People's Republic of Bangladesh
Ministry of Local Government,
Rural Development and Cooperatives
Local Government Division
Local Government Engineering Department

People's Republic of Bangladesh

Preparatory Survey on the Northern Region Rural Development and Local Governance Improvement Project

Final Report Supplementary Annexes

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List of Supplementary Annexes

Supplementary Annex 1	Draft Environmental Impact Assessment report
Supplementary Annex 2	Draft Initial Environmental Examination report
Supplementary Annex 3	Draft Abbreviated Resettlement Action Plan (Mallikbari Bazar-Borchona Upazila Road in Bhaluka Upazila, Mymensingh District)
Supplementary Annex 4	Draft Abbreviated Resettlement Action Plan (Rampura Habibpur More-Mongalpur via Ketra GC and Ekoir GC Upazila Road in Birampur Upazila, Dinajpur District)

Supplementary Annex 1
Draft Environmental Impact Assessment report
for a 150-m bridge construction over the Gudaria River
Haluaghat Upazila, Mymensingh District

Abbreviations and acronyms

ARIPO	Acquisition and Requisition of the Immovable Property Ordinance
BBS	Bangladesh Bureau of Statistics
BMD	Bangladesh Meteorological Department
CCSAP	Climate Change Strategy and Action Plan
DC	Deputy Commissioner
DEPC	Department of Environment Pollution Control
DG	Director General
DOE	Department of Environment
DSM	Design, Supervision and Monitoring
DTW	deep tubewell
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environment Conservation Rules
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ES	Environmental Specialist
FGD	Focus Group Discussion
GC	Growth Center
GRM	Grievance Redress Mechanism
HTW	hand tubewell
HYV	high yielding variety
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
LCS	Labor Contracting Society
LGED	Local Government Engineering Department
LGD	Local Government Division
LLP	low lift pump
MLGRD&C	Ministry of Local Government Rural Development and Cooperatives
NEMAP	National Environmental Management Action Plan
NOC	no objection certificate
NRRDLGIP	Northern Region Rural Development and Local Governance Improvement Project
O&M	operation and maintenance
PAPs	Project affected persons
PMO	Project Management Office
REE	Regional Environmental Expert

RCC	reinforced concrete cement
RDPD	Regional Deputy Project Director
RPF	Resettlement Policy Framework
RRS	Rehabilitation and Resettlement Specialist
RRRE	Regional Rehabilitation and Resettlement Expert
STW	shallow tubewell
UE	Upazila Engineer
UNR	Union road
UZR	Upazila road
XEN	Executive Engineer

List of local terms

Aman	Rice cultivated in the monsoon season
Beel	Relatively small surface water body such as pond or small lake with static water from internal drainage system lying depression or low land and drying up in winter
Bigha	A unit of area equal to approximately 0.13 hectare
Boro	Rice cultivated in the winter season under irrigated condition
Country boat	Manually propelled rural boat, usually wooden
Decimal	a unit of area approximately equal to 40.4686 m^2
Engine boat	Rural boat powered by a small diesel engine, wooden or steel construction
Ghat	A rural boat landing station, often connected to a market
Hat day	Market day
Parishad	Council

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1 Background

1.1 Background of the NRRDLGIP

The Government of Bangladesh (GOB) has made poverty reduction an important development strategy, which has declined from 58.8% in 1991-1992 to 31.5% in 2010. Poverty reduction through rural development is one of the most important issues in Bangladesh, since about 70% of the population is living in the rural areas. It is observed that poverty level is the highest in Rangpur Division (the north-west part of the country) according to the statistics in 2010. The area is left behind from development and thus development needs are high in the field of rural infrastructure and access to public services.

Taking into consideration of the above, Japan International Cooperation Agency (JICA) plans to assist the Northern Region Rural Development and Local Governance Improvement Project (NRRDLGIP) with the objective to expand access to rural and urban infrastructures and services, and improve urban governance in the northern region. The NRRDLGIP will have two main components: Component 1 (rural infrastructure development); and Component 2 (Pourashava infrastructure and governance improvement).

Component 1 will include the following infrastructure development: 1) upgrading of Upazila roads (UZR) and Union roads (UNR) including bridges and culverts; 2) rehabilitation of UZR; 3) improvement of Growth Centers and rural markets; and 4) improvement of *ghats* or boat landing stages.

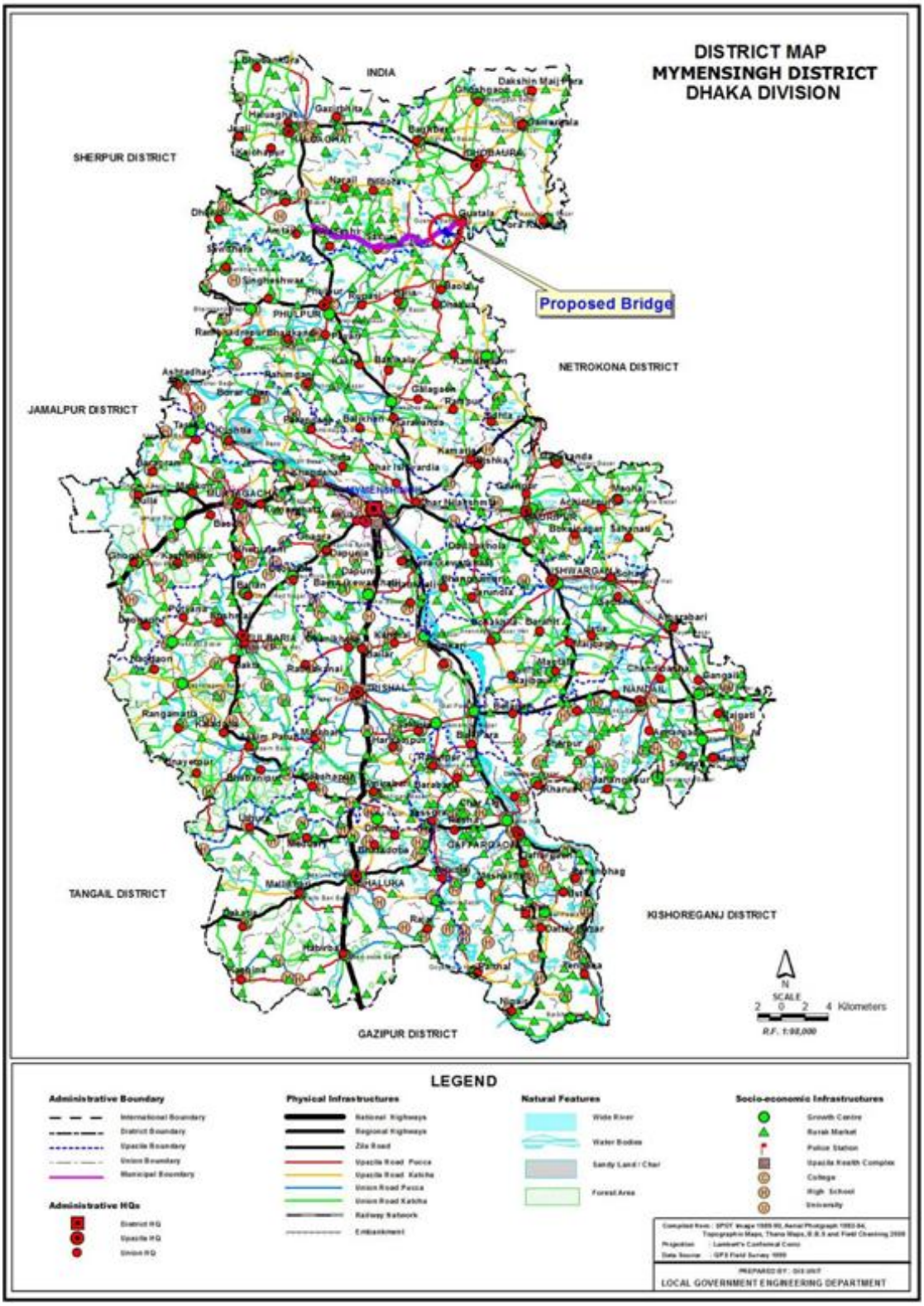
Subprojects under Subcomponent 2-1 will not be determined at the preparatory survey phase. They will be selected through participatory approaches in the implementation phase of the Project. The eligible types of infrastructure works under the subcomponent may include: 1) improvement and rehabilitation of Pourashava roads, bridges, and culverts; 2) repair, rehabilitation, and expansion of drains; 3) improvement of municipal markets; 4) construction of slaughter houses; 5) rehabilitation and expansion of water distribution network and tubewells; 6) construction of public and community toilets; 7) construction of solid waste management facilities; 8) construction of bus and truck terminals; 9) installation of streetlights; 10) establishment of parking areas; and 11) basic infrastructures for the poor.

