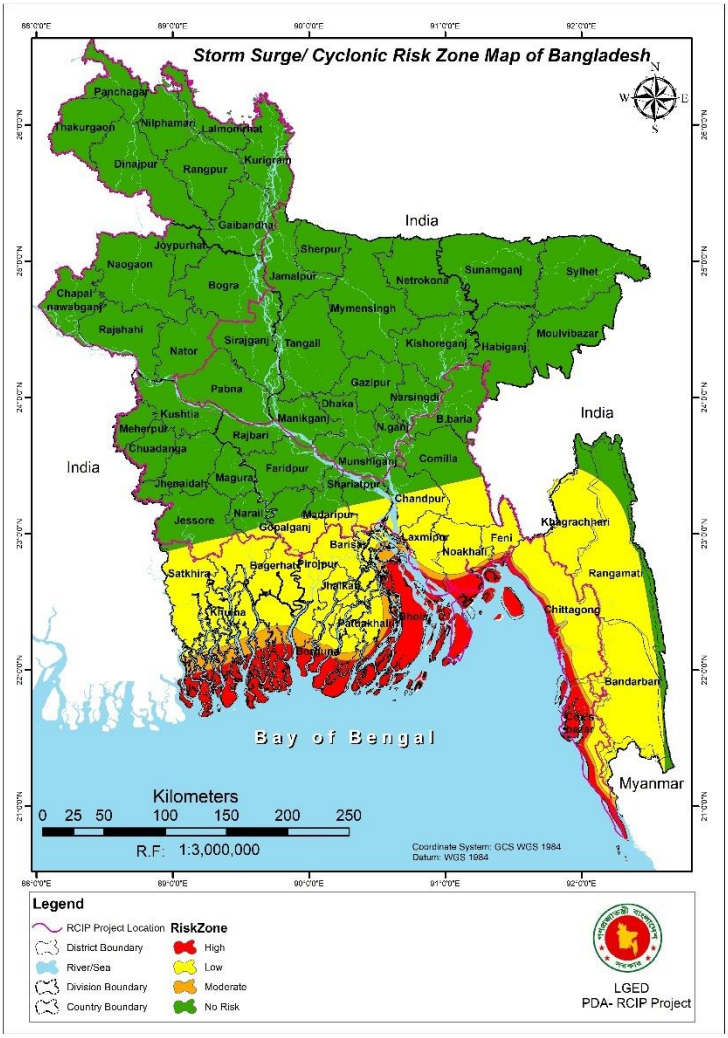
Figure 19: Flood-Prone Map of Bangladesh and Project Area



10. Cyclones and Storm Surges

72. Seasonal storms, popularly known as nor'westers *(Kalbaishakhi)* occur in the project area. Tornadoes can be associated with severe nor'westers. The frequency of nor'westers is greatest in April and they most often occur in late afternoons. The majority of the cyclones follow the northeasterly directions confined between Khulna and Cox's Bazaar. One of the major hazards in the country is tropical cyclone from the Bay of Bengal that is accompanied by storm surges. In 1876, a cyclone generated a surge height of 13.6 m and in 1970 the height was 9.11 m (WARPO, 2005). The 1970 cyclone is the deadliest cyclone that has ever hit the Bangladesh coastline with a wind-speed in excess of 224 km per hour which generated a storm surge between 6.1 to 9.11 m, and killed an estimated 300,000 people. None of the 96 rural roads proposed for upgrading under the RCIP-AF is under the risk of storm surge inundation.

Figure 20: Storm-Surge Map of Bangladesh



A. Environmental Quality

11. Ambient dust levels

73. Within rural areas of Bangladesh, the main sources of outdoor air pollution are brick kilns (Guttikunda, 2009), combustion of wood, coal, and biomass for domestic heating and cooking (UNEP, 2002). It is likely in rural areas that the principal air contaminants are particulate matter and volatile organic compounds. Other common sources of rural air pollution include emissions from engine vehicles, and dust during the dry season from construction sites, roads, disturbed areas and cleared agricultural lands. Standard quality of ambient air in different area categories, according to the Bangladesh Environmental Conservation Rules, is provided in the following table.

Table 18: Standards of Ambient Air Quality

Air Pollutant	Standards	Averageing Time
Carbon Monoxide (CO)	10 mg/m3	8-hour

Air Pollutant	Standards	Averageing Time
	(9 ppm)[a]	
	40 mg/m3 (35 ppm)	1-hour
Lead (Pb)	0.5 µg/m3	Annual
Oxides of Nitrogen (NOx)	100 µg/m3 (0.053 ppm)	Annual
Suspended Particulate Matter	200 µg/m3	8-hour
PM10	50 µg/m3 [b]	Annual
	150 µg/m3 [c]	24-hour
PM2.5	15 µg/m3	Annual
	65 µg/m3	24-hour
Ozone (O3)	235 µg/m3 (0.12 ppm) [d]	1-hour
	157 µg/m3 (0.08 ppm)	8-hour
Sulfur dioxide (SO2)	80 µg/m3 (0.03 ppm)	Annual
	365 µg/m3 (0.14 ppm) [a]	24-hour

Note: i) ppm- Parts Per Million

ii) In this schedule, Air Quality Standards means Ambient Air Quality Standards

a. Not to be exceeded more than once per year
b. Annual average value will be less than or equal to 50 microgram/cubic meter
c. The average value of 24 hours will be less or equal to 150 microgram/cubic meter for one day each year.
d. The maximum average value for every one hour each year will be equal or less than 0.12 ppm.

Source: DOE. Schedule 2, Rule-12, ECR, 1997. (Bangladesh Gazette, 19 July, 2005).

74. Ambient air quality measurements were taken on February 2020 at 32 Upazila of 16 Districts locations of the Project alignment. The key air quality parameters were monitored (PM_{10}, $PM2_{2.5}$, CO, SO_2, NO, and NO_2. These data were collected using the Environmental Perimeter Air Sampler (EPAS) (model haz-Scanner) of Environmental Devices Corporation (EDC), USA. These data were used to develop the following table and compared with Bangladesh national standards for ambient air quality. The test results show that the local ambient air quality condition meets the national standard, according to the Bangladesh National Ambient Air Quality Standards defined in the Environmental Conservation Rules amendment 19th July 2005 vide S.R.O. No. 220-Law/2005.

75. LGED monitoring indicated that the average PM2.5 concentration in selected roads is 81 ug/m^3 with a minimum and maximum concentrations of 43 ug/m^3 and 157 ug/m^3. The average PM10 concentration in selected roads is 109 ug/m3 with a minimum and maximum concentrations of 56 ug/m^3 and 224 ug/m^3.

76. Using the USEPA air quality index (AQI)[14], and average AQI 63 corresponds to unhealthy air quality when people with respiratory or heart disease, the elderly and children are the groups most at risk. Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population. About 90% of the total observations fall within the unhealthy AQI and the remaining 10% of the total observations corresponding to healthy air quality.

[14] https://www.airnow.gov/index.cfm?action=airnow.calculator

Figure 21: Air and Noise level measurements at selected locations of RCIP –AF roads

Table 19: Air Quality monitoring results of Selected RCIP-AF Roads (Source: LGED (2020)

Sample ID	Longitude	Latitude	District	Upazila	CO µg/m3	NO µg/m3	NO2 µg/m3	O3 µg/m3	PM2.5 µg/m3	PM10 µg/m3	SO2 µg/m3	VOCS	AQI
AAQ-01	89.188690	24.875409	Bogura	Kahalo	0.00	3.12	12.05	87.21	54.28	119.42	110.92	124.93	77.4
AAQ-02	89.07500	24.834119	Bogura	Adamdighi	0.09	1.89	10.21	75.05	55.71	75.18	106.29	54.48	64.866
AAQ_03	88.840856	25.617439	Dinajpur	Parbatipur	0.37	3.92	11.20	76.68	48.98	64.19	65.12	70.96	54.018
AAQ_04	88.950651	25.497509	Dinajpur	Phulbari	0.05	5.13	9.06	49.79	65.92	91.81	54.69	146.63	55.28
AAQ_05	89.353905	25.283410	Gaibandha	Sadullapur	0.63	1.38	16.57	0.066	99.78	108.77	45.03	13.84	54.3192
AAQ_06	89.569002	25.388914	Gaibandha	Gaibandha-S	0.04	3.32	12.68	36.68	75.97	88.72	52.56	10.77	53.986
AAQ_07	88.775428	25.982443	Nilphamary	Nilphamary-s	0.09	4.81	32.73	2.69	143.59	154.28	12.12	34	70.044
AAQ_08	88.878356	25.820241	Nilphamary	Sayedpur	0.06	2.91	5.37	39.34	90.64	105.76	31.29	2.83	55.062
AAQ_09	88.566183	26.336419	Panchagor	Panchagor-s	0	1.06	47.66	0.44	157.08	171.09	0.28	100.81	75.522
AAQ_10	88.370128	26.502095	Panchagor	Tetulia	0	8.92	12.11	53.64	87.54	149.93	45.96	37.88	71.62
AAQ_11	88.276561	26.087513	Thakurgaon	Baliadangi	0	3.25	12.00	79.62	51.36	80.45	72.59	66.76	59.854
AAQ_12	88.359053	25.851739	Thakurgaon	Pirgonj	0.18	7.17	13.78	50.87	77.90	107.24	63.38	107.89	64.068
AAQ_13	88.751451	23.613452	Chuadanga	Damurhuda	0.63	0.84	25.20	51.64	45.58	84.73	153.30	153.07	72.258
AAQ_14	88.955662	23.749413	Chuadanga	Alamdanga	0.01	4.02	32.14	5.47	130.97	152.37	74.65	69.04	79.924
AAQ_15	89.227888	22.974222	Jashore	Monirampur	0.002	2.16	18.20	37.81	92.10	109.89	112.10	24.60	74.452
AAQ_16	89.380260	23.019006	Jashore	Avainagar	0.57	5.98	24.40	35.84	66.96	75.72	160.54	12.03	73.888
AAQ_17	89.369942	24.396076	Natore	Gurudaspur	0.59	2.26	17.80	36.16	88.52	95.50	126.41	23.92	73.33
AAQ_18	89.048272	24.270969	Natore	Lalpur	0.19	0.25	55.12	0.44	150.76	180.53	94.40	30.31	96.3
AAQ_19	88.644094	24.835437	Naogaon	Niamatpur	0.12	0.71	11.45	21.78	85.55	95.76	110.25	26.78	65.1
AAQ_20	88.754024	24.720524	Naogaon	Manda	0	2.49	30.20	52.31	75.32	83.09	94.37	103.55	67.556
AAQ_21	88.731071	24.617507	Rajshahi	Bagmara	0.47	3.38	43.02	57.92	76.92	93.03	104.30	116.11	75.714
AAQ_22	88.637005	24.512846	Rajshahi	Mohonpur	0.01	3.30	37.80	49.85	72.88	87.44	83.83	113.79	67.02
AAQ_23	90.830967	23.533808	Cumilla	Daudkhandhi	0.02	1.45	14.00	26.22	129	224	3.13	33.25	79.56
AAQ_24	91.044550	23.588216	Cumilla	Debidwar	0.01	0.84	18.00	49.00	44	116	4.88	54.31	46.544
AAQ_25	91.940712	22.449995	Chattogram	Raozan	0.02	2.44	6.16	121	44	77	8.32	66.10	51.784
AAQ_26	91.529437	22.859692	Chattogram	Mirsharai	0.20	0.01	0.02	12.91	43.84	55.70	8.78	28.39	24.252
AAQ_27	89.802571	23.112409	Gopalganj	Kasiani	0.05	0.77	8.06	38.18	86.31	98.91	21.23	61.25	50.692
AAQ_28	90.000783	23.295359	Gopalganj	Maksudpur	0.63	4.32	16.17	3.69	77.90	109.24	52.37	39.24	52.738
AAQ_29	90.245222	23.074582	Madaripur	Kalkini	0.07	3.16	2.68	29.74	46.58	88.73	38.45	88.28	41.868
AAQ_30	90.124102	23.172388	Madaripur	MadaripurS	0.08	4.28	31.33	7.44	71.97	147.37	43.43	71.39	61.164
AAQ_31	89.419202	23.779098	Rajbari	Pangsha	0.06	2.72	5.34	43.64	92.10	109.99	51.35	43.19	61.028
AAQ_32	89.549543	23.635219	Rajbari	Baliakandi	0.35	2.79	41.16	51.62	69.96	78.92	44.78	49.27	57.846
The amended Schedule-2, 2005, of (Air Quality Standard) Environmental Conservation Rules, 1997					10 (8 hour)	100 (Annual)	100 (Annual)	157 (8 hour)	65 (24 hour)	150 (24 hour)	365 (24 hour)	NSE**	

a. Ambient noise levels

77. Noise is another potentially serious threat to the quality of an environment. Noise levels vary at the given locations according to ambient noise, including the movement of road-traffic, industrial noise, and the general community. According to World Health Organization's Guidelines for Community Noise (1999), daily sound pressure levels of 50 decibels (dB) or above can create discomfort for humans, while ongoing exposure to sound pressure levels over 85 dB is considered the critical level for at least temporary hearing damage.

78. Noise level monitoring was carried out at selected rural road by using a Lutron's Sound Level Metre (SL-4033SD) in February 2020. The noise level was measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). The noise measurements were taken at the known sensitive receptors, which are important for their ecological and social value. The succeeding table presents the results of noise monitoring in numerous points along selected rural roads. Average noise level of 49 dB(A) across the selected project roads were noted with maximum and minimum observations at 67 and 32 dB(A), respectively. The monitoring results are shown in the following Table.

Table 20: Noise in dB(A) monitoring of Selected RCIP Roads

S.L. No.	Longitude	Latitude	Upazila	District	Noise in dB (A)	Feature
1.	89.074982	24.841657	Adamdighi	Bogura	45.9	Settlement
2.	89.076676	24.866257	Adamdighi	Bogura	52	Road Crossing
3.	89.075305	24.858106	Adamdighi	Bogura	43.2	Settlement
4.	89.076307	24.863502	Adamdighi	Bogura	46.4	Road
5.	89.075449	24.857321	Adamdighi	Bogura	53	Mosque
6.	89.075491	24.846933	Adamdighi	Bogura	44.1	Settlement
7.	89.075432	24.853944	Adamdighi	Bogura	47.3	Settlement
8.	89.192003	24.877403	Kahaloo	Bogura	53.6	Brick Field
9.	89.196552	24.880266	Kahaloo	Bogura	51.7	Mosque
10.	89.286477	24.950471	Kahaloo	Bogura	59.8	Market
11.	89.285489	24.948483	Kahaloo	Bogura	46.9	Settlement
12.	89.239663	24.909285	Kahaloo	Bogura	52.3	Mosque
13.	89.218117	24.893158	Kahaloo	Bogura	54	Brick Field
14.	89.221995	24.896014	Kahaloo	Bogura	48.6	Settlement
15.	88.958093	23.727851	Alamdanga	Chuadanga	53.4	Mosque
16.	88.965326	23.630404	Alamdanga	Chuadanga	52.3	Bridge
17.	88.974333	23.656837	Alamdanga	Chuadanga	54.2	Mosque
18.	88.956017	23.691885	Alamdanga	Chuadanga	58.7	School
19.	88.962479	23.711560	Alamdanga	Chuadanga	41.2	Settlement
20.	88.956405	23.741136	Alamdanga	Chuadanga	57.2	Culvert
21.	88.957862	23.672212	Alamdanga	Chuadanga	60.1	Market
22.	88.711719	23.652953	Damurhuda	Chuadanga	50	Settlement
23.	88.725669	23.631048	Damurhuda	Chuadanga	43.8	College Road

S.L. No.	Longitude	Latitude	Upazila	District	Noise in dB (A)	Feature
24.	88.752846	23.625827	Damurhuda	Chuadanga	60.3	Market
25.	88.755349	23.620021	Damurhuda	Chuadanga	52.5	Culvert
26.	88.745242	23.626979	Damurhuda	Chuadanga	52.3	Settlement
27.	88.702872	23.636664	Damurhuda	Chuadanga	55.1	Settlement
28.	88.708644	23.645672	Damurhuda	Chuadanga	52.9	Settlement
29.	88.916350	25.431499	Phulbari	Dinajpur	39.8	Mosque
30.	88.912676	25.438403	Phulbari	Dinajpur	40.3	Madrasah
31.	88.928194	25.461841	Phulbari	Dinajpur	52.3	Settlement
32.	88.944956	25.477169	Phulbari	Dinajpur	49.4	Settlement
33.	88.873125	25.585040	Parbatipur	Dinajpur	51	Settlement
34.	88.844221	25.606082	Parbatipur	Dinajpur	54.5	Settlement
35.	88.855234	25.584785	Parbatipur	Dinajpur	57.2	Road Crossing
36.	88.857457	25.579424	Parbatipur	Dinajpur	48.2	Brick Field
37.	88.946166	25.481970	Phulbari	Dinajpur	53	Settlement
38.	88.939147	25.470625	Phulbari	Dinajpur	54.8	Road Crossing
39.	88.918322	25.453354	Phulbari	Dinajpur	46.3	Agricultural Land
40.	88.915915	25.447341	Phulbari	Dinajpur	52.1	Settlement
41.	88.839674	25.624762	Parbatipur	Dinajpur	53.5	Settlement
42.	88.842689	25.612035	Parbatipur	Dinajpur	47.7	Agricultural Land
43.	89.777856	23.090263	Kasiani	Gopalgonj	45.9	Settlement
44.	89.802564	23.112419	Kasiani	Gopalgonj	52.4	Road Crossing
45.	89.802251	23.099581	Kasiani	Gopalgonj	43.2	Settlement
46.	89.783894	23.091252	Kasiani	Gopalgonj	42.8	Agri Land
47.	89.792852	23.093510	Kasiani	Gopalgonj	48.2	Culvert
48.	89.802568	23.109685	Kasiani	Gopalgonj	41.4	Settlement
49.	89.918602	23.303620	Muksudpur	Gopalgonj	61.2	Market
50.	89.920542	23.302835	Muksudpur	Gopalgonj	65.2	Bus Stand
51.	89.957283	23.277336	Muksudpur	Gopalgonj	47.2	Mosque
52.	89.981310	23.274332	Muksudpur	Gopalgonj	42.8	Settlement
53.	89.944732	23.285688	Muksudpur	Gopalgonj	51.6	Mosque
54.	89.967820	23.273132	Muksudpur	Gopalgonj	43.7	Settlement
55.	89.932040	23.293909	Muksudpur	Gopalgonj	47.5	Settlement
56.	89.372538	23.017637	Abhoynagar	Jashore	33.1	Agricultural Land
57.	89.392723	23.027774	Abhoynagar	Jashore	46.8	Market
58.	89.381617	23.019973	Abhoynagar	Jashore	42.7	School
59.	89.389384	23.024139	Abhoynagar	Jashore	39.1	School
60.	89.356903	23.008564	Abhoynagar	Jashore	38.8	Low Land/Beel
61.	89.366295	23.014629	Abhoynagar	Jashore	40.2	Settlement
62.	89.191002	23.006785	Monirampur	Jashore	32.2	Agricultural Land

S.L. No.	Longitude	Latitude	Upazila	District	Noise in dB (A)	Feature
63.	89.195578	23.001893	Monirampur	Jashore	34.8	Settlement
64.	89.202996	22.998143	Monirampur	Jashore	40.8	Road Crossing
65.	89.214699	22.979320	Monirampur	Jashore	34.2	Settlement
66.	89.211086	22.981568	Monirampur	Jashore	35.6	Settlement
67.	89.208034	22.992771	Monirampur	Jashore	33.8	Settlement
68.	90.126034	23.174698	Madaripur-S	Madaripur	42.7	Culvert
69.	90.126030	23.175701	Madaripur-S	Madaripur	45.9	Market
70.	90.126696	23.186205	Madaripur-S	Madaripur	39.7	Settlement
71.	90.124789	23.200061	Madaripur-S	Madaripur	50.2	Road Crossing
72.	90.128526	23.202792	Madaripur-S	Madaripur	52.2	School
73.	90.136291	23.209177	Madaripur-S	Madaripur	39.5	Settlement
74.	90.245323	23.074492	Kalkini	Madaripur	40.2	Settlement
75.	90.274447	23.075724	Kalkini	Madaripur	62.8	Market
76.	90.286352	23.076094	Kalkini	Madaripur	42.5	Road Crossing
77.	90.299443	23.082482	Kalkini	Madaripur	63.2	Bus Stand
78.	90.314637	23.093063	Kalkini	Madaripur	36.4	Agricultural Land
79.	90.296545	23.081546	Kalkini	Madaripur	42.3	Settlement
80.	90.308134	23.084746	Kalkini	Madaripur	37.6	Agricultural Land
81.	89.009713	24.268963	Lalpur	Natore	44.5	Settlement
82.	89.002834	24.266706	Lalpur	Natore	52.1	Market
83.	88.992076	24.266961	Lalpur	Natore	43.6	Settlement
84.	88.973556	24.275424	Lalpur	Natore	54.5	Brick Field
85.	88.967488	24.266816	Lalpur	Natore	48.9	Rail Crossing
86.	88.952405	24.181588	Lalpur	Natore	66.4	Market
87.	88.944197	24.244011	Lalpur	Natore	49.5	Road Crossing
88.	89.169465	24.393502	Gurudaspur	Natore	46.2	Settlement
89.	89.168272	24.390886	Gurudaspur	Natore	43.4	Settlement
90.	89.153585	24.376898	Gurudaspur	Natore	42.5	School
91.	89.153318	24.376769	Gurudaspur	Natore	39.8	Mosque
92.	89.150992	24.364079	Gurudaspur	Natore	49.6	Market
93.	89.141386	24.348175	Gurudaspur	Natore	37.6	Culvert
94.	88.615835	24.901296	Niamatpur	Naogaon	41.2	Road Crossing
95.	88.593733	24.905359	Niamatpur	Naogaon	38.5	Settlement
96.	88.576472	24.911274	Niamatpur	Naogaon	51.7	Market
97.	88.567420	24.913184	Niamatpur	Naogaon	58.2	Market
98.	88.530113	24.921685	Niamatpur	Naogaon	61.4	Market
99.	88.525837	24.920381	Niamatpur	Naogaon	48.2	Mosque
100.	88.850895	24.697648	Manda	Naogaon	38.4	Settlement

S.L. No.	Longitude	Latitude	Upazila	District	Noise in dB (A)	Feature
101.	88.830906	24.700825	Manda	Naogaon	40.5	Agricultural Land
102.	88.799676	24.710262	Manda	Naogaon	56.4	Market
103.	88.755596	24.719203	Manda	Naogaon	38.4	Culvert
104.	88.745665	24.721967	Manda	Naogaon	58.8	Market
105.	88.710369	24.759363	Manda	Naogaon	64.4	Market
106.	89.007584	25.817002	Sayedpur	Nilphamari	39.1	Culvert
107.	88.994606	25.824537	Sayedpur	Nilphamari	38.6	Settlement
108.	88.969037	25.834977	Sayedpur	Nilphamari	41.6	Settlement
109.	88.955346	25.833863	Sayedpur	Nilphamari	51.4	Market
110.	88.920998	25.829347	Sayedpur	Nilphamari	54.8	School
111.	88.887127	25.823699	Sayedpur	Nilphamari	61.7	Market
112.	88.779305	25.983427	Nilphamari-S	Nilphamari	42.3	Settlement
113.	88.774395	25.980576	Nilphamari-S	Nilphamari	45.4	Settlement
114.	88.767805	25.969520	Nilphamari-S	Nilphamari	39.8	Mosque
115.	88.762948	25.974371	Nilphamari-S	Nilphamari	34.5	Agricultural Land
116.	88.751726	25.984289	Nilphamari-S	Nilphamari	43.4	Settlement
117.	88.754909	25.983331	Nilphamari-S	Nilphamari	40.1	Culvert
118.	88.349253	26.490221	Tetulia	Panchagarh	64.8	Highway
119.	88.361543	26.498353	Tetulia	Panchagarh	49.5	Road Crossing
120.	88.366868	26.500303	Tetulia	Panchagarh	47.4	Settlement
121.	88.374701	26.505041	Tetulia	Panchagarh	48.5	Settlement
122.	88.378231	26.506887	Tetulia	Panchagarh	39.5	Culvert
123.	88.389624	26.514306	Tetulia	Panchagarh	57.2	Road Crossing
124.	88.401424	26.521389	Tetulia	Panchagarh	41.2	Agricultural Land
125.	88.408744	26.530041	Tetulia	Panchagarh	43.2	Settlement
126.	88.568889	26.340072	Panchagarh-S	Panchagarh	55.2	Settlement
127.	88.584015	26.349013	Panchagarh-S	Panchagarh	52.8	Bridge
128.	88.604310	26.349581	Panchagarh-S	Panchagarh	48.6	Agricultural Land
129.	88.616264	26.357854	Panchagarh-S	Panchagarh	55.8	Settlement
130.	88.625324	26.364010	Panchagarh-S	Panchagarh	62.2	Market
131.	88.643389	26.380333	Panchagarh-S	Panchagarh	65.4	Market
132.	88.733312	24.616452	Bagmara	Rajshahi	59.8	Filling Station
133.	88.739409	24.614702	Bagmara	Rajshahi	42.8	Settlement
134.	88.749643	24.614500	Bagmara	Rajshahi	46.4	Brick Field
135.	88.760035	24.613209	Bagmara	Rajshahi	42.5	Mosque
136.	88.762072	24.612835	Bagmara	Rajshahi	64.2	Market

S.L. No.	Longitude	Latitude	Upazila	District	Noise in dB (A)	Feature
137.	88.762553	24.612183	Bagmara	Rajshahi	39.5	Culvert
138.	88.762938	24.610452	Bagmara	Rajshahi	51.4	Brick Field
139.	88.761906	24.603526	Bagmara	Rajshahi	41.4	Mosque
140.	88.779862	24.579669	Bagmara	Rajshahi	46.8	Settlement
141.	88.767673	24.587094	Bagmara	Rajshahi	43.3	Culvert
142.	88.762663	24.601252	Bagmara	Rajshahi	54.8	School
143.	88.676387	24.513210	Mohonpur	Rajshahi	38.8	Bridge
144.	88.674224	24.514113	Mohonpur	Rajshahi	39.6	Settlement
145.	88.665258	24.512315	Mohonpur	Rajshahi	41.6	Settlement
146.	88.657232	24.510544	Mohonpur	Rajshahi	51.4	Market
147.	88.655074	24.511048	Mohonpur	Rajshahi	44.1	Settlement
148.	88.652447	24.511207	Mohonpur	Rajshahi	47.8	Market
149.	88.647308	24.510632	Mohonpur	Rajshahi	58.6	Market
150.	88.638684	24.512358	Mohonpur	Rajshahi	46.5	Settlement
151.	88.337556	25.801165	Pirganj	Thakurgaon	52.8	Market
152.	88.344781	25.814021	Pirganj	Thakurgaon	49	Settlement
153.	88.339931	25.807716	Pirganj	Thakurgaon	44.8	Road Crossing
154.	88.343387	25.812822	Pirganj	Thakurgaon	60.2	Settlement
155.	88.349333	25.820706	Pirganj	Thakurgaon	56.6	Eidgah
156.	88.356716	25.833118	Pirganj	Thakurgaon	58.8	Road Crossing
157.	88.358530	25.847415	Pirganj	Thakurgaon	48.2	Settlement
158.	88.277887	26.092842	Baliadangi	Thakurgaon	54.2	School
159.	88.277694	26.093995	Baliadangi	Thakurgaon	55.8	Culvert
160.	88.276991	26.096141	Baliadangi	Thakurgaon	55.8	Medical Complex
161.	88.280078	26.102092	Baliadangi	Thakurgaon	48.4	College Gate
162.	88.283393	26.109938	Baliadangi	Thakurgaon	50.2	Settlement
163.	88.283820	26.116711	Baliadangi	Thakurgaon	49.4	School
164.	88.292935	26.141468	Baliadangi	Thakurgaon	39.8	Settlement
165.	88.294215	26.143863	Baliadangi	Thakurgaon	65.2	Bus Stop
166.	91.044499	23.581694	Debidwar	Cumilla	52.4	Market
167.	91.043662	23.583438	Debidwar	Cumilla	48.6	Settlement
168.	91.044486	23.587086	Debidwar	Cumilla	46.8	Settlement
169.	91.044963	23.591193	Debidwar	Cumilla	44.2	Settlement
170.	91.044584	23.595694	Debidwar	Cumilla	52.4	Road Crossing
171.	91.045361	23.600405	Debidwar	Cumilla	44.6	Settlement
172.	91.047370	23.605094	Debidwar	Cumilla	45.3	Road Crossing
173.	91.048000	23.618165	Debidwar	Cumilla	39.8	Settlement
174.	91.048843	23.628580	Debidwar	Cumilla	52.3	Road Crossing

S.L. No.	Longitude	Latitude	Upazila	District	Noise in dB (A)	Feature
175.	91.049134	23.640023	Debidwar	Cumilla	41.2	Culvert
176.	91.049491	23.641867	Debidwar	Cumilla	38.4	Mosque
177.	91.049842	23.645692	Debidwar	Cumilla	55.9	Market
178.	91.035915	23.668478	Debidwar	Cumilla	46.8	Culvert
179.	91.030575	23.669846	Debidwar	Cumilla	41.9	Agricultural Land
180.	90.830483	23.533755	Daudkandi	Cumilla	42.5	Mosque
181.	90.831011	23.534432	Daudkandi	Cumilla	61.6	Market
182.	90.831364	23.537728	Daudkandi	Cumilla	45.6	Settlement
183.	90.833066	23.539748	Daudkandi	Cumilla	64.8	Bus Stop
184.	90.833860	23.543033	Daudkandi	Cumilla	39.4	Bridge
185.	90.834015	23.544363	Daudkandi	Cumilla	43.8	Market
186.	90.833266	23.550690	Daudkandi	Cumilla	54.9	Low Land/Beel
187.	90.830882	23.554510	Daudkandi	Cumilla	57.2	Settlement
188.	90.829822	23.558338	Daudkandi	Cumilla	59.6	Road Crossing
189.	90.831185	23.563533	Daudkandi	Cumilla	54.9	Settlement
190.	91.940735	22.449842	Raojan	Chattogram	59.5	Road Crossing
191.	91.940593	22.453371	Raojan	Chattogram	56.2	Settlement
192.	91.941817	22.456963	Raojan	Chattogram	53.2	Culvert
193.	91.940501	22.460241	Raojan	Chattogram	53.2	Settlement
194.	91.937070	22.464314	Raojan	Chattogram	60.1	Road Crossing
195.	91.935924	22.471971	Raojan	Chattogram	53.2	Culvert
196.	91.932323	22.482095	Raojan	Chattogram	50.9	Culvert
197.	91.933620	22.486434	Raojan	Chattogram	53.2	Culvert
198.	91.928861	22.497712	Raojan	Chattogram	50.3	Culvert
199.	91.928785	22.502136	Raojan	Chattogram	57.2	Road Crossing
200.	91.490771	22.910025	Mirsharai	Chattogram	51.2	Settlement
201.	91.492039	22.907636	Mirsharai	Chattogram	55.2	Road Crossing
202.	91.496196	22.900982	Mirsharai	Chattogram	59.3	Market
203.	91.498778	22.897889	Mirsharai	Chattogram	52.7	Settlement
204.	91.502655	22.892955	Mirsharai	Chattogram	55.8	Market
205.	91.506756	22.887407	Mirsharai	Chattogram	56.3	Market
206.	91.520935	22.869994	Mirsharai	Chattogram	54.2	Mosque
207.	91.526140	22.863654	Mirsharai	Chattogram	52.7	Temple
208.	91.528980	22.860270	Mirsharai	Chattogram	61.2	Market
209.	89.550719	23.635106	Baliakandi	Rajbari	50.2	Bridge
210.	89.545090	23.634505	Baliakandi	Rajbari	49.2	Market
211.	89.526571	23.633576	Baliakandi	Rajbari	48.6	Culvert
212.	89.510095	23.636279	Baliakandi	Rajbari	50.4	Market
213.	89.476416	23.642025	Baliakandi	Rajbari	48.3	Settlement

S.L. No.	Longitude	Latitude	Upazila	District	Noise in dB (A)	Feature
214.	89.459430	23.654738	Baliakandi	Rajbari	48.7	Madrasah
215.	89.452741	23.663797	Baliakandi	Rajbari	51.1	Settlement
216.	89.489418	23.637770	Baliakandi	Rajbari	49.8	Road Crossing
217.	89.422288	23.716509	Pangsha	Rajbari	48.5	Settlement
218.	89.419148	23.725079	Pangsha	Rajbari	54.2	Brick Field
219.	89.417061	23.739566	Pangsha	Rajbari	48.5	School
220.	89.419148	23.746276	Pangsha	Rajbari	46.9	Culvert
221.	89.421506	23.755189	Pangsha	Rajbari	48.7	Culvert
222.	89.422830	23.759895	Pangsha	Rajbari	57.5	Brick Field
223.	89.422952	23.769569	Pangsha	Rajbari	54.6	Market
224.	89.419272	23.778969	Pangsha	Rajbari	60.5	Road Crossing & Bus Stand
225.	89.417977	23.783003	Pangsha	Rajbari	50.2	Settlement
226.	89.353939	25.282361	Sadullapur	Gaibandha	58.2	Hwy Crossing
227.	89.353965	25.283495	Sadullapur	Gaibandha	53.4	Market
228.	89.354137	25.283912	Sadullapur	Gaibandha	52.8	Road Crossing
229.	89.354406	25.285918	Sadullapur	Gaibandha	49.3	Settlement
230.	89.355206	25.289252	Sadullapur	Gaibandha	53.2	Market
231.	89.357668	25.297615	Sadullapur	Gaibandha	51.2	Settlement
232.	89.364290	25.304849	Sadullapur	Gaibandha	55.2	Brick Field
233.	89.375555	25.314871	Sadullapur	Gaibandha	49.5	Settlement
234.	89.385483	25.321789	Sadullapur	Gaibandha	50.2	Settlement
235.	89.388823	25.323634	Sadullapur	Gaibandha	43.9	Agricultural Land
236.	89.392131	25.325875	Sadullapur	Gaibandha	47.5	Culvert
237.	89.516703	25.425848	Sadar	Gaibandha	49.3	Mosque
238.	89.520422	25.423085	Sadar	Gaibandha	48.3	Settlement
239.	89.521545	25.421150	Sadar	Gaibandha	51.3	Market
240.	89.523926	25.418115	Sadar	Gaibandha	49.2	Agricultural Land
241.	89.532986	25.411662	Sadar	Gaibandha	46.3	Market
242.	89.543028	25.403750	Sadar	Gaibandha	42.2	Settlement
243.	89.550622	25.399151	Sadar	Gaibandha	44.6	Road Crossing
244.	89.555776	25.398273	Sadar	Gaibandha	42.1	Settlement
245.	89.562229	25.392010	Sadar	Gaibandha	40.9	Culvert
246.	89.568980	25.389704	Sadar	Gaibandha	50.3	Bus Stop & Market
247.	89.570466	25.389441	Sadar	Gaibandha	43.2	Settlement

b. Surface Water Quality

79. Bangladesh is a land of rivers. Around 230 rivers flow through the country including 53 international rivers. Rivers in the urban areas are in rapidly deteriorating which includes: Buriganga, Karnaphully, Sangu, Bhairab, Pashur, Rupsha, Nabaganga, Mathavanga, Moyur, Kopotakkya, Shitalakkya, Turag, Baloo, Bongshee, Kaleeganga, Meghna, Brahmaputra, Jamuna, Dhaleshwaree, Tista, Padma, Karatoa, Kushiyara, Kirtankhola. The main causes of river pollution are reduction of flows, silt deposition, river erosion, unplanned industrialization, use as open latrines, clothes washing, disposal of untreated wastes, oil spills of a different kind from water vessels, and agrochemicals use in agriculture land. As previously mentioned, no bridge will be upgraded under the RCIP and no significant adverse impacts are expected on the water quality of nearby roads.

12. Groundwater Quality

80. The government's response to bacterial contamination concerns surface water supplies in the project area, the domestic water supply is now predominantly groundwater. However, in 1993 the Department of Public Health Engineering (DPHE) first detected arsenic in hand tube wells (HTW's) which has become one of the most pressing environmental issues in Bangladesh. The levels of arsenic in groundwater in Bangladesh are some of the highest in the world. At present, occurrence of arsenic in drinking water has been identified in 272 Upazilas under 61 Districts of the country (DPHE, 2009). The World Health Organization (WHO) has defined the tolerance limit of arsenic for drinking water at 0.01mg/L while the Bangladesh standard for arsenic in drinking water is 0.05mg/L. There is excellent availability of groundwater in the project area as indicated by the preponderance of handpumps to supply domestic water requirements. Past studies indicated that iron and arsenic are the major water contaminants for drinking purposes. Groundwater levels in most of Bangladesh are within two meters of the ground surface during July through October. Groundwater levels during the dry season vary across the country depending upon the proximity to surface water, depth and type of aquifer, extent of irrigation, and many other factors.

C. Biological Environment

13. Bio-ecological zoning

81. IUCN-The World Conservation Union has identified 25 bio-ecological zones (2002) in Bangladesh based on physiography, climate, soil type, flooding depth, and biodiversity. The Project falls within nine of these defined bio-ecological zones, i.e. (i) Himalayan Piedmont Plain, (ii) Barind Tract, (iii)Teesta Floodplains, (iv) Ganges Floodplains, (v) Meghna Floodplains, (vi) Chalan Beel, (vii) Gopalganj/ Khulna peatlands, (viii) Coastal Plains, and (ix) Meghna Estuarine Floodplains.

14. Ecosystem Diversity

82. The project area predominantly comprised of paddy land/floodplains followed by homesteads, terraces, canals in order of significance. Overall ecosystems in the project area can be divided into the following categories:

(i) ***Crop fields***: This land is used for paddy cultivation once, twice, or three times in a year and inundated during the monsoon period. In these areas, there is least

diversity of floral communities, but numerous indigenous fishes and birds that feed in these areas.

(ii) ***Settlements/homesteads***: This ecosystem is comprised of economic tall plants e.g. jute, maize with undergrowth of wild flora. Homesteads are constructed at a comparatively higher elevation and settlement/homestead land exhibits mainly terrestrial ecology. Homestead platforms and higher agricultural land is also used for commercial plantations with fruit and timber yielding trees for furniture making and to meet domestic fuelwood needs.

(iii) ***Canals and rivers***: Canals and rivers are the main sources of surface water in the project area for all ecological components both terrestrial and aquatic. The main rivers are perennial sources of water. Numerous canals also exist and these support scattered hydrophytes in the areas which retain water for at least a part of the year.

(iv) ***Ponds and ditches***: These are largely closed water wetland areas and are controlled to meet human needs for domestic use and for irrigation purposes. Water levels fluctuate widely with the seasons; various smaller water-dependent animals are supported in this environment.

(v) ***Roadside vegetation:*** Consisting of fast-growing flora which is planted to protect embankments and roads from soil degradation and erosion. The lower land is occupied by marginal vegetation, while along the roadside species indicated in Table 21 are planted by the local communities.

(vi) ***Mangrove ecosystem:*** This system is found in areas of the country with tidal flows and many mangroves species are found mainly in southwest Bangladesh outside the project area. The ecotone or transition zone between two ecosystems (tidal and freshwater) had abundant mangrove vegetation. This is now much changed with river levees and canal banks inhibiting the tidal flow to develop fish culture. The main area of mangrove forest is the Sundarbans reserve.

15. Biodiversity

a. Flora

83. ***Terrestrial Flora:*** The project area, in general, contains a diversity of species in the different ecosystems described above. In and around homesteads species are planted according to their potential for human use and consumption for timber, fuel and fruit purposes. Trees that are to be found are Gagon Sirish *(Albizia richardiana),* Rendi Sirish *(Albizia saman),* Sada Koroi *(Albizia procera),* Mahagoni *(Swietenia mahogoni),* Eucalyptus *(Eucalyptus* sp*).* For fruit demand (coconuts, banana, dates, mango etc) the following species are grown Narikel *(Cocos nucifera),* Taal *(Borassus flabellifer),* Kola *(Musa* sp.*)*, Khejur *(Phoenix sylvestris),* andAam *(Mangifera indica)* mainly around homesteads. Bamboo is grown widely. Commercial planted crops are to be found in homesteads, along village roads and directly in crop land and the following three species predominate - Akashmoni *(Acacia moniliformis),* Mahagoni *(Swietenia mahagoni)* and Taal *(Borassus flabellifer)* or the Asian sugar palm. Table 21 indicates the major plant species and their use.