The target area of the NRRDLGIP covers eight Districts in Rangpur Division, namely Dinajpur, Thakurgaon, Panchagarh, Rangpur, Lalmonirhat, Nilphamari, Kurigram and Gaibandha, and six Districts in Mymensingh area of Dhaka Division, namely, Jamalpur, Sherpur, Tangail, Mymensingh, Netrokona and Kishoreganj. The Bangladesh counterpart agencies are the Local Government Division (LGD) and the Local Government Engineering Department (LGED) of the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C).

1.2 Background of the environmental impact assessment

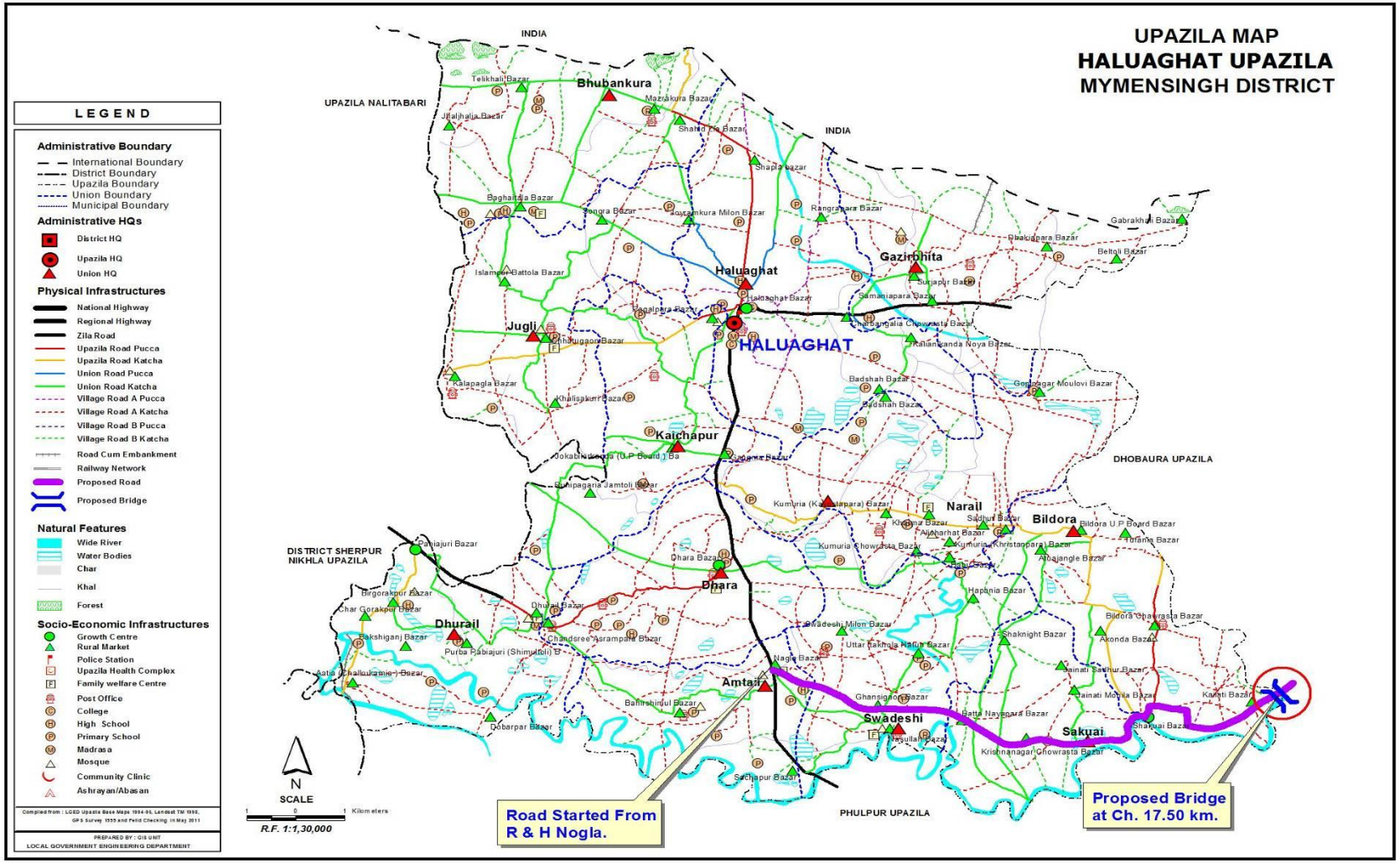
1.2.1 Description of the subproject

Under Component 1 of the NRRDLGIP, the LGED has proposed the construction of a bridge as part of a subproject under the NRRDLGIP. The proposed subproject is the improvement of the UZR of "R&H (Nagla) - Goatola GC via Shakuai GC (Road Code: 361242003)" in Haluaghat Upazila, Mymensingh District, Dhaka Division. A bridge is proposed to be constructed at the ending point of the UZR to connect the different UZR in Dobaura Upazila in Mymensingh District.



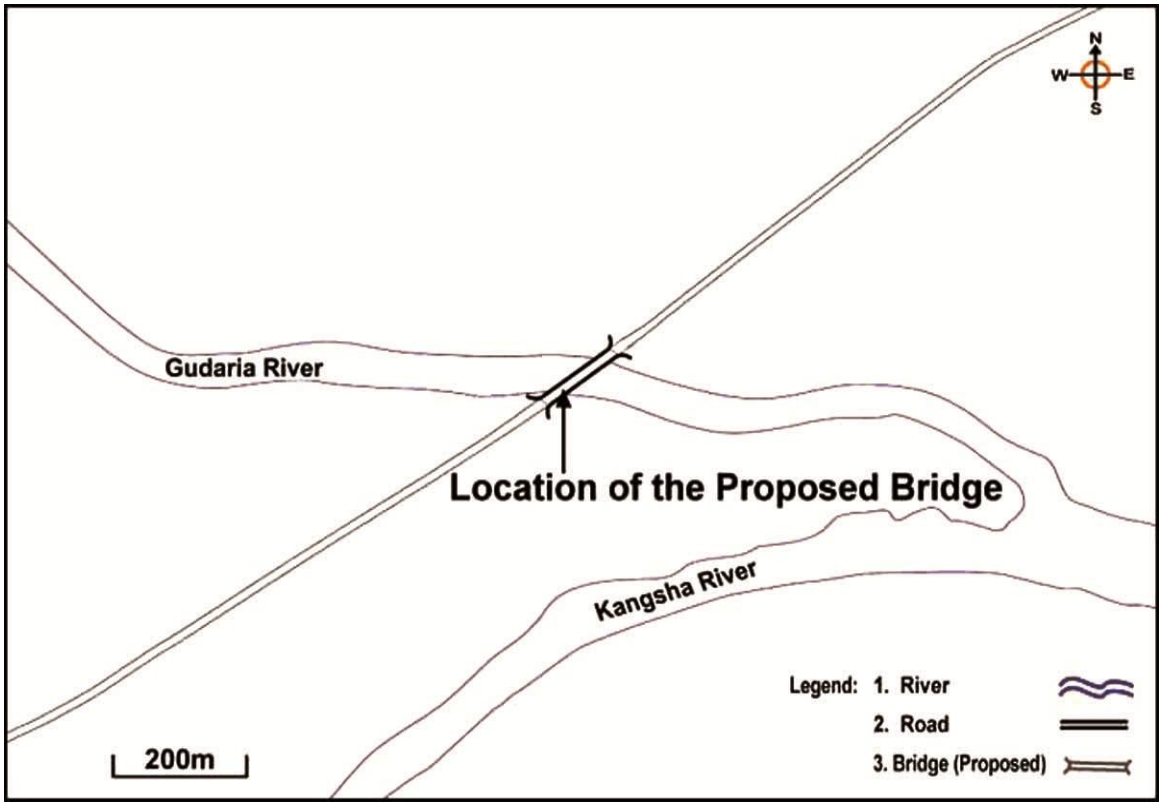
Source: LGED and Survey Team

Figure 1 Location of the proposed bridge



Source: LGED and Survey Team

Figure 2 Location of the proposed bridge



Source: Survey Team

Figure 3 Simplified drawing of the proposed bridge construction site

The proposed bridge construction site is at Futkai ferry ghat, which is located between Kailati village (latitude-25°01.391'N and longitude 90°29.097'E) of Bildora Union of Haluaghat Upazila (right bank) and Futkai village (latitude-25°01.439'N and longitude 90°29.447'E) of Goatola Union of Dobaura Upazila (left bank) in Mymensingh District, Dhaka Division. The site is located about 17.5 km east of Nagla bazar, which is about 40 km north from the center of Mymensingh Pourashava and 11 km south of Haluaghat Upazila center.

Figure 1 and Figure 2 demonstrate the location of the proposed bridge construction site, and Figure 3 shows the simplified drawing of the site. The bridge will be constructed over the Gudaria River. The Gudaria River connects with the Kangsha River at 0.7 km south-east downstream from the bridge construction site.

Current road condition

The UZR passes from Nagla bazaar to Futkai ferry ghat. The length of the UZR is approximately 17.5 km, of which about 3.84 km is earthen in the portion adjacent to the Futkai ferry ghat. About 10.20 km of the road has bituminous carpeting, and 3.47 km of the road is paved by brick. The crest width of the UZR is 5.03 m on average. This UZR will be improved under the NRRDLGIP, and the proposed bridge will be constructed as part of the UZR improvement works.

On the left bank of the Futkai ferry ghat, there is another UZR going to the Goatola bazar or Growth Center (GC). The road is then connected to Dobaura Upazila. The portion from the Futkai ferry ghat and the Goatola GC is earthen, and the remaining part is paved by bitumen.

As described earlier, there is a small ferry ghat, called the "Futkai ferry ghat", at the proposed bridge

site over the Gudaria River. Many people living in Bildora Union of Haluaghat Upazila, situated on the right bank, routinely cross the Gudaria river to reach Goatola GC located on the left bank. They cross the river by ferry service for selling and buying agricultural products and groceries, attending educational institutions, going hospitals and clinics, and other various socioeconomic reasons. Therefore, the proposed bridge construction will contribute to the improved connectivity between the both banks, and to the enhancement of the livelihood conditions.

No residential house and settlement have been found nearby the ghat along the existing alignment of the UZR, though some agricultural land and wetlands are found along the alignment. A view of the proposed bridge construction site is shown in Image 1.

Image 1 View of the proposed bridge construction site

Proposed bridge

The width of the Gudaria River at the proposed bridge construction site is 112 m according to the LGED road inventory. However, the field survey observed that the possible length of the proposed bridge would be approximately 150 m, taking into account the expected specifications of the proposed bridge, possible locations of bridge abutments, and soil and geological conditions of the bank.

The alignment of the bridge is expected to be almost linear connecting the existing road alignments of the two UZRs on both banks of the river. Along the alignment, approach roads will be constructed for the proposed bridge. The bridge will be constructed basically in accordance with the LGED road design standards for rural roads. The LGED Design Unit has also provided the Survey Team with the guidance on the current bridge design practices. The latest guidance on bridge design is shown in Table 1.