Figure 22: Bio-ecological Zones of Bangladesh

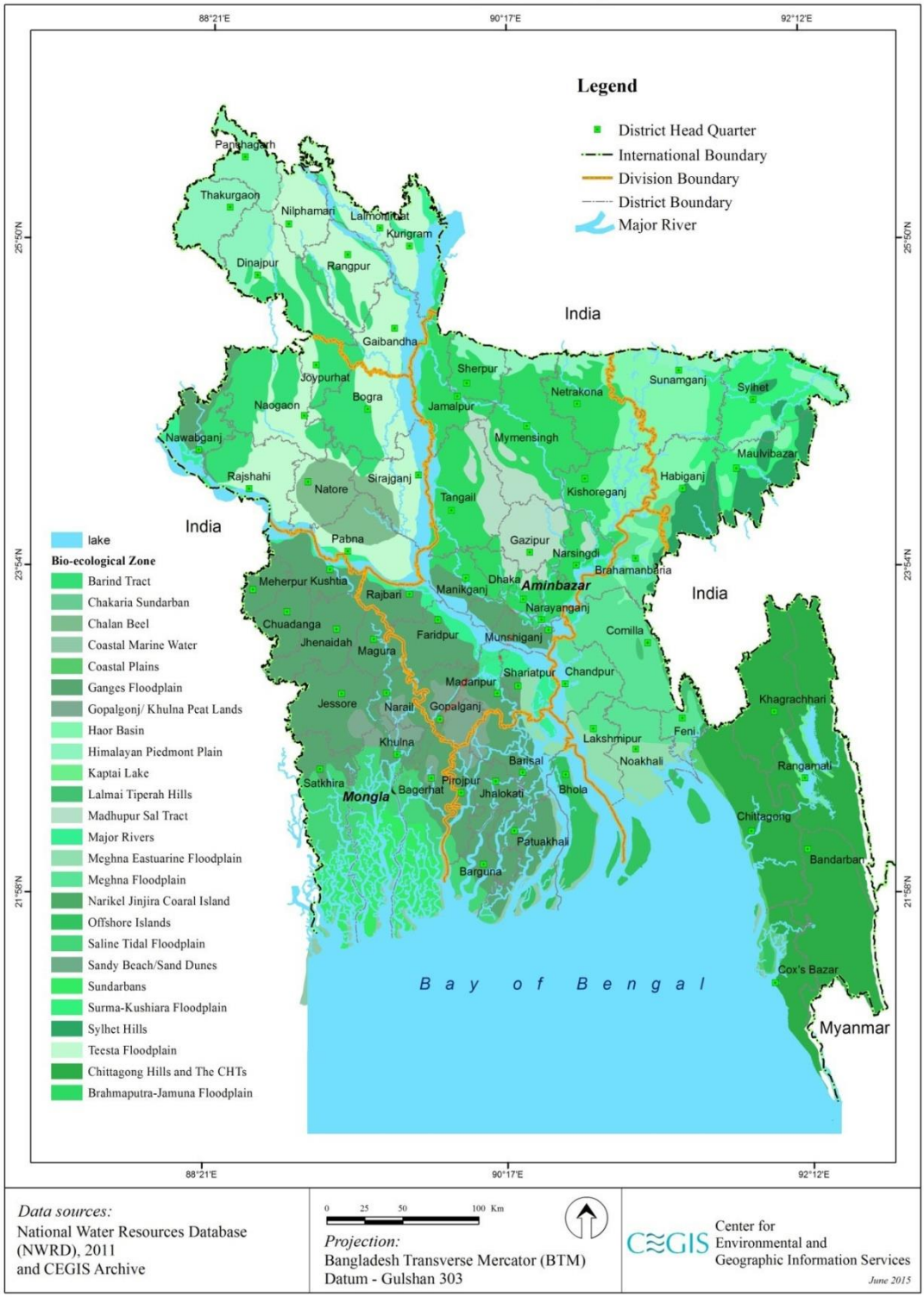


Table 21: Plants Species Growing in the Project Area

Average Height (Meter)	Tree Species	Family	Usage	Density
15-20	Narikel (*Cocos nucifera*)	Palmae	Fruit and fuel wood	H
10-15	Aam *(Mangifera indica)*	Anacardiaceae	Fruit and timber	H
20-25	Akashmoni *(Acacia sp.)*	Mimosaceae	Timber and fuel wood	H
15-20	Bansh *(Bamboosa* sp*)*	Poaceae	Thatching	H
10-15	Mahagoni *(Swietenia mahagoni)*	Meliaceae	Timber and medicine	H
20-25	Sirish (*Albizia lebbeck*)	Leguminosae	Timber and fuel wood	H
30-35	Chambul (*Albizia richardiana*)	Leguminosae	Timber	H
25-30	Eucalyptus *(Eucalyptus* sp*)*	Leguminosae	Timber and fuel wood	M
25-30	Rendi Sirish *(Albizia saman)*	Leguminosae	Timber and fuel wood	M
15-20	Taal *(Borassus flabellifer)*	Palmae	Fruit and timber	M
9-12	Khajur (*Phoenix dactylifera*)	Arecaceae	Fruit and fuel wood	M
5-7	Katbel (*Limonia acidissima*)	Rutaceae	Fruit and timber	L
8-10	Supari (*Areca catechu*)	Palmae	Timber and fuel wood	M
10-15	Tatul (*Tamarindus indica*)	Leguminosae	Fruit	L
20-25	Silkoroi *(Albizia procera)*	Leguminosae	Timber and fuel wood	M
15-20	Sisso *(Dalbergia sissoo)*	Fabaceae	Timber and fuel wood	M
7-10	Gewa *(Exocearia agallocha)*	Euphorbiaceae	Timber and fuel wood	L
6-8	Kawra (*Sonneratia apetala)*	Sonneratiaceae	Fruit and fuel wood	L
5-8	Kanthal*(Artocarpus heterophyllus)*	Moraceae	Fruit and timber	M
10-15	Kadom*(Anthocephalus chinensis)*	Rubiaceae	Timber and fuel wood	L
3-5	Desi Gaeb (*Diospyros peregrina*)	Ebenaceae	Fruit	L

Note: H = High M = Medium L = Low

84. While cultivated species predominate in the landscape, there are a variety of other species of flora, both native and non-native, to be found on agricultural lands such as *Digiteria spp* (wild grass), *Eclipta alba* (false daisy – a herb), *Echinochola colonum* (jungle rice), *Hemarthrira sp* (herbaceous grass), *Polygonum* spp (knotweed family), *Rumex aciculate* (buckwheat family), *Alternanthera sessilis* (aquatic plant), *Dentella repense* (creeping plant), *Cynodon dactylon* (couch grass), and *Cyperus spp* (sedges).

85. **Aquatic Flora*:*** There is a great floral diversity of aquatic plant life in the river, canals and seasonal floodplains and ditches inside agricultural lands. Among the free-floating species, kochuripana *(Eicchornia crassipes)* is mostly found inside rivers and canals. Shapla *(Nymphaea spp.) and* chandmala *(Nymphoides* sp*)* grown in floodplains during the monsoon period and comprise the common rooted floating plant. Also, the species *Hydrilla versillata, and Hygrorhiza aristata* are present along with the rarer *Enhydra fluctuans* and ludwigia species.

b. Fauna

86. **Terrestrial Fauna:** Mammals species are few or have disappeared completely from much of the area where there is lack of natural forest cover and changed habitat with loss of native plant species. Small mammals are present in forest patch habitats and open grasslands in some locations such as fishing cat (*Falis viverrina*) vulnerable (V), jungle cat (*Falis chaus*) least concerned (LC), bengal fox (*Vulpes bengalensis*) LC. common mongoose (*Herpestes edwardsi*) LC and some bats are to be found. Common lizards within the project area include the common skink (*Mabuya carinata*) LC and the garden lizard (*Calotes versicolor*) near threatened (NT). Populations of grey monitor (*Varanus bengalensis*) LC are **healthy**. Some snakes such as checkered keelback (*Xenochrophis piscator)* not evaluated (NE) and the smooth water snake (*Enhydris enhydris)* LC are present in wetland areas. While most of these species are not endangered, the fishing cat is listed as vulnerable on the IUCN Red List. Fishing cat and Jungle cat are included in CITES appendix II prohibiting trade.

87. **Avian**: Many birds found in the area are reliant on habitat in crop fields, settlement vegetation, the floodplain areas and under LC classification. Mynas, pied starling, sparrow, bulbuls, cuckoo, crows, herons, egrets and babui are common, and various species of raptors such as kites, buzzards and eagles are found in the open area of crop fields and floodplains.

88. ***Aquatic Fauna:*** There are many fish species present, and seasonal floodplain and water bodies support wide breeding and feeding habitat for indigenous fish. Common amphibian and LC species occurring in the area are common toad, skipper frog, cricket frog and Indian bull frog. Turtles are quite rare, but spotted flapshell (*Lissemys punctata*) LC and Indian roofed turtles (*Pangshura tecta*) LC do occur in undisturbed ditches and ponds. Water dependent bird species are found along the many rivers, floodplains, ditches e.g. little cormorant, Indian pond heron, common kingfisher, stilts etc.

16. Ecologically Critical Areas

89. The Bangladesh Environment Conservation Act 1995 (ECA'95) includes provisions for Ecologically Sensitive Area (ESA) declarations by the Director General of the DoE in certain cases where the ecosystem is in danger of reaching a critical state. The following areas have been declared as sensitive areas under the Act.

Table 22: Potentially Ecologically Sensitive Areas near the Project Area

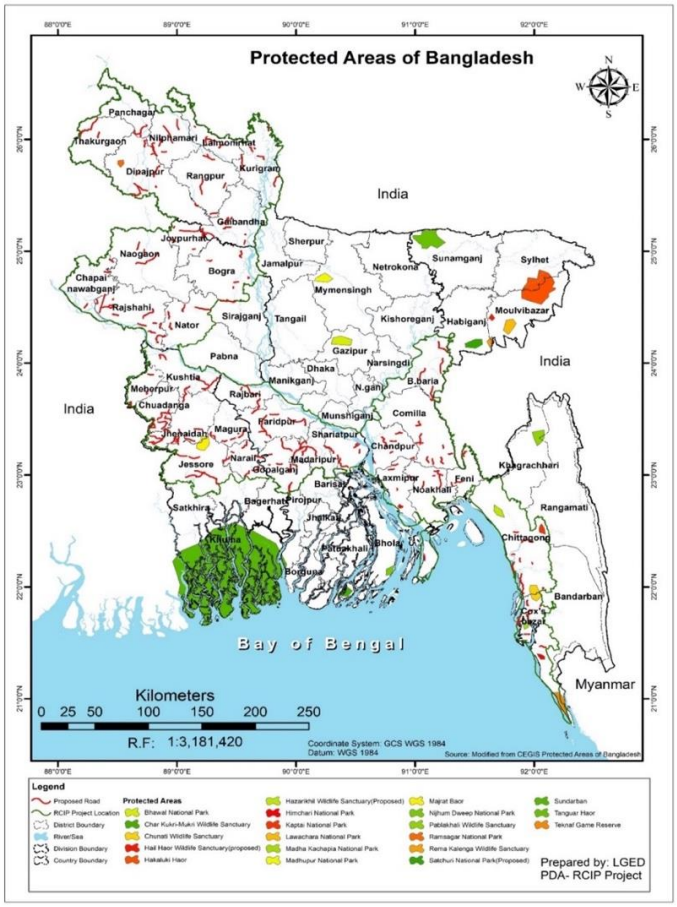
Sl. No.	Name	Districts	Area (Ha)
1	The Sundarbans	Begerhat, Khulna, Satkhira	762,034
2	Coxsbazar (Teknaf, Sea beach)	Coxsbazar	10,465
3	St. Martin Island	Coxsbazar	590
4	Sonadia Island	Coxsbazar	4,916
5	Hakaluki Haor	Maulavi Bazar	18,383
6	Tanguar Haor	Sunamganj	9,727
7	Marjat Baor	Jhinaidha	200
8	Gulshan-Banani-Baridhara Lake	Dhaka	n.a

Source: DoE

90. Hakulaki Haor and Tanguar Haor are both marsh wetland systems in Sylhet division in the northeast. The Chattogram Hills which has two wildlife sanctuaries and the Kaptai National Park are also outside the project area. The Sundarbans Delta is situated on the border of India and Bangladesh, where the Ganges, Brahmaputra, and Mehgna rivers converge in the Bengal basin. The Sundarbans constitute the largest mangrove forest in the World. None of these declared

sensitive areas are in the project area or are affected by the project as shown in the figure below. Similarly, none of the roads passes through the Key Biodiversity Areas (KBAs), in Bangladesh, which is mostly located along with coastal areas in south, riverine area in north, and areas around Sylhet in northeast. According to the Integrated Biodiversity Assessment Tool (IBAT), there are 22 KBAs[15], however, no rural roads under this project pose risks to these sensitive zones because the project roads are far from these wildlife habitats. During the finalization of the list of the selected rural roads under this additional financing project, any roads passing through sensitive areas or objects such as cultural heritage sites were removed to avoid impacts to sensitive zones or objects. The nearest KBA is 15 km away from any roads under the project (Hazarikhil Wildlife Sanctuaryand and Zorargonj UP to Burburiaghat Bazar road in Mirsharai). The following map shows all the 310 CIP supported roads, including 96 to be covered by RCIP-AF, juxtaposition to protected areas of Bangladesh.

Figure 23: Protected Area Map of Bangladesh



[15] KBAs identified by IBAT: (i) Farakka Barrage and adjoining area, (ii) Ganges-Brahmaputra-Meghna Delta, (iii) Gorumara National Park, (iv) Gumti Wildlife Sanctuary, (v) Hazarikhil Wildlife Sanctuary, (vi) Jamuna-Brahmaputra River, (vii) Kachhudah Lake and Mahananda River Course, (viii) Kulik (Raiganj) Bird Sanctuary, (ix) Mahananda Wildlife Sanctuary, (x) Mai Valley Forest, (xi) Muhuri Dam, (xii) Naya Bandh Wetland Complex, (xiii) Northern Rakhine Yoma, (xiv) Pablakhali Wildlife Sanctuary, (xv) Patenga Beach, (xvi) Rampahar-Sitapahar Wildlife Sanctuary, (xvii) Rudrasagar Lake, (xviii) Sangu Matamuhari, (xix) Senchel, (xx) Sepahijala, (xxi) Sonadia Island and (xxii) Trishna Wildlife Sanctuary.

B. Socio-Cultural Environment

91. Information on the baseline condition of social and economic resources of the project area is provided below. Several socio-economic indicators are analyzed based on available data from the 2011 census for the 16 project districts.

17. Administrative Area

92. LGED had prepared 317 subprojects within 34 districts of Bangladesh. Within the 34 project districts, the roads are in 179 upazillas. The current project is supporting the upgrading of 214 roads. The additional financing will be supporting additional 96 roads in 16 districts and 61 upazillas. The table below presents the distribution of benefitted upazillas by the current project and additional financing.

Table 23: Number of directly benefited Upazilas by Project Roads

S No.	District	Total LGED proposed subprojects		RCIP subprojects		RCIP-AF subprojects (to be financed in 2020)	
		No	Location in Upazillas	No	Location in Upazillas	No	Location in Upazillas
1	Gopalganj	10	5	7	5	3	2
2	Faridpur	7	5	7	5		
3	Madaripur	15	4	7	1	8	4
4	Shariatpur	8	4	8	4		
5	Rajbari	13	5	6	1	7	4
6	Cumilla	11	8	7	5	4	3
7	Chandpur	7	6	7	6		
8	B. Baria	5	4	5	4		
9	Chattogram	13	11	7	6	6	6
10	Coxsbazar	5	4	5	4		
11	Noakhali	7	4	7	4		
12	Laxmipur	5	5	5	5		
13	Feni	4	3	4	3		
14	Jashore	18	8	8	4	10	6
15	Kushtia	6	5	6	5		
16	Jhenaidah	10	5	10	5		
17	Chuadanga	10	4	7	2	3	2
18	Magura	7	3	7	3		
19	Meherpur	3	3	3	3		
20	Narail	7	3	7	3		
21	Rajshahi	26	9	14	5	12	4
22	Naogaon	10	5	4	2	6	3
23	C.Nawabganj	4	3	4	3		
24	Natore	9	5	5	2	4	3
25	Bogura	13	8	7	3	6	5
26	Joypurhat	5	5	5	5		
27	Lalmonirhat	4	3	4	3		
28	Kurigram	6	6	6	6		
29	Gaibandha	12	6	8	3	4	3
30	Rangpur	6	5	6	5		
31	Dinajpur	19	9	10	3	9	6

S No.	District	Total LGED proposed subprojects		RCIP subprojects		RCIP-AF subprojects (to be financed in 2020)	
		No	Location in Upazillas	No	Location in Upazillas	No	Location in Upazillas
32	Thakurgaon	10	5	4	2	6	5
33	Panchagarh	5	4	2	1	3	3
34	Nilphamari	10	4	5	3	5	3
Total		310	180	214	124	96	62

Source: Social Diligence Report (2018)

18. Population and Households

93. The 16 districts cover 25% of the land area of Bangladesh. In terms of population, the 16 districts represent 28% of the total population of the country. The female to male ratio is close to 1 in all districts. Population densities in Bangladesh are relatively high throughout the country. Panchaghar District has the lowest density of the divisions in the project area and Cumilla District has the highest with more than 1,700 per km^2.

Table 24: Demographic Characteristics

SL No	District	House-hold	Population	Male	Female	Sex Ratio (F/M)	Area Sq/km	Per-sons per Sq/km
1	Bogura	867,137	3,400,874	1,708,806	1,692,068	0.99	2,898.68	1,173.25
2	Chattogram	1,532,014	7,616,352	3,838,854	3,777,498	0.98	5,282.92	1,441.69
3	Chuadanga	277,464	1,129,015	564,819	564,196	1.00	1,174.10	961.60
4	Cumilla	1,053,572	5,387,288	2,575,018	2,812,270	1.09	3,146.30	1,712.26
5	Dinajpur	715,773	2,990,128	1,508,670	1,481,458	0.98	3,444.30	868.14
6	Gaibanda	612,283	2,379,255	1,169,127	1,210,128	1.04	2,114.77	1,125.07
7	Gopalganj	249,872	1,172,415	577,868	594,547	1.03	1,468.74	798.25
8	Jashore	656,413	2,764,547	1,386,293	1,378,254	0.99	2,606.94	1,060.46
9	Madaripur	252,149	1,165,952	574,582	591,370	1.03	1,125.69	1,035.77
10	Naogaon	655,801	2,600,157	1,300,227	1,299,930	1.00	3,435.65	756.82
11	Natore	423,875	1,706,673	854,183	852,490	1.00	1,900.16	898.17
12	Nilpamari	421,572	1,834,231	922,964	911,267	0.99	1,546.59	1,185.98
13	Panchaghar	228,581	987,644	496,725	490,919	0.99	1,404.63	703.13
14	Rajbari	238,153	1,049,778	519,999	529,779	1.02	1,092.28	961.09
15	Rajshahi	633,758	2,595,197	1,309,890	1,285,307	0.98	2,425.37	1,070.02
16	Thakugaon	320,786	1,390,042	701,281	688,761	0.98	1,781.74	780.16
	Bangladesh	32,173,630	144,043,697	72,109,796	71,933,901	1.00	147,570.00	976.10

Source: Population Census, BBS, 2011

a. Household size

94. The 2011 Census shows that 66% of households (HH) in the project area comprise four or more family members as depicted in the succeeding Table. The average household size in the project area is 4.43 members, which is lower than the national average of 4.44 members.

Table 25:Household Size

Districts	No of HHs	No of Persons in Household								Ave. HHs size
		1	2	3	4	5	6	7	8+	
Bogura	863,596	35,415	117,832	218,505	245,386	136,966	60,530	25,025	23937	3.88

Districts	No of HHs	No of Persons in Household								Ave. HHs size
		1	2	3	4	5	6	7	8+	
Chattogram	1,509,724	34,722	124,196	238,137	329,244	293,272	201,516	118,698	169934	4.92
Chuadanga	276,906	7,793	32,042	64,986	82,039	49,280	22,378	9,610	8778	4.05
Cumilla	1,048,984	21,534	73,423	149,928	218,934	211,855	152,908	92,178	128224	5.07
Dinajpur	713,251	25,974	78,950	151,183	203,034	134,949	64,462	28,021	26678	4.14
Gaibanda	611,293	31,809	84,510	142,355	165,759	104,571	47,680	19,400	15209	3.88
Gopalganj	248,735	6,768	21,028	40,586	57,761	52,292	33,515	18,011	18774	4.66
Jashore	653,419	15,991	68,823	147,880	190,875	120,329	58,273	25,832	25416	4.17
Madaripur	251,581	6,390	21,934	41,585	58,643	54,146	34,779	17,665	16439	4.61
Naogaon	654,271	23,732	83,405	168,954	187,108	102,254	45,747	20,570	22501	3.95
Natore	422,917	14,983	51,083	103,558	123,987	68,763	31,307	13,893	15343	4.01
Nilpamari	420,902	14,851	44,160	77,051	107,824	86,892	48,195	21,572	20357	4.34
Panchaghar	228,043	7,056	20,913	42,968	63,484	48,690	25,082	10,713	9137	4.31
Rajbari	237,352	6,026	22,515	46,426	64,615	47,237	25,291	12,056	13186	4.39
Rajshahi	630,327	22,653	71,574	155,325	184,726	102,803	47,782	21,552	23912	4.03
Thakurgaon	320,249	9,918	30,393	57,587	91,820	68,465	33,912	14,717	13437	4.30
Total /Avg Project	9,091,550	285,615	946,781	1,847,014	2,375,239	1,682,764	933,357	469,513	551,262	4.429

Source: Population Census, BBS, 2011

b. Housing Condition

95. According to the 2011 census, 10% of the houses identified were pucka houses, i.e., houses fully made of concrete, cement and iron, while a further 20.7% structures were semi-pucka houses built with bamboo mats, timber, earth-filled wall and plinth in combination with bricks and concrete foundation and bamboo and timber roofing. The majority of the population (over 65%) lives in kutcha houses that have walls of organic materials such as sticks, jute, straw and earth. The foundations of kutcha houses are made of earth and bamboo/timber posts and roofs are made of thatched straw and grass with bamboo framing.

Table 26: Type of Housing Structure in the Project Area

Districts	Type of House			
	Pucca	Semi-pucca	Kutcha	Jhupri
Bogura	48,980	179,661	622,894	12,065
Chattogram	377,078	311,225	729,467	91,947
Chuadanga	61,245	76,828	128,726	10,111
Cumilla	103,881	165,148	765,904	14,051
Dinajpur	39,354	166,771	470,485	36,645
Gaibanda	12,219	78,497	507,751	12,830
Gopalganj	10,034	30,557	205,595	2,549
Jashore	106,899	219,372	293,069	34,083
Madaripur	11,920	39,173	197,424	3,064
Naogaon	34,619	143,166	452,678	23,812
Natore	21,901	115,920	272,699	12,401
Nilpamari	10,445	52,076	351,653	6,732
Panchaghar	4,586	24,257	192,906	6,325
Rajbari	7,806	43,090	179,711	6,745
Rajshahi	80,836	175,247	347,898	26,350
Thakurgaon	8,856	64,633	230,578	15,862
Project Area	940,659	1,885,621	5,949,438	315,572

Source: Population Census, BBS, 2011

96. Meherpur and Kurigram districts show the greatest variation in housing type. 53% of houses in Meherpur are either pucca or semi-pucca while only 8% of the houses in Kurigram are recorded as pucca or semi-pucca in construction.

c. Age Structure in Project Area

97. Analysis of age structure shows that just over 36% of the total population in the 34 districts are children (ages up to 14 years), 58% are of working age i.e., between 15 to 59 years, which is considered as the active workforce.

Table 27:Population Distributions by Different Age Groups

Districts	Population in Each Age Group									
	00-04	05-09	10-14	15-19	20-24	25-29	30-49	50-59	60-64	65+
Bogura	317,333	377,872	350,712	276,959	313,356	342,676	917,121	240,839	96,083	167,923
Chattogram	387,208	464,042	473,773	404,994	379,548	352,549	890,697	236,426	98,019	151,595
Chuadanga	108,649	128,691	111,380	88,049	86,312	92,943	244,714	62,462	24,114	40,330
Cumilla	620,037	319,443	313,554	238,935	206,671	193,049	514,497	151,185	74,325	142,061
Dinajpur	296,758	350,957	324,335	253,331	259,973	285,475	781,863	208,336	81,724	147,376
Gaibanda	262,216	319,358	261,271	170,621	195,806	223,808	593,988	164,906	70,423	116,858
Goplaganj	125,808	160,175	150,495	101,606	95,456	96,622	265,622	76,507	35,275	64,506
Jashore	245,909	294,454	304,308	241,818	254,017	266,013	744,495	190,926	77,235	145,372
Madaripur	121,266	161,839	151,137	101,560	91,686	92,347	264,050	79,232	38,952	63,280
Naogaon	225,827	274,535	260,427	210,826	241,752	262,485	729,058	186,148	76,331	132,768
Natore	155,823	187,847	176,280	140,116	154,588	171,506	467,477	116,898	47,467	88,671
Nilpamari	207,219	253,856	213,612	155,975	153,630	164,797	444,193	117,036	48,695	75,218
Panchaghar	108,649	128,691	111,380	88,049	86,312	92,943	244,714	62,462	24,114	40,330
Rajbari	381,693	464,520	418,454	313,895	265,789	249,857	611,519	166,520	83,110	152,726
Rajshahi	217,457	266,932	278,336	237,218	256,913	262,436	717,838	170,478	67,968	119,621
Thakurgaon	147,345	179,315	159,855	11,544	116,764	130,664	351,681	88,963	34,751	61,160
Project	3,929,197	4,332,527	4,059,309	3,035,496	3,158,573	3,280,170	8,783,527	2,319,324	978,586	1,709,795

Source: Population Census, BBS, 2011

d. Literacy

98. The literacy rate for the population 7 years and above in the project area is 52.28 % which is higher than the national literacy rate of 51.7 %. Similarly, male and female literacy rates in the project area are higher than those of the country. Narail shows the highest literacy rates at 63.34 % for males and 59.31 % for women, while Gaibanda has the lowest rates at 42.81 %. Female literacy rates consistently trail those of men but by only a few percentage points.

Table 28:Literacy Rates by Each District of the Project Area

Districts	Total Literacy		Male Literacy		Female Literacy	
	Total Population	% of Total Literate	Total Male Population	% of Males Literate	Total Female Population	% of Females Literate
Bogura	3,400,874	49.38%	1,708,806	52.86%	1,692,068	45.89%
Chattogram	7,616,352	58.91%	3,838,854	61.13%	3,777,498	56.66%
Chuadanga	1,129,015	45.91%	564,819	46.88%	564,196	44.93%
Cumilla	5,387,288	53.32%	2,575,018	54.08%	2,812,270	52.65%
Dinajpur	2,990,128	52.42%	1,508,670	55.68%	1,481,458	49.12%
Gaibanda	2,379,255	42.81%	1,169,127	46.29%	1,210,128	39.50%
Gopalganj	1,172,415	58.09%	577,868	60.30%	594,547	55.98%
Jashore	2,764,547	56.52%	1,386,293	59.38%	1,378,254	53.65%
Madaripur	1,165,952	47.97%	574,582	50.11%	591,370	45.93%
Naogaon	721,668	48.22%	353,527	51.29%	368,141	45.17%
Natore	1,834,231	49.59%	922,964	51.90%	911,267	47.29%
Nilpamari	3,108,083	44.37%	1,485,169	47.59%	1,622,914	41.13%
Panchaghar	987,644	53.19%	496,725	56.16%	490,919	50.19%
Rajbari	1,049,778	52.28%	519,999	53.98%	529,779	50.63%
Rajshahi	2,595,197	52.98%	1,309,890	55.84%	1,285,307	50.09%
Thakurgaon	1,390,042	51.80%	701,281	54.10%	688,761	49.40%
Project	39,692,469	52.28%	19,693,592	54.77%	19,998,877	49.82%

Source: Population Census, BBS, 2011

e. Disability

99. Rates of disability provide an indication of social condition and wellbeing. The table below shows that the overall disability rate in the project area is 1.49%. Six categories are defined in the Census i.e. disability in speech, vision, hearing, physical and mental and autism. Among these categories, physical disability is the most significant with 298,112 persons, which is 0.75% of the total population.

Table 29: Distribution of Population by Type of Disability

Districts	Population	Disability						
		Total	Speech	Vision	Hearing	Physical	Mental	Autism
Bogura	3,400,874	51419	6431	10959	4948	20290	6690	2101
Chattogram	7,616,352	96144	12102	16954	7264	37952	13796	8076
Chuadanga	1,129,015	18979	2357	3883	1838	7755	2246	900
Cumilla	5,387,288	71092	11321	12911	5550	28043	8375	4892
Dinajpur	2,990,128	45534	6285	9078	4760	17817	5515	2079
Gaibanda	2,379,255	47095	5314	12008	4557	17442	4903	2871
Gopalganj	1,172,415	16236	2507	2897	1376	6743	1772	941
Jashore	2,764,547	37296	4935	5797	3125	16768	4986	1685

Districts	Population	Disability						
		Total	Speech	Vision	Hearing	Physical	Mental	Autism
Madaripur	1,165,952	15006	2260	3216	1325	5343	1808	1054
Naogaon	721,668	42194	4969	9117	4017	16555	5669	1867
Natore	1,834,231	27420	3286	4846	2369	11768	3848	1303
Nilpamari	3,108,083	27322	3915	4219	2579	12078	3047	1484
Panchaghar	987,644	15659	1943	35842	18377	66978	19615	9012
Rajbari	1,049,778	17124	2084	3577	1620	6775	2303	765
Rajshahi	2,595,197	40558	4833	7459	3655	17290	5368	1953
Thakurgaon	1,390,042	21603	2977	4310	2405	8515	2352	1044
Project	39,692,469	590,681	77,519	147,073	69,765	298,112	92,293	42,027
		1.49%	0.20%	0.37%	0.18%	0.75%	0.23%	0.11%

Source: Population Census 2011

f. Occupations and Livelihoods

100. The table below shows census data of occupation and livelihood for districts in which the current project will be implemented under four very broad categories.

Table 30: Occupation and Livelihood by Districts and for Project Area

Districts	Employment Status			
	Employed	Looking for work	Household work	Do not work
Bogura	1,033,035	21,996	990,953	659,685
Chittagaong	2,273,836	75,196	1,753,675	1,848,337
Chuadanga	355,090	4,772	330,655	217,758
Cumilla	1,233,128	50,233	1,385,318	1,337,332
Dinajpur	912,737	15,884	824,465	589,327
Gaibanda	661,300	15,160	691,438	429,783
Gopalganj	302,467	9,030	304,392	270,507
Jashore	832,533	15,604	762,280	613,767
Madaripur	314,275	9,999	299,368	259,137
Naogaon	818,896	16,646	790,318	473,935
Natore	516,246	11,675	503,294	331,788
Nilpamari	521,709	12,603	482,329	356,515
Panchaghar	291,080	6,209	256,156	196,859
Rajbari	299,732	5,050	289,986	222,447
Rajshahi	769,536	20,857	732,713	587,702
Thakurgaon	400,026	370,999	284,917	7,895
Project	11,535,626	661,913	10,682,257	8,402,774

Source: Population Census, BBS, 2011

g. Poverty[16]

101. The table below shows 15.12% of the population is extremely poor and an additional 35% is under the upper poverty line.

[16] Poverty headcount ratio (%): Percentage of the population that lives below the official national upper poverty line. Extreme poverty headcount ratio (%): Percentage of the population that lives below the official national lower poverty line

Table 31: Poverty Line

District	Population	% Extreme poor (lower poverty line)	% Poor (Uper poverty line)
Bogura	3,400,874	6.70	16.60
Chattogram	7,616,352	4.00	11.50
Chuadanga	1,129,015	10.80	27.70
Cumilla	5,387,288	21.10	37.90
Dinajpur	2,990,128	21.30	37.90
Gaibanda	2,379,255	30.30	48.00
Gopalganj	1,172,415	26.80	42.70
Jashore	2,764,547	18.40	39.00
Madaripur	1,165,952	17.40	34.90
Naogaon	2,600,157	7.00	16.90
Natore	1,706,673	21.30	35.10
Nilpamari	1,834,231	18.80	34.80
Panchaghar	987,644	12.30	26.70
Rajbari	1,049,778	25.70	41.90
Rajshahi	2,595,197	16.50	31.40
Thakugaon	1,390,042	13.80	27.00
Project	40,169,548	15.12	35.19
Bangladesh		15.72	29.90

h. Land Resources

102. **Agro-ecological zones.** There are 30 agro-ecological zones (AEZ) and 88 sub-zones that have been identified in Bangladesh. An AEZ is a zone or region with a unique combination of physiographic (landforms and parent materials), soil properties, soil salinity, depth and duration of seasonal flooding and agro-climatology (FAO/UNDP, 1988, BARC, 2012). The fertility status of these regions varies considerably. Individual farmers have fragmented the land into small pieces causing wide variation in the management of each and every piece of land. This leads to the large difference in the fertility levels even between adjacent plots. The following AEZs partly or fully fall under additional financing rural road:

(i) **Old Himalayan Piedmont Plain (AEZ-1).** This a distinctive region, developed in an old Tista alluvial fan extending from the foot of the Himalayas. It has a complex relief pattern. Deep, rapidly permeable sandy loams and sandy clay loams are predominant in this region. They are strongly acidic in topsoil and moderately acidic in subsoils: Low in weatherable potassium minerals. Seven general soil types occur in the region, of which non-calcareous brown floodplain soils, black terai soils, and non-calcareous dark grey floodplain soils predominate. Organic matter content is generally higher than in most Floodplain soils of Bangladesh. The natural fertility of the soil is moderate but well sustained. Soil fertility problems include rapid leaching of trace metals. Most of Panchagarh and Thakurgaon districts and the northwestern part of Dinajpur district are included in this zone.

(ii) **Active Tista Floodplain (AEZ-2).** This region includes the active floodplains of the Tista, Dharla and Dudhkumar rivers. It has a complex patterns of low, generally smooth ridges, inter-ridge depressions, river channels, and cut-off channels. The area has irregular patterns of grey stratified sands and silts. They are moderately acidic throughout. Four general soil types occur in the region, and of them, non-

calcareous alluvium predominates. Organic matter contents and soil fertility levels are low to medium.

(iii) **Tista Meaner Floodplain (AEZ-3).** This region occupies the major part of the Tista floodplain as well as the floodplain of the Atrai, Little Jamuna, Karatoya, Dharla and Dudhkumar rivers. Most areas have broad floodplain ridges and almost level basins. There is an overall pattern of olive-brown, rapidly permeable, loamy soils on the floodplain ridges, and grey or dark grey, slowly permeable, heavy silt loam or silty clay loam soils on the lower land. Eight general soil types occur in the region; they are moderately acidic throughout, low in organic matter content on the higher land, but moderate in the lower parts. The fertility level is low to medium. Soils, in general, have good moisture-holding capacity.

(iv) **Karatoya-Bangali Floodplain (AEZ-4).** This region is very similar to the Tista Meander Floodplain in physiography and soil and comprises a mixture of Tista and Brahmaputra sediments. Most areas have smooth, broad, floodplain ridges and almost level basins. The soils are grey silt loams and silty clay loams on ridges and grey or dark grey clays in basins. Five general soil types occur in the region, of which non-calcareous grey floodplain and non-calcareous dark grey floodplain soils predominate. The soil is moderately acidic throughout. Organic matter contents are generally low in the cultivated layer of ridge soils and moderate in basins. General fertility is medium. The eastern half of Bogura and most of Sirajganj districts are included in this zone.

(v) **Lower Atrai Basin (AEZ-5).** This region comprises the low lying area between the Baring Tract and the Ganges river floodplain. It includes the Chalan Beet area. Dark grey, heavy, acidic clays predominate in this smooth low-lying basin land. Seven general soil types occur in the region. Organic matter, and status of other essential nutrients are medium, while the level of available potassium is high. The fertility status of soils is moderate.

(vi) **Lower Purnarbhaba Floodplain (AEZ-6).** This small region of only 129 sq km occupies basins and beels separated by low floodplain ridges. In this area, dark grey, mottled red, very strongly acid, heavy clays occupy both ridge and basin sites. Organic matter status is medium to high. The general fertility level is medium with high potassium bearing minerals. The western part of Naogaon and the northern part of Nawabganj districts are included in this AEZ.

(vii) **Active Brahmaputra-Jamuna Floodplain (AEZ-7).** This region comprises the belt unstable alluvial land along the Brahmaputra-Jamuna rivers where land is constantly being formed and eroded by shifting river channels. It has an irregular relief of broad and narrow ridges and depressions. The area is occupied by sandy and silty alluvium rich in minerals with slightly alkaline in reaction. Six general soil types occupy the area; of which, only Noncalcareous Alluvium predominates. Organic matter status is low and fertility status low to medium.

(viii) **Active Ganges Floodplain (AEZ-10).** The Active Ganges Floodplain comprises young, stratified, alluvium land within and adjoining the shifting channels of the Ganges River and its two main distributaries, the Gorai- Madhumati and Arial Khan. The alluvial formations (chars) are liable to change shape each year as river banks are eroded, new alluvium is deposited within and along channels and older deposits are buried by layers of new alluvium. The relief varies from smooth to irregular, with 2-3 meters or more difference in elevation between the adjacent ridges and depressions. Seasonal flooding varies from shallow to deep at different sites and may vary in depth by more than a meter between years. The area has complex mixtures of calcareous sandy, silty and clayey alluvium. The general soil types predominately include calcareous alluvium and calcareous brown floodplain

soil, which are low in organic matter and mildly alkaline in reaction. The fertility status generally is medium.

(ix) **High Ganges River Floodplain (AEZ-11).** This region includes the western part of the Ganges River Floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions, separated by areas with smooth broad ridges and basins. There is an overall pattern of olive-brown silt loams and silty clay loams on the upper parts of floodplain ridges and dark grey, mottled brown, mainly clay soils on ridge sites and in basins. Most ridge soils are calcareous throughout. General soil types predominantly include Calcareous Dark Grey Floodplain soils and Calcareous Brown Floodplain soils. Organic matter content in brown ridge soils is low and higher in dark grey soils. Soils are slightly alkaline in reaction. The general fertility level is low.

(x) **Low Ganges River Floodplain (AEZ-12).** This region comprises the north-eastern, eastern and south-eastern parts of the Ganges Meander Floodplain which are lower-lying than the western part. The ridges are mainly shallowly flooded, but basins become moderately deep or deeply flooded in the rainy season. The soils of the Low Ganges River Floodplains are silt loams and silty clay loams on the ridges and silty clay loams to heavy clays on lower sites. General soil types predominately include calcareous dark grey, grey and calcareous brown floodplain soils. Organic matter content is low in ridges and moderate in the basins. Soils are calcareous in nature having neutral to slightly alkaline in reaction. The general fertility level is medium.

(xi) **Gopalganj-Khulna Beels (AEZ-14).** The region occupies extensive low-lying areas between the Ganges River Floodplain and the Ganges Tidal Floodplain. Almost level, low-lying basins occupy most of the region with low ridges along rivers and creeks. Soils of the area are grey and dark grey acidic heavy clays overlying peat or muck at 25-100 cm. Soft peat and muck occupy perennially wet basin centers. General soil types include mainly Peat and Non-Calcareous Dark Grey Floodplain soils. Organic matter content is medium to high. The fertility level is medium.