Table 1 Latest guidance on bridge design

Design loading criterion	AASHTO-LFRD-HL-93 – this supersedes the H20S16 loading specified previously
Carriageway width	5.5 m, i.e., double lane, is standard to allow for future growth of traffic. 7.32 m to be used for more important roads with higher traffic levels
Footpath	0.65 m width on each side of the carriageway. Increased to 1.0 m width on each side of the carriageway for more important roads
Girder web width	450 mm
Deck slab thickness	200 mm
Railings	1,050 mm height, posts 200 mm x 200 mm reinforced cement-concrete (RCC), bars 150 mm X 150 mm RCC
Cast-in-situ piles	Minimum diameter 500 mm, maximum diameter 1,200 mm Minimum pile depth 15 m, maximum pile depth 55 m Pile cap should be 500 mm above the lowest water level
Pier geometry	For normal water flow, two circular columns Where skewed, one column For height greater than 12 m, single H type
Concrete strength	25 MPa, except for pre-stressed girders 35 MPa
Mild steel reinforcement rod	60 grade

Source: Communication with LGED Design Unit

However, it should be noted that the detailed design of the proposed bridge has not been determined yet at the preparatory survey phase. The detailed design will be determined after the commencement of the NRRDLGIP.

1.2.2 Necessity of environmental impact assessment

Since the estimated length of the proposed bridge is over 100m, the Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) on the bridge construction is required as per the Environmental Conservation Rules 1997.

The IEE and EIA have been conducted from July to September 2012 under the Preparatory Survey for the NRRDLGIP. They are carried out on the assumption that the bridge will be constructed as per the LGED's design standard for rural road and the latest guidance from the LGED Design Unit shown in Table 1.

However, it should be kept in mind that the detailed design survey for the proposed bridge will be carried out after the commencement of the NRRDLGIP, and thus the design has not been determined yet at the preparatory survey phase. It is therefore required, when the design is determined, this draft EIA report should be updated and finalized according to it.

2 Environmental policy and regulations

2.1 National policy

2.1.1 National Environmental Policy 1992

The National Environmental Policy, formulated in 1992, sets the policy framework for environmental action, in combination with a set of broad sectoral guidelines. It emphasizes the following:

- Maintenance of the ecological balance and overall development of Bangladesh through conservation and improvement of the environment;
- Protection of Bangladesh against natural disasters;

- Identification and control of the activities related to pollution and degradation of the environment;
- Environmentally sound environment;
- Environmentally sustainable use of all natural resources; and
- Active association with all environmental related international initiatives to the maximum possible level.

2.1.2 National Environmental Management Action Plan 1995

The National Environmental Management Action Plan (NEMAP) is based on a nationwide consultation program, intended to develop the Environmental Policy and the National Conservation Strategy into an implementable strategy. It constitutes a synthesis of the Government's and people's perception of the key environmental issues and actions required to address them. It also outlines respective sectoral and environmental policies for 12 identified sectors. NEMAP also provides an overview of the existing institutional issues and actions to meet the objectives of sustainable development and environmental management. It is a wide ranging plan which builds on and extends the statements set out in the National Environment Policy. NEMAP was developed to address issues and management requirements during the period 1995 to 2000, and sets out the framework within which the recommendations of the National Conservation Strategy are to be implemented. NEMAP has the following objectives:

- Identification of key environmental issues affecting Bangladesh
- Identification of actions necessary to halt or reduce the rate of environmental degradation
- Improvement of the natural and build environment
- Conservation of habitats and biodiversity
- Promotion of sustainable development
- Improvement in the quality of life of the people

2.2 National legislation

2.2.1 Background

The early concern for the state of the environment in Bangladesh goes back to the passing of the water pollution act in 1974, under which a small unit was established in the Department of Public Health Engineering to monitor the quality of surface and ground water. The Government promulgated the Environment Pollution Control Ordinance in 1977 and established the Environment Pollution Control Board responsible for formulating policies and proposing measures for implementing them. In 1982, the Department was renamed as the Department of Environment Pollution Control (DEPC) consisting of four Divisional offices in Dhaka, Chittagong, Khulna, and Bogra.

In 1989, the DEPC was again renamed as the Department of Environment (DOE), placed under the newly formed Ministry of Environment and Forest.

2.2.2 Environment Conservation Act 1995 (subsequent amendments in 2000 and 2002)

The Environment Conservation Act (ECA) 1995 is the main legal framework on environmental conservation in Bangladesh. The main objectives of the ECA are: 1) conservation and improvement of the environment; and 2) control and mitigation of pollution in the environment. To achieve these objectives, the ECA focuses on the following items:

1) Declaration of Ecologically Critical Areas (Section 5)
2) Regulations of emissions from vehicles (Section 6)
3) Issuance of environmental clearances (Section 12)

4) Formulation of environmental guidelines (Section 13)
5) Regulation of development activities' discharge permits (Section 20)
6) Promulgation of standards for the quality of air, water, noise and soil (Section 20)
7) Promulgation of standard limits for waste discharge (Section 20)

The ECA also stipulates the establishment of the DOE and the power and functions of the Director General (DG) for carrying out the purposes of the ECA (Section 3 and 4). For instance, the DG who is appointed by the Government of Bangladesh may issue directions of prohibition or regulations on an industry, undertaking or process when he or she considers it necessary for environmental conservation. In addition, according to Section 12 of the ECA, all development projects must obtain an Environmental Clearance Certificate (ECC) from the DG of the DOE.

2.2.3 Environment Conservation Rules 1997 (subsequent amendments in 2002 and 2003)

The Environment Conservation Rules (ECR) 1997, which was issued by the Ministry of the Environment and Forest, spells out the detailed procedures and requirements for the enforcement of the ECA. The ECR was promulgated in exercise of the powers conferred by Section 20 of the ECA, stating that the government is empowered to make rules for carrying out the purposes of the ECA. The subjects relevant to environmental assessment are as follows:

1) Considerations for the declaration of Ecologically Critical Areas (Rule 3)
2) Classification of projects (Rule 7)
3) Procedures to obtain ECCs (Rule 7)
4) Requirements for IEE and EIA (Rule 7)
5) Determination of environmental quality standards for air, water, noise, odor and other components of the environment (Rule 12)
6) Determination of standards for waste discharge and gaseous emissions from industry or development projects (Rule 13)

Rule 3 defines the factors to be considered in declaration of Ecologically Critical Areas such as wetlands and forest areas as per Section 5 of the ECA. It also empowers the government to specify the activities which cannot be continued or initiated in an Ecologically Critical Area.

Rule 7 provides a classification for development projects into four categories depending upon their environmental impact and location. These categories are labeled as: 1) Green; 2) Orange A; 3) Orange B; and 4) Red. Classified projects shall obtain an ECC for each category in accordance with the requirements stipulated in the ECR. Table 2 illustrates the documents for each category which are required to be submitted to the Division Officer of the DOE for an application for the ECC.