(xii) **Middle Meghna River Floodplain (AEZ 16).** This region occupies the abandoned channel of the Brahmaputra River on the border between greater Dhaka and Cumilla Districts. It includes islands – former Brahmaputra chars, within the Meghna River as well as adjoining parts of the mainland. Soils of the area are grey, loamy on the ridges and grey to dark grey clays in the basins. Grey sands to loamy sands with compact silty topsoil occupy areas of Old Brahmaputra char. The dominant general soil type is non-calcareous grey floodplain soil. Topsoils are strongly acidic and sub-soils moderately acidic to slightly alkaline. The general fertility level is medium with low nitrogen and organic matter contents. The phosphorus and zinc levels are low to medium.

(xiii) **Lower Meghna River Floodplain (AEZ-17).** This area occupies the transitional area between Middle Meghna River Floodplain and the Young Meghna Estuarine Floodplain. The region has slightly irregular relief with little difference in elevation between the ridges and depressions. Soils of this area are relatively uniform. Silt loams occupy relatively higher areas and silty clay loams the depressions. Non-calcareous Dark Grey Floodplain and Calcareous Grey Floodplain soils are major components of general type. Topsoils are moderately acidic and subsoils neutral in reaction. The general fertility level is medium to high with low to medium organic matter status.

(xiv) **Young Meghna Estuarine Floodplain (AEZ-18).** This region occupies young alluvial land in and adjoining the Meghna estuary. It is almost level with very low ridges and broad depressions. The major soils are grey to olive, deep, calcareous silt loam and silty clay loams and are stratified either throughout or at shallow depth. Calcareous Alluvium and Non-calcareous Grey Floodplain soils are the dominant general type. The soils in the south become saline in dry season. Topsoils and subsoils of the area are mildly alkaline. General fertility is medium but low in organic matter.

(xv) **Old Meghna Estuarine Floodplain (AEZ-19).** This region occupies a large area, mainly low-lying between south of the Surma-Kushiyara Floodplain and the northern edge of the Young Meghna Estuarine Floodplain. It comprises smooth, almost level, floodplain ridges and shallow basins. Seasonal flooding occurs due to accumulated rainwater. It is moderately deep or deep in the north and west, but it is shallow in the southeast. Silt loam soils predominate on highlands and silty clay to clay in low lands. Non-calcareous dark grey floodplain soils are the only general type of the area. The organic matter content of the soils is moderate. Moisture holding capacity is medium. Top-soils are moderately acidic, but sub-soils are neutral in reaction. The general fertility level is medium.

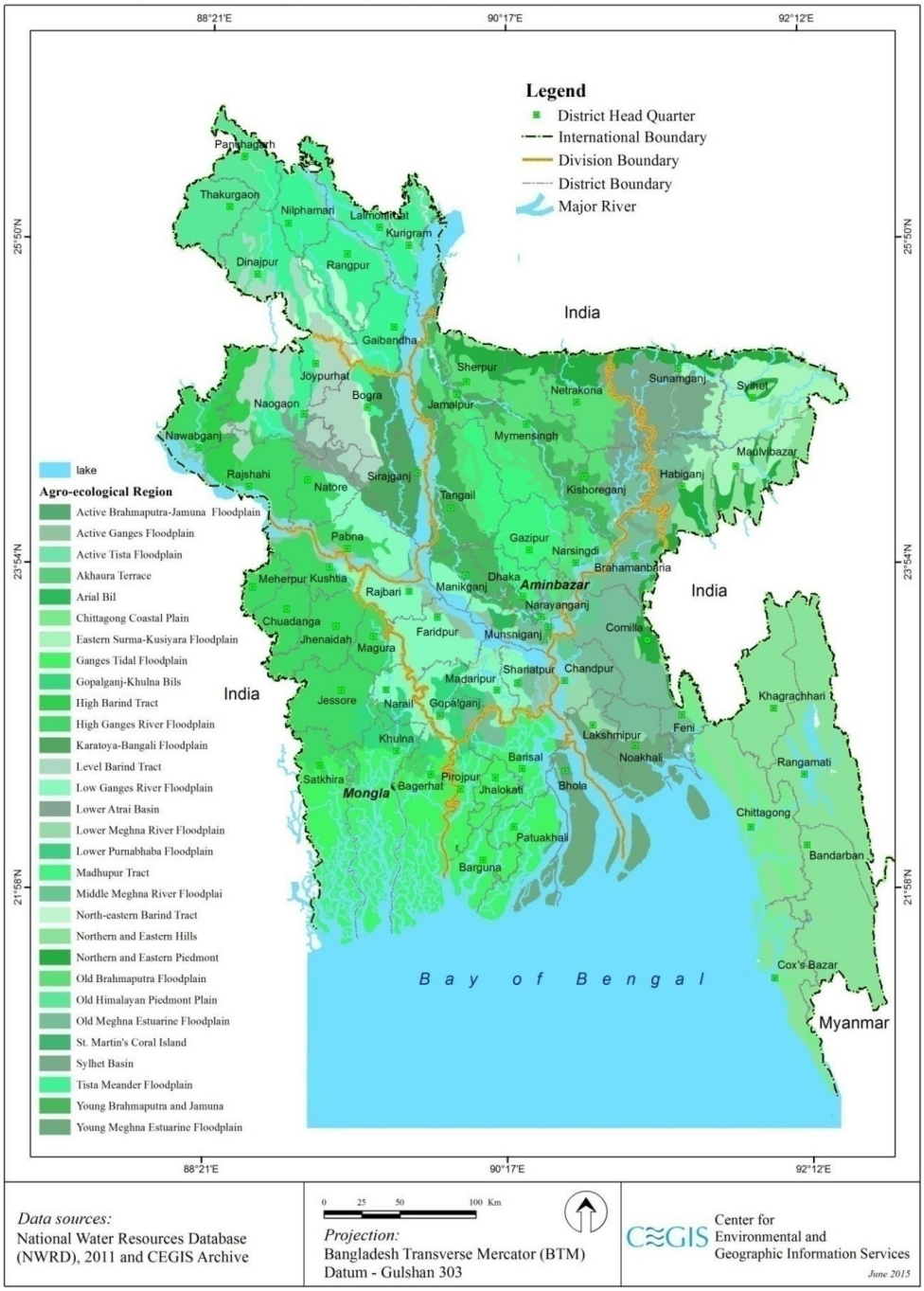
(xvi) Chattogram **Coastal Plains (AEZ- 23).** This region occupies the plain land in greater Chattogram district and the eastern part of the Feni district. It is a mixture of piedmont, river, tidal and estuarine floodplain landscapes. The major problem in these soil is high in salinity during the dry season (October to May). Grey silt loams and silty clay loam soils are predominant. Acid Sulphate soil which is potentially extremely acidic occurs in mangrove tidal floodplains. Non-calcareous grey floodplain soils, non-calcareous alluvium and acid sulfate soils are most available general soil types of the area. General fertility level of the soils is medium, and nitrogen and potassium are limiting. The status of sulfur is high.

(xvii) **Level Barind Tract (AEZ-25).** This region is developed over Madhupur Clay. The landscape is almost level and locally irregular along river channels. The predominant soils have a grey silty paddled topsoil with plough pan which either directly overlies grey heavy little weathered Madhupur Clay or merges with the porous silt loam or silty clay loam subsoils having strongly acid clay at greater depth. Shallow Grey Terrace soils and Deep Grey Terrace soils are the major components of general soil types of the area. The soils are low in available moisture-holding capacity and slightly acidic to acidic in reaction. Organic matter status is very low and most of the available nutrients are limiting.

(xviii) **High Barind Tract (AEZ- 26).** This is a very small zone of 16 sq km; it includes the southwestern part of the Barind Tract where the underlying Madhupur Clay had been uplifted and cut into by deep valleys. The soils include puddled silt loam to silty clay loam in the topsoils and porous silt with mottled plastic clay at varying depth. Deep grey terrace soils and grey valley soils are major components of the general soil types of the area. General fertility status is low, having a low status of organic matter.

(xix) **North Eastern Barind Tract (AEZ-27).** This Zone occupies several discontinuous areas in the south of the Rajpur Division. It has silty or loamy topsoil and clay loams to clay subsoil. The soils are strongly acidic in reaction. Organic matter in the soils is low. General fertility is poor.

Figure 24: Agro-Ecological Zones in Bangladesh



19. Land Use and Land Type

103. Land use in the project area and much of Bangladesh is dominated by human activity. According to the World Bank, only 11.1% of Bangladesh has forest, further only 30.2 % is primary forest, and the majority of forests are the Sundarban mangrove forests and the Chattogram Hill Tracts. Much of the land particularly in the south and central area of the Project area is low lying

and subject to flooding in the monsoon season. The land, although low lying is used intensively for agriculture. The basic land use map for Bangladesh is depicted in the succeeding Figure.

Figure 25 General Land Use Map of Bangladesh

104. Based on the transect walks for all the proposed 96 rural roads, the land use of the bordering lands in terms of water bodies, settlement, and agricultural uses are presented in the succeeding Table. The dominant land use is agriculture accounting for 44% of the total road length, followed by settlement with 39%, and water bodies most ponds with 17%.

Table 32: Roadwise Land Use Based on Transectwalk chainage and Percent of Total Length

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
1	2	3	4	6						
1	Gopalganj	Kasiani	Nizam kandi-Gohala Road	3.055	1.63	0.50	0.93	53.36	16.37	30.28
2	Gopalganj	Muksudpur	Bonogram GC-Bhamondanga Bazar-Dignagar R&H	11.268	0.85	4.98	5.44	7.54	44.20	48.26
3	Gopalganj	Muksudpur	Gohala UP office (Monirkandi)-Jalirpar GC Road	5.221	1.00	2.72	1.50	19.15	52.10	28.75
4	Madaripur	Madaripur-S	Khagdi R&H-Char Muguria-Sreenadi Hat GC	17.250	0.85	10.25	6.15	4.93	59.42	35.65
5	Madaripur	Madaripur-S	NHW-Tribhagdi Hat GC.	5.031	0.90	1.75	2.38	17.89	34.78	47.33
6	Madaripur	Madaripur-S	Trivagdi GC-Mithapur Hat-Habiganj hat-Mollahat-Shekhpur RHD	9.049	0.90	3.98	4.17	9.95	43.98	46.07
7	Madaripur	Sadar	Madaripur Puran Bazar-Bangla Bazar-Hosnabad Bazar-Kalikapur UP Road.	6.300	0.90	2.00	3.40	14.29	31.75	53.97
8	Madaripur	Kalkini	Kalkini Upazila HQ to Khasherhat GC Road via Shomitirhat Bazar.	10.977	2.35	4.65	3.98	21.41	42.36	36.23

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
9	Madaripur	Kalkini	Khoajpur Takerhat R & H to Khasherhat GC Road via Laxmipur UP Office & Shurjamoni hat.	15.138	1.58	5.83	7.73	10.44	38.51	51.05
10	Madaripur	Kalkini	Khasherhat GC to Shariatpur R & H Road (Kalkini Part)	2.100	0.40	0.70	1.00	19.05	33.33	47.62
11	Madaripur	Shibchar	R&H Bypass road to Kathalbari ferry ghat via Kutubpur growth center & bangla bazar	8.280	1.20	3.25	3.83	14.49	39.25	46.26
12	Rajbari	Baliakandi	Baliakandi-Mrigi GC. Rd. Via Narua GC.	12.300	0.58	4.59	7.13	4.72	37.32	57.97
13	Rajbari	Baliakandi	Baliakanndi GC-Modhukhali RHW. via Maghchami. Road	4.535	0.30	1.75	2.49	6.62	38.59	54.80
14	Rajbari	Goalanda	Uttar Ujanchar at NHW-Khalil mondoler Hat G.C via Ujanchar G.C.	7.320	0.80	3.87	2.65	10.93	52.87	36.20
15	Rajbari	Kalukhali	Mrigi G.C-Sonapur G.C. Road	2.875	0.88	0.96	1.05	30.43	33.22	36.35
16	Rajbari	Kalukhali	Belgachi G.C.-Sonapur G.C. Road	3.355	0.20	1.12	2.04	5.96	33.38	60.66
17	Rajbari	Pangsha	Jasai UP-Joygram-Machpara UP. Road	4.279	0.85	1.73	1.70	19.86	40.43	39.71

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
18	Rajbari	Pangsha	Pangsa HQ-Mrigi G.C. Road	10.900	1.30	3.90	5.70	11.93	35.78	52.29
19	Cumilla	Titas	Raypur NHW-Batakandi GC road via Masimpur	10.914	2.00	3.80	5.11	18.33	34.82	46.86
20	Cumilla	Daudkandi	Roypur NHW - Batakandi G.C via Masimpur Road (Daudkandi part).	3.345	0.40	1.75	1.20	11.96	52.32	35.72
21	Cumilla	Debidwar	Jafargonj GC to Barashalghar RHD via Yousufpur UPC Road.	15.815	3.00	4.81	8.01	18.97	30.41	50.62
22	Cumilla	Titas	Batakandi GC-DaudkandiGC Via Mohanpur Launch Ghat road (Titas Upazila Portion)	11.500	0.70	7.39	3.41	6.09	64.26	29.65
23	Chattagram	Mirsharai	Zorargonj UP R & H to -Burburia ghat Bazar road Via Dhum UP, Bangla Bazar & Golokerhat	5.100	1.00	2.30	1.80	19.61	45.10	35.29
24	Chattagram	Mirsharai	Habilder Basa R&H to Santir Hat GC Road via Azamnagar (Karerhat UP-Santirhat GC)	8.650	0.97	4.25	3.43	11.20	49.13	39.66
25	Chattagram	Fatikchari	Dantmara U.P.HQ.to Balutila Bazar via Ziltoli bazar Road	13.160	2.02	5.05	6.09	15.35	38.37	46.28

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
26	Chattagram	Hathazari	Mekhol up to Gorduara UP Road (Sarang Road)	2.770	-	1.50	1.27	-	54.15	45.85
27	Chattagram	Raojan	Ramjan Ali Hat GC - Nayahat RHD via Andermanik Natun Bazar Road.	9.926	0.75	3.85	5.32	7.58	38.79	53.64
28	Chattagram	Rangunia	Santirhat GC- Malirhat - Sahery Bazar GC Road (Baraulia Road) (Rangunia Part)	5.400	0.95	2.32	2.13	17.59	42.96	39.44
29	Jashore	Monirampur	Lawri (Madrasha) RHD-Khedapara GC Road	14.850	2.30	7.90	4.65	15.49	53.20	31.31
30	Jashore	Abhoynagar	Nowapara Upazila H/Q-Monirampur via Moshiahati,Nehalpur Road.	7.300	1.90	2.10	3.30	26.03	28.77	45.21
31	Jashore	Abhoynagar	Nowapara Upazila H/Q (Shankarpasha Bazar Ghat) - Narail-Fultala RHD at Sukpara more Road.	4.789	0.58	1.34	2.87	12.11	27.98	59.91
32	Jashore	Abhoynagar	Jashore Khulna RHD Bhangagate (Badamtala) - Amtala GC via Moricha, Nawly Bazar Road	20.909	2.54	8.32	10.05	12.15	39.79	48.06
33	Jashore	Jhikorgacha	Bakra GC-Baganchara GC via Sankarpur UPC	10.515	1.60	3.80	5.12	15.22	36.14	48.64

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
34	Jashore	Sarsha	Benapole - Baganchra GC via Goga UP H/Q Road	9.855	1.80	2.90	5.16	18.26	29.43	52.31
35	Jashore	Bagherpara	Khajura-Chaturbaria road.	8.275	1.00	1.00	6.28	12.08	12.08	75.83
36	Jashore	Bagherpara	Jashore-Narail RHD at Dhalgrammore to Narikelbaria via Dhalgram Bazar	19.010	3.20	6.15	9.66	16.83	32.35	50.82
37	Jashore	Monirampur	Nehalpur GC-Payria GC via Takerghat Road	3.727	0.80	1.20	1.73	21.46	32.20	46.34
38	Jashore	Keshobpur	Chuknagar-Katakhali Road	7.200	1.00	3.40	2.80	13.89	47.22	38.89
39	Chuadanga	Alamdanga	Alamdanga-Sorajgong G.C (Alamdanga Portion) [Alamdanga]	18.000	2.20	6.10	9.70	12.22	33.89	53.89
40	Chuadanga	Damurhuda	Memnagar RHD-Karpashdanga G.C via Buichitala	13.106	1.30	3.60	8.21	9.92	27.47	62.61
41	Chuadanga	Damurhuda	Damurhuda G.C-Bhogiratpur G.C	10.900	1.60	3.50	5.80	14.68	32.11	53.21
42	Rajshahi	Tanore	Tanore-Amnura via Mundumala Hat	16.991	4.20	5.30	7.49	24.72	31.19	44.09
43	Rajshahi	Paba	Mollikpur Bipass (Kukhundipur Bazar) - Parila UP Road	4.400	0.80	1.40	2.20	18.18	31.82	50.00
44	Rajshahi	Tanore	Talanda FRB to Nizampur via Dargadanga Hat,Billi Hat Road	17.000	3.80	5.20	8.00	22.35	30.59	47.06

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
45	Rajshahi	Tanore	Talanda to Keshor Hat (from Hatishail)Tanore Part	5.440	1.02	1.30	3.12	18.75	23.90	57.35
46	Rajshahi	Tanore	Tanore-Chowbaria road	10.140	1.30	3.80	5.04	12.82	37.48	49.70
47	Rajshahi	Tanore	Saranjai Pacca Road More - Mundumala Hat Via DebipurMore,Elamdohi hat and Prokash Nagar Hat.	17.221	3.40	5.00	8.82	19.74	29.03	51.22
48	Rajshahi	Tanore	Elamdohi Hat to Kalma Hat Via Valukakandor Hat.	2.300	0.70	0.90	0.70	30.43	39.13	30.43
49	Rajshahi	Tanore	Mundumala Hat (Start from Ayrarmore) to Hat bakoil (GCM) road ViaUchadanga Narayanpur (Tanore part).	13.850	2.80	4.60	6.45	20.22	33.21	46.57
50	Rajshahi	Mohonpur	Bazorpur Trimohini to Dhupaghata hat	4.500	0.90	1.60	2.00	20.00	35.56	44.44
51	Rajshahi	Bagmara	Bhawanigonj-Ahsangonj	4.200	0.90	1.89	1.41	21.43	45.00	33.57
52	Rajshahi	Bagmara	Bhabanigong-Kesorhat	13.300	2.60	3.20	7.50	19.55	24.06	56.39
53	Rajshahi	Bagmara	Bhobanigong-Hatgangopara (from Mathabhanga)	5.000	1.10	1.80	2.10	22.00	36.00	42.00
54	Naogaon	Atrai	Ahashanganj GC-Bandaikhara GC.	8.575	1.40	2.80	4.38	16.33	32.65	51.02

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
55	Naogaon	Manda	Nurullabad GPS R&H - Jothbazar - Bandaikhara GC Road.	8.405	1.92	2.33	4.16	22.84	27.72	49.43
56	Naogaon	Niamatpur	Chhatra GC - Shibpur GC.	12.300	2.25	3.23	6.82	18.29	26.26	55.45
57	Naogaon	Manda	Chowbaria GC - R&H Santa bridge More.	19.000	3.20	5.98	9.82	16.84	31.47	51.68
58	Naogaon	Atrai	Kashiabari GC - Smaspara GC Via Islamgati hat	9.655	1.50	2.25	5.91	15.54	23.30	61.16
59	Naogaon	Atrai	Kashiabari GC - Kaliganj GC	11.882	0.90	3.00	7.98	7.57	25.25	67.18
60	Natore	Baraigram	Rajapur GC - Zonail GC Road	18.180	2.00	2.00	14.18	11.00	11.00	78.00
61	Natore	Gurudaspur	Nazirpur GC - Moukra GC Road	9.000	1.50	3.70	3.80	16.67	41.11	42.22
62	Natore	Lalpur	Bagatipara-Dayarampur-Abdulpur-Lalpur Road (Lalpur Part)	16.460	2.28	6.52	7.66	13.85	39.61	46.54
63	Natore	Lalpur	Lalpur-Bilmaria-Durduria Road	3.640	0.50	2.40	0.74	13.74	65.93	20.33
64	Bogura	Shajahanpur	Sonahata GC(Dhunot) - Tangramagur RHD via Amrul UP - Naimile	8.870	1.30	2.40	5.17	14.66	27.06	58.29
65	Bogura	Sonatola	Horikhali GC-Hatsharpur GC via Charpara hat (Sonatola)	10.010	1.50	2.60	5.91	14.99	25.97	59.04

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
66	Bogura	Bogura Sadar	Matidali NHW-Peergacha GCM (From RHD #331)	9.052	1.50	4.50	3.05	16.57	49.71	33.72
67	Bogura	Adamdighi	Nasratpur-Murail-Raykali-Beragram (Tilokpur) Road	6.610	1.32	3.10	2.19	19.97	46.90	33.13
68	Bogura	Kahaloo	Dupchachia-Namoja via Tindighi GC Road (Kahaloo)	11.750	3.00	5.25	3.50	25.53	44.68	29.79
69	Bogura	Kahaloo	Ranirhat-Durgapur Road.	10.675	2.14	5.25	3.29	20.00	49.18	30.82
70	Gaibandha	Sadullapur	Madargonj GC-Laxmipur G.C Road via Kantanagar.	10.443	2.35	5.50	2.59	22.50	52.67	24.83
71	Gaibandha	Sadullapur	Kunjo Mohipur Uttarpara - Pollasbari Border via Idulpur U.P office	5.370	1.35	3.00	1.02	25.14	55.87	18.99
72	Gaibandha	Sadar	Dariapur-Laxmipur	7.254	1.25	3.85	2.15	17.23	53.07	29.69
73	Gaibandha	Sundarganj	Sundargonj-Materhat G.C (FRA)	14.588	3.65	7.80	3.14	25.02	53.47	21.51
74	Dinajpur	Phulbari	Phulbari UZHQ-Madilahat GC Road.	10.500	1.80	4.15	4.55	17.14	39.52	43.33
75	Dinajpur	Parpatipur	Mominpur UP Office Jashai (Bot tree more) - Pan Bazar road via Jurai hat & faridpur hat.	8.960	1.50	4.25	3.21	16.74	47.43	35.83
76	Dinajpur	Phulbari	Madilahat GC (Chintamon Moor)-Ambarihat GC Road.	18.060	3.01	8.95	6.10	16.67	49.56	33.78
77	Dinajpur	Nawabgonj	Doudpur (Laugari) to Bajitpur R&H	7.200	1.44	3.55	2.21	20.00	49.31	30.69

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
78	Dinajpur	Nawabgonj	Doudpur GC-Bhaduria GC via Daria	13.200	2.64	6.28	4.28	20.00	47.58	32.42
79	Dinajpur	Parpatipur	Ambari GC - Jashai more RHD road	14.264	4.50	6.60	3.16	31.55	46.27	22.18
80	Dinajpur	Birgonj	Bottoli (NHW)-Goreya GC via Shibrampur UP Rd (Bir Muktijoddha Shahid Motilal Barman Road)	16.040	3.25	7.85	4.94	20.26	48.94	30.80
81	Dinajpur	Kaharol	Kaharol Upazila HQ-Boleyahat RHD Road	9.265	3.08	4.25	1.94	33.24	45.87	20.89
82	Dinajpur	Bochagonj	Setabgonj Sugar Mill-Meherpur Hat via Nawavita hat Road.	12.400	2.06	6.75	3.59	16.61	54.44	28.95
83	Thakurgaon	Baliadangi	Baliadangi-Lahiri G.C. Road	7.063	1.50	2.75	2.81	21.24	38.94	39.83
84	Thakurgaon	Baliadangi	Charol UP Office(Lahiri GC)-Dogachi hat via Patilabhasha Road	8.365	1.30	3.75	3.32	15.54	44.83	39.63
85	Thakurgaon	Haripur	Jadurani GC-Dangipara UP Office Road.	4.280	0.80	1.80	1.68	18.69	42.06	39.25
86	Thakurgaon	Thakurgaon-S	Thakurgaon-Farabari GC Road.	8.500	1.75	4.50	2.25	20.59	52.94	26.47
87	Thakurgaon	Pirganj	Pirganj-Nasibganj G.C Road	7.180	1.25	3.00	2.93	17.41	41.78	40.81
88	Thakurgaon	Ranisankail	Baliadangi GC - Dhirganj (Horipur) via Dharmogarh Check Post Road.	5.803	1.16	3.25	1.39	19.99	56.01	24.00
89	Panchagarh	Atwari	Fakirgonj hat GC - Shathkhamar R&H Road	17.575	4.25	7.50	5.83	24.18	42.67	33.14

Sl. No.	Name of District	Name of Upazila	Name of Schemes	Final EffectiveLength (km)	Water Bodies	Settlement	Agricultural Land	Water Bodies	Settlement	Agricultural Land
					In KM			In Percentage		
90	Panchagarh	Tetulia	Tetulia Gobra Bridge - Shalbahan GC Road	9.700	2.00	3.25	4.45	20.62	33.51	45.88
91	Panchagarh	Panchagarh-S	Panchagarh - Harivasha Road.	10.550	1.95	1.25	7.35	18.48	11.85	69.67
92	Nilphamari	Domar	Domar Bazar G.C-Basunia Hat GC.road	6.700	1.74	3.50	1.46	25.97	52.24	21.79
93	Nilphamari	Domar	Domar GC to Ambari Alsiar Bazar RHD road GC via Azizarerhat	13.460	2.69	6.79	3.98	19.99	50.45	29.57
94	Nilphamari	Domar	Boragarihat at RHD road to Baburhat GC via Motukpur UPC at Sayllar ghat (Domar Part)	4.250	0.50	2.75	1.00	11.76	64.71	23.53
95	Nilphamari	Nilphamari-S	Goregram U.P. to Bhabanigonj G.C via Majhpara Madrasha.	8.140	1.35	3.60	3.19	16.58	44.23	39.19
96	Nilphamari	Sayedpur	Taraganj G.C.-Porarhat G.C. Via Hazarihat G.C	17.750	3.50	8.75	5.50	19.72	49.30	30.99

C. Agriculture Resources

20. Cropping Pattern and Cropping Intensity in the Project Area

105. Most agricultural land in the project area tends to be intensively used with double or triple cropping patterns being common with rice as the main crop. Jute, maize, wheat, potatoes and various vegetables are also grown depending on season and location.

21. Sources of Drinking Water

106. Access to clean drinking water is a major indicator of social condition and wellbeing. Data from the 2011 census show that less than 6% of the population in the project area have reticulated tap water compared with over 10% for Bangladesh as a whole. More than 89% of the populations in the project area have access to water from tube well sources and 4% are reliant on other sources.

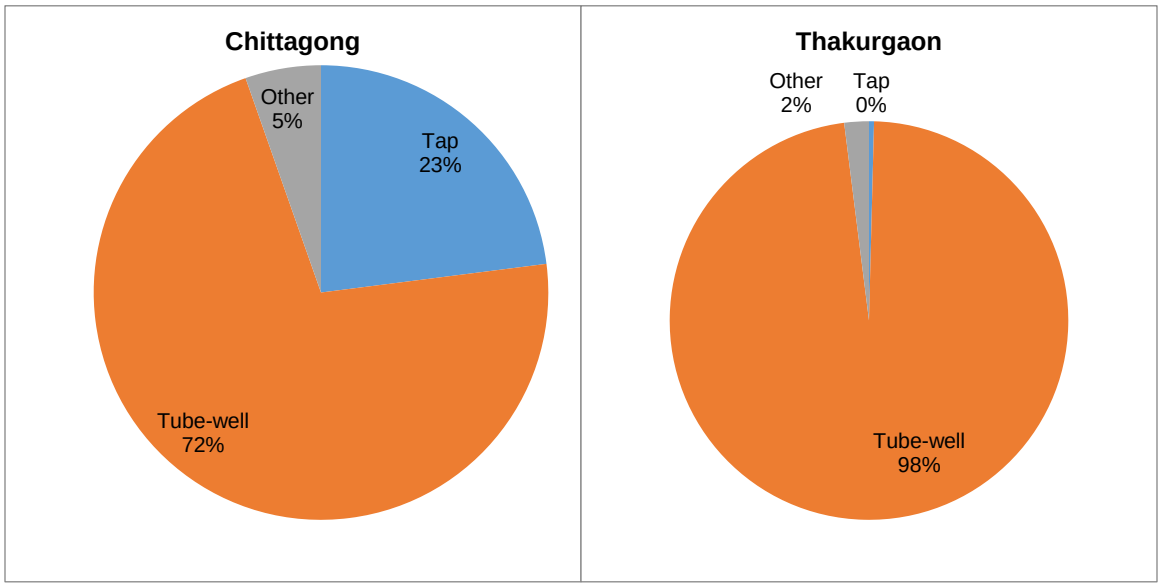
Table 33: Sources of Drinking Water

Districts	Tap	Tube-well	Other
Bogura	35,534	808,148	19,918
Chattogram	347028	1081404	81285
Chuadanga	8,292	262,575	6,043
Cumilla	58502	937220	53262
Dinajpur	10,227	688,004	15,024
Gaibanda	6,281	579,934	25,082
Gopalganj	14,467	225,554	8,714
Jashore	7,691	633,953	11,779
Madaripur	2470	240925	8186
Naogaon	20,816	587,826	45,633
Natore	8,750	395,932	18,239
Nilpamari	2,951	405,383	12,572
Panchaghar	2,818	215,601	9,655
Rajbari	1792	229369	6191
Rajshahi	50,994	558,072	21,265
Thakurgaon	1,298	312,258	6,373
Project Area	768,619	14,576,958	640,854

Population Census, BBS, 2011

107. Sources of drinking water and the level of access to tap water across the 16 administrative districts is similar. In Thakurgaona, only 0.41% can access tap water while only 23% in Chattogram. Tube-well water provides most of the water requirement at 98% in Thakurgaon and 92% in Chattogram relying on this source. The share of each source of drinking water in Thakugaon and Chattogram districts is depicted in the following Figures.

Figure 26: Sources of Drinking Water in Khulna and Rajshahi Divisions Sanitation Facilities



108. According to the population census 2011, 26% of the households in the project area have access to water-sealed sanitation facilities while 34% have non-water-sealed sanitation facilities. Unfortunately, 29% of households have non-sanitary toilet facilities and more than 11% households report that they have no sanitation facility at all. District wise, Naogaon has 18% and 19% households have access to water sealed and non-water sealed sanitation facilities respectively, only 32% have the non-sanitary toilet and 31% have no access to sanitation facilities at all.

Table 34: Access to Sanitation Facilities

Districts	Sanitation			
	Water Sealed	Non-water Sealed	Non-sanitery	None
Bogura	290,053	274,243	211,214	88,090
Chattogram	477,308	688,084	307,480	36,845
Chuadanga	52,457	72,992	132,475	18,986
Cumilla	229,875	574,918	212,078	32,113
Dinajpur	230,897	111,023	204,810	166,525
Gaibanda	65,195	121,046	266,871	158,185
Gopalganj	109,756	102,697	30,590	5,692
Jashore	187,077	207,250	229,814	29,282
Madaripur	31,605	144,998	71,699	3,279
Naogaon	117,635	122,904	212,611	201,125
Natore	113,618	180,684	104,085	24,534
Nilpamari	62,371	76,427	188,724	93,384
Panchaghar	85,828	62,448	47,626	32,172
Rajbari	93,226	92,248	43,884	7,994
Rajshahi	152,884	180,553	238,898	57,996
Thakurgaon	38,190	50,533	144,860	86,346
Project Area	**2,337,975**	**3,063,048**	**2,647,719**	**1,042,548**

Source: Population Census, BBS, 2011

22. Access to electricity

109. In the project area, about 55% households have access to electricity in 2011 compared with the national electrification level at 53%. However, there is a significant variation in the electrification level among the 16 project districts varying from 26.96% in Panchaghar to 79.06% in Chattogram.

Table 35: Access to Electricity

Districts	House Hold with Electric Connections			
	HH with electricity	HH without electricity	% of HH with electricity	% of HH without electricity
Bogura	454,086	409,514	52.58%	47.42%
Chattogram	1,193,563	316,154	79.06%	20.94%
Chuadanga	167,836	109,074	60.61%	39.39%
Cumilla	785,728	263,256	74.90%	25.10%
Dinajpur	280,944	432,311	39.39%	60.61%
Faridpur	203,903	214,651	48.72%	51.28%
Gaibanda	179,977	431,320	29.44%	70.56%
Gopalganj	122,081	126,654	49.08%	50.92%
Jashore	399,144	254,279	61.09%	38.91%
Madaripur	149,063	102,518	59.25%	40.75%
Naogaon	257,871	396,404	39.41%	60.59%
Natore	206,523	216,398	48.83%	51.17%
Nilpamari	145,009	275,897	34.45%	65.55%
Panchagharr	61,490	166,584	26.96%	73.04%
Rajbari	108,620	128,732	45.76%	54.24%
Rajshahi	391,365	238,966	62.09%	37.91%
Thakurgaon	110,999	208,930	34.69%	65.31%
Project	8,331,544	7,654,887	52.12%	47.88%

Source: Population Census, BBS, 2011

23. Cultural and Common Property Resources

110. Cultural property means those have a regional and or national cultural heritage significance, e.g., ancient mosque, historic buildings, works of art, archaeological sites, libraries and museums while common property resources refer to properties usually used by the local communities, e.g., educational institutes, religious institutes, eidgah, crematory etc. These properties require to be protected as they contribute to local culture. None of these properties will be affected by the proposed road upgrading.

V. IMPACT ASSESSMENT AND MITIGATION MEASURES

111. Road improvement projects are likely to bring several changes in the local environment both beneficial and adverse. This section of IEE identifies nature, extent, and magnitude of all such likely changes vis-a-vis project activities for all stages of the project cycle i.e. pre-construction, construction and operation.

112. This Chapter presents the environmental assessment process and planning undertaken by LGED in addressing the environmental impacts and risks associated with the upgrading of rural roads under the RCIP. This chapter starts with the identification and screening of potential impacts. The identification of impacts starts with the enumeration of the general project components e.g. site mobilization, establishment of camps, road construction, and road operation in consultation with the district engineers and the technical consultants of the LGED. Corresponding interaction of these general components with specific environmental aspects e.g. physical, biological, and human were identified through a series of discussions with the community stakeholders, Union Parishads, and Departments of Environment and Forest.

113. The civil work components that are anticipated to have substantial interaction with the environment are as follows:

(i) Preconstruction Phase
  (a) Road alignment and design – involves the screening and selection roads to avoid environmentally sensitive areas, and survey
  (b) finalization of road alignment including minor geometric realignment particularly on intersections and sharp curves
  (c) Utility shifting – removal and transfer from the carriageway of electric, telephone, and water supply pipelines, gas pipeline, drainage pipes, gas pipelines, and hand pumps.
  (d) Construction mobilization - land clearing, installation of electricity and other utility connections, perimeter fencing, establishment of storage areas, waste disposal, and installation of production equipment (cold mix, concrete batching, rock crusher, casting) in the labor and campsites.
  (e) Tree cutting and clearing – tree marking, cutting, and grubbing

(ii) Construction Phase:
  (a) Road construction – includes preparation for earthworks to restore design geometric shape; earth filling; sub-grade, earthwork in box cutting on-road crest; aggregate sand sub-base; brick aggregates for base course; earthen shoulder construction in layers and converted to hard shoulder; bitumen surfacing;
  (b) Quarries and borrow area site management
  (c) Construction plants operation for WMM mix and cement batching plants
  (d) Site-Restoration involves the clean-up and restoration of construction zones to near its original condition prior to contractor demobilization to include: riverbeds used for sand mining; camps; hot mix plant, crushers, batching plant sites; and borrow areas rehabilitated.

(iii) Post-Construction Phase:
  (a) Road maintenance
  (b) Vegetation control – involves periodic mechanical mowing, trimming, removal of brush, and removal of trees when necessary to enhance aesthetics and to prevent potential safety hazards (e.g. reduced visibility, obstruction of signs, and debris in the roadway).

A. Identification and Assessment of Environmental Impacts

114. The identification of potential effect requires the definition of the environment into its physical, biological, and human components that are at risk of being impacted in the upgrading of 96 rural roads in 16 project districts. Like the classical Leopold matrix, it involves an integration grid between the valued environmental components and project activities. The valued environmental components for this project were drawn from the environmental baseline and are as follows:

(i) Physical environment – air quality and greenhouse gas emissions, land and soil, surface water quality and quantity, and groundwater quality and quantity,
(ii) Biological environment – terrestrial vegetation, mammals, avifauna, and fish species
(iii) Human environment – private land and buildings, public infrastructures, sound environment, aesthetic and visual, and community and occupational health and safety.

115. The assessment of potential environmental impacts requires the definition of the effects associated with the rural roads upgrading in terms of intensity, duration, and scope as follows:

(i) **Intensity of the effect:** The intensity of the effect refers to the level of disruption to the component. Three levels have been defined:
  (a) Low: Little change in the characteristics of the component. Difficult to quantify;
  (b) Average: Change in certain characteristics of the component. The change may be quantifiable;
  (c) High: Change in all or in the main characteristics of the component. The change is quantifiable
(ii) **Duration of the effect:** Duration means the time dimension of the effect. The terms permanent, temporary and short are used to describe the period (time):
  (a) Short-lived: the effect disappears promptly;
  (b) Temporary: the effect is felt during one project activity or, at most, throughout the implementation of the project;
  (c) Permanent: the effect has repercussions for the life of the infrastructure.
(iii) **Scope of the effect**: The scope describes the spatial dimension of the effect caused by an action in the environment. It refers to the distance or area covered by the disruption. The terms regional, local and limited are used to describe the scope:
  (a) Limited: the scope is limited when the action affects only one environmental element located near the project;
  (b) Local: the scope is local when the action affects the study area;
  (c) Regional: the scope is regional when the action affects areas beyond the study area
(iv) **Assessment of the potential effect**. These three parameters are incorporated into a multicriteria matrix, making it possible to place the potential effect into one of three categories:
  (a) Major (MAJ): signifies an effect that is permanent and that affects the integrity, diversity, and sustainability of the element. Such an effect substantially or irremediably alters the quality of the environment.
  (b) Medium (MED): signifies a perceptible, temporary and/or low return effect that has little impact on the environmental component and is not irreversible. Such an effect is short-lived and/or limited in scope.
  (c) Minor (MIN): signifies that the effect is non-existent or virtually non-existent, that it does not affect the environmental component in any

observable or quantifiable way and that it is related to a randomly occurring natural effect. As a rule, this would be a short-lived effect, limited in scope.

Table 36: Multi-Criteria Analysis to Determine the Potential Environmental Impacts

Intensity	Scope Duration	Short-lived	Temporary	Permanent
Low	Limited	MIN	MIN	MED
	Local	MIN	MIN	MED
	Regional	MIN	MED	MAJ
Average	Limited	MIN	MED	MED
	Local	MED	MED	MAJ
	Regional	MED	MAJ	MAJ
High	Limited	MED	MAJ	MAJ
	Local	MED	MAJ	MAJ
	Regional	MAJ	MAJ	MAJ

116. The relationship between these project phases and its components, and the environment were established to identify the anticipated environmental impact is provided in the succeeding Figure.

Table 37: Grid Displaying the Interaction between Environmental Components and Bangladesh Roads Upgrading

Environmental Component	Pre-Construction					Construction						Operation		
	Road Alignment	Construction and Camp Site Location	Utility shifting	Construction	Tree Cutting/Land	Drainage works	Road Construction	Quarries and borrow	Construction plants	Maintenance of by passed	Site Restoration	Road Maintenance	Vegetation Control	Road Operation
Physical Environment														
Air Quality and GHG				x		x	x	x	x	x	x	x		x
Land and Soil		x		x		x	x	x	x		x			
Surface Water Quality and Quantity		x		x		x	x	x	x					
Groundwater Quality and Quantity		x		x				x						
biological environment														
Terrestrial Vegetation	x	x			x		x		x					
Mammals	x	x					x		x			x		x
human environment														
Private Land and Buildings	x	x					x		x					
Public Infrastructures			x				x					x		
Sound Environment				x			x	x	x					x
Aesthetic and Visual			x											
Community and OH Safety	x		x				x	x		x		x	x	x

117. Mitigation measures were identified to reduce the adverse impacts including residual effects. The environmental assessment as shown in the succeeding Table revealed the following:

(i) During the pre-construction phase, potential adverse environmental impacts are related to road upgrading design to retain the original geometric shape, upgrading of the shoulders from soft to a paved surface, repair and strengthening of embankment slope and toe against erosion, and enhance road safety during the project operation phase. Adverse environmental impacts are limited to the potential loss of trees that have encroached on the road embankment and increase risks of road crashes from inadequate road design and localized flooding from inadequate drainage design.