All development projects that are considered to be low-polluting are classified in the Green category, and shall automatically be granted an ECC after the submission of the application with the necessary documents. Projects that are considered to be potentially polluting are classified as Orange A, Orange B, and Red categories in order of the magnitude of the potential environmental impact, and are required to obtain first a Site Clearance Certificate, and thereafter an ECC after the submission of the application form and other required documents according to their categories in Table 2.

Apart from the general requirements and the Environmental Management Plan (EMP), for projects classified as Orange B and Red category projects, the application shall also be accompanied with an IEE or EIA report on the basis of the terms of reference approved by the DOE, respectively.

Table 2 Requirements by environmental categories

Category	Requirements
Green	General information, no objection certificate (NOC) from the local authority, etc.
Orange-A	General information, NOC, etc.
Orange-B	IEE, EMP, NOC, etc.
Red	EIA, EMP, NOC, etc.

Source: Environment Conservation Rules (1997)

According to Item 68 of Section D, Schedule 1 of the ECR, construction, reconstruction, and extension of bridges over 100 meters in length are classified as "Red" category. Thus, IEE and EIA are mandatory for the proposed bridge construction, whose length will be approximately 150 m.

2.2.4 Acquisition and Requisition of the Immovable Property Ordinance 1982

The Acquisition and Requisition of the Immovable Property Ordinance (ARIPO) 1982 and the subsequent amendments made during 1993 and 1994 constitute the legal framework that governs all cases of land acquisition in Bangladesh. The Acquisition and Requisition of Immovable Property Rules 1982 were issued under Section 46 of the ARIPO stipulating that the government is empowered to make rules for carrying out the purposes of the ARIPO.

Land acquisition below 50 *bigha* (about 6.7 hectare) is handled by the Division Commissioner, and that of over 50 *bigha* by the Ministry of Land. Regardless of the size of land to be acquired, it is Deputy Commissioner (DC) who determines market price of the assets based on the approved procedure, and pays one hundred and fifty percent of the assessed value as compensation. Section 10A inserted by the amendment in 1994 made provisions for payment of crop compensation to tenant cultivators.

However, the ARIPO does not cover project-affected persons (PAPs) without titles of ownership record. For example, informal settlers or squatters, occupiers, and informal tenants and lease-holders without legal documents will not be compensated under the ARIPO. Also, it does not ensure replacement value of the property acquired. The two issues should be considered in the proposed bridge construction, namely the PAPs without titles should be compensated, and the compensation should be based on the replacement values of the property.

2.3 JICA Guidelines for Environmental and Social Considerations (2010)

According to the JICA Guidelines for Environmental and Social Considerations (hereinafter the "JICA Guidelines"), the following conditions should be met in principle:

- When assessment procedures already exist in host countries, and projects are subject to such procedures, project proponents must officially finish those procedures and obtain the approval of the government of the host country.
- EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to the local residents, written materials must be provided in a language and form understandable to them.
- It is required that EIA reports be made available to the local residents of the country in which the project to be implemented. The EIA reports must be available at all times for perusal by project stakeholders such as residents and copying must be permitted.

- In preparing EIA reports, consultation with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultation must be prepared.
- Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding a consultation is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared.

It is desirable that EIA reports cover the items enumerated (in short) as follows:

- Policy, legal and administrative framework
- Project description including a map showing the project site
- Baseline data
- Environmental impact
- Analysis of alternatives
- EMP
- Consultation

2.4 LGED Environmental Guidelines

The LGED published the "Environmental Guidelines for the LGED Projects" (hereinafter the "LGED Guidelines") in 2008, as part of its goal to implement all development projects in an environmentally sound and sustainable manner. If a project follows the LGED Guidelines, it will meet all requirements of the GOB and its financing partners, including JICA. The guidelines outline required procedures and formats for IEEs and EIAs for rural infrastructure development and urban sector projects. For example, procedures such as analysis of alternatives, public consultations, and preparation of EMPs are included in the suggested outline of the EIA report. Thus, it can be concluded that conduct of an IEE and EIA in accordance with the LGED Guidelines would generally satisfy the requirements of the JICA Guidelines.

3 Baseline environmental conditions

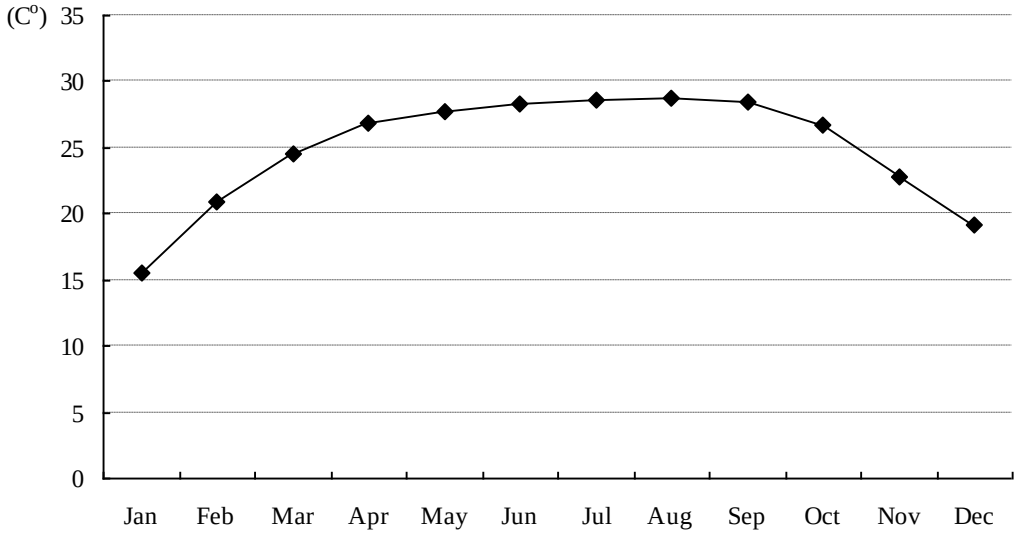
3.1 Physical environment

3.1.1 Climate

The subproject area has a typical monsoon climate with three main seasons, summer (March to May), monsoon (June to October), and winter (November to February). The summer is generally hot with occasional moderate to heavy rainfall. The monsoon is generally humid with 80% of annual rainfall. The winter is generally cold with less humidity.

The nearest meteorological station of the Bangladesh Meteorological Department (BMD) from the subproject site is the station of the Mymensingh branch of the BMD. Meteorological data from 2001 to 2011 were collected from the station. The climate conditions of the subproject site are described below.