(ii) During construction, major potential negative impacts from the project include the loss of productive soil from new borrow areas. Medium potential impacts from increase dust emissions, generation of noise, risks of accident from improper management of borrow areas, and inadequate clean-up operation, restoration and rehabilitation prior to decommissioning.

(iii) Only minor impacts were identified during project operation, which the contractors will address during the 5-year maintenance of the rural roads on selected roads for piloting.

118. **Cumulative and Induced Impact:** The project upgrades existing roads following their current alignment, hence the project is not likely to have any significant direct impact on ecosystems. However, the improvement in connectivity is expected to induce increase of productivity in the districts and potentially some negative impacts on the environment in the long term. Due to increase of production, the improvement of connectivity is expected to have land-use changes in areas near to the improved rural roads. Vehicle emissions would increase because higher automobiles running on the improved roads. Besides, the road infrastructure facilitates market linkages, creating opportunities for Agri-processing and small manufacturing, which might lead to increased amount of pollution and solid waste, if not appropriately managed.

Table 38: Analysis of Environmental Impacts-RCIP-AF Roads

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
1.	Pre-Construction	Road Alignment and Design	Terrestrial Vegetation	Tree cutting	Low	Permanent	Local	Medium	The road land width requiring clearing shall be clearly demarcated on ground. Avoid or minimize the number of trees to be cleared. Avoid the requirement of forestland for road construction. In case unavoidable, minimise it to extent possible by exploring alternative options. In case, requirement of forestland is unavoidable, determine the legal status of forestland and initiate actions to seek permits for diversion of forestland for non-forest uses (road construction). Forest clearance is to be obtained in accordance with the provisions of Department of Forest (DOF) under the Ministry of Forest and Environment (MoFE) and all conditions related with the clearance must be implemented. In case alignment has trees, which are known to be nesting/breeding places for migratory birds, contact the Department of National Park and Wildlife Conservation for seeking permits and details about non-breeding	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									seasons. In any case, no tree shall be cut in such stretches and construction works are to be strictly scheduled for non-breeding/nesting season and all permit conditions are to be complied. Roadside trees to be removed with prior approval of competent authority. Compensatory plantation at 1:3 based on Forest Department guidelines	
3.	Pre-Construction	Road Alignment and design	Land and Buildings	Localized flooding from inadequate drainage	Average	Permanent	Limited	Medium	Construction of concrete pavement in community areas like bazars with covered side drains considering alignment level and natural drainage channels .	Non-significant
4.	Pre-Construction	Road alignment and design	Community Safety	Road crashes	High	Permanent	Local	Major	Make provisions of crash barriers at accident prone areas as identified in the road safety studies. Provision of rumble strips in community areas to regulate speed. Provision of retro-reflective warning sign boards nears school, hospital, religious places and forests areas Provision of proper side-walks /pedestrian zone along the road near habitat areas, school, hospital, religious places and forests Compliance with norms specified in LGED codes for rural roads for curvature and grading	significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Provision of safety kerb at all bridges	
5.	Pre-Construction	Construction and Camp Site Location	Land and Building	Disturbance of inhabited areas	Low	Short-lived	Limited	Minimum	The Contractor shall comply with the Factories Act (1965) and amendment thereof The construction campsites shall be located away from any local human settlement areas and preferably located on lands, which are barren/waste lands. The camps shall be located, at a minimum, 5 km from forest areas to deter trespassing of construction labour. The campsites shall be provided with adequate water supply, sanitation and all requisite infrastructure facilities. This would minimize dependence on outside resources, presently being used by local populace and minimize undesirable social friction thereof. The camps shall have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. After completion of construction works, location of campsites shall be restored	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									to its previous state by undertaking cleanup operations. The location, layout and basic facility provision of each labor camp will be submitted to PIU and and DES prior to their construction. The construction shall commence only after approval of DES and PIU. Preparation of solid waste management plan that includes collection, storage, and disposal subject to the review and approval of the DES.	
6.	Pre-Construction	Utility shifting	Public infrastructures	Disruption of utility services to local community	Low	Short-lived	Limited	Minor	All telephone and electrical poles/wires, gas pipeline and underground cables should be shifted before start of construction Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any	Non-significant
8.	Pre-Construction	Utility shifting	Aesthetic and visual	Diggings, shifting and reestablishment of poles	Low	Short-lived	Limited	Minor	Immediately complete the utility shifting to reduce the duration of impact and restore the disturbed areas	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
				will impair the view of community areas					Provide visual barriers, when necessary, on active construction zones Consultation with affected people prior to the start of utility shifting presenting construction timelines and guidelines Proper disposal of demolition debris	
9	Pre-construction	Utility shifting	Community and OH Safety	Hazards to road users	Low	Short-lived	Limited	Minor	Possible re-route traffic during utility shifting to avoid the accumulation of noise beyond standards. The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for nighttime traffic and precautions for transportation of hazardous materials. The contractor will ensure that the diversion is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. Restriction of construction activity to only one side of the existing road.	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from PIU. Provide clear signages and warnings down the road. Contractor will assign staff to manage traffic along the road	
10.	Construction	Site Mobilization	Air quality	Construction of temporary facilities, hauling of equipment and materials may result to short term air quality deterioration	Low	Short-lived	Local	Minor	Transport, loading and unloading of loose and fine materials through covered vehicles. Paved approach roads. Storage areas to be located downwind of the habitation area. Water spraying on earthworks, unpaved haulage roads and other dust prone areas. Provision of PPEs to workers	Non-significant
11.	Construction	Site Mobilization	Surface water	Accidental spills	Low	Temporary	Limited	Minor	No vehicles or equipment should be parked or refueled near waterbodies, so as to avoid contamination from fuel and lubricants. Oil and grease traps and fueling platforms to be provided at refueling locations. All chemicals and oil shall be stored away from water and concreted	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									platform with catchment pit for spills collection. All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.	
12.	Construction	Site Mobilization	Groundwater quality	Accidental spills when transporting construction materials particularly fuels and lubricants could affect groundwater quality	Low	Temporary	Limited	Minor	Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil. To avoid soil contamination Oil-Interceptors shall be provided at wash down and refueling areas. Waste oil and oil soaked cotton/ cloth shall be stored in containers labeled 'Waste Oil' and 'Hazardous' sold off to authorized vendors	Non-significant
13.	Construction	Site Mobilization	Sound environment	Mobilization of heavy equipment and machineries will increase noise level	Low	Temporary	Limited	Minor	Construction equipment and machinery to be fitted with silencers and maintained properly. Only IS approved equipment shall be used for construction activities. Timing of noisy activities shall be done during night time and weekends near schools and selected suitable times near temples when there are no visitors, concurrent noisy operations	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									may be separated to reduce the total noise generated, and if possible re-route traffic during construction to avoid the accumulation of noise beyond standards. Else provision of temporary noise barrier at sensitive locations or near sources. Time regulation near residential, built up and forest areas to daylight hours. Honking restrictions near sensitive areas	
14.	Construction	Tree cutting and clearing	Terrestrial Vegetation	Loss of trees and vegetation	High	Permanent	Limited	Major	Avoid or minimize the number of trees to be cleared through minor geometric realignment or eccentric widening. Roadside trees to be removed with prior approval of competent authority.	Non-significant
15.	Construction	Tree cutting and clearing	Avifauna	Disturbance of potential avifaunal habitat	Low	Short-lived	Limited	Minor	Avoid cutting of trees during nesting time for birds	Non-significant
16.	Construction	Drainage work	Land and soil	Compaction of soil and impact on quarry haul roads due to movement or vehicles	Low	Temporary	Limited	Minor	During land clearing operations, topsoil shall be collected, preserved, and reused as a base for turfing of embankment slopes or development of barren areas along roadside. Equipment to be stationed in the designated ROW to avoid compaction.	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Approach roads/ haulage roads shall be designed along the barren and hard soil area to reduce the compaction.	
17.	Construction	Drainage work	Surface water quality	Disturbance of waterway bed to cause increase suspended solids	Low	Temporary	Limited	Minor	Provision of Silt fencing shall be made at water bodies. Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be revegetated. Earthworks and stone works to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system.	Non-significant
18.	Construction	Drainage work	Public Infrastructure	The works may damage the road used by local and regional population	Low	Temporary	Local	Medium	Temporary access and diversion, with proper drainage facilities shall be planned by the contractor and approved by the PIU. Access to the schools, temples and other public places must be maintained when construction takes place near them. The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for Night time traffic and precautions for transportation of hazardous materials.	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. Restriction of construction activity to only one side of the existing road. The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from PIU.	
19.	Construction	Road Construction	Air quality and GHG	Fugitive dust emission and fumes from construction vehicles	High	Short-lived	Local	Medium	Transport, loading and unloading of loose and fine materials through covered vehicles. Paved approach roads. Storage areas to be located downwind of the habitation area. Water spraying on earthworks, unpaved haulage roads and other dust prone areas such as unpaved roads Provision of PPEs to workers. Regular maintenance of machinery and equipment.	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
20.	Construction	Road Construction	Land and Soil	Slope failure and Soil erosion due to construction activities, earthwork, and cut and fill, stockpiles etc.	Low	Temporary	Limited	Minor	Bio-turfing of embankments to protect slopes. Slope protection by palisade, paliwall, and toe protection, stone pitching, masonry retaining walls, planting of grass and trees. The side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. Care should be taken that the slope gradient shall not be greater than 2:1. The earth stockpiles to be provided with gentle slopes to prevent soil erosion.	Non-significant
21.	Construction	Road Construction	Surface water quality and quantity	Sourcing of water during construction could compete with the local demand	Low	Temporary	Limited	Minor	Provisions shall be made to connect road side drains with exit to nearby ponds. Existing drainage system to be maintained and further enhanced. Embankment slopes to be modified suitably to restrict the soil debris entering water bodies. Provision of Silt fencing shall be made at water bodies. Silt/sediment should be collected and stockpiled for possible reuse as	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									surfacing of slopes where they have to be revegetated. Earthworks and stone works to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system. No vehicles or equipment should be parked or refueled near water bodies, to avoid contamination from fuel and lubricants. Oil and grease traps and fueling platforms to be provided at refueling locations. All chemicals and oil shall be stored away from water and concrete platform with catchment pit for spills collection. All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand and preferably written in the local language emergency response procedure, including	

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									reporting, will be provided by the contractors Arrangements shall be made by contractor that the water availability and supply to nearby communities remain unaffected.	
22.	Construction	Road Construction	Terrestrial Vegetation	Loss of vegetation	Low	Temporary	Limited	Minor	Minimize tree cutting to the extent possible. Plantation of trees on both sides of the road. Additional plantation near river banks to check erosion as part of compensatory plantation.	Non-significant
23.	Construction	Road Construction	Mammals	Crashes with Domesticated animals	Low	Local	Temporary	Minor	Installation of warning signs on know active mammal crossings for equipment operator to reduce speed.	Nonsignificant
24.	Construction	Road Construction	Private land and Building	Damage to private lands and buildings from vibration due to movement of heavy equipment	Low	Short-lived	Limited	Minor	Route heavily loaded trucks away from residential areas. Select areas with the fewest homes in routing haul trucks. Operate earthmoving and compaction equipment as far away from vibration sensitive sites (residents, property and cultural heritage) Phase demolition of existing pavement and structures earth moving, and ground impacting activities not to occur simultaneously.	Nonsignificant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Avoid nighttime activities. Avoid vibratory rollers and packers near sensitive areas	
25.	Construction	Road Construction	Public Infrastructures	Soil compaction producing vibration can damage buildings and pipes	Low	Short-lived	Limited	Minor	Route heavily loaded trucks away from residential streets. Select streets with the fewest homes in routing haul trucks. Operate earthmoving equipment as far away from vibration sensitive sites Phase demolition of existing pavement and structures earth moving, and ground impacting activities not to occur simultaneously. Avoid nighttime activities. Avoid vibratory rollers and packers near sensitive areas	Nonsignificant
26.	Construction	Road Construction	Sound environment	Noise from construction vehicle, equipment and machinery can elevate ambient noise	High	Short-lived	Local	Medium	All equipment to be timely serviced and properly maintained. Traffic bottlenecks to be removed. Construction equipment and machinery to be fitted with silencers and maintained properly. Only approved equipment shall be used for construction activities.	Nonsignificant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Timing of noisy construction activities shall be done during night time and weekends near schools and selected suitable times near temples when there are no visitors, concurrent noisy operations may be separated to reduce the total noise generated, and if possible re-route traffic during construction to avoid the accumulation of noise beyond standards. Else provision of temporary noise barrier at sensitive locations or near sources. Time regulation near residential, built up and forest areas construction shall be restricted to daylight hours. Honking restrictions near sensitive areas PPEs to workers	
27.	Construction	Road Construction	Community and occupational health and safety	Increase human mortality and injuries	Average	Temporary	Local	Medium	The location, layout and basic facility provision of each labor camp will be submitted to DES and PIU prior to construction. The construction shall commence only after approval of DES and PIU. The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner as approved by the PIU.	Nonsignificant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Adequate water and sanitary latrines with septic tanks attached to soak pits shall be provided. Preventive medical care to be provided to workers including a First-Aid kit that must be available in the camp. Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste must be carried out. The Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health. No alcoholic liquor or prohibited drugs will be imported to, sell, give, and barter to the workers of host community. Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases. Contractors to adopt and maintain safe working practices.	

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Usage of fluorescent and retroreflector signage, in local language at the construction sites Training to workers on safety procedures and precautions. Mandatory appointment of safety officer. All regulations regarding safe excavations, trenches and safe means of entry and egress shall be complied with. Provision of a readily available first aid unit including an adequate supply of dressing materials. The contractor will not employ any person below the age of 16 years for any work Use of hazardous material should be minimized and/or restricted. Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies. Temporary access and diversion, with proper drainage facilities.	

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Access to the schools, temples and other public places must be maintained when construction takes place near them. Fencing wherever cattle movement is expected. Restrict access to construction sites to authorized personnel. Physical separation must be provided for movement of vehicular and human traffic. Adequate signage must be provided for safe traffic movement	
28.	Construction	Quarries and borrow sites	Air quality and GHG	Deterioration of air quality along haul road due to increase in dust	Low	Short-lived	Limited	Minor	Transport of materials in covered trucks. Ensure adequate water sprinkling of storage and rock crushing operation.	Nonsignificant
29.	Construction	Quarries and borrow sites	Land and soil	Loss of productive lands and topsoil	Average	Permanent	Limited	Major	Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents. Topsoil to be stockpiled and protected for use at the rehabilitation stage.	

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Borrow areas not to be dug continuously. Aggregates will be sourced from existing licensed quarries.	
30.	Construction	Quarries and borrow sites	Surface water quality	Deterioration of receiving water quality from surface runoff	Low	Temporary	Limited	Minor	Installation of bunds around exposed area Collection of surface runoff in sedimentation pond prior to disposal.	Nonsignificant
31.	Construction	Quarries and borrow sites	Sound Environment	Increase noise level in quarries from blasting, rock crushing, and hauling	Average	Short-lived	Limited	Minor	Comply with the location separation distance from nearest inhabited area Use materials storage piles to attenuate noise	Nonsignificant
32.	Construction	Quarries and borrow sites	Community and occupational health and safety	Increase risk of accident from open borrow areas	Low	Permanent	Limited	Medium	Depths and slopes of borrow pits to be comply with LGED guidelines. To the extent borrow areas shall be sited away from habituated areas. Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fishpond in consultation with land owner/community. Rehabilitation of the borrow areas as per Guidelines for re-development of Borrow Areas.	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
33.	Construction	Construction Plant operation	Air Quality and GHG	Air quality deterioration from plant combustion and fugitive emissions	Low	Short-lived	Limited	Minor	Batching, WMM mixing plants and crushers preferably downwind direction from the nearest settlement. Only crushers licensed by the GoB shall be used DG sets with stacks of adequate height and use of low Sulphur diesel as fuel.	Non-significant
34.	Construction	Construction Plant and Camp Site Operation	Surface water quality	Deterioration of receiving water quality from batching and cold mix plants effluents	Low	Short-lived	Limited	Minor	Collection of all surface runoff and facility washing to a sedimentation basin prior to disposal Proper collection, storage, and disposal of waste according to the approved solid waste management plan.	
35.	Construction	Construction Plant and Camp Site Operation	Groundwater quality	Deterioration of ground water quality	Low	Temporary	Limited	Minor	Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil. To avoid soil contamination Oil-Interceptors shall be provided at wash down and Refueling areas. Waste oil and oil soaked cotton/ cloth shall be stored in containers labeled 'Waste Oil' and 'Hazardous' sold off to authorized vendors Collection and treatment of sewage in septic tanks	

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
36.	Construction	Construction Plant and Camp Site Operation	Private lands and buildings	Damage to private lands and properties	Low	Short-lived	Limited	Minor	Locate plants and camp sites away from Community areas. In case of leased properties, ensure the proposed activities are clearly stated in the agreement and nearby properties are consulted and prior consent secured.	Non-significant
37.	Construction	Construction Plant and Camp Site Operation	Sound Environment	Increase in noise level due to batching plant and hot mix plant operations	Low	Short-lived	Limited	Minor	Observe regular and proper maintenance of plant equipment Install silencers on all tail/ emission pipes Establish multi-layer vegetation in-between the plant and nearest sensitive receptor for attenuation To the extent possible, enclose noise generating equipment with noise barriers	Non-significant
38.	Post Construction	Site Restoration	Land and soil Clean-up Operations, Restoration and Rehabilitation		Low	Short-lived	Limited	Minor	Contractor will prepare site restoration plans, which will be approved by the PIU and DES The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. All construction zones including river-beds, culverts, road-side areas, camps, WMM plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									expense, to the satisfaction of the PIU and DES. All the opened borrow areas will be rehabilitated and DES will certify in this regard.	
39.	Operation	Road Repair	Public Infrastructures	Localized flooding and damage to road from clogging of drainage	Low	Short-lived	Limited	Minor	Regular cleaning of drainage before start of monsoon and proper disposal of debris	Non-significant
40.	Operation	Road Repair	Community and occupational health and safety	Risk of injury to pedestrian road users, livestock, and wildlife	Low	Short-lived	Limited	Minor	Training to workers on safety procedures and precautions. Mandatory appointment of safety officer. Provision of a readily available first aid unit including an adequate supply of dressing materials. The contractor will not employ any person below the age of 16 years for any work Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies. Temporary access and diversion, with proper drainage facilities.	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
									Access to the schools, temples and other public places must be maintained when construction takes place near them. Fencing and posting of signage wherever people, livestock and wildlife movement are expected. Restrict access to construction sites to authorized personnel. Physical separation must be provided for movement of vehicular and human traffic. Adequate signage must be provided for safe traffic movement	
41.	Operation	Vegetation Control	Community and occupational health and safety	Risk of injury to pedestrian and road users	Low	Temporary	Limited	Minor	Vegetation clearing to enhance aesthetic and prevent potential safety hazard like reduced visibility, obstruction of signs, and debris in the roadway.	Non-significant
42.	Operation	Road operation	Air Quality and GHG	Air quality deterioration from increased vehicle emissions	Low	Permanent	Limited	Minor	Maintenance of vegetation and trees along roads. Installation and maintenance of awareness sign boards to slowdown driving near community areas. Speed limitation restrictions are enforced near sensitive locations.	Non-significant

S. No.	Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
	Operation	Road operation	Animal crossings	Risks on animals and wildlife due to increased road vehicles	Low	Permanent	Limited	Minor	Installation and maintenance of awareness sign boards to slowdown near animal crossings. Speed limitation restrictions are enforced near sensitive locations.	Non-significant
43.	Operation	Road operation	Sound Environment	Increase noise levels[17]	Low	Permanent	Limited	Minor	Maintenance of vegetation and trees along roads Installation and maintenance of awareness sign boards to slowdown driving near community areas. Speed limitation and honking restrictions are enforced near sensitive locations.	Non-significant
44.	Operation	Road operation	Community and OH Safety	Risk of injury to pedestrian and road users	Low	Permanent	Limited	Minor	Installation and maintenance of awareness sign boards to slowdown driving near community areas. Speed limitation restrictions may be enforced near sensitive locations.	Non-significant

[17] Noise levels of International Finance Corporation's standards would not be exceeded during operations based on the forecast, which the increase in road traffic will not double over the lifetime of the project.

B. Climate Change Impacts and Risks

24. Climate Change Projection

a. Precipitation and Rainfall

119. Historical monthly average temperature and rainfall from 1901-2015 compiled by the Climatic Research Unit (CRU)–University of East Angliais presented in the succeeding Table. Average monthly temperature and rainfall are 22.1^{o}C and 190.50 mm. The maximum average monthly temperature and rainfall are 28.1 ^{o}C and 512.1 mm.

Table 39: Historical Temperature and Rainfall

Month	Historical Average Monthly (1901-2015)		Predicted Rainfall Change (2020-2040) Ensemble			Predicted MaxTemperature Change (2020-2040) Ensemble		
	Temp. (^{o}C)	Rainfall (mm)	Low 10%	Median	High (90%)	Low	Median	High
January	18.3	7.7	-8.2	-3.8	1.8	1.8	2.1	2.1
February	20.6	19.3	-9.1	-3.3	15.4	1.1	2.3	2.3
March	25.0	41.2	-43.0	-2.7	33.5	1.1	2.3	2.3
April	27.6	15.8	-17.2	23.0	67.2	0.3	2.0	2.0
May	28.1	270.3	-93.7	67.8	210.7	-0.8	1.4	1.4
June	28.1	482.8	-104.4	22.6	138.6	0.3	1.5	1.5
July	28.	512.1	-114.4	14.5	110.4	0.8	1.7	1.7
August	28.0	432.6	-30.0	56.3	131.2	0.9	1.7	1.7
September	28.0	300.6	-98.6	-3.4	77.4	0.9	1.7	1.7
October	26.7	165.0	-49.3	8.8	90.8	0.6	1.5	1.5
November	23.1	32.1	-26.2	1.2	40.8	0.7	1.7	1.7
December	19.3	6.8	-8.0	-0.5	22.6	1.0	1.9	1.9
Max	28.1	512.1	-8.0	67.8	210.7	1.2	2.3	2.3
Min	18.1	6.8	-114.4	-3.8	1.8	-0.8	1.4	1.4
Avg.	22.1	190.5	150.2	67.8	78.4	0.68	1.8	1.8

Source: Climate Change Portal, The World Bank Group

120. Between 2020-2040, almost coinciding with the project life, there is a predicted change in temperature anomally (difference between the average baseline and predicted value) in Bangladesh ranging from 0.68-1.8 ^{o}C based on General Circulation Model ensemble average of the low (10%) and high (90%), RCP2.6 scenario. Figure 28 illustrates an increasing maximum temperature trend, departing from the historical average between 1.4^{o}C to 2.3^{o}C with the higher temperature occurring in the northwestern divisions of Rangpur, Rajshahi, and parts of Dhaka. Average monthly rainfall is expected to increase by 67.8mm with the models estimating departure from historical average between 75-225mm per year. Similarly, the predicted future rainfall is expected to maintain an increasing trend. The extreme norther sections of the Rangpur, Dhaka, and southern tip of the Chattogram Divisions are expected to experience the biggest change in rainfall distribution ranging from 350-400mm annually.

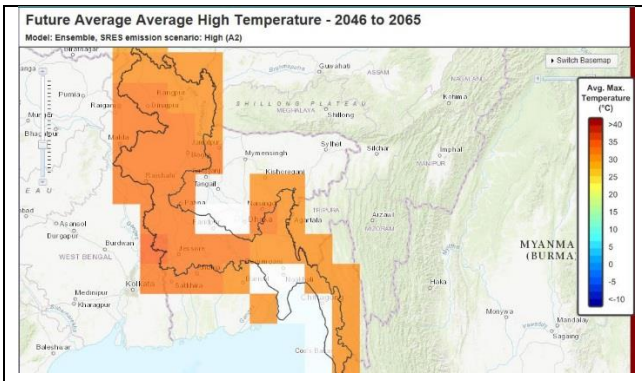


Figure 27:Map of future average of high temperature 2046-2065, Model Ensemble, SRES Emission Scenario: High(A2).

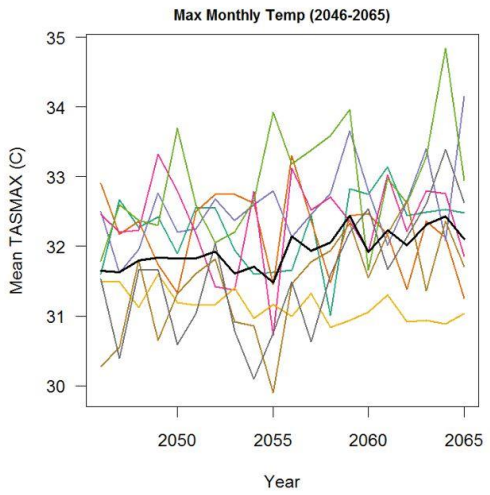


Figure 28: Predicted future average of maximum monthly temperature 2046-2065, Model Ensemble, SRES Emission Scenario: High(A2).

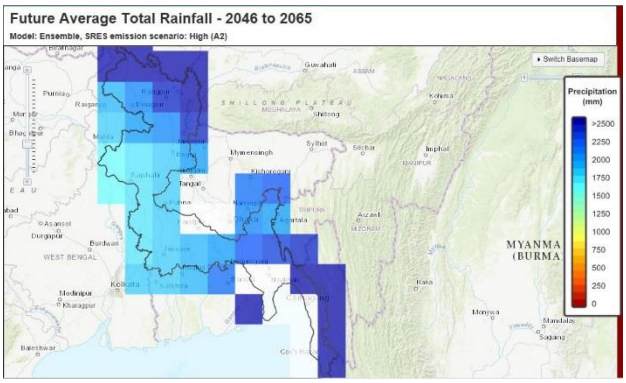


Figure 29: Map of future average in total rainfall 2046-2065, Model Ensemble, SRES Emission Scenario: A2

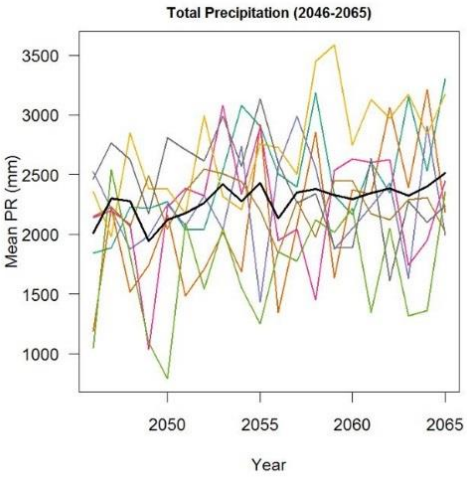


Figure 30: Future average total rainfall 2046-2065, Model Ensemble, SRES Emission Scenario: A2

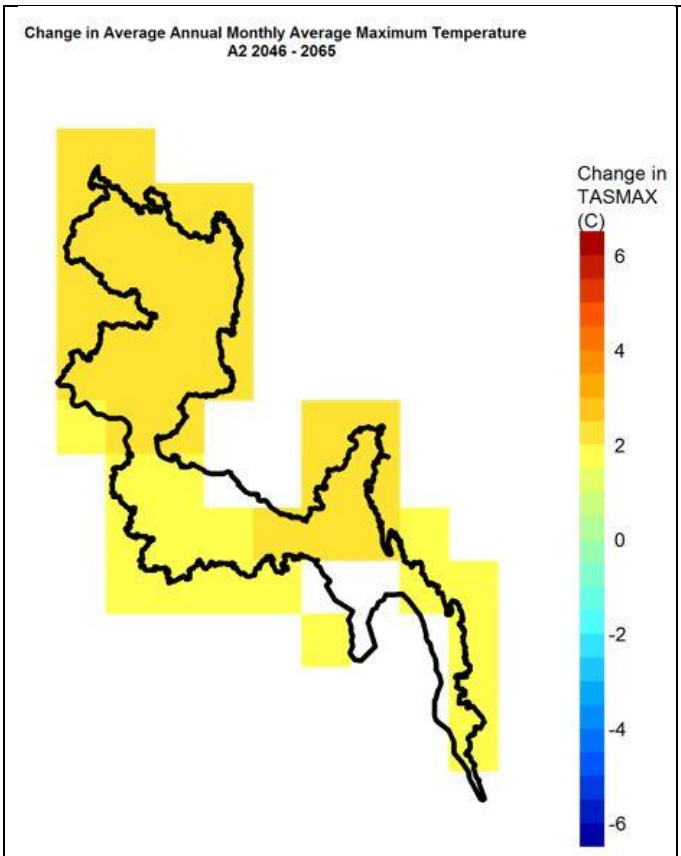


Figure 31: Map of change in average maximum temperature 2046-2065, Model Ensemble, SRES Emission Scenario: A2

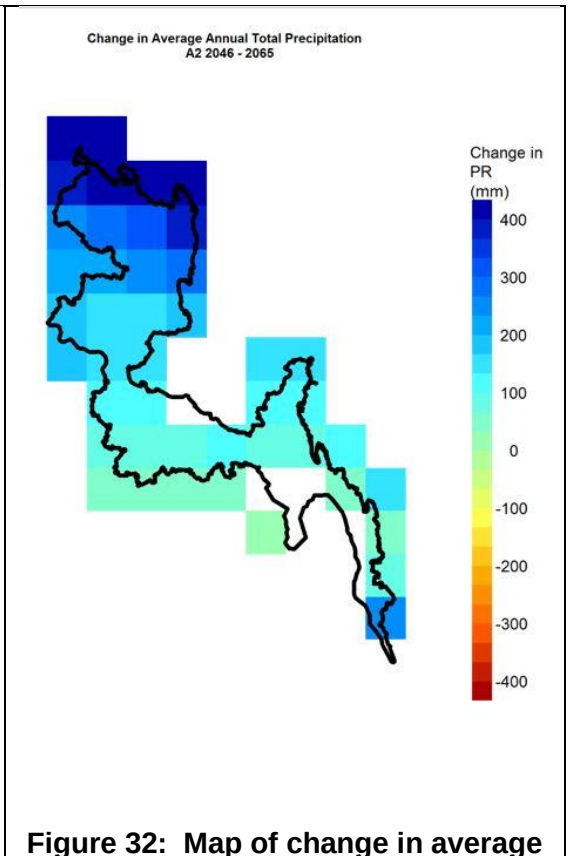


Figure 32: Map of change in average annual total precipitation 2046-2065, Model Ensemble, SRES Emission Scenario: A2

25. Effect of prolonged submergence on rural roads

121. MJM Alam and M. Zakaria (undated)[18] studied the extent of damage to road pavement structure due prolonged flood submergence in Bangladesh due to flooding. The assessment focused on flexible pavement, the main pavement used in Bangladesh, and tested for California Bearing Ratio (CBR) for sub-grade and Marshall Stability and Flow for surface layer under 4, 7, 30 and 45 days. The key observations and results area as follows:

- inundation for 45-days, the unit weight reduces by 4.6, 5.8 and 10.6 percent for compaction efforts of 56, 35 and 10 blows, respectively and CBR reductions of 16.7, 29.6 and 37.5 percent, respectively. This implies that the more compact the material, the lower will be the loss of unit weight and strength caused by inundation.

- For the surface layer, stability and flow of flexible pavement are affected by the duration of inundation by water. The inundation for 30days causes the flow value to increase by about 93 percent and stability reduces by 26 percent. The figures also imply that the longer the period

[18] MJM Alam and M Zakaria"Design and Construction of Roads in Flood Affected Areas." Department of Engineering, BUET.

of inundation, the more severe will be the deterioration although the rate of destruction may decrease.

122. The following figures presents the findings.

Figure 33: Effect of Flood Inundation on Sub-base

Compaction (No of Blows)	Average California Bearing Ratio (CBR) Value			
	4-day Soaking	7-day Soaking	30-day Soaking	45-day Soaking
56	3.5	3.4	3.1	3.0
35	2.7	2.5	2.2	1.9
10	1.6	1.2	1.1	1.0

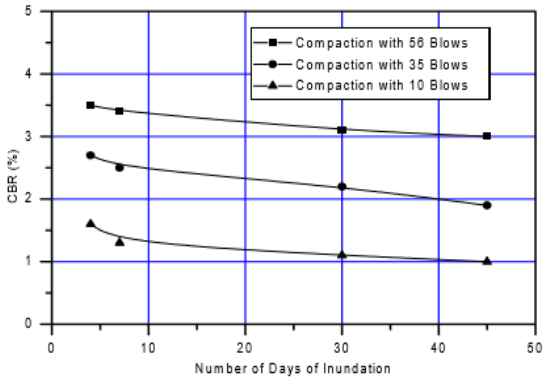
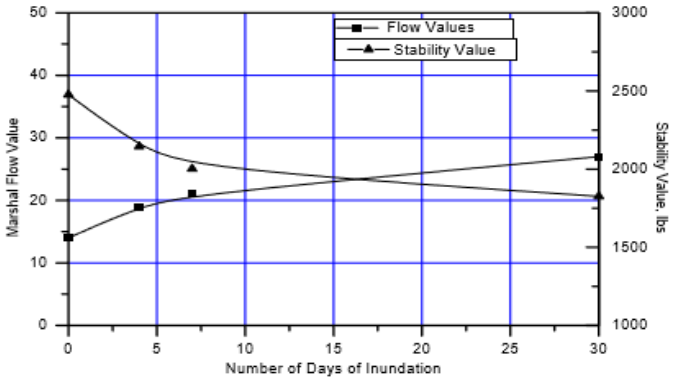


Figure 34: Effect on Inundation on Flow and Stability of Bituminous Surface



26. Natural Hazards and Climate Risks

123. The implications of the projected increases in temperature and rainfall coupled with the existing natural hazards in the divisions increase the vulnerability of the project roads to climate change variability and extremes. The most dominant natural hazards to the project's roads that can be exacerbated by climate change are flooding and storm surge. Of the 34 project districts, 20 districts are prone to flood with 25 -year return period with a depth of at least 1.8 meters. Only a portion of the Pekua Road in Coxsbazar District is prone to storm surge. The succeeding Figures present the flood inundation and storm surge maps of Bangladesh.

Figure 35: Flood Inundation Map 25 Year Return Period

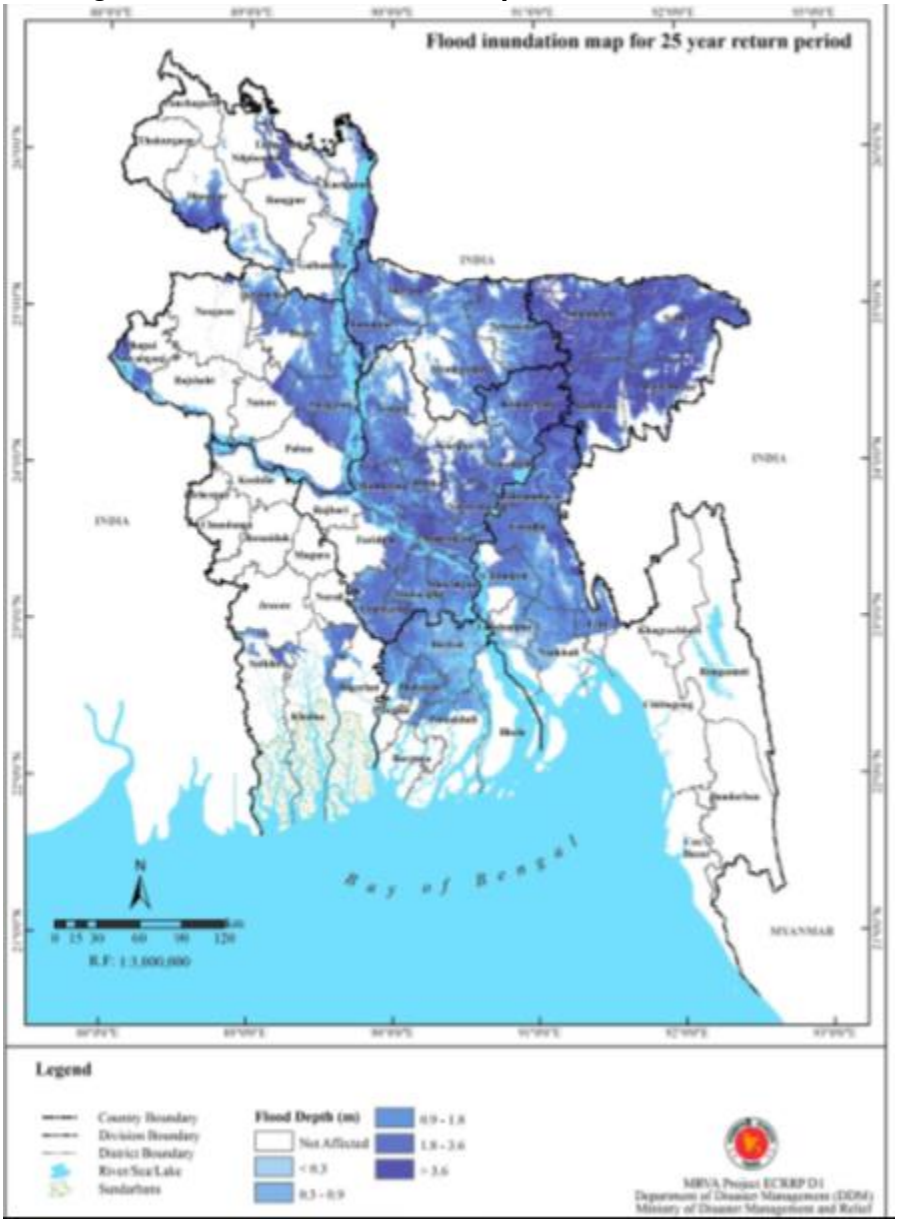
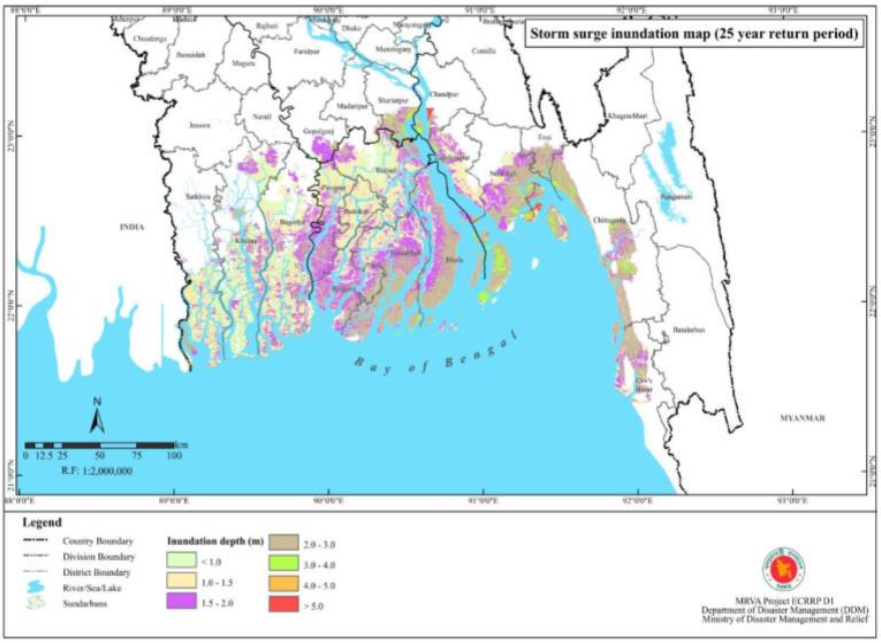


Figure 36: Storm Surge Inundation Map



27. Climate Change Adaptation Cost

124. As presented in Chapter 2, RCIP has adopted climate resilience road designs. The following table provides climate change adaptation costs derived based on discussions with the design engineers on the attribution of the itemized civil works cost with the identified climate change risks. To address the flood risks, it was estimated that 10% of the drainage, 5% of bioengineering, and 15% of the embankment costs were attributed; to address the risk of erosion and landslides, 5% of the drainage and 10% of the bioengineering costs were attributed. The total adaptation cost is presented in the following table.

Table 40: Estimated Climate Change Adaptation Cost

Estimated Climate Change Adaption Cost ($)					
District	Protection Work Cost	Structure Cost	EMP Cost	Bio Engineering	Total
Gopalganj	103,676.21	16,752.32	15,976.82	18,335.03	154,740.38
Madaripur	403,890.91	361,747.51	56,686.97	135,206.69	957,532.07
Rajbari	151,014.42	183,018.12	35,768.67	52,777.39	422,578.60
Cumilla	857,879.73	498,909.03	25,337.28	50,936.99	1,433,063.04
Chattagram	353,571.22	755,675.01	20,576.68	42,091.78	1,171,914.69
Jashore	404067.65	430954.19	49333.00	5728.90	890,083.74
Chuadanga	398511.30	185485.47	28933.31	65006.12	677,936.20

Estimated Climate Change Adaption Cost ($)					
District	Protection Work Cost	Structure Cost	EMP Cost	Bio Engineering	Total
Rajshahi	427092.20	425363.45	81229.43	66233.29	999,918.36
Naogaon	301323.19	84911.02	29066.93	27066.57	442,367.71
Natore	201354.86	83494.80	31103.42	66795.18	382,748.26
Bogura	355984.87	736649.94	40955.26	61881.77	1,195,471.84
Gaibandha	167313.54	163889.19	27075.93	31922.28	390,200.93
Dinajpur	401490.01	597266.36	56900.18	78423.83	1,134,080.38
Thakurgaon	192526.07	386537.84	56900.18	60561.72	696,525.82
Panchagarh	280325.15	487412.80	28170.30	33970.12	829,878.38
Nilphamari	42757.99	115857.28	5804.57	6913.74	171,333.57
Total	**5,042,779.32**	**5,513,924.32**	**589,818.95**	**803,851.41**	**11,950,374.00**

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Consultation Method and Information Disclosure

125. The ADB SPS requires consultation with affected communities and stakeholders and their participation in the project design and implementation. These consultations benefit LGED and ADB to better design the project based on the community's experience, knowledge, and expectations. Some of the key characteristics of meaningful consultations pertain to timing, conduct, gender-inclusive, and responsiveness. Consultations are conducted early and sustained throughout the project life and information disclosed in timely manner allows the communities to make informed decisions. Its conduct by the project sponsor is free form coercion ensuring participation is voluntary. The consultations ensure inclusive and responsive to the disadvantaged and vulnerable members of the community to ensure their concerns are considered in the project design and implementation. Finally, consultations should show proof that relevant views generated during the consultation process are considered in the design.

126. The principal consultation method used was through the transect walk. A transect walk requires both LGED District Engineers and stakeholders to "walk" or survey the entire stretch and identify issues pertaining to availability of land to accommodate needed engineering, road safety, and climate resilience measures; key sensitive resources like trees, utilities, physical cultural resources; road hazards; and other community requirements that should be considered by the project. It facilitates timely consultation that is early enough to influence the design, provides a venue to have a common understanding of the project, voluntary participation is promoted, and inclusive in terms of gender and vulnerable members of the community.

127. Consultations meetings were also organized by LGED District Engineers at all community areas to disseminate project information (carried out in local Bengali language). LGED upazila officers, community organizers, local community members took part in the community consultations and the transect walks. An information booklet was distributed prior to the transect walk providing information on the following; identification the project, project proponent, and development partners; description of how the community will participate at various stages of the project cycle; redress grievances mechanism; voluntary land donation procedure; definition of vulnerable affected persons (VAP); support and assistance to VAP; and contact details.

128. The public consultations were carried out between November 2017 to February 2018 as part of the field works and detailed project report (DPR) preparation. DPR mandated that public consultation must be done in every union and the market on which the road sections cross. Based on the public consultation a Community Participation Plan (CPP) is prepared for each subproject. In addition, an Environmental Specialist (ADB staff consultant) conducted field visits to two districts in February 2020, during which discussions were also held with district officials and contractors.

B. Institutional Level / Stakeholders Consultative Workshop

129. The institutional level consultations were held with representatives of institutions having stakes in implementation of the project. The institutions contacted included fisheries, forest department, and local DOE as part of securing the environmental clearance certificate from the DoE. In addition to these officials, other departments were also contacted on several occasions to include Tehsildars, nongovernment organizations (NGOs), industry department and respective – district and Upazila Offices.

130. The consultation with institutional officials focused on the following issues.

(i) Project description: Need for the construction of rural roads and benefits of the project.

(ii) Social and environmental assessment processes for the government and the multilateral funding agency requirements.

(iii) The extent/nature of negative social and environmental impact and the need for rehabilitation and resettlement in the project. Avoidance & mitigation aspects of the project.

(iv) People's participation in planning, implementation, and Monitoring & Evaluation Stage.

(v) The consultation process supplemented by the distribution of information booklets in Bengali (local language) has made the local community aware of the project and mitigation measures entitlement in view of their vulnerability.

C. Participants to the Transect Walk

131. Appendix D provides the number of participants to the transect walk from each benefited upazillas and unions. There were 3,015 stakeholders that participated in the transect walks organized mainly by the District engineers through the Union Parishad representatives, community officers and the technical advisory group consultants during project preparation. Of the total number of participants, 924 were female.

D. Results of Public Consultation

132. As already mentioned, inside habitation areas and in village sections where the road is narrow, the road width has been constricted to avoid damage to structures. The following impacts could also occur during civil works period which will cause public nuisance and was all addressed on the detailed project reports. The succeeding table presents the principal common concerns raised and how thee were addressed in the general EMP.

Table 41: Comments raised and how it was addressed in the EMP

Comments and Concerns Raised	EMP Provisions
Temporary loss of access/disruption of traffic	Frame appropriate traffic diversion schemes (in specific stretches as per progress of construction work) and implemented to avoid inconvenience due to construction works to present road users. The traffic diversion signs should be bold and clearly visible particularly at night. Diversion schemes are required to ensure smooth traffic flow, minimize accidents to road users during construction works. Precaution shall be taken to avoid inconvenience to the local community due to movement of materials.
Shifting of utility supply lines causing disruption to the supply.	All public utilities like power transmission cables, telephone cables, water/sewerage lines, drains, tube wells etc falling within road land width shall be inventoried, and arrange for relocation /shifting to adjacent areas in consultation with the respective agencies/authorities.
Damage to irrigation channels that have been placed across some of the selected roads	The road construction works will raise, extend and enlarge existing roadway/tracks all along the alignment. Therefore, mitigation measures to contain erosion and drainage problems are essential. The engineering measures for countering soil erosion, slope protection, drainage wherever required shall be considered and im

	plemented as per relevant Road Design Standard 2005 (Rural Road) and Environmental Assessment Guidelines for LGED Projects-2008. Measures like selection of less erodable material for embankment construction, compaction, adequate embankment slopes and turfing shall be considered as per provisions and Technical Specifications for construction of Rural Roads, LGED. Refer to hydrological studies to ensure that construction of drainage structures is not likely to alter drainage pattern, and discharge capacities of drainage structures are designed to facilitate smooth passage of water and heading up or flooding is avoided even in flood season. Schedule the construction works to dry season so that impacts on water quality of stream/river is minimize or avoided. Precaution shall be exercised to prevent oil/lubricant/hydrocarbon contamination of channel bed during construction works. Spillage, if any, shall be immediately cleared with utmost caution to leave no traces. Ensure all construction wastes are removed from work site and stream /riverbeds are to be cleaned up (at least 50 m on both upstream and downstream sides of water courses) after completion of construction but prior to onset of monsoon.
Dust, noise and vibration impacts will be felt by the people living near road sections during construction works. High vibration levels may damage structures close to the road edge. The civil contracts should include appropriate measures to avoid/ manage the issues of dust, noise.	Ensure stone quarries and crushing units have pollution control system; occupational safety procedures/practices in place and regular inspection shall be carried to ensure compliance. This shall be a pre-condition for sourcing of materials from quarries/crushing plants. Dust suppression along transportation links is to be ensured by deploying water tankers with sprinkling system are to be deployed along haul roads. The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. Transportation links are to be inspected daily to clear accidental spillage, if any.
Care should be taken to avoid any accidental damages to common properties such as Shrines, wells, water pipes, stand posts located close to the roads.	During clearing operations, any treasure trove, slabs with epigraphically evidence or edicts, sculptural or any material found and appear to have historical importance, it should be brought to the notice of Department of Archaeology (DOA), Bangladesh, and instructions of this Department, if any, must be followed. Small temples, shrines if any is within the road land width, the same may be shifted to adjacent areas in consultation with local community leaders. Establish and maintain interaction with local community to ensure that no social resentment sets in due to operations. Contractors shall comply with the National Cultural Policy 2006 and Laws of Archeology -2015 (draft) and also Guidelines for Protecting Physical Cultural Properties

133. The consultation meetings held in February 2020 together with LGED district officials and contractors in two districts, namely Rajbari and Gopalganj, were along the similar line of the public

consultations conducted between November 2017 to February 2018. The discussions emphasized the following needs:

- Traffic-flow needs to be managed properly during the construction phase in order to minimize environmental impacts such as an elevated level of noise and air pollution.
- Care should be taken not to disrupt utility supply lines by strictly adhering to protocols before undertaking any construction activities.
- Dust suppression measures should be applied sufficiently to avoid ambient air pollution.
- Occupation health and safety procedures should be adhered to strictly.
- Extra care should be given to avoid any cultural heritage assets located close to the roads.
- Regular public consultations should be held to address any issues of public concerns.

E. Information Disclosure

134. Information was disclosed through public consultations and more formally by making documents and other materials available in a form and at a location in which they can be easily accessed by stakeholders. This involved making a summary of draft reports available (in the local language) at public locations/upazillas/unions and providing a mechanism for the receipt of comments and making documents available more widely. In this regard, ADB encourages LGED all documents onto their own website. The full IEE report will be disclosed on the ADB and LGED websites and made available to the interested parties upon request. Any future update in the IEE will be reviewed by the ADB prior to disclosure on the ADB website.

135. Monitoring is one of the components of EMP. Monitoring of physical, biological and socio-economic parameters of the environment of this project will be carried out. The outcomes of the monitoring activities will be maintained in a database. The results of monitoring will also be disclosed to the local people, school students, and other interested stakeholders. In the process of compliance monitoring of the project construction, local people and construction workers will be consulted. The annual monitoring reports will also be disclosed on the ADB website from the start of construction until the Project Completion Report is finalized.

136. The LGED will extend and expand the consultation and disclosure process during the implementation (construction) of the project. The feedback of the affected people, stakeholders and the public have been incorporated in the detailed project design for implementation during construction.

F. Public Consultation and Communication Plan for future

137. This IEE report, awareness and access of grievance redress mechanism, and other relevant project documents will be made available at public locations in the project affected upazillas and posted on the websites of LGED and ADB. The consultation process will be continued and expanded during the project implementation to ensure stakeholders participate fully in project execution, as well as to implement comprehensive information, education, and communication plan.

138. The public consultation and disclosure program with all interested and affected parties will remain a continuous process throughout the project implementation, and shall include the following:

(i) Consultations during the construction phase
  (a) Public meetings with affected communities to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and
  (b) Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and to provide a mechanism through which stakeholders can participate in project monitoring and evaluation.

(ii) Project disclosure
  (a) Public information campaigns (via newspaper, flyers, and media) to explain the project to the wider population of the project area and prepare them for disruptions they may experience once construction is underway;
  (b) Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in local language;
  (c) Formal disclosure of completed project reports by making copies available at convenient locations in the project area, and informing the public of their availability; and
  (d) Providing a mechanism through which comments can be made.

139. For the benefit of the community, the executive summary of this IEE may be translated in the local language and made available at (i) District Engineer's Offices, (ii) Division offices, (iii) LGED-PMU; and (iv) contractor's campsites. LGED will be ensured that the hard copies of IEE are kept at places that are conveniently accessible to people, to disclose the document and at the same time creating wider public awareness. An electronic version of the IEE Report will be placed in the official website of executing and implementing agencies and the ADB website after approval of the IEE by ADB.

VII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environment Management Plan

140. The EMP contains the agreement between LGED and ADB detailing the implementation of mitigation measures, monitoring program, cost estimates, and institutional arrangement to ensure that no significant adverse impacts resulting from the project intervention.

141. The basic objectives of the EMP are to:

(i) establish the roles and responsibilities of all parties involved in the project's environmental management;

(ii) ensure implementation of recommended actions aimed at environmental management and its enhancement; and ensure that the environment and its surrounding areas are protected and developed to meet the needs of the local communities including other stakeholders and safeguard and the interests of the common people.

142. An EMP is prepared and presented in **Appendix C** and will form part of the bidding documents. The costs for the mitigation measures other than the compensatory plantation are dealt under the engineering (civil works) and resettlement (compensation) estimate.

143. To be more effective during implementation the EMP will be attached to the tender documents. As part of the environmental management, the procedures for workers' health and safety; public safety and reducing inconvenience and disposal of construction wastes, etc., are also included.

144. A road-specific EMP (SEMP) is to be prepared by the contractor based on the general EMP provided in the IEE. The SEMP will perform a risk assessment of all mitigation options and will propose site-specific mitigation options that would be appropriate and commensurate with the actual impact. The contractor shall submit SEMP for Engineer's endorsement. The Contractor will not be able to start the construction works before the approval of SEMP from the Engineer.

B. Environmental Management, Monitoring, and Climate Change Adaptation Costs

145. The total environmental management plan implementation is estimated at $2.2 million or 0.6% of the total civil works cost. The EMP costs, which includes environmental monitoring, is comprised of the following bill of quantities items: i) Providing and maintaining adequate potable water supply (Water Supply Tube well 01 No. each sub-project) at locality to the entire satisfaction of the E-I-C; ii) Sanitation Toilet 02 Nos.(01 for man & 01 for Woman) each sub-project; iii) Dust Suppression measures (excluding watering for compaction) to the entire satisfaction of the E-I-C; iv) Environmental Monitoring a) Air quality b) Noise level c) Water quality d) Sediment at work site to the entire satisfaction of the E-I-C; v) Prevention of spillage, Leakage of polluting materials to the entire satisfaction of the E-I-C; and Maintain First aid box at site to the entire satisfaction of the E-I-C.

146. Since the rural roads to be upgraded are short, with an average length of 7.88 kilometers, the construction period may be less than 1 year which is shorter than the typical ADB monitoring and reporting frequency requirement of annually for Category B projects like the RCIP Bangladesh. Similar to rural road connectivity and upgrading projects in India, Sri Lanka, and Nepal, monitoring and reporting are conducted at least five times based on the physical accomplishment and maintenance of the road project as follow: i) once prior to start of construction; ii) second after the third month of start of construction or 25% construction,

whichever comes first; iii) third report after ninth month of construction or 75% construction, whichever comes first; and iii) fourth and fifth on completion of construction or after one month of first and second year of maintenance period. Annual summaries of the monitoring reports are compiled, project-level environmental performance status assessed, and overall compliance performance is stated to form the annual monitoring reports for review by ADB and public disclosure. Annual monitoring reports are prepared starting from the start of construction until the project completion report is issued.

147. Environmental monitoring is an essential component of the implementation of IEE recommendation. The EMoP is prepared to monitor the implementation performance of the EMP.

148. An environmental monitoring plan is prepared focusing on the following objectives:

(i) To ensure that impacts do not exceed the established legal standards
(ii) To check the implementation of mitigation measures in the manner described in the IEE report
(iii) To monitor the implementation of the EMP.
(iv) To provide an early warning of potential environmental damage
(v) To check whether the proposed mitigation measures have achieved the intended results, and or/ other environmental impacts occurred

149. The monitoring plan will be used for the performance monitoring of the project. A monitoring plan defining all parameters to be monitored, with tentative location, project stages for measurements, implementation and institutional responsibility for different environmental components is prepared for all stages of project.

C. Institutional Setting to Implement the Environmental Safeguards

150. LGED is responsible for the overall compliance to the ADB SPS 2009 environmental requirements; Government of Bangladesh environmental laws, regulations, and standards; and this EMP.

151. More specifically, the PMU will be the key institution for the successful implementation of the project and ensure compliance to ADB safeguards as contemplated in the environmental management and monitoring plans. The responsibilities of various agencies and parties for implementing environment safeguards are provided below.

152. The **PMU** is the LGED Project Management Unit and responsible for the overall compliance to the ADB SPS and the all applicable laws and rules under the Ministry of Environment and Forest (MoEF). The PMU will be supported by a Senior Safeguard Specialist (SSS) consultant responsible for ensuring the project complies with the social and environmental safeguard requirements of the ADB. The SSS will coordinate with 5 DES, 34 District Engineer to ensure project implementation complies with the project administration manual and EMP. The PMU-ES is responsible for:

(i) Ensure compliance to all environment-related statutory requirements by the LGED and contractor
(ii) Review and finalize road-specific EMPs prepared by the Division Environment Specialist (DES) and district engineers
(iii) Overall responsible for the timely endorsement and signing of key documents and forwarding to the respective agency required for processing of clearances and permits to include but not limited to: forestry clearance; tree cutting permit; permission for construction material quarrying; consent to operate WMM mix

plants, crushers, and batching plants; consent for disposal of sewage from labor camp; and pollution under control for motor vehicles, etc.

(iv) Ensure preparation, submissions, and disclosure of annual environmental monitoring reports for disclosure on ADB and LGED websites.

(v) Ensure all contractors obtain permits, licenses, etc. for activities such as operation of asphalt plants, quarries, borrow areas etc. before the implementation of the respective construction activity.

(vi) Conduct training and workshops on environmental management to include site induction of all staff and workers involved in the construction. These include all district engineers and staff and laborers of all contractors.

(vii) Guided by the initial environmental examination approved by the ADB and LGED, design and implement an effective environmental monitoring program. This includes but not limited to inspections by the PMU and LGED, self-monitoring by the contractors, inspection protocols for the DES, and Grievance and Redressal Mechanism including intake form and documentation

(viii) Taking proactive and timely measures to address any environmental safeguards related challenges at the national or province/district levels such as delays in processing of clearances during pre-construction stage and significant grievances (during construction stage)

(ix) Carry out periodic field verification and review environmental compliances by the contractor during project implementation in coordination with the DES and the Contractor's Environment Focal Person (EFC)

(x) Review and approve for submission to the LGED and ADB annual environmental monitoring reports submitted by D-ES. Lead in complying with disclosure of periodic environmental monitoring reports

(xi) Ensure grievance redress mechanism as envisaged in the EMP is in place and finalize preparation disclosure of monitoring reports

153. **Division Environmental Specialists.** Each of the LGED Division will have a consultant Environmental Specialist to support the Additional Chief Engineer and District Engineers in supervising the implementation of the EMP and EMoP by the contractor through the following:

(i) In coordination with the contractor's EFC and with guidance from the SSS, prepare road-specific EMPs and EMoPs, guided by the general EMP sand based on the more detailed survey

(ii) Guide and review all sub-plans identified in the IEE and EMP to be prepared by the Contractor to include camp layout, waste/debris management plan, borrow area management plan, traffic management plan.

(iii) Conduct environmental site induction training[19] to all contractors and PIUs to ensure understanding of the EMP, domestic environmental laws and regulations requirements particularly on the required clearances and permits, training on occupational and community health and safety, timely mobilization of the Contractor's EFC, and review of sub-plans required in the EMP and advice the District Engineer on their adequacy who in turn will instruct the contractor to make necessary revisions

(iv) Ensure contractors secure necessary permits and clearances

[19]Site induction training includes but not limited to: i)discussion and review of EMP and EMoP detailing how specific environmental risks associated with their Scope of Work will be managed legal compliance, inspection and audits, and progress tracking and reporting;ii) environmental training and awareness needs shall be determined and documented via a training needs analysis prior to commencement; iii) Health and Safety Awareness Course, which details general environmental awareness and specific performance requirements expected on site; and iv) GRM.

(v) Ensure the environmental monitoring report template are adapted by the contractor's in the preparation of the submission of self-monitoring reports
(vi) Review monthly environmental monitoring reports prepared by the Contractor-EFC
(vii) Conduct at least 3 environmental inspections during the construction phase: i) First report at pre-construction stage, ii) Second report after three months of start of construction or on completion of 25% construction, and iii) Third report after seven months of start of construction or on completion of 75% of construction,
(viii) the monthly site and follow-up inspection to ensure the veracity of the submitted monitoring reports and enforce the EMP and EMoP
(ix) Preparing summary monthly, quarterly, and periodic monitoring reports from the periodic compliance inspection monitoring and review of the environmental self-monitoring reports prepared by the Contractor's EFC for the review and guidance of the PCU and PIUs
(x) Conduct a compliance conference with the Contractor to discuss non-compliance and agree on corrective measures with guidance from the CSC-ES
(xi) Advice the Contractor through the District Engineer and SSS on how to comply with requirements to address non-compliances
(xii) Report apparent unanticipated impacts, recommend mitigation measures to be implemented by the PCU and update the IEE report
(xiii) Recommend sanctions to the SSS in case of recalcitrant contractors

154. **Contractor.** The Contractor is the principal-agent to implement the EMP and EMoP during the pre- and during construction stage. Specifically, the contractor will:

(i) Appoint the Contractor's EFP and attend the site induction workshop to be organized by the DES and SSS
(ii) Obtain necessary environmental license(s), permits, etc. from relevant agencies as specified in the IEE and this project administration manual for associated facilities for project road works, quarries, wet mix plant etc. prior to commencement of civil works contracts
(iii) As part of a detailed survey, collect the baseline data on environmental quality before the start of physical works[20] and continue collection of environmental quality data as given in the Environmental Monitoring Plan during construction and operation
(iv) Revised the EMP and EMoP, as advised by the DES based on detailed road survey
(v) Implement all mitigation measures in the EMP and activities in the EMoP
(vi) Ensure that all workers, site agents, including site supervisors and management participate in training sessions delivered by DES and SSS
(vii) During the 2-year construction period, submit monthly environmental self-monitoring reports to the District Engineer and DES with guidance from the DES
(viii) During the 5-year maintenance period, submit quarterly environmental monitoring reports to the PMU
(ix) Ensure compliance with environmental statutory requirements and contractual obligations
(x) Participate in resolving issues as a member of the GRC
(xi) Respond promptly to grievances raised by the local community or any stakeholder and implement environmental corrective actions or additional environmental mitigation measures as necessary.

[20]Pre-construction monitoring report

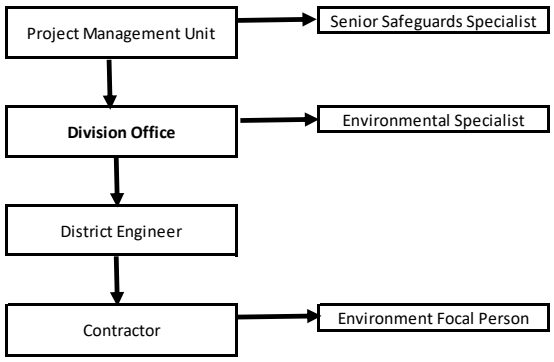
(xii) Based on the results of EMP monitoring, cooperate with the DES to implement environmental corrective actions and corrective action plans, as necessary.

155. In case unanticipated environmental impacts become apparent during project implementation, the LGED immediately informs the ADB to seek guidance on the immediate corrective and reporting actions needed. The ADB will advise the LGED on the scope of IEE update including the EMP or the need to prepare a new environmental assessment. As previously mentioned in public disclosure section, all updates in the IEE is subject to public disclosure.

156. **ADB.** ADB is responsible for the following:

(i) Review REA checklist and endorse or modify classification proposed by the executing agency
(ii) Review IEE report and disclose the final reports on the ADB website as required;
(iii) Issue subproject's approval based IEE report;
(iv) Monitor implementation of the EMP through due diligence missions;
(v) Provide assistance to the LGED, if required, in carrying out its responsibilities and for building capacity for safeguard compliance;
(vi) Monitor overall compliance of the subprojects to this PAM; and
(vii) If necessary provide further guidance to the LGED on the format, content, and scope of the IEE report and annual monitoring reports for submission to ADB.

Figure 37: Project Organisation Structure for EMP Implementation



VIII. GRIEVANCE REDRESS MECHANISM

157. The concern/grievances from local/affected people may come up related to the inappropriate implementation of various components of EMP or the overall road upgrading itself. These issues will be addressed through acknowledgment, evaluation and corrective action and response approach. A GRM will be established to receive, evaluate, and facilitate the resolution of affected people's concerns, complaints, and grievances about the social and environmental performance of the project. The GRM is designed to strengthen existing local grievance and redress system and aggrieved parties may resort to legal redress at any stage. Resorting to legal redress can run parallel to accessing the GRM and it is not dependent on the negative outcome of the GRM. The GRM aims to provide a trusted way to voice and resolve concerns linked to the project, and to be an effective way to address affected people's concerns. The GRM for the project is outlined below and consists of three levels with time-bound schedules and specific persons to address grievances. All administrative expenses to ensure the GRM's effective operation will be borne by the LGED.

A. First Level GRM

158. The first level and most accessible and immediate contact for the fastest resolve of grievances are the contractors, and design and supervision consultants on site. Prior to construction of any works, the DES, District Engineers, and Contractor- EFP will ensure local community meetings are held to notify local residents and businesses of any temporary disturbances and to inform them of the project including all Union Parishads.

159. If any complaints arise, the EFP and District Engineer can immediately resolve the complaint on-site. The DES can also be involved in grievance redress at this stage. The DES and District Engineer office phone number will be posted in public areas within the project area and construction sites. Any person with a grievance related to the project works can contact the project to file a complaint. The District Engineer may appoint staff to field and resolve complaints. The District Engineer will document the complaint, and immediately address and resolve the issue with the contractor within 1-2 days, if the complaint remains unresolved at the field level. The District Engineer may seek the assistance of the DES to resolve the issue. The District Engineer will notify the DES that a complaint was received and whether it was resolved. The District Engineer will fully document the following information: (i) name of the person; (ii) date complaint was received; (iii) nature of complaint; (iv) location, and (v) how the complaint was resolved.

B. Second Level GRM

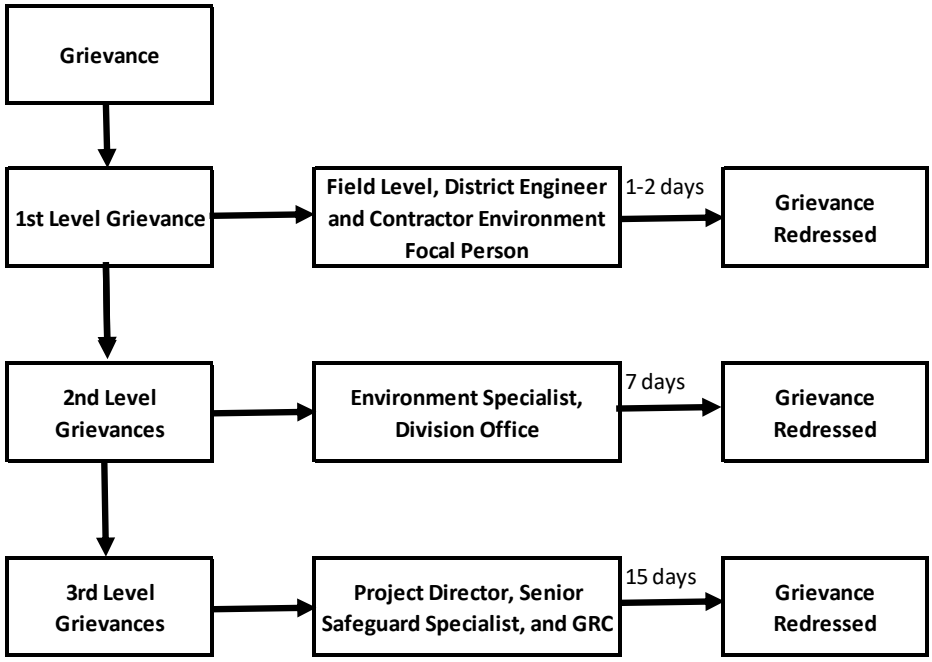
160. Should the grievance remain unresolved; the District Engineer will forward the complaint to the DES. The person filing the grievance will be notified by the DES that the grievance was forwarded by the District Engineer to the DES. The DES will address the grievance. Grievances will be resolved through continuous interactions with affected persons, and the DES will answer queries and resolve grievances regarding various issues including environmental or social impacts. Corrective measures will be undertaken at the field level by the District Engineer and the Contractors EFP within 7 days. The DES will fully document the following information: (i) name of the person; (ii) date complaint was received; (iii) nature of complaint; (iv) location and (v) how the complaint was resolved.

C. Third Level GRM

161. Should the grievance remain unresolved, the DES will request through writing the activation of the to a Grievance Redress Committee (GRC) constituted by the Project Director-PMU, which will based on the review of the grievances, address them in consultation with the DES, District Engineer and Contractor's EFP. The GRC will consist of PMU leadership, affected persons, and local area committee, among others—determined to provide impartial, balanced views on any issues. The GRC should consist of at least five persons. A hearing will be called with the GRC, if necessary, where the affected person can present his/her concern and issues. The process will promote conflict resolution through mediation. The GRC will meet as necessary when there are grievances to be addressed. The GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within 15 days. The functions of the GRC are as follows: (i) to provide support to affected persons on problems arising from environmental or social disruption, asset acquisition (where required), and eligibility for entitlements, compensation, and assistance; (ii) to record grievances of affected persons, categorize and prioritize them, and provide solutions within 15 days; and (iii) to report to the aggrieved parties developments regarding their grievances and decisions of the GRC. The DES will be responsible for processing and placing all papers before the GRC, recording decisions, issuing minutes of the meetings, and taking follow-up action to see that formal orders are issued and the decisions carried out.

162. **ADB's Accountability Mechanism**. The objectives of the Accountability Mechanism will be to provide an independent and effective forum for people adversely affected by ADB-assisted projects to voice their concerns and seek solutions to their problems, and to request compliance review of the alleged noncompliance by ADB with its operational policies and procedures that may have caused, or is likely to cause, them direct and material harm.

Figure 38: Grievances Resolution Steps and Processes



Note: PMU-Project Management Unit, SSS- Senior Safeguard Specialist, DES- District Environment Specialist, EFP-Contractor's Environment Focal Person

VIII. CONCLUSION AND RECOMMENDATION

A. Conclusion

163. The findings of initial environmental examination of the rural roads indicate that impacts are mostly similar and subprojects are unlikely to cause any significant environmental impacts. While some of the impacts are negative there are likely to occur during the construction stage, are temporary in nature, and can be mitigated with minor to negligible residual impacts.

164. The project received immense support from local people, as they perceive that this project will improve the overall connectivity and bring various economic opportunities to the people of the project area.

165. All 96 rural roads included under additional financing were selected based, among others ecological and vulnerability to climate change more particularly to floods and storm surge. Several rural roads under the LGED's authority were damaged by the 2017 floods and needs immediate attention beyond the regular road maintenance but to incorporate climate resilience design and practices. Accordingly, none of the roads passes through protected areas or encroaches precious ecology (sensitive or protected areas) or any historical or archeologically protected areas. As per selection guidelines, none of the selected roads passes through reserved forests either. Few trees cutting though may be involved.

166. Of the total 96 roads, 72 sustained serious flood damage and 1 road is subject to cyclone-induced surge. Adequate engineering measures like cross drainage structures, slope stabilization, embankment toe protection, improved pavement, are proposed to make the roads more climate-resilient and enable to retain function during and after flood events. Three roads received further strengthening through pavement upgrade since these connect to cyclone-centers which are considered critical facilities in the event of natural calamities,

167. All the 96 roads are aligned with existing rural roads. As such, land acquisition is nil or very minimal which is also acquired through donations from villagers.

168. Considering insignificant environmental sensitivity, the project is categorized as category B as per ADB Safeguard Policy Statement 2009.

169. Categorization is also made under environmental legislation of Bangladesh since these rural roads also require environmental clearance in accordance with Bangladesh Environmental Protection Acts and Rules.

170. The impacts identified are mostly related to alignment selection, land clearing, borrowing earth, and cutting of avenue trees, shifting of utilities and community structures, the establishment of construction camp or material storage areas, transportation of material and operation of WMM plant. All identified impacts are either eliminated or minimized through design consideration and suitable mitigative measures.

171. Environmental Management plan covering all stages of road construction (design, construction and operation) is prepared with defined responsibility for its implementation. The Environmental Monitoring plan is also prepared to ensure effective implementation of EMPs.

172. LGED has defined institutional setup including specified responsibility for environmental management. The existing capacity of the LGED and PMU for implementing environmental safeguard issues needs substantial strengthening. An environmental specialist will be provided

at the PMU and Division levels as part of the Project Implementation Consultants to provide the needed expertise.

173. The IEE also indicates that rural road construction works do not warrant further EIA study for subsequent rural road construction works.

B. Key Recommendations

174. Any major changes or any major additional work other than the proposed project activities will require preparation of another environmental assessment. This additional assessment will have to be submitted by LGED to concerned government authorities (DoE) and ADB for concurrence before civil works commence.

175. The implementation of prescribed mitigation measures will minimize/avoid adverse impacts. Moreover, the impacts shall be monitored continually by implementing and updating the Environmental Management Plan and Environmental Monitoring Plan. This IEE is prepared based on 96 individual environmental checklists and detailed project reports. Subproject specific EMP shall be improved as per the final provisions made under DPRs. The updated EMP if there is any change shall also be sent to ADB for information.

176. The executing agency shall ensure that EMP and EMoP is included in BOQ and forms part of bid document and civil works contract. The contractor will specify the quantity and budget for various activities like rehabilitation of borrow earth pits, first aid and Sanitation facilities at construction camp and temporary office/material storage place. The same shall be revised if necessary, during project implementation or if there is any change in the project design. Any such change shall be reported to ADB as well.

Appendices

Appendix A. List of Additional Financing Road's Salient Features and Improvement Proposals

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
1	Jessore	Monirampur	Nehalpur GC-Payria GC via Takerghat Road (UZR) (ID:241612006)	**Length :** 3.737 km **Starting Point :** At Nehalpur Kalibari Bazaar **Ending Point :** At Panchakori Bazaar **Major Settlements :** Nehalpur, Balidha, Panchakori **Existing road land width :** 8.0-12.0 m **Terrain :** Plain **Configuration :** Existing 3.7 m with 0.5 m Earthen Shoulder RCC Bridge : 1 Nos Box Culvert : 4 Nos OFC: 1 No U Drain : 8 Nos Pipe Culvert : 3 Nos	**Length :** 3.737 km **Configuration :** Proposed 5.5 m with 0.90 m both side earthen shoulder U Drain : 08 Nos Box Culvert : 03 Nos
2	Jessore	Monirampur	Lawri (Madrasha) RHD-Khedapara GC Road (ID;241612016)	**Length :** 14.850 Km **Starting Point :**Lawri (Madrasha) **Ending Point :** AtKhedapara GC **Major Settlements : Ramnagar,Lawri,Halsa,Kashirpur,Mazhiali,Chandpur,Krishnabati,Helanchi,Jalalpur,Khorinchir,Galda,Khedapara** **Existing road land width :** 15.09 m - 21.00 m **Terrain :** Plain **Configuration :** Existing 3.7 m with 0.90 m Earthen Shoulder	**Length :** 14.850 Km **Configuration :** Proposed 5.5 m with 0.90 m both side earthen shoulder
3	Jessore	Bagherpara	Jessore-Narail RHD at Dhalgrammore to Narikelbaria via Dhalgram Bazar (ID: 241092003)	**Length :** 8.275 km **Starting Point :** At Bagherpara - Kaligonj RHD **Ending Point :** At Chaturbaria GC **Major Settlements :** Chandipur, Khalia Kesobpur, Rajapur, Chotto Kundra, Chandpur Holihutto, Chaturbaria **Existing road land width :** 15.09 m - 21.00 m **Terrain :** Plain **Configuration :** Existing 3.66 m with 0.90 m Earthen Shoulder	**Length :** 8.275km **Configuration :** Proposed 3.66 m with 0.90 m both side earthen shoulder U Drain : 8 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				U drain : 6 Nos Box Culvert : 4 Nos OFC: 2 Nos	
4	Jessore	Bagherpara	**Khajura-Chaturbaria road. (ID:241092013)**	**Length :** 8.275 km **Starting Point :** At Bagherpara –Kaligong RHD(Khajura Bazar GC) **Ending Point :** At Chaturbaria Bazar GC **Major Settlements :** Chandipur, Khalia Kesobpur, Rajapur,Chotto Khudra, Uttar chadpur Holihutto,Chaturbaria villages **Existing road land width :** 15.09 m - 21.00 m **Terrain :** Plain **Configuration :** Existing 3.66 m with 0.90 m Earthen Shoulder	**Length :**8.275 km **Configuration :** Proposed 3.66 m with 0.90 m both side earthen shoulder
5	Jessore	Abhoynagar	Nowapara Upazila H/Q (Shankarpasha Bazar Ghat) - Narail-Fultala RHD at Sukpara more Road. (UZR) (ID:241042005)	**Length :** 9.3 km **Starting Point :** At Nowapara Upazila H/Q **Ending Point :** At Narail Fultala RHD **Terrain :** Plain **Configuration :** Existing 3.7 m with 0.90 m Earthen Shoulder U Drain : 2 nos Box Culvert : 5 Nos Pipe Culvert: 11 Nos	**Length :** 4.789km **Configuration :** Proposed 3.7 m with 0.9 m both side earthen shoulder Box Culvert : 28 Nos
6	Jessore	Abhoynagar	Nowapara Upazila H/Q-Monirampur via Moshiahati,Nehalpur Road. (UZR) (ID: 241042006)	**Length :** 7.3 km **Starting Point :**Nowapara Live Stock office **Ending Point :** Moshiahati Bazar **Major Settlements :** Sarkhola, Dumurtala,Kultia,Moshiahati **Existing road land width :** 8.00m-16.00m **Terrain :** Plain **Configuration :** Existing 3.66 m with 1.8 m Earthen Shoulder RCC Bridge : 1 No Box Culvert : 5 Nos	**Length :** 24.628 km **Configuration :** Proposed 5.5 m with 0.90 m both side earthen shoulder Cross Drainage Work : Nil
7	Jessore	Abhoynagar	Jessore Khulna RHD Bhangagate (Badamtala) - Amtala	**Length :** 24.628 km **Starting Point :** Shankarpasha Feri Ghat **Ending Point :** Amtola Growth Center	**Length :** 24.628km **Configuration :** Proposed 3.66 m with 0.90 m both side earthen shoulder

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			GC via Moricha, Nawly Bazar Road (UZR) (ID: 241042007)	**Major Settlements :** Sreedharpur, Baghutia, Shuvorara, Siddipasha **Existing road land width :** 10.00 m - 15.00 m **Terrain :** Plain **Configuration :** Existing 3.66 m with 0.90 m Earthen Shoulder Cross drain : 9 Nos Box Culvert : 3 Nos RCC Bridge: 6 Nos	Cross Drain : 9 Nos
8	Jessore	Jhikorgacha	Bakra GC-Baganchara GC via Sankarpur UPC (UZR) (ID:241232003)	**Length :** 10.86 km **Starting Point :** At Bakra Bazar(GC) **Ending Point :** At Baganchara Bazar(GC) **Major Settlements :** Bakra Bazar, Ulakol Bazar, Sankarpu Ferighat Bazar, Baganchara Bazar GC **Terrain :** Plain **Configuration :** Existing 3.7 m with 1.15 m Earthen Shoulder RCC Bridge: 2 Nos Pipe Culvert: 28 Nos Box Culvert : 7 Nos U Drain : 5 Nos OFC: 2 Nos	**Length :** 10.86 km **Configuration :** Proposed 5.5 m with 0.90 m both side earthen shoulder U DRAIN : 9 Nos
9	Jessore	Sarsha	Benapole - Baganchra GC via Goga UP H/Q Road (UZR) (ID:241902007)	**Length** : 19.94 km **Starting** Point : At Benapole Bazar Bonpara, Shaghata **Ending** Point : At Goga Bazar **Major Settlements** : Benapole Bazar, Chotoanchra, Khoridanga, Shikri Village, Baropota Bazar, Rahamotpur, Kaliani Village & Goga Bazar **Existing Road Land Width** : 8.50m – 13.10m **Terrain** : Plain **Configuration** : 3.66m with 0.80m soft shoulder on both sides, **Box Culvert** : 13 Nos U drain : 23 Nos RCC Bridge : 2 Nos Pipe Culvert : 9 Nos	**Length : 9.141** km **Configuration :** 3.70 m with 0.90m both side soft shoulder all through U Drain : 5 Nos **Box Culvert :** 7 Nos Surface Drain : 258m