Temperature
Mean monthly temperature in Mymensingh in the last 10 years (2002-2011) is given in Figure 4. December and January are the coolest months with average monthly temperature of below 20º C, while the period from May to September is the hottest with average monthly temperatures ranging from 26 to 30°C. The maximum monthly temperatures recorded at Mymensingh are 37.5°C (May, 2006). The minimum monthly temperatures recorded at Mymensingh are 5.4°C (January, 2001 and January, 2003).

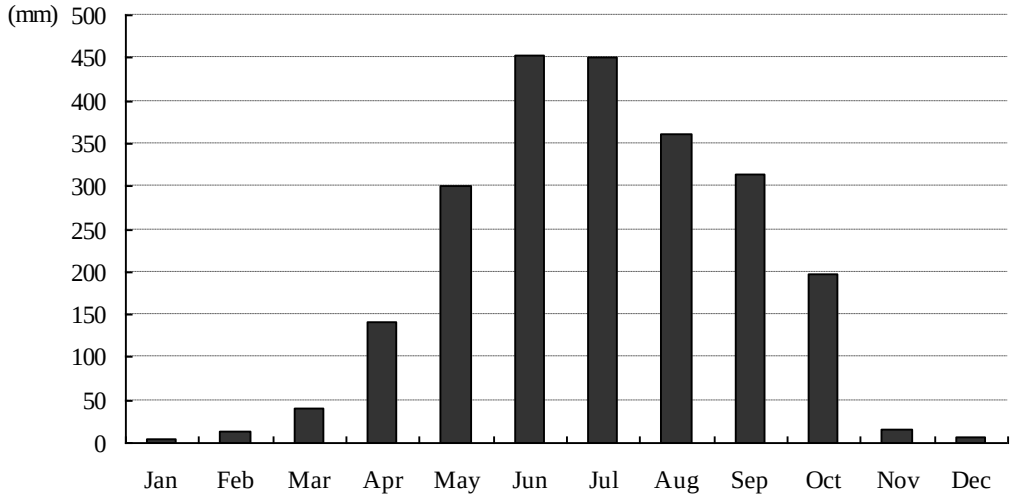


Source: Bangladesh Meteorological Department

Figure 4 Mean monthly temperature in Mymensingh in last 10 years (2002-2011)

Rainfall

Annual rainfall of Mymensingh varies from 1,662 to 3,193 mm, during 2001 to 2011. Average monthly rainfall data in the last ten years in Mymensingh is given in Figure 5. In general, May to October is the rainy season, and the maximum rainfall takes place during June and August. June and July are the wettest months with the highest monthly rainfall of about 450 mm on average, but the rainfall during these months sometimes exceeds 750 mm. From November to February is the driest period with almost no rainfall.



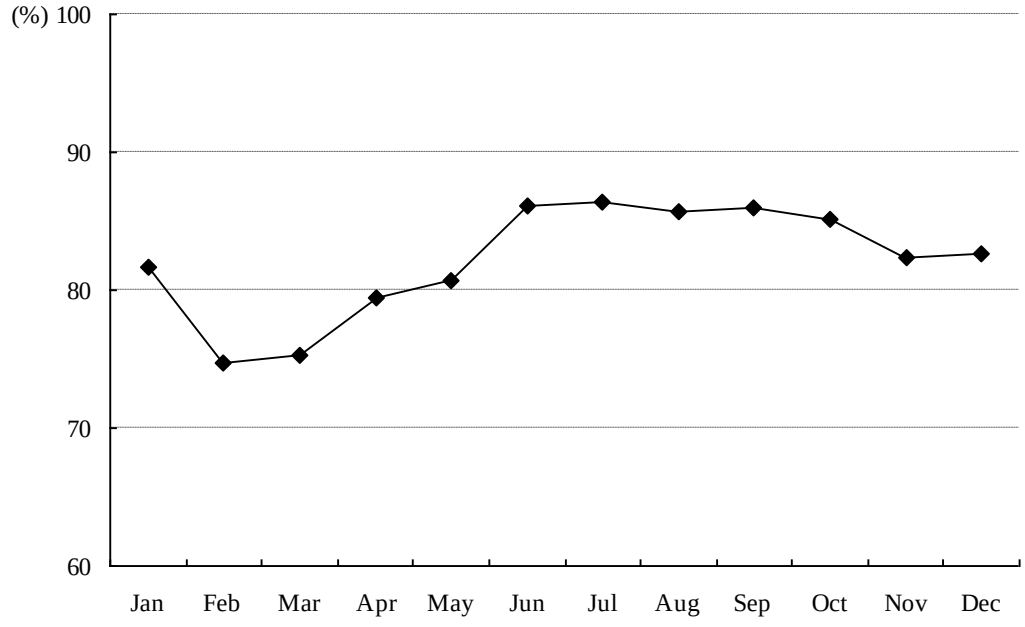
Source: Bangladesh Meteorological Department

Figure 5 Mean monthly rainfalls in Mymensingh in last 10 years (2002-2011)

Humidity

Annual humidity of Mymensingh is quite static from June to January, ranging from 80% to 90% during 2001 to 2011. The highest humidity corresponds to the rainy season between June and October. The maximum monthly humidity was about 90%, recorded in July 2002, August 2008 and September 2004.

Low humidity prevails in February and March, and the mean monthly humidity was less than 80%.



Source: Bangladesh Meteorological Department

Figure 6 Mean monthly humidity in Mymensingh in last 10 years (2002-2011)

Wind Speed

Annual wind speed and direction in Mymensingh vary each month. April, May and June have a higher mean wind speed than the other months of the year. On the other hand, a low wind flow was observed during October to February. Wind flows mainly from east and north-east during November to January with some from north-west, whereas it flows from east to south-east during February to October. The highest wind was recorded as 4.5 knots/hour in April 2001.

3.1.2 Topography, geology and soils

The topography of the proposed bridge construction site is almost flat, and the altitude is approximately from 5 m to 15 m above sea level. It is gently undulating landscape of flood plain ridges. The soil consists of the recent and sub recent alluvial sediments which are mainly medium to fine textured on or near the surface. In terms of physiographic aspect, the proposed bridge site belongs to older piedmont alluvial plain.

It occupies nearly level piedmont plain gently sloping southwards. It is crossed by some narrow higher ridges and underlain by clayey deposits which sometimes bury Brahmaputra alluvium within 40 inches. The topography appears, at least partly buried basin landscape of the Older Brahmaputra floodplain.

The soils are loamy to clayey in texture, where mainly two crops are grown annually, i.e., Transplanted Aman[1] (both local variety and high yielding variety) grown during rainy season (mainly August to mid-December) and Boro[2] (high yielding variety) grown during dry season (mainly mid-December to May). In some areas, Transplanted Aman is followed by various rabi crops.