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Slab Culvert : 8 Nos	
10	Jessore	Keshobpur	Chuknagar-Katakhali Road (UZR) (ID: 241382003)	**Length** : 7.200 km **Starting** Point : Chuknagar Bazar Bonpara, Shaghata **Ending** Point : Kalagachi Bazar **Major Settlements** : Sannasgacha, Verchi, Daskhahunia, Sarutia, Sufalakati, Kayemkhola, Sarutia (North), Kalagachi **Existing Road Land Width** : 10.00m – 14.00m **Terrain** : Plain **Configuration** : 3.7m with 1.05 soft shoulder on both sides **Box Culvert** : 3 Nos Pipe Culvert : 16 Nos	**Length :**7.200 km **Configuration :** 5.50 m with 0.90m both side soft shoulder all through U Drain : 5 Nos **Box Culvert :** 16 Nos
11	Gaibandha	Sadullapur	Madargonj GC-Laxmipur G.C Road via Kantanagar.(ID : 132822013)	**Length** : 10.443 km **Starting** Point : At Mirpur Bazar **Ending** Point : At Kantanagar Bazar **Major Settlements** : Mirpur, Boro Daudpur, Junidpur, Tarf Kamal, Lichur Bagan, Tafof Fazil, Sandiapur, Mohishbandi, Bhangamore **Existing Road Land Width** : 7.00-17.19m **Terrain** : Plain **Configuration** : 3.70m with 0.90m soft shoulder on both sides, **Box Culvert** : 2 Nos U drain : 8 Nos Pipe Culvert : 2 Nos RCC Bridge : 2 Nos Sluice Gate : 1 No	**Length : 10.433** km **Configuration :** 3.66 m with 0.90 m both side soft shoulder all through U Drain : 7 Nos **Box Culvert :** 1 Nos
12	Gaibandha	Sadullapur	Kunjo Mohipur Uttarpara - Pollasbari Border via Idulpur U.P office (ID : 132823019)	**Length** : 5.370 km **Starting** Point : At Kunjo Mohipur Uttorpara **Ending** Point : At Polashbari Bazar **Major Settlements** : Kunjo Mohipur, Idilpur, Harani, Gobindo Roy Pukur Par, Tajnagar **Existing Road Land Width** : 8.50-15.25m **Terrain** : Plain **Configuration** : 3.70m with 0.90m soft shoulder on both sides,	**Length : 5.370** km **Configuration :** 3.66 m with 0.90 m both side soft shoulder all through U Drain : 7 Nos **Box Culvert :** 7 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Box Culvert : 3 Nos Pipe Culvert : 7 Nos Slab Culvert : 1 No	
13	Gaibandha	Sadar	Dariapur-Laxmipur(UZR) (ID#132242004)	**Length :** 7.254 km **Starting Point :** At Dariapur GC **Ending Point :** At Laxmipur GC **Major Settlements :** Dariapur, Gorerbatha Mazar,Dhandhonipara, Malibari Mathbazar, Khordo malibari, Malibari Chowrastha,Balaatta,Nandirvita,Laxmipur **Existing road land width :** 15.09 m - 21.00 m **Terrain :** Plain **Configuration :** Existing 3.66 m with 0.90 m Earthen Shoulder U drain : 1 No Box Culvert : 3 Nos OFC: 1 Nos RCC Bridge : 4 Nos Pipe Culvert : 1 No	**Length :** 7.254km **Configuration :** Proposed 3.66 m with 0.90 m both side earthen shoulder
14	Gaibandha	Sundarganj	Sundargonj-Materhat G.C (FRA) (ID : 132912005)	**Length** : 12.778 km **Starting** Point : At Collegemore Sundorgonj **Ending** Point : At Materhat GC **Major Settlements** : Dakhin Dumaitari, Zhinia, Paran, Uttar Maruadaha, Dakhin Maruadaha, Paschim Chaporhati, Purbo Chaporhati **Existing Road Land Width** : 8.00-12.00m **Terrain** : Plain **Configuration** : 3.70m with 0.60m soft shoulder on both sides, **Box Culvert** : 20 Nos U drain : 3 Nos Pipe Culvert : 15 Nos Slab Culvert : 3 No	**Length : 12.778** km **Configuration :** 3.70 m with 0.90 m both side soft shoulder all through U Drain : 5 Nos **Box Culvert :** 1 Nos
15	Panchagorh	Sadar	Panchagarh - Harivasha Road. (ID : 177732001)	**Length** : 10.55 km **Starting** Point : Jalashi Bazar Bazar ,Panchagarh **Ending** Point : Harivasha G.C (Bazar)	**Length :** 10.55 km **Configuration :** Proposed: 5.5 m with 0.90 m both side soft shoulder all

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Major Settlement: Jalshi, , Boleapara,Maghai(Talma),Bishmoni,Shekerhat,Panimatch,Mahonjhar, Basuniapara, Khalpara & Harivasha **Existing Road Land Width** : 13.5-18.5m **Terrain** : Plain **Configuration** : Existing 3.7m with 0.90m soft shoulder on both sides, Box **Culvert** : 9 Nos Slab Culvert : 2 No RCC Bridge : 2 Nos	through Box Culvert : 1 No
16	Panchagorh	Tetulia	Tetulia Gobra Bridge - Shalbahan GC Road (ID: 177902005)	**Length** : 9.70 km **Starting** Point : Gobra Bridge **Ending** Point : Salbahan Hat Major Settlement: Sahebjote, Dangapara, Aziznagar, Mathafata, Biralijote, Khalpara, Pranjote, Namagoch, Velkugoch, Pramanikpara, Gobragoch, Sarkerpara, Dariagoch, Salbahan **Existing Road Land Width** : 10.28m – 11.15m **Terrain** : Plain **Configuration** : Existing 3.66 m with 0.90m soft shoulder on both sides, Box **Culvert** : 11 Nos Cross Drain : 2 No	**Length :** 9.70 km **Configuration :** Proposed: 5.5 m with 0.90 m both side soft shoulder all through Box Culvert : 6 No (4 nos repair) Cross Drain : 3 Nos Surface Drain : 510m
17	Panchagorh	Atwari	Fakirgonj hat GC - Shathkhamar R&H Road (ID : 177042001	**Length** : 9.70 km **Starting** Point : Fakirgonj hat GC **Ending** Point : Shathkhamar R&H Major Settlement: Choto Dap, Boro Dap, Radhanagar, MAligaon, Ranigonj, Namajpora, Sholohori, Kalkuti, Shamagaon, Bolrampur, Kurulia, Sathkumar **Existing Road Land Width** : 12.m – 13m **Terrain** : Plain **Configuration** : Existing 3.66 m with 0.90m soft shoulder on both sides, Box **Culvert** : 20 Nos Cross Drain : 2 No Slab Culvert : 5 nos	**Length :** 9.70 km **Configuration :** Proposed: 5.5 m with 0.90 m both side soft shoulder all through Box Culvert : 6 No U drain : 1 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Pipe culvert : 1 nos RCC girder bridge : 2 Nos	
18	Chittagong	Mirsharai	ZorargonjUP R& H to -Burburiaghat Bazar road Via Dhum UP, Bangla Bazar &Golokerhat (UZR) (ID:415532002)	**Length** : 5.100 km **Starting** Point : At Zorargonj Bazar **Ending** Point : AtBurburiaGhat **Major Settlements** : Poragolpur,PaschimPoragolpur,Naherpur,UttorNaherpur,UttorDhum,Bangla Bazar, Goloker Hat **Existing Road Land Width** : 10.00m – 12.00m **Terrain** : Plain **Configuration** : Existing 3.00m with 1.0m soft shoulder on both sides **Box Culvert** : Existing 8 (Eight) cross drainage structure only one is in good condition	**Length :**5.100 km **Configuration :** Proposed: 3.70m with 0.90 m both side soft shoulder all through **Box Culvert :** Proposed: 2 Nos 3x4.0mx4.0m,1 No 1x3.0mx3.0m, 5Nos1x1.5mx1.5m .
19	Chittagong	Mirsharai	Habilder Basa R&H to Santir Hat GC Road via Azamnagar (Karerhat UP-Santirhat GC) (UZR) (ID:415532013)	**Length** : 8.65 km **Starting** Point : At Habildar basha **Ending** Point : Santir Hat **Terrain** : Plain **Configuration** : From Ch. 00-1043 Existing 2.70m with 0.90m soft shoulder on both sides, From Ch. 1043-3780 Existing 2.2m with 0.90m soft shoulder on both sides, From Ch. 6550-6850 Existing 2.2m with 0.90m soft shoulder on both sides, From Ch. 2550-5400 Existing earthen road **Box Culvert** : 7 Nos Slab Culvert : 1 No RCC Bridge : 2 Nos U Drain: 18 Nos	**Length :** 8.65 km **Configuration :** Proposed: 3.7 m with 0.90 m both side soft shoulder all through **Box Culvert :** Proposed: 17 Nos
20	Chittagong	Rangunia	Santirhat GC-Malirhat - Sahery	**Length** : 5.400 km **Starting** Point : At Santir Hat GC	**Length :** 5.400 km **Configuration :** Proposed: 5.50 m with

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			Bazar GC Road (Baraulia Road) (Rangunia Part) (ID : 415702011)	**Ending** Point : At Baishzoom **Major Settlements** : Saplezapara, Rosai Para, Asua Para, Sam Talukder Para, Malir hat, Uttar Pomra Sikder Para, Bar Aulia, Baishzoom **Existing Road Land Width** : 8.00-15.00m **Terrain** : Plain **Configuration** : From Ch. 00-100 Existing 3.70m with 0.90m soft shoulder on both sides, From Ch. 100-600 Existing 2.44m with 0.90m soft shoulder on both sides, From Ch. 600-2550 Existing 3.00m with 0.90m soft shoulder on both sides, From Ch. 2550-5400 Existing earthen road **Box Culvert** : 13 Nos Pipe Culvert : 11 Nos RCC Bridge : 1 Nos	0.90 m both side soft shoulder all through **Box Culvert :** Proposed: 19 Nos
21	Chittagong	Fatikchari	Dantmara U.P.HQ.to Balutila Bazar via Ziltoli bazar Road (ID : 415333002)	**Length** : 13.013 km **Starting** Point : Dantmara U.P. **Ending** Point : Balutila Bazar. **Major Settlements** : **Existing Road Land Width** : **Terrain** : Plain **Configuration** : Earthen road **Bridge :** 2 Nos Slab Culvert : 1 nos Pipe Culvert : 1 no	**Length :** 13.013 km **Configuration :** Proposed: 5.50m with 0.90m soft shoulder on both sides all through **Box Culvert** : 11 Nos
22	Chittagong	Hathazari	Mekhol up to Gorduara UP Road (Sarang Road) (ID : 415373004)	**Length** : 4.97 km **Starting** Point : Mekhol up **Ending** Point : Gorduara UP. **Major Settlements** : **Existing Road Land Width** : **Terrain** : Plain **Configuration** : Existing 3.70m with 0.90m hard shoulder on both sides **Box Culvert** : 2 Nos **Bridge :** 2 Nos Pipe Culvert : 2 nos	**Length :** 4.97 km **Configuration :** Proposed: 5.50m with 0.90m soft shoulder on both sides all through **Box Culvert** : 1 Nos
23	Chittagong	Raojan	At (RHD)Upazila	**Length** : 9.926 km	**Length :** 9.926 km

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			Hospital & Ramjan Ali hat (UZR) (ID:415043015)	**Starting** Point : At (RHD)Upazila Hospital & Ramjan Ali hat **Ending** Point : At Nayahat RHD Road(Re-zonal) **Major Settlements** : Ramjan Ali hat, Adharmanik Natun Bazar, Nayahat **Existing Road Land Width** :10.09m – 15.00m **Terrain** : Plain **Configuration** : Existing 3.70m with 0.90m hard shoulder on both sides **Slab Culvert** : 4 Nos **Box Culvert :** 2 Nos **RCC Bridge :** 1 No	**Configuration :** Proposed: 5.5m with 0.90m soft shoulder on both sides all through **Box Culvert** : 1 Nos **Slab Culvert :** 6Nos
24	Dinajpur	Parbatipur	Ambari GC - Jashai more RHD road (UZR) (ID#127772003)	**Length :** 14.264 km **Starting Point :** At Ambari G.C **Ending Point :** Jashai Mor RHD **Major Settlements :** Chotto Ramchandrapur, Kutubpur, Mostofapur, Dondopani, Dobolgachi, Modhupur, Chandra, Mominpur, Durgapur, joypur **Existing road land width :** 10.0m- 15.0m **Terrain :** Plain **Configuration :** Existing 3.7m with 0.90m shoulder **Box Culvert :** 17 Nos Box Culvert **Cross Drain** : 7 Nos **OFC** : 3 Nos	**Length :** 14.264km **Configuration :** Data Not Found **Cross drain :** 20 Nos **Box Culver**t : 15 Nos
25	Dinajpur	Parbatipur	Mominpur UP Office Jashai (Bot tree more) - Pan Bazar road via Jurai hat & faridpur hat. (ID : 127773001)	**Length :** 9.600 km **Starting Point :** Jashai (Bot Tre More) **Ending Point :** Panbazar **Major Settlements :** Doania, Shalbari, Teroania, Foridpur, Mornai **Existing road land width :** 8.00m- 12.0m **Terrain :** Plain **Configuration :** Existing 3.7m with 0.90m shoulder **Box Culvert :** 5 Nos Box Culvert **Cross Drain** : 1 Nos Pipe Culvert : 1 Nos Slab Culvert : 6 Nos	**Length :** 9.600 km **Configuration :** 5.50 m with 0.90m shoulder **Cross drain :** 26 Nos **Box Culver**t : 05 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
26	Dinajpur	Phulbari	Madilahat GC (Chintamon Moor)-Ambarihat GC Road.(UZR) (ID#127382004)	**Length :** 18.06 km **Starting Point :** Chintamoon mor **Ending Point :** Ambarihat GC **Major Settlements :**Chintamor, Chowrait, Baikantapur, Nirankuri, Dadul, Kazihat, Kalkun, Zhajira, Jayanti, Veram, Rudrani, Jagannathpur, Banahar, Zoar, Panikata, Uttar Shibpur, Eluary **Existing road land width :** **Terrain :** Plain **Configuration :** Existing 3.0m with 0.45m earthen shoulder (Ch. 00 to 8.140km) & Existing 3.0m with 0.45m earthen shoulder (Ch. 8.140 to 18.06km) **Box Culvert :** 18 Nos **Pipe Culvert :** 11Nos **Cross Drain** : 03 Nos **Girder Bridge:** 1 No **Open Foundation Culvert:** 1 No **Regulator** : 1 No	**Length :** 18.06km **Configuration :** 5.5m carriage way with 0.90m earthen shoulder **Cross drain :** 17 Nos **Box Culver**t : 8 Nos
27	Dinajpur	Phulbari	Phulbari UZHQ-Madilahat GC Road (ID : 127382001)	**Length :** 10.50 km **Starting Point :** Fulbari GC **Ending Point :** Madilahat GC **Major Settlements:** Suzapur,Krishnopur, Basudevpur Aldipur UP,Chowrait,Chintamon,Enaet pur,Faridabad,Modho mohesh pur,Nandanal pur,Purba chak Mathura,siddisi,Baikanta pur,Mukter pur, Betdhighi UP, **Existing road land width :** 15.09 - 21.55m **Terrain :** Plain **Configuration :** (Ch.00 to 1.00 km) 5.5m and (Ch.1.00 to10.50 km) 3.66 m and 0.90 m earthen **Box Culvert :** 23 Nos **Cross Drain** : 01 Nos **Girder Bridge:** 2 Nos	**Length :** 10.50 km **Configuration :** 5.5m carriage way with 0.90m earthen shoulder **Cross drain :** 4 Nos **Surface Drain : 153m**
28	Dinajpur	Bochagonj	Setabgonj Sugar Mill-Meherpur Hat via Nawavita hat Road. (ID : 127212002)	**Length :** 12.400 km **Starting Point :** Setaganj Sugar Mill **Ending Point :** Maherpur Hat Chowrasta Road **Major Settlements :** Melagachi, Mushidhat, Hat Rampur, Maladgaon, Khangaon, Shekhorpur, Dhodir,	**Length :** 12.40 km **Configuration :** 5.5m carriage way with 0.90m earthen shoulder **Cross drain :** 3 Nos (replace) **Box Culver**t : 2 Nos (replace)

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Anorah, Sukdebpur, Maherpur, **Existing road land width : 12.00m - 15.50m** **Terrain :** Plain **Configuration :** Existing 3.70m with 1.50m earthen shoulder (Ch. 00 to 5.040km), hard shoulder (Ch. 5.040 to 12.400km) and 0.60m soft shoulder **Box Culvert :** 7 Nos **Pipe Culvert :** 4 Nos **U Drain** : 04 Nos	
29	Dinajpur	Kaharol	Kaharol Upazila HQ-Boleyahat RHD Road (UZR) (ID:127562005)	**Length :** 9.265 km **Starting Point :** Kaharol Bazar **Ending Point :** Boleya Hat(Birgonj – Bochagonj Road) **Major Settlements :** Uchitpur, Rasulpur,Khasulpur, Sadur Bazar, Valua, Kushotti, Boleya **Existing road land width : 10.00m - 15.0m** **Terrain :** Plain **Configuration :** Existing 3.70m with 0.9m earthen shoulder **Box Culvert :** 7 Nos **Open Foundation Culvert :** 3 Nos **Cross Drain** : 14 Nos	**Length :** 9.265 km **Configuration :** 5.5m carriage way with 0.90m earthen shoulder **Cross drain :** 14 Nos (Extension) Cross Drain : 5 Nos (New) **Box Culver**t : 7 Nos **Surface Drain :** 180m
30	Dinajpur	Nawabgonj	Doudpur (Laugari) to Bajitpur R&H(ID:127692005)	**Length :** 7.2 km **Starting Point :** Daudpur **Ending Point :** Bazidpur **Major Settlements :**Laugary, Polashbari, Takonoti, Dharanda, bazitpur **Existing road land width : 10.00 - 12.00 m** **Terrain :** Plain **Configuration :** Existing 5.50m with 0.9m earthen shoulder RCC Girder bridge : 1 nos	**Length :** 7.2 km **Configuration :** 5.5m carriage way with 0.90m earthen shoulder **Box Culver**t : 5 Nos
31	Dinajpur	Nawabgonj	Doudpur GC-Bhaduria GC via Daria (ID:127692006)	**Length :** 13.189 km **Starting Point :** Daudpur **Ending Point :** Bhaduria **Major Settlements :** Monirampur, Hayetpur, Tangorgi, Mogorparar, Toperhat, Karimpur, Harinathpur	**Length :** 13.189 km **Configuration :** 5.5m carriage way with 0.90m earthen shoulder **Box Culver**t : 3 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Existing road land width : 5.00- 10.00 m **Terrain :** Plain **Configuration :** Existing 5.50m with 0.9m earthen shoulder RCC box Culvert:44 nos	
32	Dinajpur	Birgonj	Bottoli (NHW)-Goreya GC via Shibrampur UP Rd (Bir Muktijoddha Shahid Motilal Barman Road) (ID : 127122005)	**Length :** 16.04 km **Starting Point :** Bottoli GC **Ending Point :** Goyera GC **Major Settlements :** Chowpukuria, Shialkheda, Chowpukria, Arazi Shialkheda, Dograi, Singhajani, Gobindopara, Shahadubi, Milonpur, Sitolskora, Aragidangi, Chunggakhata **Existing road land width : 10.00 - 15.00 m** **Terrain :** Plain **Configuration :** Existing 5.50m with 0.9m earthen shoulder **Box Culvert :** 13 Nos Pipe Culvert: 3 Nos **U Drain** : 08 Nos RCC Girder bridge : 1 nos	**Length :** 16.04 km **Configuration :** 5.5m carriage way with 0.90m earthen shoulder **Box Culver**t : 10 Nos
33	Madaripur	Sadar	Trivagdi GC-Mithapur Hat-Habiganj hat-Mollahat-Shekhpur RHD (UZR) (ID#354542005)	**Length :** 9.663 km **Starting Point :** At Tribagdi G.C. **Ending Point :** At Shekhpur RHD **Major Settlements :** Trivagdi, Rajdoedi, Mithapur, Hobigonj, Sumbug, Shakpur, Tribagdi **Existing road land width :** Data not found **Terrain :** Plain **Configuration :** Existing 5.50m(00-10.00km) and 3.67m(10km-17.025km) with 0.9m hard shoulder **RCC Bridge :** 2 Nos	**Length :** 9.663 km **Configuration :** 5.50m carriage way with 0.90m hard shoulder
34	Madaripur	Sadar	Khagdi R&H-Char Muguria-Sreenadi Hat GC (UZR) (ID#354542001)	**Length :** 17.250 km **Starting Point :** At Khagdi R&H **Ending Point :** At Sreenadi Hat **Major Settlements :** Khagdi, Bahadurpur, Rajarhat, Sirkhara, Sreenadi **Existing road land width :** Data not found **Terrain :** Plain	**Length :** 17.250km **Configuration :** 5.5m carriage way with 0.90m shoulder

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Configuration : Existing 3.67m with 0.9m hard shoulder and 0.3m earthen shoulder **RCC Bridge :** 10 Nos **Box Culvert :** 7 Nos	
35	Madaripur	Sadar	NHW-Tribhagdi Hat GC. (UZR) (ID#354542003)	**Length :** 5.100 km **Starting Point :** At NHW (Gotokchar Bazar) **Ending Point :** Tribagdi GC **Major Settlements :** Gotokchar, Payerpur, H T Aditopur, Tribagdi **Existing road land width : Terrain :** Plain **Configuration :** Existing 3.65m with 0.9m soft shoulder **RCC Girder Bridge**: **Steel Bridge**: **Box Culvert**:	**Length :** 5.10km **Configuration :** 5.5m carriage way with 0.9m shoulder
36	Madaripur	Sadar	Madaripur Puran Bazar-Bangla Bazar-Hosnabad Bazar-Kalikapur UP Road.(UNR) (ID#354543005)	**Length :** 10.05 km **Starting Point :** At Madaripur Puran Bazar **Ending Point :** At kalikapur UP **Major Settlements :** Hosnabad, Kalikapur, Pachkhola, Kazir mor **Existing road land width :** Data not found **Terrain :** Plain **Configuration :** Existing **3**.67m with 0.9m hard shoulder	**Length :** 6.30km **Configuration :** 3.67m carriage way with 0.90m shoulder
37	Madaripur	Kalkini	Khoajpur Takerhat R & H to Khasherhat GC Road via Laxmipur UP Office & Shurjamoni hat.(UZR) (ID#354402005)	**Length :** **Starting Point :** Khoajpur Takerhat **Ending Point : Kasherhat GC** **Major Settlements : Khoajpur Takerhat, Biddyabagis, Jalalpur, Mridakandi, Laxmipur, Dadpur, Surjomoni, Jaigir, Snanghata, Vabanishankar** **Existing road land width : 15.50-22.5m** **Terrain :** Plain **Configuration :** carriage width 3.66m and earthen shoulder 0.9m on both sides	**Length :** 16.5km **Configuration :** 3.66m carriage way with 1.6m hard shoulder **Surface Drain** : 2 nos (250m & 350m)

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				RCC Girder Bridge: 4 Nos **Pipe Culvert**: 25 Nos	
38	Madaripur	Kalkini	Kalkini Upazila HQ to Khasherhat GC Road via Shomitirhat Bazar. (ID: 354402002)	**Length : 12.51 Km** **Starting Point :** Kalkini bazar at Palordi Bazar **Ending Point : Kasherhat GC** **Major Settlements : Enayetnagar Bashgari, Majertkandi, Moulovi Bazar, Somitirhat, Ramchandropur, Issagura, Bashgari Guccogram, Kalkairchair** **Existing road land width : 14.60-20.55m** **Terrain :** Plain **Configuration :** carriage width 3.66m and earthen shoulder 0.9m on both sides **RCC Girder Bridge**: 7 Nos **Pipe Culvert**: 4 Nos **Box culvert :** 1 Nos	**Length :** 10.977km **Configuration :** 5.5m carriage way with 0.6m soft shoulder **Surface Drain :** 250m
39	Madaripur	Kalkini	Khasherhat GC to Shariatpur R & H Road (Kalkini Part) (ID: 354402007)	**Length : 2.100 Km** **Starting Point : Kasherhat GC** **Ending Point : UZR - 05** **Major Settlements : Khasherhat, Kanurgaon, Vabanishankar** **Existing road land width : 14.60-20.55m** **Terrain :** Plain **Configuration :** carriage width 3.66m and earthen shoulder 0.9m on both sides **RCC Girder Bridge**: 4 Nos **Box culvert :** 3 Nos	**Length :** 10.977km **Configuration :** 5.5m carriage way with 0.9m soft shoulder
40	Madaripur	Shibchar	R&H Bypass road to Kathalbari ferry ghat via Kutubpur growth center & bangla bazar (UZR) (ID#354872005)	**Length :** 13.18km **Starting Point :** Shibchar R&H Bridge **Ending Point :** Kathalbari Bazar **Major Settlements :** Kutubpur Kadirpur Shibchar Kathalbari **Existing road land width :** 15.09-21.55m **Terrain :** Plain **Configuration :** carriage width 4.88m and earthen shoulder 0.9m on both sides **RCC Girder Bridge**: 6Nos	**Length :** 8.28km **Configuration :** 5.5m carriage way with 0.9m soft shoulder **Box Culvert** : 1No

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Pipe Culvert: 2Nos	
41	Rajshahi	Bagmara	Bhawanigonj-Ahsangonj (ID : 181122001)	**Length : 12.700** km **Starting Point :** At Upazila HQ/ Bagmara **Ending Point :** Ibrahimpur Bazar near Atrai Upazila **Major Settlements :** Bhatkhali, Jaytapukur, Baruihati **Existing road land width : 12m to 14.00m** **Terrain :** Plain **Configuration :** carriage width 3.66m and earthen shoulder 0.9m on both sides **Pipe Culvert**: 2 Nos **Box Culvert : 3 Nos** **U Drain : 8 nos** **Slab Culvert : 3 nos** **RCC Girder Bridge : 1 Nos**	**Length :** 4.200 km **Configuration :** 5.5 m carriage way with 0.9m soft shoulder **U Drain** : 1 no (replacement) **Box Culvert : 1 No** **Surface Drain : 134m**
42	Rajshahi	Bagmara	Bhabanigong-Kesorhat (UZR) (ID#181122003)	**Length : 13.30**km **Starting Point :** Deowla Moar **Ending Point :** Mugaipara **Major Settlements :** Dewla, Chikabari, Dwipnagar, Dowlatpur, Binodpur, Morakuri, Mochmoil, Bokpara, Narayanpur, Mugaipara **Existing road land width :** **Terrain :** Plain **Configuration :** carriage width 3.00m and earthen shoulder 0.9m on both sides **Pipe Culvert**: 9Nos **Box Culvert :** 8Nos **U Drain :** 2Nos (One Damaged) **Slab Culvert :** 4 Nos **RCC Girder Bridge :** 1 No	**Length :** 13.30km **Configuration :** 5.5 m carriage way with 0.9m soft shoulder **U Drain** : 1No (Replacement) **Box Culvert :** 4Nos (Replacement) **Slab Culvert** : 2 Nos (Replacement)
43	Rajshahi	Bagmara	Bhobanigong-	**Length : 9.05** km	**Length :** 9.05 km

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			Hatgangopara (from Mathabhanga) (UZR) (ID#**181122004**)	**Starting Point :** Mathabhanga Mor **Ending Point :** Hatgongapara GC **Major Settlements :** Mathabhanga, Kamnagar, Sainpara, ramnagar, Basantopur,Rampur, Baigacha, Hatgongapara **Existing road land width : 12m to 14m** **Terrain :** Plain **Configuration :** carriage width 3.70m and earthen shoulder 1.30m on both sides **Pipe Culvert**: 9 Nos **Box Culvert :** 5 Nos **U Drain :** 5 Nos	**Configuration :** 5.5 m carriage way with 0.9m soft shoulder **Box Culvert** : 4 Nos
44	Rajshahi	Tanore	Mundumala Hat (Start from Ayrarmore) to Hat bakoil (GCM) road ViaUchadanga Narayanpur (Tanore part).(ID: 181942005)	**Length : 13.88** km **Starting Point :** Mundumala hat **Ending Point :** Bakoil hat **Major Settlements :** Ayra, Uchadanga, Narayonpu, Bohorail, Boiddhopur, Kondopur, Bakultala, Chotipur,Bongpur, Billi, **Existing road land width : 10m to 14m** **Terrain :** Plain **Configuration :** carriage width 3.0m and earthen shoulder 0.9 m on both sides **Pipe Culvert**: 6 Nos **Box Culvert :** 7 Nos **U Drain :** 34 Nos	**Length :** 13.85 km **Configuration :** 4.88 m carriage way with 1.00m soft shoulder **U Drain** : 5 Nos **Box Culvert** : 4 Nos
45	Rajshahi	Tanore	Elamdohi Hat to Kalma Hat Via Valukakandor Hat (ID: 181943005)	**Length : 2.30** km **Starting Point :** Malbandha **Ending Point : Noytipara** **Major Settlements :** Malbandha, Noytipara, kalma **Existing road land width : 10m to 14m** **Terrain :** Plain **Configuration :** carriage width 3.70m and earthen shoulder 1.10m on both sides **Pipe Culvert**: 17 Nos **Box Culvert :** 2 Nos **U Drain :** 11 Nos Slab culvert : 1 No RCC girder Bridge : 1 No	**Length :** 2.30 km **Configuration :** 5.00 m carriage way with 1.16m soft shoulder **U Drain** : 5 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
46	Rajshahi	Tanore	Saranjai Pacca Road More - Mundumala Hat Via DebipurMore,Elamdohi hat and Prokash Nagar Hat. (ID : 181942014)	**Length : 17.211** km **Starting Point :** Saranjai **Ending Point : Mundumala Hat** **Major Settlements :** Saranjai, Sarkarpara, Manik Kanna, Lalpur, Nayanpur, Elamdohi, Dhobul, Debipur, Prokash nagar **Existing road land width : 10m to 15m** **Terrain :** Plain **Configuration :** carriage width 3.70m and earthen shoulder 0.65m on both sides **Pipe Culvert**: 17 Nos **Box Culvert :** 9 Nos **U Drain :** 16 Nos Slab culvert : 10 No RCC girder Bridge : 1 No	**Length :** 17.211 km **Configuration :** 3.70 m carriage way with 1.81m soft shoulder **U Drain** : 15 Nos Box culvert : 12 nos
47	Rajshahi	Tanore	Tanore-Amnura via Mundumala Hat (ID: 181942003)	**Length : 16.991** km **Starting Point :** Tanore **Ending Point : Amnura** **Major Settlements :** Tanore. Debipur, Jogisho, Krisnopur, Phatakhata, Panchondor, Mundumala hat, Ayra, Talupara Zumarpara, Jhilim more, Dorgapara, Amnura hat **Existing road land width : 10m to 15m** **Terrain :** Plain **Configuration :** from Ch. 00 to 11.150 km carriage width 5.50m and earthen shoulder 0.90m on both sides, from Ch. 11.150 to 16.991 km, carriage width 3.70m and earthen shoulder 1.150 m on both sides, **Pipe Culvert**: 2 Nos **Box Culvert :** 12 Nos **U Drain :** 2 Nos Slab culvert : 11 No RCC girder Bridge : 1 No	**Length :** 16.991 km **Configuration :** from Ch. 00 to 11.150 km carriage width 5.50m and earthen shoulder 0.90m on both sides, from Ch. 11.150 to 16.991 km, carriage width 5.50m and earthen shoulder 0.9 m on both sides, Box culvert : 10 nos
48	Rajshahi	Tanore	Talanda to Keshor Hat (from Hatishail)Tanore Part	**Length : 5.440** km **Starting Point :** Hatishail **Ending Point : Kaucha Bazar**	**Length :** 16.991 km **Configuration :** carriage width 3.70m and earthen shoulder 0.60m on both

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			(ID: 181942011)	**Major Settlements :** Hatishail, Mohadebpur, Kamaranga, Gounghati, Kochua **Existing road land width : 10m to 15m** **Terrain :** Plain **Configuration :** carriage width 3.00m and hard shoulder 0.50m on both sides, **Box Culvert :** 5 Nos **U Drain :** 16 Nos Slab culvert : 1 No RCC girder Bridge : 1 No	sides, Box culvert : 1 nos U drain : 1 Nos
49	Rajshahi	Tanore	Tanore-Chowbaria road (ID: 181942002)	**Length : 3.50** km **Starting Point :** Tanore **Ending Point : Chowbaria** **Major Settlements :** **Existing road land width :** **Terrain :** **Configuration :** , Pipe Culvert : 3 Nos **Box Culvert : 6 Nos** **U Drain : 1 Nos** Slab culvert : 1 Nos RCC girder Bridge : 2 Nos	**Length :** 3.500 km **Configuration :** Box culvert : 1 Nos U drain :
50	Rajshahi	Tanore	Talanda FRB to Nizampur via Dargadanga Hat,Billi Hat Road (ID: 181942007)	**Length : 17.00** km **Starting Point :** Talanda ERB **Ending Point : Nizampur** **Major Settlements :** Talanda, Horidev, Deol, Rabyer More, Bonkeshore, Azizpur, Dorgadanga, Kalma, Billi **Existing road land width : 10m to 14m** **Terrain :** Plain **Configuration :** carriage width 3.70m and hard shoulder 1.10m on both sides, **Box Culvert :** 23 Nos **U Drain : 5** Nos Slab culvert : 11 Nos	**Length :** 17.00 km **Configuration :** carriage width 5.00m and Hard shoulder 1.16 m on both sides, Box culvert : 9 nos U drain : 6 Nos
51	Rajshahi	Paba	Mollikpur Bipass (Kukhundipur Bazar) - Parila UP Road (ID:	**Length : 4.40** km **Starting Point :** Mollikpur Bypass **Ending Point : Parilla UP**	**Length :** 4.40 km **Configuration :** 3.70 m carriage way with 1.00m soft shoulder

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			181723024)	**Major Settlements :** Boro Mollikpur, Choto Mollikpur, Tebarai, Koipukuria, Dangirpara, Ramchandrapur **Existing road land width : 10m to 15m** **Terrain :** Plain **Configuration :** carriage width 3.00m and earthen shoulder 0.90m on both sides **Pipe Culvert**: 1 Nos **OFC :** 2 Nos **U Drain :** 3 Nos	**U Drain** : 6 Nos Pipe Culvert : 1 nos
52	Rajshahi	Mohanpur	Bazorpur Trimohini to Dhupaghata hat(UZR) (ID#181532001)	**Length : 4.5**km **Starting Point :** Bozorpur R&H **Ending Point :** Dhopaghat **Major Settlements :** Bozorpur, Dumuria, Akubari, Bosontopur, Moupara, Vetupara, Krishnopur, Dhopaghata **Existing road land width :** 11.0m to 11.50m **Terrain :** Plain **Configuration :** carriage width 3.7m and earthen shoulder 1.7m on both sides **Box culvert** : 10 Nos(all in good condition)	**Length :** 4.5 km **Configuration :** 5.5 m carriage way with 1.8m soft shoulder **Cross drainage structure** : Nil
53	Comilla	Titas	Raypur NHW-Batakandi GC road via Masimpur(ID : 419892001)	**Length : 10.914** km **Starting Point :** Batakhandi GC **Ending Point : Regulator over Chorer Khal** **Major Settlements :** Batakandi, Kalaigobindopur, Pangashia, Masimpur Gc, Kadamtoli, Asmania, South Naeandia **Existing road land width : 15.09 to 21.55m** **Terrain :** Plain **Configuration : From Ch. 0+00 - 0+315 m** carriage width 5.50m, From Ch. 0+315 to 3+350m carriage way 3.70m and earthen shoulder 0.45m on both sides, From Ch. 3+350 - 10+914 carriage way 3.70m and earthen shoulder 0.45m on both sides, RCC Girder Bridge: 5 Nos	**Length :** 10.914 km **Configuration :** 5.50 m carriage way with 0.90m soft shoulder Cross Drain : 2 Nos Surface Drain : 521m
54	Comilla	Titas	Batakandi GC-	**Length : 11.50 km**	**Length :** 11.50 km

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			DaudkandiGC Via Mohanpur Launch Ghat road (Titas Upazila Portion) (ID : 419892002)	**Starting Point :** Batakandi GC **Ending Point :** Daudkandi GC **Major Settlements :** Badderkandi, Puran Batakandi, Barokawmnia, Harinpur, Krisnapur, Satani, Kalairkandi, Mohanpur **Existing road land width :** 12.50m – 15.30m **Terrain :** Plain **Configuration :** Carriage width 3.70m with 0.50m shoulder Box Culvert: 7 Nos Bridge : 5 Nos	**Configuration :** 5.00 m carriage way with 0.9m soft shoulder U Drain: 2 No Surface Drain : 729m
55	Comilla	Daudkandi	Roypur NHW - Batakandi G.C via Masimpur Road (Daudkandi part). (ID : 419362001)	**Length : 3.345** km **Starting Point :** Roypur Bazar **Ending Point : Regulator over Chorer Khal** **Major Settlement :** Autbag, Khoshkandi, Kushiara, Singula **Existing road land width : 15.09 to 21.55m** **Terrain :** Plain **Configuration :** carriage way 3.66m and hard shoulder 0.90m on both sides, RCC Girder Bridge: 1 Nos	**Length :** 3.345 km **Configuration :** 5.50 m carriage way with 0.90m soft shoulder
56	Comilla	Debidwar	Jafargonj GC to Barashalghar RHD via Yousufpur UPC Road. (ID: 419402006)	**Length : 15.815 km** **Starting Point :** Jafargonj GC **Ending Point :** Barashalghar RHD **Major Settlements : K**alikapur, Sultanpur, Fatahabadh, Subil, Shibpur **Existing road land width :** 5.00m – 15.50m **Terrain :** Plain **Configuration :** Carriage width 3.00m with 0.50m shoulder Box Culvert: 13 Nos Pipe Culvert : 1 Nos Bridge : 6 Nos	**Length :** 15.815 km **Configuration :** 3.70 m carriage way with 0.9m soft shoulder Box Culvert : 8 No
57	Nilphamari	Nilphamari-S	Goregram U.P. to Bhabanigonj G.C via Majhpara Madrasha. (ID : 173643008)	Length : 8.140 km Starting Point :At Goregram U.P Ending Point : At Bhabanigonj G.C Major Settlements : Kithoniapara, Baltolihat, Musruth	Length : 8.140 km Configuration : Carriage way 3.70 with 1.00m earthen shoulder Box Culvert : 6 No