[1] Aman is paddy crops grown during the rainy season, mainly between August and December.
[2] Boro is paddy crops grown during the dry season (mainly mid-December to May).

3.1.4 Surface water hydrology

The proposed bridge will be constructed on the Gudaria River at location of existing Futkai ferry ghat. The Gudaria River falls to the Kangsha River at 0.7 km south-east and the flow discharges subsequently to the Dhanu river of the Meghna basin area.

The Gudaria River is formed of numerous streamlets originating from hills of Meghalaya State of India and it is flashy in nature. The important streamlets flowing into the river are, the Gangina, Ramkali, Paiddajuri, Bhoraghat, Jam nadi and Netai.

The Gudaria River flows about 10 months a year, and usually dries up between late February and early April, depending on the annual variations of rainfalls in the catchments area. Data from the nearest rainfall station shows the area has the maximum rainfalls in July varying from 497 mm to 801 mm on average. The Gudaria River suffers from flash flood almost every year usually in June, July and August when river banks go under water. There is also severe flood every 10 to 15 years interval which causes more inundation, e.g., in 1988 water level rose to 2.5 feet (0.76 m) in Futkai village on the left bank, and 2.0 (0.61m) in Kailati village on the right bank respectively, compared with the homestead level. Similarly in 1998, water level rose to 1.5 feet (0.46 m) and 1.0 foot (0.31 m) in Futkai village on the left bank and Kailati village on the right bank respectively. Such data are summarized in Table 3.

Table 3 Data on the highest flood level in 1988 and 1998

Flood year	Location	Depth of flooding above homestead level	Duration of flooding
1988	Village-Futkai	2.5 feet (0.76 m)	15-18 days
	Village-Kailati	2.0 feet (0.61 m)	
1998	Village-Futkai	1.5 feet (0.46 m)	15-22 days
	Village-Kailati	1.0 foot (0.31 m)	

Source: Data collected through FGD

3.1.5 Ground water

Ground water is widely used for both drinking and irrigation purposes in the subproject area. The depth of the hand tubewells (HTWs) for drinking water in the area varies from 40 feet to 120 feet (12.23 to 36.70 m).

The discharge of HTWs for drinking, which have less depth than deep tubewells (DTWs) for irrigation, gets substantially reduced in the irrigation season. Water quality and discharge characteristics of HTWs are given in Table 4.

Table 4 HTWs for drinking water in the subproject area

Depth of HTW	Discharge level	As- Contamination	Fe-Contamination	Related information
40-50 feet (12.23-15.29 m)	Discharge is severely reduced during irrigation season	30% of HTWs have As-contamination beyond tolerance limit (>0.05 mg/l)	Have high iron contamination	Discharge of the HTWs are affected by operation of DTWs for irrigating Boro during February to April
50-120 feet (15.29-36.70m)	Discharge is reduced during irrigation season	30% As-contamination beyond tolerance limit (0.05 mg/l)	Have less iron contamination having depth >85 feet (25.99m)	

Source: Data collected through FGD

According to the laboratory test of HTWs by the Haluaghat Upazila DPHE laboratory, it is found that the water quality is within permissible limit as per contents of arsenic, iron and chloride. The data is

shown in Table 5.

Table 5 Laboratory analytical data of HTW water

Sample number	Arsenic (BDS permissible limit=up to 0.05 mg/l)		Iron (BDS permissible limit=0.3-1.0 mg/l)		Chloride (BDS permissible limit=150-160 mg/l)	
	Content	Method	Content	Method	Content	Method
1	0.004	AAS	0.34	AAS	15	ASS
2	0.003		0.41		13	
3	0.003		0.80		10	
4	0.003		0.21		11	
5	0.004		0.80		15	

Source: Upazila DPHE, Haluaghat
Legend: AAS: Atomic absorption spectrophotometry; BDS: Bangladesh drinking water standard

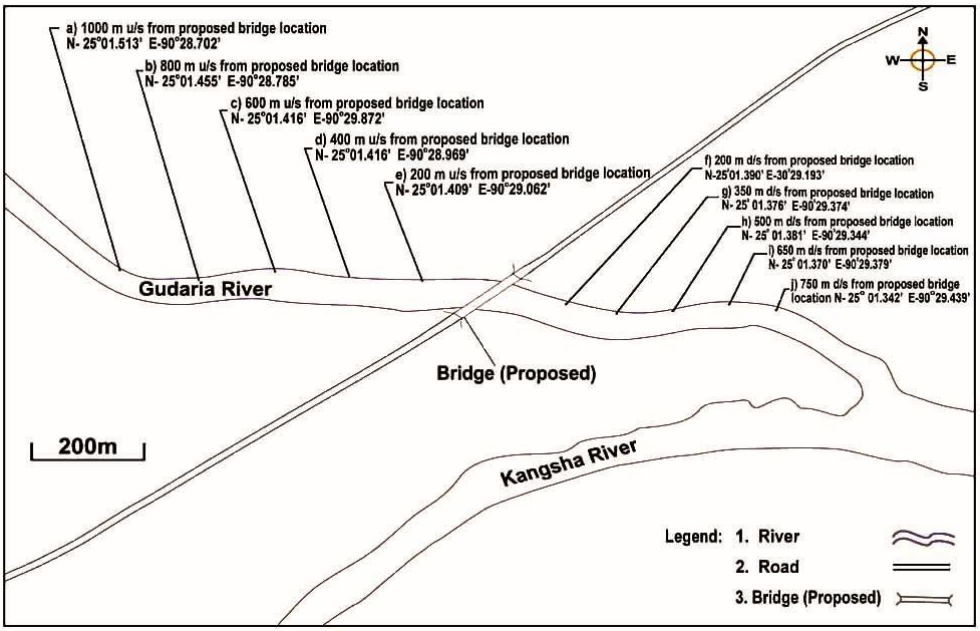
The ground water aquifer depth depends on the rate of discharge and recharge of water. Overexploitation of ground water would affect the water discharge capacity, which would affect availability of both drinking and irrigation water. Thus, required measures, including less use of ground water, are to be undertaken for maintenance of a balanced aquifer level.

3.1.6 River morphology

The Gudaria River is a flashy river composed of numerous streamlets coming from Meghalaya State of India. The important streamlets feeding the river are, Gangina, Ramkali, Paiddajuri, Bhoraghat, Jamnadi and Netai.

The river causes flush-flooding during peak monsoon months (mainly in July and August) and occasionally during early monsoon period (May and June), depending mainly on the onrush of rain water coming from the catchments areas of Meghalaya State of India. The monsoon flood damages the transplanted Aman crops. This requires the re-plantation of Aman, and eventually leads to increase in the cost of cultivation and reduction of yield. The monsoon flooding is, thus, increasing vulnerability of the farmers in the area.