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Gorgram, Mazarpara. Shakpara, Bhababanigonj Existing road land width : 8.00m – 14.00m Terrain : Plain Configuration : Carriage way 3.70m with 0.5m earthen shoulder Box Culvert : 3 Nos	
58	Nilphamari	Sayedpur	Taraganj G.C.-Porarhat G.C. Via Hazarihat G.C (ID : 173852001)	Length : 17.750 km Starting Point : Taraganj G.C Ending Point : Tangonmari hat Existing road land width : 10.00m – 15.00m Terrain : Plain Configuration : Carriage way 3.70m with 0.9m earthen shoulder Box Culvert : 25 Nos Pipe Culvert : 10 Nos U Drain: 2 Nos	Length : 17.750 km Configuration : Carriage way 5.50 with 0.90m earthen shoulder Cross Drain : 7 Nos Box Culvert : 12 nos
59	Nilphamari	Domar	Domar GC to Ambari Alsiar Bazar RHD road GC via Azizarerhat (ID : 173152008)	Length : 13.46 km Starting Point : Domar GC Ending Point : Ambari Alsiar Bazar Existing road land width : 10.00m – 15.00m Terrain : Plain Configuration : Carriage way 3.70m with 0.9m earthen shoulder Box Culvert : 14 Nos U Drain: 12 Nos	Length : 13.460 km Configuration : Carriage way 5.50 with 0.90m earthen shoulder Cross Drain : 7 Nos U Drain : 8 nos Surface drain : 140m
60	Nilphamari	Domar	Domar Bazar G.C-Basunia Hat GC.road (ID : 173152003)	Length : 6.7 km Starting Point : Domar Bazar RHD at Senior Madrasha Ending Point : Dabigonj Nilphamair road at Snahar bottloy Major Settlement : Chikonmati, Jalir more, Bosunia para, Khaturia, Bosunia GC, Babigonj, Existing road land width : 12.00m – 16.00m Terrain : Plain Configuration : Carriage way 3.70m with 0.9m earthen shoulder Box Culvert : 8 Nos	Length : 6.70 km Configuration : Carriage way 5.50 with 0.90m earthen shoulder

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Slab culvert : 3 Nos U Drain: 1 Nos	
61	Nilphamari	Domar	Boragarihat at RHD road to Baburhat GC via Motukpur UPC at Sayllar ghat (Domar Part) (ID: 173152009)	Length : 4.25 km Starting Point : Boragarihat more Ending Point : Sayllar ghat Major Settlement : Musarmore, Dangapara, Panga Chowpothi Existing road land width : 12.00m – 16.00m Terrain : Plain Configuration : Carriage way 3.70m with 0.9m earthen shoulder Box Culvert : 3 Nos Pipe culvert : 4 Nos U Drain: 4 Nos	Length : 4.25 km Configuration : Carriage way 5.50 with 0.90m earthen shoulder Box Culvert : 1 Nos
62	Chuadanga	Damurhuda	Memnagar RHD-Karpashdanga G.C via Buichitala (ID : 218312006)	Length : 24.650 km Starting Point :At Memnagar RHD Ending Point : At Karpashdanga GC Major Settlement: Memnagar, Paschim Ramnagar, Parkishnapur, Sultanpur, Chaighoria, Jhajhaddanga, Nastipur, Kamarpara Baradi, Hoibatpur, Sotoboldia, Boroboldia, Buichitola, Fulbari, Chakulia, Thakurpur, Aramdanga, Karpashdanga, Existing road land width : 10.00-14.00m Terrain : Plain Configuration : Carriage way 3.66m with 0.60m earthen shoulder Slab culvert : 7 Nos RCC Girder Bridge : 4 Nos Box Culvert : 10 nos Pipe Culvert : 9 Nos Hydraulic Structure : 1 Nos U drain : 32 Nos	Length : 13.106 km Configuration : Carriage way 5.50 with 0.9m earthen shoulder U-Drain : 29 nos Box Culvert : 2 Nos Surface Drain : 1009 m
63	Chuadanga	Damurhuda	Damurhuda G.C-Bhogiratpur G.C (ID : 218312005)	Length : 11.375 km Starting Point :At Chitla More Ending Point : At Bhogiratur GC Major Settlement: Chitla, Juranpur, Holgoldanga, hemayetpur, Berbari, Notipota, Bhogiratpur,	Length : 11.375 km Configuration : Carriage way 5.50 with 0.9m earthen shoulder U-Drain : 1 nos Surface Drain : 435 m

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Existing road land width : 11.00-14.00m Terrain : Plain Configuration : Carriage way 3.66m with 0.60m earthen shoulder Slab culvert : 2 Nos RCC Girder Bridge :1 Nos Box Culvert : 5 nos Pipe Culvert : 1 No Hydraulic Structure : 1 Nos U drain : 12 Nos	
64	Chuadanga	Alamdanga	Alamdanga-Sorajgong G.C (Alamdanga Portion) [Alamdanga] (ID : 218072002)	Length : 18.00 km Starting Point :At Alamdanga Ending Point : At Sorajgonj GC Major Settlement: Aushpur, Belgachi, Khejurtola, Badamari, Jahapur, Chilabalki, Raisa, Parlokhipur, Railokhipur, Ramdeyal, Khakorbazar, Ashanondopur Existing road land width : 10.00-12.00m Terrain : Plain Configuration : Carriage way 3.66m with 0.90m earthen shoulder Bridge : 2 Nos Box Culvert : 10 nos Pipe Culvert : 1 No Hydraulic Structure : 2 Nos U drain : 17 Nos	Length : 18.00 km Configuration : Carriage way 5.50 with 0.9m earthen shoulder U-Drain : 6 nos Box culvert : 1 Nos
65	Thakurgaon	Thakurgaon-S	Thakurgaon-Farabari GC Road. (ID#194942005)	**Length : 8.50** km **Starting Point :** Senua Graveyard **Ending Point :** At Farabari Bazar **Major Settlements :** Borunagaon Borunagaon Eaqubpur,Bagpur, Chawrangi ,Kalukhetro, Dhakhin, Botina, Farabari **Existing road land width :** 10.00m – 15.00m **Terrain :** Plain **Configuration :** Carriage way 3.70m with 0.90m earthen shoulder **Cross** Drain: 1 No	**Length :** 8.50 km **Configuration :** Carriage way 5.5 with 0.9m earthen shoulder **Box Culvert :** 3 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Bridge : 2 Nos **Box Culvert :** 4 Nos	
66	Thakurgaon	Haripur	Jadurani GC-Dangipara UP Office Road. (ID : 194513004)	**Length : 4.280** km **Starting Point :**At Jadurani (Shillar) **Ending Point :** At Shehipur (Sautalpara) **Major Settlements :** Shiallar, Faldangi, Ranahatta (Chaurangi) Bazar, Shehipur **Existing road land width :** 10.00 - 12.00m **Terrain :** Plain **Configuration :** Earthen Road Box **Culvert** : 2 Nos Slab Culvert : 3 Nos Pipe Culvert : 5 Nos Cross Drain : 8 Nos	**Length :** 4.280 km **Configuration :** Carriage way 3.70 with 1.00m earthen shoulder **U Drain**: 9 Nos **Box Culvert :** 1 Nos
67	Thakurgaon	Ranisankail	Baliadangi GC - Dhirganj (Horipur) via Dharmogarh Check Post Road. (ID: 194862007)	**Length : 5.803** km **Starting Point :**At Puler hat **Ending Point :** At Dhumpukur **Major Settlements :** Pulhat Bazar , Jagdal Dholpukur ,Jorpukur, Koloni, Bakhradangi, Check post Bazar, Razadighi, Chikni, Sukani, Dhumpukur. **Existing road land width :** 10.00 - 12.00m **Terrain :** Plain **Configuration :** Carriage way 3.70 with 0.90m earthen shoulder Box **Culvert** : 4 Nos Slab Culvert : 2 Nos RCC Girder Bridge : 1 Nos Cross Drain : 1 Nos	**Length :** 5.803 km **Configuration :** Carriage way 5.50 with 0.90m earthen shoulder **U Drain**: 4 Nos **Box Culvert :** 4 Nos
68	Thakurgaon	Pirganj	Pirganj-Nasibganj G.C Road (ID: 194822001)	**Length : 7.280** km **Starting Point :**At Pirganj West Chowrasta **Ending Point :** At Nasibganj Hat GC **Major Settlements :** Priganj, Daulatpur, Sengaon. **Existing road land width :** 9.01 - 14.55m **Terrain :** Plain **Configuration :** Carriage way 3.70 with 0.90m	**Length :** 7.280 km **Configuration :** Carriage way 5.50 with 0.90m earthen shoulder **Box Culvert :** 1 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				earthen shoulder Box **Culvert** : 4 Nos Cross Drain : 1 Nos	
69	Thakurgaon	Baliadangi	Charol UP Office(Lahiri GC)-Dogachi hat via Patilabhasha Road **(**ID : 194083011)	**Length : 8.30** km **Starting Point :**At Lahiri GC **Ending Point :** At Dogachi hat **Major Settlements :** Choto Singia, Votepara, Khalipur, Dogachi, **Existing road land width :** 13.00 - 17.00m **Terrain :** Plain **Configuration :** Earthen road Box **Culvert** : 5 Nos Cross Drain : 2 Nos Slab Culvert : 4 Nos	**Length :** 8.30 km **Configuration :** Carriage way 3.70 with 1.00m earthen shoulder **Box Culvert :** 6 Nos
70	Thakurgaon	Baliadangi	Baliadangi-Lahiri G.C. Road (ID: 194082001)	**Length : 7.063** km **Starting Point :**At Baliadangi Chowrasta **Ending Point :** At Lahiri GC **Major Settlements :** Barabari, Dangi, Goalkari, Jaunia, Choto Singia **Existing road land width :** 15.00 - 20.00m **Terrain :** Plain **Configuration :** Carriage way 4.88 with 0.40m earthen shoulder Box **Culvert** : 2 Nos Cross Drain : 2 Nos Slab Culvert : 2 Nos Bridge : 2 Nos	**Length :** 7.063 km **Configuration :** Carriage way 5.50 with 0.90m earthen shoulder **Box Culvert :** 1 Nos Slope Drain : 16 Nos Surface drain : 200m
71	Naogaon	Atrai	Ahashanganj GC-Bandaikhara GC. (ID : 164032008)	**Length : 14.55** km **Starting Point : At Gondogohali mauza** **Ending Point : At Bandaikhara GC** **Major Settlements :** Gondogohali, Lalua, Sholia, Baghmara, Kochua, Nandonali, Bandaikhara **Existing road land width :** 7.00m – 12.00m	**Length :** 5.975 km **Configuration :** Carriage way 4.90 with 2.40m earthen shoulder

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Terrain : Plain **Configuration :** Carriage way 3.70 with 0.90 - m earthen shoulder **Regulator** : 2 Nos	
72	Naogaon	Atrai	Kashiabari GC - Kaliganj GC (ID: 164032006)	Length : 11.882 km Starting Point : Kashiabari GC Ending Point : Muskipur Major Settlement: Bhonpara, Balaramchak, Chak Banka, Banka, Palsha, Naouduli, Dighirpir, Birsimlla, Maniari, Muskipur, Existing road land width : 20.00m – 22.00m Terrain : Plain Configuration : Carriage way 4.90 with 0.65m soft shoulder from Ch. 0+00 to Ch, 11+634 and Carriage way 3.70 with 0.65m soft shoulder from Ch. 11+634 to Ch, 11+882 Box Culvert : 4 Nos RCC Girder Bridge : 5 Nos Slab Culvert : 3 Nos Hydraulic Structure : 2 Nos	Length : 11.882 km Configuration :Carriage way 4.95 with 1.21m soft shoulder
73	Naogaon	Atrai	Kashiabari GC - Smaspara GC Via Islamgati hat (ID: 164032010)	Length : 9.655 km Starting Point : Gurnai Mauza Ending Point : Samspara GC Major Settlement: Gurnai, Islamgati, Raninagar, Sridhorgunai, Yejnandi, Chakradhar, Samspara Existing road land width : 18.00m – 20.00m Terrain : Plain Configuration : Carriage way 4.90 with 0.65m soft shoulder Hydraulic Structure : 1 Nos	Length : 9.655 km Configuration :Carriage way 5.5 with 0.90m soft shoulder
74	Naogaon	Manda	Nurullabad GPS R&H - Jothbazar - Bandaikhara GC Road. (ID: 164472012)	Length : 9.405 km Starting Point : RHD Road & Nurullabad GPS More Ending Point : At Mitapur Ghat More (Bandaikhara GC) Major Settlement: Par Nurullabad,Bonkura,Chalk balu,vorotto shibnagar ,ChakHarinarayanpur,Daspara,Chakrampur, Koylabari,	Length : 9.405 km Configuration :Carriage way 3.70m with 0.90m soft shoulder

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Kornabhag,Shorbari, khordobandaikhara Existing road land width : 17m – 24m Terrain : Plain Configuration : Carriage way 3.00m with 0.50m soft shoulder from Ch. 0+00 to Ch. 1+000 and Carriage way 3.70m with 0.60m soft shoulder from Ch. 1+000 to Ch. 10+500 RCC girder Bridge: 1 No	
75	Naogaon	Manda	Chowbaria GC - R&H Santa bridge More (ID : 164472015)	Length : 19.00 km Starting Point : Chowbaria GC Ending Point : R&H Santa bridge More Major Settlement: Chokdah, Shimladah, Balaketra, Srekola, Sursurinia, sugunia, rajenrobati, kochra, nolgor, poranpur, holudgor, chokkesob Existing road land width : 17m – 24m Terrain : Plain Configuration : Earthen road Hydraulic Structure : 6 Nos	Length : 19.00 km Configuration : Carriage way 3.70m with 0.90m soft shoulder
76	Naogaon	Niamatpur.	Chhatra GC - Shibpur GC. (ID : 164692004)	Length : 12.300 km Starting Point : End point of Mohadebpur GC – Chatra GC Ending Point : Shibpur More R&H road Major Settlement: Chatra Ghatpara, Charagipara, Notipukur, Begunbari, Bamoin Deripara, Bamoin School para, Damapara, Chilla Dighirpar, Kuntiol, Belin More, Kapastia, Hazinagar, Shibpur Existing road land width : 17m – 24m Terrain : Plain Configuration : Carriage way 3.70m with 0.90m soft shoulder Box culvert : 22 Nos Slab Culvert : 1 Nos U Drain : 1 Nos	Length : 12.300 km Configuration : Carriage way 5.50m with 0.90m soft shoulder
77	Gopalgonj	Muksudpur	Bonogram GC-Bhamondanga Bazar-Dignagar R&H	**Length : 12.210** km **Starting Point :**At Bonogram RHD road **Ending Point :** At Dignanar	**Length :** 11.268 km **Configuration :** Carriage way 3.70 with 0.9m earthen shoulder

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			(ID : 335582009)	**Major Settlements :** Aikdia, Paikdia, Chowgacha, Baghadia, Naora, Bamunia, Khas-Baghadia, Boroihati, Baghail, Baghat **Existing road land width :** 11.08 - 13.50m **Terrain :** Plain **Configuration :** Carriage way 3.70m with 0.36m earthen shoulder Box **Culvert** : 2 Nos RCC Girder Bridge :10 Nos Hydraulic Structure : 1 Nos	
78	Gopalgonj	Muksudpur	Gohala UP office (Monirkandi)-Jalirpar GC Road (ID : 335583010)	**Length : 5.50** km **Starting Point :**At Gohala UP Office **Ending Point :** At Jalirpar GC **Major Settlement:** Gohala, Munirkhandi, Aruakandi, Acharpara,Jalirpar **Existing road land width :** 12.00 - 16.00m **Terrain :** Plain **Configuration :** Carriage way 3.7m with 0.6m earthen shoulder Box **Culvert** : 4 Nos RCC Bridge :4 Nos	**Length :** 5.221 km **Configuration :** Carriage way 3.70 with 0.6m earthen shoulder U drain : 4 Nos Box Culvert : 1 nos
79	Gopalgonj	Kashiani	Nizam kandi-Gohala Road (ID:335433011)	**Length : 3.055** km **Starting Point :**At Nizam kandi **Ending Point :** At Gohala UP **Terrain :** Plain **Configuration :** Carriage way 3.00m with 0.90m earthen shoulder **Cross Drainage Structure** : 4 Nos	**Length :** 3.055 km **Configuration :** Carriage way 3.70 with 0.9m earthen shoulder
80	Rajbari	Pangsha	Pangsa HQ-Mrigi G.C. Road(UZR) (ID: 382732002)	**Length : 10.9** km **Starting Point :** At Pangsha H/Q (Pangsha Bazar Rail Gate). **Ending Point :** At Laribari Bazar Bridge. **Major Settlement:** TBisnopur, Malonchi, Bagduli, Puijor & Asurhat. **Existing road land width :** 10.00-16.00m **Terrain :** Plain **Configuration :** Carriage way 5.5m(Ch. 0-950),	**Length :** 10.9 km **Configuration :** Carriage way 5.5 with 0.9m earthen shoulder Cross Drainage Work : Nil

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				3.60m(ch. 950-5770),5.5m (ch. 5770-7749 3.66m(ch. 7749-10006m) with 0.60m hard shoulder(ch 0-7749) 0.4m (7749-10006m) RCC Girder Bridge :6 Nos	
81	Rajbari	Pangsha	Jasai UP-Joygram-Machpara UP. Road(UNR) (ID: 382733015)	**Length : 8.57** km **Starting Point :**At Jasai Bazar More **Ending Point :** At Char Gopinathpur **Major Settlement:** Jasai West para, Shamaspur, Monirampur, Sadbari, Shagdaha & Char Gopinathpur **Existing road land width :** 9.00m - 12.00m **Terrain :** Plain **Configuration :** Carriage way 3.70m with 0.90m earthen shoulder RCC Girder Bridge :1 Nos Box Culvert : 1 nos	**Length :** 4.279 km **Configuration :** Carriage way 3.70 with 0.9m earthen shoulder Cross Drainage Work : Nil
82	Rajbari	Kalukhali	Mrigi G.C-Sonapur G.C. Road (UZR) (ID: 382772007)	**Length : 7.6** km **Starting Point :**At Near Bothundia Bazar **Ending Point :** At Sonapur (G.C) Bazar **Major Settlement:** Bothundia, Betbaria, Sonapur (G.C) Bazar, **Existing road land width :** 9.00m - 12.00m **Terrain :** Plain **Configuration :** Carriage way 3.40m with 0.90m earthen shoulder RCC Girder Bridge :3 Nos Pipe Culvert : 1 nos	**Length :** 6.688 km **Configuration :** Carriage way 4.9m with 1.0m earthen shoulder Surface Drain : 158m
83	Rajbari	Kalukhali	Belgachi G.C.-Sonapur G.C. Road (UZR) (ID : 382772009)	**Length : 10.46** km **Starting Point :**At Damukdia **Ending Point :** At Modapur Bazar **Major Settlement:** Damukdia, Gandhimara, Gopalpur, Modapur Bazar, **Existing road land width :** 14.00m – 16.00m **Terrain :** Plain **Configuration :** Carriage way 3.70m with 0.60m earthen shoulder RCC Girder Bridge :4 Nos	**Length :** 3.505 km **Configuration :** Carriage way 4.9 with 1.0m earthen shoulder Surface Drain : 194m

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
84	Rajbari	Goalanda	Uttar Ujanchar at NHW-Khalil mondoler Hat G.C via Ujanchar G.C.(ID : 382292003)	Length : 7.960 km Starting Point : At Uttar Ujanchar Ending Point : At Khalil mondoler Hat G.C Major Settlement: Uttar Ujanchar, Dakhin Ujanchar, Purbo Ujanchar Existing road land width : 14.00-17.00m Terrain : Plain Configuration : Carriage way 3.70m with 0.60m earthen RCC Girder Bridge : 2 Nos Box Culvert : 1 Nos Pipe Culvert : 1 Nos	Length : 7.960 km Configuration : Carriage way 3.70 with 0.90m earthen shoulder Box Culvert : 1 Nos
85	Rajbari	Baliakandi	Baliakandi-Mrigi GC. Rd. Via Narua GC. (UZR) (ID : 382072002)	Length : 12.3 km Starting Point :At Baliakandi GC Ending Point : At Kakukhali Upazila Border Major Settlement: Baliakandi, Bockchor, Nischintopur,Shalmara, Garakola, Narua, Bil Taka Para, Shalki, Patkiabari, Choto Ghee-Komla, Baro Ghee Kamla Existing road land width : 10.00-14.00m Terrain : Plain Configuration : Carriage way 3.66m with 0.90m hard shoulder RCC Girder Bridge : 2 No Box Culvert : 4 Nos Sluice Gate : 2 Nos	Length : 12.30 km Configuration : Carriage way 5.5 with 0.9m earthen shoulder Surface Drain : 210m
86	Rajbari	Baliakandi	Baliakanndi GC-Modhukhali RHW. via Maghchami. Road (UZR) (ID : 382072003)	Length : 4.57 km Starting Point :At Baliakandi GC Ending Point : At Modhukhali Upazila Border Major Settlement: Baliakandi, Moukuri, Bhimnagar, Khordo Megchami. Existing road land width : 10.19m – 14.70m Terrain : Plain Configuration : Carriage way 3.30m with 1.1m earthen shoulder RCC Girder Bridge : 2 Nos Pipe Culvert : 2 Nos Slab Culvert ; 4 Nos	Length : 4.570 km Configuration : Carriage way 3.30 with 0.9m earthen shoulder Box Culvert : 2 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
87	Bogra	Kahaloo	Dupchachia-Namoja via Tindighi GC Road (Kahaloo) (UZR) (ID:110542005)	**Length :11.750 km** **Starting Point :**Bogra-Naogaon NHW at Baromile Bazar **Ending Point :Namoja math (Dhunot part)** **Major Settlement:** 1.Kumarpara, 2.Birkedar Kharchak, 3. Chak Mahmudpur, 4.Kalai Kumarpara,5.Kalai Khamarpara6.Kunnipara,7.Naodapara 8.Choto Vadahar 9.Kaora **Existing road land width :** 15.09m – 21.55m **Terrain :** Plain **Configuration : C**arriage way 5.50m with 1.18m earthen shoulder Box Culvert : 15 Nos Pipe Culvert : 7 Nos	**Length :** 11.750 km **Configuration :** Carriage way 5.5m with 1.18m earthen shoulder RCC Culvert : 1 No
88	Bogra	Kahaloo	Ranirhat-Durgapur Road. (UZR) (ID: 110542001)	**Length :10.675km** **Starting Point :Ranirhat** **Ending Point :Durgapur** **Major SettlementDehor, boro Chapor, Eruil, Dumorgram, Matihas, Moharaja, Sabanpur, Haturpura, Durgapur** **Existing road land width : 08m-24m** **Terrain : Plain** **Configuration : Carriage way 5.50m(0+00-2+257)** **3.7m(2+257-3+900)** **4.9m(3+900-10+050)** **7.0m(10+050-10+670)** **with 1.18m earthen shoulder** **Box Culvert : 15 Nos** **Pipe Culvert : 3 Nos**	**Length : 10.675 km** **Configuration : Carriage way 5.5m with 1.18m earthen shoulder** **RCC Culvert : 1 No**
89	Bogra	Adamdighi	Nasratpur-Murail-Raykali-Beragram (Tilokpur) Road (UZR) (ID:110062006)	Length : 6.70km Starting Point :At Nasratpur Bazar Ending Point :At Binahali Major Settlement: Nasraratpur, Binshara, Khariakandi, Tholpara, Muroil, Pushinda, Aurjungari, Dhamail,	Length : 6.70km Configuration : Carriage way 5.5m with 1.18m earthen shoulder U Drain : 9 No

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Delunja and Binahali Existing road land width : 9.50m – 13.50m Terrain : Plain Configuration : Carriage way 3.6m with 0.6m earthen shoulder Box Culvert : 5 Nos	
90	Bogra	Sonatola	Horikhali GC-Hatsharpur GC via Charpara hat (Sonatola) (UZR) (ID:110952006)	Length : 10.010 km Starting Point :At Horikhali GC Ending Point :At Porapaikor (Salur Ghat) towards Hatsherpur Major Settlement: Horikhali, Pakulla, Huakua , Charpara Bazar, Porapaikor Existing road land width : 9.50m – 13.50m Terrain : Plain Configuration :Existing Carriage way 3.0m(00-4620m)(7070-7220) 3.60 with 0.6m(4200-7070) (7220-9700) earthen shoulder 0.9m(00-4620m)(7070-7220) 0.6m(4200-7070) (7220-9700) Box Culvert : 9 Nos RCC Bridge : 3 Nos	Length :10.010 km Configuration : Carriage way 5.5m with 0.9m earthen shoulder U Drain : 2 Nos
91	Bogra	Shahajanpur	Sonahata GC(Dhunot) - Tangramagur RHD via Amrul UP - Naimile (UZR) (ID: 110962006)	Length :8.870 km Starting Point : At Gujar Khal Eidgah-math Ending Point : Naimile. Major Settlement: Aria, Maria,Amrul, Boronagar, Rajarampur, Polipolash, Narchi Existing road land width :7.0m – 9.0m Terrain : Plain Configuration : Carriage way 3.00m with 0.90m earthen shoulder Cross Drain : 19 Nos	Length : 8.870 km Configuration : Carriage way 3.7 with 0.9m earthen shoulder
92	Bogra	Sadar	Matidali NHW-Peergacha GCM (From RHD) (UNR) (ID : 110202001)	**Length :9.1 km** **Starting Point :**Matidali Bazar **Ending Point :Pirgacha GCM** **Major Settlement: Mohastan, Gabtoli, Sonatola, Sakunpukur Rail Station** **Existing road land width :** 15.09m – 21.55m	**Length :** 9.1 km **Configuration :** Carriage way 5.5m with 1.8m earthen shoulder Box Culvert: 1 Nos

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
				Terrain : Plain **Configuration : C**arriage way width 3.7m with 0.5m Shoulder Box Culvert :4 Nos	
93	Natore	Lalpur	Bagatipara-Dayarampur-Abdulpur-Lalpur Road (Lalpur Part) (ID : 169442001)	**Length** 16.46 km **Starting Point :**Dhupail **Ending Point :**Madhobpur **Major Settlement:Dhupail, Abdulpur Rail Station, Salampur, Kachua, Lalpur** **Existing road land width :** 8.00m – 16.00m **Terrain :** Plain **Configuration : C**arriage way 3.7 m with earthen soft shoulder 1.2m RCC Bridge : 10 Nos	**Length :** 16.46 km **Configuration :** Carriage way 5.5m with 0.9m earthen shoulder
94	Natore	Lalpur	Lalpur-Bilmaria-Durduria Road (ID:169442006)	**Length** 11.00 km **Starting Point :**Lalpur RHD Road **Ending Point Bilmaria Bazar** **Major Settlement:Ramkrishnapur, Baknai, Mominpur, Mohorkoia** **Existing road land width :** 13.09m – 18.55m **Terrain :** Plain **Configuration : C**arriage way 3.7 m with earthen soft shoulder 1.2m U Drain : 1 No	**Length :** 11.00 km **Configuration :** Carriage way 5.5m with 0.9m earthen shoulder
95	Natore	Baraigram	Rajapur GC - Zonail GC Road (ID : 169152002)	**Length 18.18 km** **Starting Point :**At Rajapur Bazar **Ending Point :**At Jonail bazaar Bridge **Major Settlement:** Rajapur Purbo para ,Akbar more, Dashgream, Chandai, Kushmile,Garfa Bazar, **Existing road land width :** 15.09m – 19.75m **Terrain :** Plain **Configuration : C**arriage way 3.7 m with earthen soft shoulder 1.2m RCC Bridge : 10 Nos	**Length :** 18.18 km **Configuration :** Carriage way 5.5m with 0.9m earthen shoulder
96	Natore	Gurudaspur	Nazirpur GC - Moukra GC Road	**Length 9.00 km** **Starting Point :**At Nazirpur Bazar	**Length :** 9.00km **Configuration :** Carriage way 5.5m with

Sl No.	District	Upazila	Road and Road ID	Existing Road's Salient Features	Improvement Proposal
			(ID:169412003)	**Ending Point :**At moukra bazar **Major Settlement:Nazirpur, brikasow, Rashidpur, Chakantopur, Roypur, Khamarputhia, Noapar, Moukara Bazar** **Existing road land width :** 15.09m – 19.75m **Terrain :** Plain **Configuration : C**arriage way 3.66 m with earthen soft shoulder 1.2m	0.9m earthen shoulder

Appendix B. ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING FORMS FOR RURAL ROAD*

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
A. Pre-Construction Phase						
Finalization of alignment	• Consult with local people to finalize the alignment especially to avoid landslide area, to decide location for culverts and other drainage structures. • Avoid excessive cut and fill and road should be aligned to follow natural topography. • In case of hilly/mountainous area, alignment selection should follow provisions of Environment Friendly Road Construction ("LGED's Road Design Standard 2005- Rural Road") and should refer to geological survey data to identify landslide prone area, and settlement/loose rock areas. • In flood prone region/areas, refer to hydrological data to finalize provision for culvert drainage structures especially for alignment that intersects/crosses ground and surface water flow. • Avoid the requirement of forestland for road construction. In case unavoidable, minimise it to extent possible by exploring alternative options.	All through the alignment of proposed rural road	Prior to commencing any construction works	Part of Project Cost	PD, RCIP	MoLG&RDC

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	• In case, requirement of forestland is unavoidable, determine the legal status of forestland and initiate actions to seek permits for diversion of forestland for non forest uses (road construction). • Forest clearance is to be obtained in accordance with the provisions of Department of Forest (DOF) under the Ministry of Forest and Environment (MoFE) and all conditions related with the clearance has to be implemented. • In case alignment has trees, which are known to be nesting/breeding places for migratory birds, contact the Department of National Park and Wildlife Conservation for seeking permits and details about non-breeding seasons. In any case, no tree shall be cut in such stretches and construction works are to be strictly scheduled for non-breeding/nesting season and all permit conditions are to be complied. • Avoid or minimize tree felling, acquisition of agricultural land, shifting of shrines/temples, disturbance to community ponds, community resources, burial grounds, etc. to the extent possible through evolving alternate alignment options.					

*This is a Standard Environmental Management Plan for the construction of rural road projects under the RCIP, Bangladesh. This standard EMP and the Environmental Checklist will be included among contract documents. The contractor must be aware of his responsibilities indicated in this EMP and must ensure that

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
the necessary budget for applicable and appropriate mitigating measures is incorporated in the contractor's cost. The contractor should show also the indicative costs, if possible.						
Land Transfer	• Land acquisition, resettlement and rehabilitation, poverty alleviation programs for affected people and all other related issues are addressed in Social Impacts and Resettlement & Rehabilitation report.	All through the alignment of proposed rural road (as applicable)	Pre construction Phase	Encumbrance- free land to be made available by the State Government	LGED and PD	MoLG&RDC
B. Construction Phase						
Land clearing operations	•The road land width requiring clearing shall be clearly demarcated on ground. • During land clearing operations, topsoil shall be collected, preserved, and reused as a base for turfing of embankment slopes or development of barren areas along roadside.	All through the alignment of proposed Rural road (as applicable)	Pre construction Phase	Encumbrance- free land to be made available by the contractor Relocation of utilities are to be	All facilities are to be planned and implemented by PMU and/or contractor as per the conditions of	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	• Trees falling within roadway width and other vegetative cover are to be removed. • Small temples, shrines if any is within the road land width, the same may be shifted to adjacent areas in consultation with local community leaders. • During clearing operations, any treasure trove, slabs with epigraphically evidence or edicts, sculptural or any material found and appear to have historical importance, it should be brought to the notice of Department of Archaeology (DOA), Bangladesh, and instructions of this Department, if any, must be followed. • All public utilities like power transmission cables, telephone cables, water/sewerage lines, drains, tube wells etc falling within road land width shall be inventoried, and arrange for relocation /shifting to adjacent areas in consultation with the respective agencies/authorities. • Establish and maintain interaction with local community to ensure that no social resentment sets in due to operations.			undertaken by respective departments and costs are to be reimbursed	civil works under approval by the DSMC	

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	• Contractors shall comply with the National Cultural Policy 2006 and Laws of Archeology -2015 (draft) and also Guidelines for Protecting Physical Cultural Properties					
Establishment of temporary office and storage area	•The temporary office and storage area for construction works shall be located away from human settlement areas (minimum 500 m) and forest areas (minimum 1 km). • The office and storage areas shall preferably be located on barren/waste lands and conversion of agricultural/cultivable lands for office and storage areas shall not be allowed under any circumstances. • All fuel oil/lubricants loading/unloading and storage areas shall be paved (impermeable), and have separate storm water collection system with facility for separation of oil/lubricants prior to discharge. • The temporary office and storage area shall be provided with adequate water supply, sanitation, septic tank/soak pit of adequate capacity so that it functions properly for the entire duration of its use. • After completion of construction works, the site shall be restored to its previous state by undertaking clean up operations.	As determined by contractor under approval of PMU	Pre construction and Construction Phase	To be included in contractor's cost	All facilities are to be planned and implemented by contractor	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
Construction Camp Sites	• The Contractor shall comply with the Factories Act (1965) and amendment thereof •The construction campsites shall be located away from any local human settlement areas and preferably located on lands, which are barren/waste lands. • The camps shall be located, at a minimum, 5 km from forest areas to deter trespassing of construction labour. • The campsites shall be provided with adequate water supply, sanitation and all requisite infrastructure facilities. This would minimize dependence on outside resources, presently being used by local populace and minimize undesirable social friction thereof. • The camps shall have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. • Construction camps shall be provided with kerosene/LPG to avoid dependence on firewood for cooking to the extent possible. • After completion of construction works, location of campsites shall be restored to its previous state by undertaking cleanup operations.	As determined by contractor under approval of PMU	Pre construction and Construction Phase	To be included in contractor's cost	All facilities are to be planned and implemented by contractor	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
Mobilization of construction materials - Stone aggregates, earth and construction water	• Stone aggregates, sands, and bricks shall be sourced only from licensed existing quarries and brick kiln. • A list of such existing quarries is available from responsible department/ authority for mining related works in each state. In case new quarries are to be opened, quarry license/permits are to be obtained from this department/authority. • In case, only stone crushing plants are to be installed near work sites, required permits are to be obtained and all conditions of permits are to be complied. • Ensure stone quarries and crushing units have pollution control system; occupational safety procedures/practices in place and regular inspection shall be carried to ensure compliance. This shall be a pre-condition for sourcing of materials from quarries/crushing plants. • Earth borrow areas identified during DPR stage shall be revisited to assess its environmental sensitivity and ensure it is not an ecologically sensitive areas. Permits are to be obtained from authorities and all permit conditions are complied.	As determined by contractor	Pre construction and Construction Phase	To be included in contractor's cost	All facilities are to be planned and implemented by contractor	PMU

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	• The borrow areas are to be demarcated with signboards and operational areas are to be access controlled. • Topsoil from borrow areas (first 30cm) are to be preserved and used for redevelopment of borrow areas or as a base for turfing along embankment slopes. • The borrow areas as an option may be converted into ponds wherever possible, which can be used for storage of rainwater. • Conversion of agricultural lands for borrowing earth is to be discouraged to the use possible unless warranted by local conditions. In such cases, written consent shall be obtained from the landowners. • All borrow area shall comply with the Environmental Assessment Guidelines for LGED Projects-2008.					
Mobilization of construction materials - Stone aggregates, earth and construction water	• Water for construction works shall NOT be drawn from sources, which serve routine needs of local people. • In case water is sourced from existing private tube wells, well owner shall be informed about the quantity and duration for which water drawls will be carried out and possible implications. Written consent for use of groundwater shall be obtained.					

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
(contd……)	• In case new tube wells are to be constructed, required concurrence from the PIU • In any case, care shall be taken not to source all requirements from one single source and no two sources (in case of tube wells) shall be less than 500 m from each other.					
Transportation of construction materials	• Existing tracks/roads are to be used for hauling of materials to extent possible. • The alignment of haul roads (in case of new ones) shall be finalized to avoid agricultural lands to the extent possible. In unavoidable circumstances, suitable compensation shall be paid to people, whose land will be temporarily acquired for the duration of operations. The compensation shall cover for loss of income for the duration of acquisition and land restoration. • Prior to alignment of new haul roads, topsoil shall be preserved or at least shall be used for any other useful purposes like using in turfing of embankment rather than allowing its loss by construction activities.	As determined by contractor	Pre construction and Construction Phase	To be included in contractor's cost	All facilities are to be planned and implemented by contractor	LGED Field offices

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	• Dust suppression along transportation links is to be ensured by deploying water tankers with sprinkling system are to be deployed along haul roads. • The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. Transportation links are to be inspected daily to clear accidental spillage, if any. • Precaution shall be taken to avoid inconvenience to the local community due to movement of materials.					
Diversion of traffic	• Frame appropriate traffic diversion schemes (in specific stretches as per progress of construction work) and implemented to avoid inconvenience due to construction works to present road users. • The traffic diversion signs should be bold and clearly visible particularly at night. • Diversion schemes are required to ensure smooth traffic flow, minimize accidents to road users during construction works.	All through the alignment of proposed rural road	Construction Phase	To be included in contractor's cost	Diversion schemes shall be prepared by Contractor and approved	LGED Field offices

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	• Provision shall be made for fencing and posting of signage wherever people, livestock and wildlife movement are expected.					
Cut and fill	• Finalisation of alignment plan and profile shall consider options to minimize excessive cuts or fills. The design shall as per the relevant Road Design Standard 2005 (Rural Road) and Environmental Assessment Guidelines for LGED Projects-2008. • The cut and fill quantities required for profile correction shall be balanced to the extent possible, to avoid dependence on earth from borrow areas.	All through the alignment of proposed rural road	Construction Phase	To be included in contractor's cost	The alignment plan and profile is to be reviewed by contractor, , if any changes are to be effected after approval PMU	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	• In both cases of cut and fill, top soil shall be preserved and reused for turfing of embankment slopes or redevelopment of borrow areas or any other areas in the vicinity of roads. • Under no circumstances, topsoil shall be allowed to be used as a fill material in road construction activities.					
Preparation of embankment and road base	• The road construction works will raise, extend and enlarge existing roadway/tracks all along the alignment. Therefore, mitigation measures to contain erosion and drainage problems are essential. • The engineering measures for countering soil erosion, slope protection, drainage wherever required shall be considered and implemented as per relevant Road Design Standard 2005 (Rural Road) and Environmental Assessment Guidelines for LGED Projects-2008. • Measures like selection of less erodable material for embankment construction, compaction, adequate embankment slopes and turfing shall be considered as per provisions and Technical Specifications for construction of Rural Roads, LGED.	All through the alignment of proposed rural road	Construction Phase	To be included in contractor's cost	The alignment plan and profile is to be reviewed by contractor, , if any changes are to be effected after approval PMU	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
Cross Drainage Structures	• The road construction will also require construction of several cross drainage structures, across streams/rivers flowing across the road. • Refer to hydrological studies to ensure that construction of drainage structures is not likely to alter drainage pattern, and discharge capacities of drainage structures are designed to facilitate smooth passage of water and heading up or flooding is avoided even in flood season. • Schedule the construction works to dry season so that impacts on water quality of stream/river is minimize or avoided. • Precaution shall be exercised to prevent oil/lubricant/ hydrocarbon contamination of channel bed during construction works. Spillage, if any, shall be immediately cleared with utmost caution to leave no traces. • Ensure all construction wastes are removed from work site and stream /river beds are to be cleaned up (at least 50 m on both upstream and downstream sides of water courses) after completion of construction but prior to onset of monsoon.	All through the alignment of proposed rural road	Construction Phase	To be included in contractor's cost	The alignment plan and profile is to be reviewed by contractor, , if any changes are to be effected after approval PMU	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
Tree Planting	• Tree planting operations shall be commenced immediately after completion of embankment compaction. • Tree plantation along the road shall be undertaken as per permit conditions issued by the Ministry of Forests, prior to tree felling. • The species shall be suitable for local climate and available. The concerned District Forest Officer can be consulted for selection of species and technical guidance, if required. • Proper care shall be taken to increase survival rate of saplings like regular watering, pruning, provision of tree guards, manure for better nourishment, etc. including timely replacement of perished saplings.	All through the alignment of proposed rural road (in stretches wherever applicable)	Construction Phase	To be included in contractor's cost	The tree plantation work can be entrusted to District LGED Office under the supervision of PMU	PMU
Hot Mix Plants and Laying of bitumen	• Hot mix plants shall be at least 500 m away from human settlements and preferably located on leeward side of most dominant wind direction.	As determined by contractor under	Construction Phase	To be included in contractor's cost	All facilities are to be planned and implemented by contractor	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	• Consent/permits to establish and operate are to be obtained from State Pollution Control Board and all permit conditions are to be implemented/complied. • The hot mix plants shall be set up on barren/waste lands and conversion of agricultural/cultivable lands for this purpose shall not be allowed under any circumstances. • All operational areas like storage, handling, loading, unloading areas shall be paved, and have separate storm water collection system with facility for separation of oil/lubricants prior to discharge. • The storm water from storage area shall not be directly discharged into any, near by water courses/drains. • The hot mix pants shall be provided with adequate water supply, sanitation, septic tank/soak pit of adequate capacity so that it functions properly for the entire duration of its use. • After completion of construction works, the site shall be restored to its previous state by undertaking clean up operations. • Hot mix plants shall have required measures for control of dust, air, and noise pollution as per regulatory limits of Ministry of Population and Environment measures. • Appropriate traffic diversion schemes shall be implemented during bitumen paving is under progress and all works shall be planned and swiftly completed to avoid inconvenience to road users.	approval of PIU				

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
Clean up of construction work Sites and Disposal of waste	• All operational areas under road construction works like work sites, office/storage area, work force camps, and borrow areas, shall be cleaned up and restored to its previous state soon after operations are complete. • All construction waste shall be disposed in approved areas. Local district authorities shall be consulted to determine disposal site and implement any conditions imposed while issuing permits. • Contractors shall comply with the Spoil Mass Disposal Management Guideline including the preparation of Disposal Plan of DOE.	Along all the alignment	Prior claiming the final payment	To be included in contractor's cost	Contractor as per approve plan.	Project Director, RCIP
Equipment/ vehicles deployed for Construction works	• All earthmoving and compaction equipment shall be operated as far away from vibration sensitive sites (residents, property and cultural heritage) strictly within ROW. All diesel run equipment/vehicles/ deployed for construction activities shall be regularly maintained for smooth operation, a measure contributing to air quality and noise. • Vehicles/equipment shall be periodically subjected for emission tests and shall have valid Department of Transport and Management NO POLLUTION CERTIFICATE. Revalidation of certificates shall be done annually. • All vehicles deployed for material movement shall be spill proof to the extent possible. In any case, all material movement routes shall be inspected daily twice to clear off any accidental spills.	As determined by contractor	Construction Phase	To be included in contractor's cost	All facilities are to planned and implemented by contractor	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
Occupational Safety and Health Hazards at Work and camp sites	• All Contractors shall comply with the Bangladesh National Building Code (BNBC)/ ADB's Occupational Health and Safety Guidelines • All personnel at work sites shall be provided with protective gears like helmets, boots, etc. so that injuries to personnel are avoided or minimized. • Children (less than 16 years) and pregnant women shall not be allowed to work under any circumstances. • No personnel shall be allowed to work at site for more than 10 hours per day (8-hour makes one work shift). • Workforce, likely to be exposed to noise levels beyond regulatory stipulated limits, shall be provided with protective gears like hear plugs etc and regularly rotated. • Dust suppression measures like sprinkling of water shall be ensured at all operations areas. • The construction camps shall have health care facilities for adults, pregnant women and children. • All construction personnel shall be subjected to routine vaccinations and other preventive/healthcare measures. • The work and campsites shall have suitable facilities for handling any emergency situation like fire, explosion, etc. • All areas intended for storage of hazardous materials shall be quarantined and provided with adequate facilities to combat	As determined by contractor	Construction Phase	To be included in contractor's cost	All facilities are to planned and implemented by contractor	Project Director, RCIP

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
	emergency situations. All required permits for storage of inflammable/hazardous materials are to be obtained. • The personnel in charge of such areas shall be properly trained, licensed and with sufficient experience. • The operational areas shall be access controlled and entry shall be allowed only under authorization. • The construction camps shall have in-house community/common entertainment facilities. Dependence of local entertainment outlets by construction camps should be discouraged/ prohibited to the extent possible.					
C. Operation Stage						
Air and Noise Quality	Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due vehicle movement. Speed limitation and honking restrictions may be enforced near sensitive locations.	Along all the alignment	Operation Phase	To be included in contractor's cost		PIU with Support from PCU
Site Restoration	All construction camp/temporary office/material storage areas are to be restored to its original conditions. The borrow areas rehabilitation will be ensured as per the agreed plan with the landowner. Obtained clearance from PIU and CSC before handling over the site to LGED.	Along all the alignment	Operation Phase	To be included in contractor's cost		PIU with Support from PCU

Project Activities	MITIGATION MEASURES	Location	Time Frame	Cost	Responsible for Implementation	Responsible for Monitoring
Hydrology and Drainage	Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions shall be regularly conducted	Along all the alignment	Operation Phase	To be included in contractor's cost		PIU with Support from PCU
Occupational Health and Safety	Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and T-intersection' warning sign shall be installed on the village road.	Along all the alignment	Operation Phase	To be included in contractor's cost		PIU with Support from PCU
Grievance Redress	Obtaining information from village level grievance redress committee, PIU as applicable	As applicable	Operation phase	To be incurred to PMU's cost		PIU with Support from PCU and PMU
Road Operation	Maintenance of vegetation and trees along roads Maintenance of awareness sign boards to slowdown driving near community areas and animal crossings Speed limitation restrictions are enforced near sensitive locations	Along all the alignment	Operation Phase	To be included in contractor's cost		PIU with Support from PCU

Table VIII.1: Environmental Monitoring Plan (EMoP)

Environmental Monitoring During Design and Pre-Construction Stage

Monitoring Responsibility: CONTRACTOR with Support from DES

Monitoring Frequency: Once prior to start of construction

Road Name /District Name: ……

Road Length: ……..

Report No.: ……

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Finalization of alignment	Ensure Road-Specific Environmental Checklist and Community Participation Framework Documents are prepared. Ensure the IEE report has been approved by the DOE. In case, requirement of forestland is unavoidable, determine the legal status of forestland and ensure the process of seeking Forest Clearance has been initiated by the PCU. Forest clearance is to be obtained in accordance with the provisions of DOF conditions related with the clearance has to be implemented Consult with local people to finalize the alignment specially to avoid landslide area, to	All through the alignment of each rural road	Approval of IEE Report Compliance to Conditions of Forest Clearance if applicable		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		decide location for culverts and other drainage structures. In case of hills and hillocks in Chittagong and Cox's Bazar districts, alignment selection should follow provisions of Environmental Conservation Act, 1995 and should refer to geological survey data to identify landslide prone area. Avoid excessive cut and fill and road should be aligned to follow natural topography. In case alignment has trees, which are known to be nesting/breeding places for migratory birds, contact Forest Department for seeking permits and details about non-breeding seasons. In any case, no tree shall be cut in such stretches and construction works are to be strictly scheduled for non-breeding/nesting season and all permit conditions are to be complied. Avoid or minimize tree felling, acquisition of agricultural land, shifting of shrines/temples, disturbance to community ponds, community resources, burial grounds, etc. to the extent possible through evolving alternate alignment options. Project shall not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO,				

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		and shall avoid any monuments of cultural or historical importance. Project will not pass through any designated wild life sanctuaries, national park, notified eco-sensitive areas or area of international significance such as protective areas designated under ECA 1995. Alignment finalization considering availability of right of way and in consultation with local people. ROW may be reduced in built up area or constricted areas to minimize land acquisition as per LGED Guidelines. Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure. The road shall follow natural topography to avoid excessive cut and fill.				
2.	Land Transfer	Confirm if the Land acquisition, resettlement and rehabilitation, poverty alleviation programs for affected people and all other related issues are addressed in Social Impacts and Resettlement & Rehabilitation report.	All through the alignment of each rural road	Confirm the status of land transfer (% of total)		
3.	Biological Environment – Tree Planting	All efforts shall be taken to avoid tree cutting wherever possible. Requisite permission from Forest Department shall be obtained for cutting of roadside trees.	Throughout the project section of the road	Confirm issuance of Forest Clearance		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		Provision of Compensatory Afforestation shall be made on 1:3 ratio basis. Permission shall be taken for diversion of any forest land if involved. Provision shall be made for additional compensatory tree plantation.				
4.	Planning for Land Clearing	The road land width shall be clearly demarcated on the ground. The utility and community structure shifting shall be planned in consultations and concurrence of the community. Tree felling shall be limited to those, which could not be saved even by design measures. The tree shall be cut with a prior permission of Forest department. The vegetation cover shall be removed and disposed in consultation with community. All public utilities shifting shall be planned with prior concurrence of respective agencies/authority and to the adjacent location approved by them.	All through the Rural roads excepting in stretches of habitations	Tree cutting permission from Forests Department Concurrence from community for utility, community structure, and vegetation cover removal		
5.	Shifting on Common Properties Resources	All efforts are made to minimize shifting of common utilities and community structures. The community structures/utilities, which can not be saved, will be shifted to adjacent area	As determined by contractor under	Assess compliance based on LGED's Guidelines		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		with the concurrence and in consultation with community.	approval of PIU and CSC			
6.	Cut and Fill, and Embankment Construction Design and Planning	The alignment design shall consider options to minimize excessive cuts and fills. The cut and fill quantities shall be used for embankment to minimize barrow earth requirement. The design shall be as per relevant LGED Guideline provisions for cut and fill, slope protection and drainage. Adequate provision shall be made for cross drainage structure for maintaining natural drainage pattern in the Project area and preventing soil erosion. Side drain for channelizing water to nearby natural drain in water stagnation /logging prone area. The top soil of the cut and fill area shall be used for embankment slope protection. Embankment will be designed above High Flood Level wherever, area is prone to flood.	All through the alignment of each rural road			
7.	Hydrology and Drainage	Provision of adequate cross drainage (CD) structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. The discharge capacity of the CD structure shall be designed accordingly.	Near all drainage crossing, canals and river crossings etc.			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		Provision of adequate side drainage shall be made in water stagnant/logging areas. The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. Elaborate drainage system shall be provided to drain the storm water from the roadway and embankment to ensure minimum disturbance to natural drainage of surface and subsurface water of the area. Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides. Provision of concrete road construction in habitat area with drainage of both side of the road shall be made as per the design provision and with adequate slope to prevent any water logging. Road level shall be fixed above HFL. Embankment slope stabilization measures shall be planned. Stabilization measures may include vegetative treatment, stone pitching, retaining wall where feasible, and bioengineering.				
8.	Establishment of Construction Camp,	Construction camp sites shall be located away from any local human settlements	As determined by	Location of Construction		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
	Temporary Office and Storage area	(minimum 0.5 km away) and preferably located on lands, which are not productive (barren/waste lands) presently. Similarly, temporary office and storage areas shall be located away from human settlement areas (minimum 500 m). The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. The construction camps shall be located at a minimum 0.5 km from forest land/areas to deter the construction labour in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 0.5 km from forest land/areas. The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. All construction camps shall have provision for kerosene/LPG so that dependence on firewood for cooking is avoided completely to the extent possible. The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children.	contractor under approval of PIC/PIU	camp with planning of requisite facilities and making provision of such facilities prior to start of construction. Compliance to LGED's Guidelines for Water Management for Labor Camp.		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		Personal Protective Equipment (PPEs) like helmet, boots, earplugs for workers, first aid and fire fighting equipment shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire. Provision shall be made for domestic solid waste disposal in a control manner. The recyclable waste shall be sold off and non-saleable and biodegradable waste shall be disposed through secured land filling. Provision of paved area for unloading and storage of fuel oil, lubricant oil away from storm water drainage.				
9.	Traffic Movement	The contractor will prepare appropriate traffic diversion scheme approved by respective PIU. This shall be implemented prior to start of construction to avoid any inconvenience to the present road users. This shall be implemented in other stretches of the road as per the progress of the construction work. The diversion plan should ensure smooth flow of traffic, minimize accidents to road users during construction works. Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and	As proposed under DPR and determined by contractor and approved by PIU/CSC			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		retro reflective in nature for good visibility in day and night both. Provision shall be made for fencing and posting of signage wherever people, livestock and wildlife movement are expected.				
10.	Occupational Health and Safety	Speed breakers (Rumble strips) shall be provided at sharp curves design and bends where the curve design speed is less than 40 km per hour in plain and rolling terrain. Speed breakers shall also be provided at regular intervals (150-200 m) through habitation area. The speed breakers shall be provided and directional sign boards installed at sites where reverse horizontal curves are closely spaced and speed reduction is required. Provision shall be made for Hazard markers at each end of all box culverts, river crossing causeways and similar CD structures. Shoulder side slopes shall not be steeper than 2H:1V unless stone pitching of the slopes is provided. Cement concrete pavement and V-shaped drain shall be constructed to the full width of the available roadway within densely populated habitation and as per feasibility.	Throughout the project section at the location determined by contractor and approved by CSC			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		Provision shall be made for Directional sight board shall be installed on all sharp curves and bends. At the main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. It is proposed to approach railways for adequate safety at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both side of the railway crossing.				
11.	Grievance Redress	Obtaining information from village level grievance redress committee, PIU as applicable	Each Sample road once.			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.

Environmental Monitoring During Construction Stage

Monitoring Responsibility: PIU with Support from CSC (also serves as self-monitoring report of the Contractor)

Monitoring Frequency: (First Report after third month of start of construction or 25% construction. Second report after ninth month of construction or 75% construction).

Project Details: …….

Road Stretch Name: …….

Monitoring Report Quarter No. …….

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Sourcing and Transportation of Construction Material (Aggregates, Earth)	**Borrow Earth:** The borrow earth shall be obtained from identified locations and with prior permission for landowner and clear understanding for its rehabilitation. LGED guideline should be used for selection of borrow pits and amount that can be borrowed. No earth shall be borrowed from agricultural land and already low-lying areas. A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal). Borrowing of earth will not be done continuously through out the stretch.	At Borrow sites and quarries (if required) location	Compliance to LGED guidelines and stated criteria, Permission from land owners, Rehabilitation of borrow areas Availability of valid consent of quarries		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		Ridges of not less than 8m widths will be left at intervals not exceeding 300m. Small drains will be cut through the ridges, if necessary, to facilitate drainage. The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside. The borrow area shall be rehabilitated as per the understanding arrived with the land-owner. The re-habilitation plan may include the following: Borrow pits shall be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation sloped will be smoothed and depression will be filled in such a way that it looks more or less like the original ground surface. Borrow areas might be used for aquaculture in case landowner wants such development. **Aggregate:** 177. The stone aggregate shall be sourced from existing licensed quarries and				

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		the later should follow the LGED Guidelines for Quarry Area Management Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU. Topsoil to be stockpiled and protected for use at the rehabilitation stage **Transportation of Construction Material:** Existing tracks / roads are to be used for hauling of materials to the extent possible. Prior to construction of roads, topsoil shall be preserved or at least shall be used for any other useful purposes like using in turfing of embankment rather than allowing its loss by construction activities. The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. In any case, the transportation links/roads are to be inspected at least twice daily to clear accidental spillage, if any.				
2.	Loss of Productive Soil, Erosion and Land Use Change	It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use before handing it over back to landowner. The top soil from the productive land (borrow areas, road widening areas etc.)	Throughout the road section			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		shall be preserved and reused for plantation purposes. It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. Cut and fill shall be planned as per LGED guidelines. All steep cuts shall be flattened and benched. Shrubs shall be planted in loose soil area. Recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration as instructed by the CSC. Soil erosion shall be visually checked on slopes and embankment areas. In case soil erosion is found, suitable measures shall be taken to control the soil erosion				
3.	Compaction and Contamination of Soil	To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. The productive land shall be reclaimed after construction activity.	Throughout the project section of the road			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. The non-biodegradable and recyclable waste shall be sold off. Fuel and lubricants shall be stored at the predefined storage location. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oil. All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fuelling areas, "oil interceptors" shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to authorized re-refiners.				
4.	Construction Debris and Waste	178. All excavated materials from roadway, shoulders, verges, drains, cross	Throughout the project section of the road			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		drainage will be used for backfilling embankments, filling pits, and landscaping. Unusable debris material should be suitably disposed off at predesignated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in secure manner at designated landfill sites only in an environmentally accepted manner. For removal of debris, wastes and its disposal guidelines provided by the CSC should be followed. Unproductive/wastelands shall be selected with the consent of the land owner and local authority. The dumping site should be of adequate capacity. It should be located at least 500 m away from the residential areas. Dumping sites should be away from water bodies to prevent any contamination of these water bodies.				
5.	Air and Noise Quality	Vehicles delivering loose and fine materials like sand and aggregates shall be covered. Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads,	Throughout the project section of the road			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		earthworks, stockpiles and asphalt mixing areas. Mixing plants and asphalt (hot mix) plants shall be located at least 500 m away and in downwind direction of the human settlements. Material storage areas shall also be located downwind of the habitation area. Hot mix plant shall be fitted with stack of adequate height (30m) or as may be prescribed by local authority to ensure enough dispersion of exit gases. Consent to establish and operate shall be obtained from local authority and comply with all consent conditions. Diesel Generator (DG) sets shall also be fitted with stack of adequate height. Low sulphur diesel shall be used in DG sets and other construction machineries. Construction vehicles and machineries shall be periodically maintained. The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers. Workers' exposure to noise will be restricted to less than 8 hours a day.				

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		Workers duty shall be regulated accordingly. Contractor shall comply with the GoB and World Bank OH&S Gudelines.				
6.	Groundwater and Surface Water Quality and Availability	The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. Water intensive activities shall not be undertaken during summer period to the extent feasible. Provision shall be made to road side drains with the nearby ponds for facilitating water harvesting if feasible, where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. Preventive measures like slope stabilisation, etc. shall be taken for prevention of siltation in water bodies.	Throughout the project section of the road specially near all drainage crossing, canals and river crossings etc.			
7.	Occupational Health and Safety	Verification of implementation of provision made at planning stage. Each worker is provided with requisite PPE Directional sight board shall be installed on all sharp curves and bends	Throughout the project section at the location determined by contractor and approved by PIU			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		At a main road, intersection or crossing "STOP" sign and 'Tintersection'warning sign shall be installed on the village road.				
8.	Grievance Redress	Obtaining information from Village level Grievance redress committee, PIU as applicable	Each sample roads once			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.

Environmental Monitoring During Operation Stage

Monitoring Responsibility: PIU with Support from PCU

Monitoring Frequency: (On completion of construction and after one month of first and second year of maintenance period)

Project Details: …….

Road Stretch Name: …….

Monitoring Report No.: …….

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Air and Noise Quality	Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due vehicle movement. Speed limitation and honking restrictions may be enforced near sensitive locations.	Throughout the project section at the location determined by contractor and approved by PIU			
2.	Site Restoration	All construction camp/temporary office/material storage areas are to be restored to its original conditions. The borrow areas rehabilitation will be ensured as per the agreed plan with the landowner. Obtained clearance from PIU and CSC before handling over the site to LGED.	Throughout the road stretch	Survivability report, land owner concurrence of land reversal		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
3.	Hydrology and Drainage	Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions shall be regularly conducted	Throughout the project section at the location determined by contractor and approved by PIU and CSC			
4.	Occupational Health and Safety	Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and T-intersection' warning sign shall be installed on the village road.	Throughout the project section at the location determined by contractor and approved by PIU and CSC			
5.	Grievance Redress	Obtaining information from village level grievance redress committee, PIU as applicable	Each sample roads once			
6.	Road Operation	Maintenance of vegetation and trees along roads Maintenance of awareness sign boards to slowdown driving near community areas and animal crossings Speed limitation restrictions are enforced near sensitive locations	Throughout the project section at the location determined by contractor and approved by PIU and CSC			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.

Environmental Monitoring During Operation Stage

Monitoring Responsibility: PIU with Support from PCU

Monitoring Frequency: (On completion of construction and after one month of first and second year of maintenance period)

Project Details: …….

Road Stretch Name: …….

Monitoring Report No.: …….

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Air and Noise Quality	Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due vehicle movement. Speed limitation and honking restrictions may be enforced near sensitive locations.	Throughout the project section at the location determined by contractor and approved by PIU			
2.	Site Restoration	All construction camp/temporary office/material storage areas are to be restored to its original conditions. The borrow areas rehabilitation will be ensured as per the agreed plan with the landowner. 179. Obtained clearance from PIU and CSC before handling over the site to LGED.	Throughout the road stretch	Survivability report, land owner concurrence of land reversal		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
3.	Hydrology and Drainage	Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions shall be regularly conducted	Throughout the project section at the location determined by contractor and approved by PIU and CSC			
4.	Occupational Health and Safety	Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing “STOP” sign and T-intersection’ warning sign shall be installed on the village road. Provided for fencing and posting of signage wherever livestock and wildlife movement is expected.	Throughout the project section at the location determined by contractor and approved by PIU and CSC			
5.	Grievance Redress	Obtaining information from village level grievance redress committee, PIU as applicable	Each sample roads once			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.

Appendix C. Details of the Transect Walk Participants

Sl. No.	District	Upazila	Name of Schemes	Length (Km)	Name of Union along the road	Number of Union	No. of Participants in Transect Walk	
							Total	Women
1	Gopalganj	Kasiani	Nizam kandi-Gohala Road	2.969	Nizamkandi	1	25	6
2	Gopalganj	Muksudpur	Bonogram GC-Bhamondanga Bazar-Dignagar R&H	11.268	Moharajpur, Mochna & Dignagar	3	72	15
3	Gopalganj	Muksudpur	Gohala UP office (Monirkandi)-Jalirpar GC Road	5.221	Munirkandi, Aruakandi, Acrapara, Jalirpar	4	31	10
Sub Total				**19.458**		**8**	**128**	**31**
4	Madaripur	Sadar	Madaripur Puran Bazar-Bangla Bazar-Hosnabad Bazar-Kalikapur UP Road.	6.12	Kalikapur & Bahadurpur	2	67	21
5	Madaripur	Shibchar	R&H Bypass road to Kathalbari ferry ghat via Kutubpur growth center & bangla bazar	8.280	Dityakhonda	1	30	9
6	Madaripur	Madaripur-S	Khagdi R&H-Char Muguria-Sreenadi Hat GC	17.250	Dhutkhali & Kalikapur	2	67	21
7	Madaripur	Madaripur-S	Trivagdi GC-Mithapur Hat-Habiganj hat-Mollahat-Shekhpur RHD	8.617	Dhurail & Kalikapur	2	67	21
8	Madaripur	Madaripur-S	NHW-Tribhagdi Hat GC.	5.07	Bahadurpur	1	15	6
9	Madaripur	Kalkini	Kalkini Upazila HQ to Khasherhat GC Road via Shomitirhat Bazar.	10.977	Enayetpur, Purbo Enayetpur & Bashgari	3	115	34
10	Madaripur	Kalkini	Khoajpur Takerhat R & H to Khasherhat GC Road via Laxmipur UP Office & Shurjamoni hat.	16.02	puisur, Singa	2	27	9
11	Madaripur	Kalkini	Khasherhat GC to Shariatpur R & H Road (Kalkini Part)	2.092	Bashgari	1	12	4
Sub Total				**74.426**		**14**	**400**	**125**
12	Rajbari	Baliakandi	Baliakandi-Mrigi GC. Rd. Via Narua GC.	12.300	Narua & Baliakandi	2	93	20
13	Rajbari	Kalukhali	Mrigi G.C-Sonapur G.C. Road	2.875	Mrigi & Majbari	2	74	10

Sl. No.	District	Upazila	Name of Schemes	Length (Km)	Name of Union along the road	Number of Union	No. of Participants in Transect Walk	
							Total	Women
14	Rajbari	Kalukhali	Belgachi G.C.-Sonapur G.C. Road	3.355	Modapur	1	54	11
15	Rajbari	Pangsha	Jasai UP-Joygram-Machpara UP. Road	4.279	Murat, Patta	2	14	5
16	Rajbari	Goalanda	Uttar Ujanchar at NHW-Khalil mondoler Hat G.C via Ujanchar G.C.	7.960	Ujanchar	1	22	7
17	Rajbari	Baliakandi	Baliakanndi GC-Modhukhali RHW. via Maghchami. Road	4.535	Narua & Baliakandi	2	93	31
18	Rajbari	Pangsha	Pangsa HQ-Mrigi G.C. Road	10.900	Murat & Patta	2	58	21
Sub Total				**46.204**		**12**	**408**	**105**
19	Comilla	Daudkandi	Roypur NHW - Batakandi G.C via Masimpur Road (Daudkandi part).	3.345	Eliatganj North	1	9	3
20	Comilla	Debidwar	Jafargonj GC to Barashalghar RHD via Yousufpur UPC Road.	15.815	Fatebad, Subil, Yusufpur & Barosalghor	4	55	18
21	Comilla	Titas	Raypur NHW-Batakandi GC road via Masimpur	10.914	Kalakandi & Narandia	2	48	19
22	Comilla	Titas	Batakandi GC-DaudkandiGC Via Mohanpur Launch Ghat road (Titas Upazila Portion)	11.500	Satani, Majidpur & Jagatpur	3	58	18
Sub Total				**41.574**	**0**	**10**	**170**	**58**
23	Chittagong	Mirsharai	Zorargonj UP R & H to - Burburia ghat Bazar road Via Dhum UP, Bangla Bazar & Golokerhat	5.100	Zorargong	1	12	4
24	Chittagong	Raojan	Ramjan Ali Hat GC - Nayahat RHD via Andermanik Natun Bazar Road.	9.926	Raijan	1	44	13
25	Chittagong	Fatikchari	Dantmara U.P.HQ.to Balutila Bazar via Ziltoli bazar Road	13.160	Dantmara	1	40	12
26	Chittagong	Hathazari	Mekhol up to Gorduara UP Road (Sarang Road)	2.770	Mekhol	1	18	7
27	Chittagong	Mirsharai	Habilder Basa R&H to Santir Hat GC Road via Azamnagar (Karerhat UP- Santirhat GC)	8.650	Karerhat & Hinguli	2	35	14

Sl. No.	District	Upazila	Name of Schemes	Length (Km)	Name of Union along the road	Number of Union	No. of Participants in Transect Walk	
							Total	Women
28	Chittagong	Rangunia	Santirhat GC- Malirhat - Sahery Bazar GC Road (Baraulia Road) (Rangunia Part)	5.400	Pomra	1	25	8
Sub Total				**45.006**		**7**	**174**	**58**
29	Jessore	Keshobpur	Chuknagar-Katakhali Road	7.200	Gourighona & Sufalakathi	2	25	9
30	Jessore	Jhikorgacha	Bakra GC- Baganchara GC via Sankarpur UPC	10.858	Hazirbag, Bakra & Sankarpur	3	28	8
31	Jessore	Monirampur	Nehalpur GC-Payria GC via Takerghat Road	3.727	Nehalpur	1	24	15
32	Jessore	Monirampur	Lawri (Madrasha) RHD-Khedapara GC Road	14.850	Shyamkur & Khedapara	2	41	18
33	Jessore	Abhoynagar	Nowapara Upazila H/Q-Monirampur via Moshiahati,Nehalpur Road.	7.300	Sundali	1	7	3
34	Jessore	Abhoynagar	Jessore Khulna RHD Bhangagate (Badamtala) - Amtala GC via Moricha, Nawly Bazar Road	20.909	Sreedharpur, Bagutia, Suvorara & Siddipasha	4	41	13
35	Jessore	Abhoynagar	Nowapara Upazila H/Q (Shankarpasha Bazar Ghat) - Narail-Fultala RHD at Sukpara more Road.	4.790	Bagutia & Shuvarara	2	12	4
36	Jessore	Sarsha	Benapole - Baganchra GC via Goga UP H/Q Road	9.141	Benapole, Putkhali & Goga	3	12	5
37	Jessore	Bagherpara	Jessore-Narail RHD at Dhalgrammore to Narikelbaria via Dhalgram Bazar	19.550	Narikelbaria & Dhalgram	2	27	6
38	Jessore	Bagherpara	Khajura-Chaturbaria road.	8.275	Bandobila & Johurpur	2	56	18
Sub Total				**106.6**		**22**	**273**	**99**
39	Chuadanga	Alamdanga	Alamdanga-Sorajgong G.C (Alamdanga Portion) [Alamdanga]	18.000	Nagdha, Belgachi, khaskorara	3	50	15

Sl. No.	District	Upazila	Name of Schemes	Length (Km)	Name of Union along the road	Number of Union	No. of Participants in Transect Walk	
							Total	Women
40	Chuadanga	Damurhuda	Memnagar RHD-Karpashdanga G.C via Buichitala	13.106	Parkrishnapur, Manda, Kurulgachi, Karpashdanga	4	15	5
41	Chuadanga	Damurhuda	Damurhuda G.C-Bhogiratpur G.C	11.375	Damurhuda, Juranpur, Notipota	3	15	5
Sub Total				**42.481**		**10**	**80**	**25**
42	Rajshahi	Tanore	Tanore-Chowbaria road	10.140	Talonda & Kamarga	2	9	
43	Rajshahi	Bagmara	Bhawanigonj-Ahsangonj	4.200	Maria & Jugipara	2	25	10
44	Rajshahi	Bagmara	Bhabanigong-Kesorhat	13.300	Basupara, Shuvadanga & Achpara	3	35	10
45	Rajshahi	Bagmara	Bhobanigong-Hatgangopara (from Mathabhanga)	4.970	Basupara, Shuvadanga & Achpara	3	5	2
46	Rajshahi	Tanore	Tanore-Amnura via Mundumala Hat	16.991	Talonda, Pachondar & Badhair	3	10	3
47	Rajshahi	Tanore	Talanda FRB to Nizampur via Dargadanga Hat,Billi Hat Road	17.000	Talono, Pachandor & Kalma	3	8	3
48	Rajshahi	Tanore	Talanda to Keshor Hat (from Hatishail)Tanore Part	5.440	Kamarga	1	10	4
49	Rajshahi	Tanore	Mundumala Hat (Start from Ayrarmore) to Hat bakoil (GCM) road ViaUchadanga Narayanpur (Tanore part).	13.850	Badhair & Kalma	2	8	4
50	Rajshahi	Tanore	Saranjai Pacca Road More - Mundumala Hat Via DebipurMore,Elamdohi hat and Prokash Nagar Hat.	17.211	Soranjal, & Talondo	2	8	2
51	Rajshahi	Tanore	Elamdohi Hat to Kalma Hat Via Valukakandor	2.300	Kalma	1	8	3
52	Rajshahi	Mohonpur	Bazorpur Trimohini to Dhupaghata hat	4.500	Mougasi & Bagsomouil	2	21	5
53	Rajshahi	Paba	Mollikpur Bipass (Kukhundipur Bazar) - Parila UP Road	4.400	Horian, Parila	2	21	6
Sub Total				**114.302**		**26**	**168**	**52**
54	Naogaon	Atrai	Ahashanganj GC-Bandaikhara GC.	8.575	Ahashanganj, Kalikapur, Hattalupur, Shabola,	8	65	25

Sl. No.	District	Upazila	Name of Schemes	Length (Km)	Name of Union along the road	Number of Union	No. of Participants in Transect Walk	
							Total	Women
					Bhounpara, Moniari, Pachupara, Bisha			
55	Naogaon	Manda	Nurullabad GPS R&H - Jothbazar - Bandaikhara GC Road.	9.405	Nurullabad, Kosob & Bishnopur	3	29	9
56	Naogaon	Niamatpur	Chhatra GC - Shibpur GC.	12.260	Chandan Nagar & Hazi Nagar	2	52	11
57	Naogaon	Atrai	Kashiabari GC - Smaspara GC Via Islamgati hat	9.655	Panchupur & Bisha	2	37	12
58	Naogaon	Atrai	Kashiabari GC - Kaliganj GC	11.882	Bonpara & Maniary	2	60	12
59	Naogaon	Manda	Chowbaria GC - R&H Santa bridge More.	19.000	Manda, Versho, Poranpur	3	31	11
Sub Total				**70.777**		**20**	**274**	**80**
60	Natore	Baraigram	Rajapur GC - Zonail GC Road	18.18	Gopalpur, Chandai & Jonail	3	50	15
61	Natore	Gurudaspur	Nazirpur GC - Moukra GC Road	9.000	Nazirpur, Chapila	2	25	8
62	Natore	Lalpur	Bagatipara-Dayarampur-Abdulpur-Lalpur Road (Lalpur Part)	16.460	Walia & Chongdhupail	2	13	3
63	Natore	Lalpur	Lalpur-Bilmaria-Durduria Road	3.640	Lalpur, Bilmaria & Durduria	3	27	7
				47.28		**10**	**115**	**33**
64	Bogra	Shajahanpur	Sonahata GC(Dhunot) - Tangramagur RHD via Amrul UP - Naimile	8.870	Amrul, Aria	2	49	10
65	Bogra	Kahaloo	Dupchachia-Namoja via Tindighi GC Road (Kahaloo)	11.750	Kalai	1	40	15
66	Bogra	Sonatola	Horikhali GC-Hatsharpur GC via Charpara hat (Sonatola)	10.010	Madhupur, Pakulla, Jorgacha	3	8	3
67	Bogra	Bogra Sadar	Matidali NHW-Peergacha GCM (From RHD #331)	9.100	Shakharia, shekheskala, Lahiripara	**3**	**27**	**9**
68	Bogra	Adamdighi	Nasratpur-Murail-Raykali-Beragram (Tilokpur) Road	6.610	Nasratpur	1	9	3

Sl. No.	District	Upazila	Name of Schemes	Length (Km)	Name of Union along the road	Number of Union	No. of Participants in Transect Walk	
							Total	Women
69	Bogra	Kahaloo	Ranirhat-Durgapur Road.	9.675	Durgapur, Malancho	2	22	7
				56.015		**12**	**155**	**47**
70	Gaibandha	Sadullapur	Madargonj GC-Laxmipur G.C Road via Kantanagar.	10.443	Rasulpur	1	15	4
71	Gaibandha	Sundarganj	Sundargonj-Materhat G.C (FRA)	12.778	Dohobandh, Shantirum & Chaporhati	3	7	2
72	Gaibandha	Sadar	Dariapur-Laxmipur	7.254	Laxmipur & Ghaghoa	2	9	3
73	Gaibandha	Sadullapur	Kunjo Mohipur Uttarpara - Pollasbari Border via Idulpur U.P office	5.370	Idilpur	1	50	17
Sub Total				**35.845**		**7**	**81**	**26**
74	Dinajpur	Birgonj	Bottoli (NHW)-Goreya GC via Shibrampur UP Rd (Bir Muktijoddha Shahid Motilal Barman Road)	16.040	Sator & Shibrampur	2	35	14
75	Dinajpur	Kaharol	Kaharol Upazila HQ-Boleyahat RHD Road	9.265	Rasulpur & Mukandapur	2	52	11
76	Dinajpur	Bochagonj	Setabgonj Sugar Mill-Meherpur Hat via Nawavita hat Road.	12.400	Mushidhat, Chatail, & Rongaon	3	33	6
77	Dinajpur	Phulbari	Phulbari UZHQ-Madilahat GC Road.	10.500	Aladipur & Betdighi	2	30	12
78	Dinajpur	Phulbari	Madilahat GC (Chintamon Moor)-Ambarihat GC Road.	18.060	Eluaryi & Betdighi	2	43	15
79	Dinajpur	Nawabgonj	Doudpur (Laugari) to Bajitpur R&H	7.200	Daudpur	1	12	6
80	Dinajpur	Nawabgonj	Doudpur GC-Bhaduria GC via Daria	13.190	Bhaduria	1	12	5
81	Dinajpur	Parpatipur	Ambari GC - Jashai more RHD road	14.264	Mostafapur & Mominpur	2	36	12
82	Dinajpur	Parpatipur	Mominpur UP Office Jashai (Bot tree more) - Pan Bazar road via Jurai hat & faridpur hat.	8.960	Mostafapur & Mominpur	2	45	5
Sub Total				**109.879**		**17**	**298**	**86**
83	Thakurgaon	Baliadangi	Baliadangi-Lahiri G.C. Road	7.063	Barobari, Paria & Charol	3	34	9
84	Thakurgaon	Pirganj	Pirganj-Nasibganj G.C Road	7.180	Daulatpur, Sengoan	2	12	5

Sl. No.	District	Upazila	Name of Schemes	Length (Km)	Name of Union along the road	Number of Union	No. of Participants in Transect Walk	
							Total	Women
85	Thakurgaon	Ranisankail	Baliadangi GC - Dhirganj (Horipur) via Dharmogarh Check Post Road.	5.803	Dharmogarh & Kasipur	2	20	7
86	Thakurgaon	Thakurgaon-S	Thakurgaon-Farabari GC Road.	8.500	Saladar & Akcha	2	9	4
87	Thakurgaon	Baliadangi	Charol UP Office(Lahiri GC)-Dogachi hat via Patilabhasha Road	8.300	Charol	1	9	4
88	Thakurgaon	Haripur	Jadurani GC-Dangipara UP Office Road.	4.280	Amgaon	1	13	7
Sub Total				**41.126**		**11**	**97**	**36**
89	Panchagarh	Atwari	Fakirgonj hat GC - Shathkhamar R&H Road	16.136	Radhanagar & Balorampur	2	7	3
90	Panchagarh	Tetulia	Tetulia Gobra Bridge - Shalbahan GC Road	9.500	Tetulia, & Salbahan	2	6	2
91	Panchagarh	Panchagarh-S	Panchagarh - Harivasha Road.	10.550	Panchogarh, Hafizabad & Harivasha	3	100	29
Sub Total				**36.186**		**7**	**113**	**34**
92	Nilphamari	Domar	Domar Bazar G.C-Basunia Hat GC.road	6.700	Ambari and Boragari	2	19	6
93	Nilphamari	Domar	Domar GC to Ambari Alsiar Bazar RHD road GC via Azizarerhat	13.460	Boragari, Jorabari.	2	9	3
94	Nilphamari	Domar	Boragarihat at RHD road to Baburhat GC via Motukpur UPC at Sayllar ghat (Domar Part)	4.250	Domar and Ambari	2	15	6
95	Nilphamari	Sayedpur	Taraganj G.C.-Porarhat G.C. Via Hazarihat G.C	17.750	Taragonj, Porarhat	2	29	10
96	Nilphamari	Nilphamari-S	Goregram U.P. to Bhabanigonj G.C via Majhpara Madrasha.	8.140	Tupamari & Ltakhola	2	9	4
Sub Total				**50.3**		**10**	**81**	**29**
Total under Additional Financing				**937**		**203**	**3015**	**924**

Appendix D Environnent Clearance Certificate

শেখ হাসিনার বাংলাদেশ
পরিচ্ছন্ন পরিবেশ

Government of the People's Republic of Bangladesh
Department of Environment
Head Office, Paribesh Bhaban
E-16 Agargaon, Dhaka-1207
www.doe.gov.bd

Memo No: 22.02.0000.18.72.68.18 · 238 Date: 12/06/2019

Subject: Renewal of Environmental Clearance Certificate for Rural Connectivity Improvement Project (RCIP), LGED, RDEC Bhaban, Agargaon, Sher-E-Bangla Nagar, Dhaka.

Ref: Your Application dated 10/04/2019.

With reference to the above, the Department of Environment has decided to renew the Environmental Clearance Certificate in favor of Renewal of Environmental Clearance Certificate for Rural Connectivity Improvement Project (RCIP), LGED, RDEC Bhaban, Agargaon, Sher-E-Bangla Nagar, Dhaka subject to following terms and conditions.

i. The terms and conditions as stated in Environmental Clearance Certificate issued on 27.05.2018 vide 22.02.0000.18.72.68.18.341 shall remain valid for the renewed period.

ii. This renewal is valid up to 26.05.2020. Application for further renewal along with the fee for renewal shall have to be submitted to the Director General, Department of Environment, Head Office, Dhaka with a copy to concerned Regional Office of DOE at least 30 days ahead of expiry.

12.06.19

(Syed Nazmul Ahsan)
Director (Environmental Clearance)
Phone: 8181673

Chief Engineer
Rural Connectivity Improvement Project
Local Government Engineering Department
Agargaon, Sher-E-Bangla Nagar, Dhaka

Copy Forwarded to :

1. PS to the Hon'ble Secretary, Ministry of Environment, Forest and Climate Change, Bangladesh Secretariat, Dhaka.
2. Director, Department of Environment, Dhaka/ Chattogram Regional/ Khulna/ Rajshahi Divisional Office, Dhaka, Chattogram, Khulna, Bogura.
3. Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.