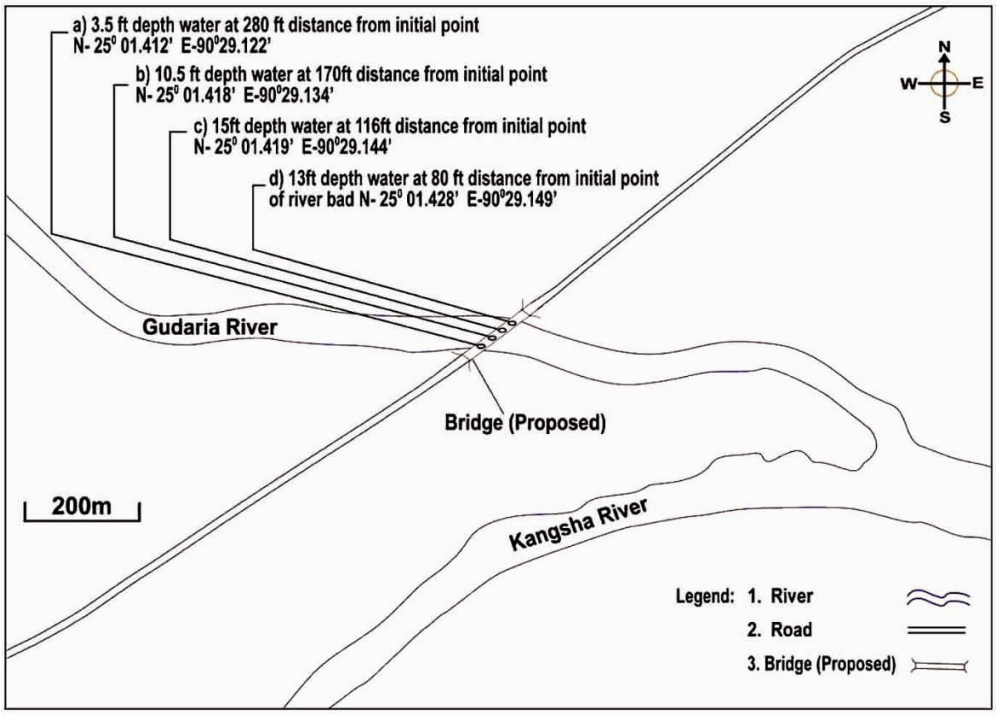
Although the river banks are often flooded every year, almost no change of the river course has been observed during the last 10, 20 and 30 years, according to the local consultation meetings. Local people stated that the river banks are stable, and no outstanding erosion is visible within 1,000 m upstream and 750 m downstream where the river meets the Kangsha River. For the further verification of the status of erosion and river bank stability, five sites of upstream at distances of about 200 m intervals, and five sites for downstream at distance of 150 m intervals have been sampled in the survey (Figure 7). No severe erosion has been observed from the survey. The images of different places in both upstream and downstream of the proposed bridge site are indicated in Attachment 2 to this Supplementary Annex.



Source: Survey Team

Figure 7 Locations on U/S and D/S of Gudaria River for river bank stability

Depth of the Gudaria River has been measured at four sample spots within the river flows (Figure 8 and Image 2). The measured depths are indicated in Table 6.



Source: Survey Team

Figure 8 Locations for river (Gudaria) depth measurement along the proposed bridge alignment

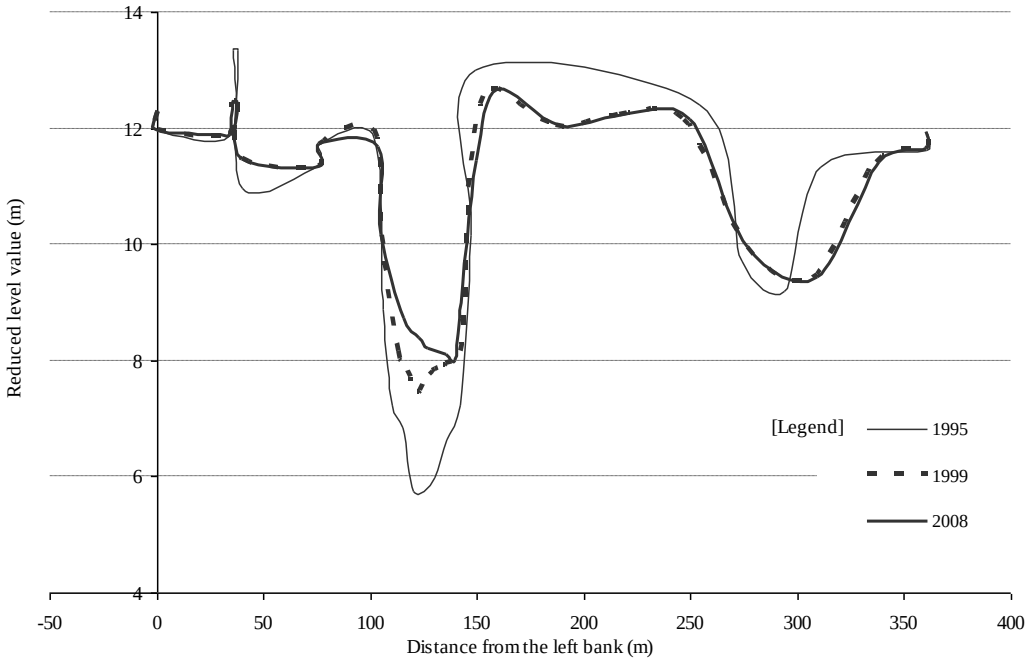
Image 2 Depth measurement of the Gudaria River

Table 6 Data on depth of the Gudaria River

Distances from right bank of the Gudaria River	Location	Depth	Date of measurement
80 feet (24.46m)	Latitude 25°01.428'N Longitude 90°29.149'E	13.00 feet (3.98m)	August 30, 2012
116 feet (35.47m)	Latitude 25°01.419'N Longitude 90°29.144'E	15.00 feet (4.59m)	August 30, 2012
180 feet (55.05m)	Latitude 25°01.418'N Longitude 90°29.134'E	10.42 feet (3.19m)	August 30, 2012
280 feet (85.63m)	Latitude 25°01.412'N Longitude 90°29.122'E	3.75 feet (1.15m)	August 30, 2012

Source: Field Survey

The cross section data of the Gudaria River was not available. However, the data of the river Bhogai-Kangsha at Haluaghat Upazila, which is connected at the downstream of the proposed bridge site, has been collected from the Bangladesh Water Development Board (BWDB). The river cross-section chart in selected years from 1995 to 2008 at the point code of rmbh9, which is approximately 500 m southeast from the proposed bridge site, is given in Figure 9.



Source: BWDB

Figure 9 Bhogai-Kangsha River cross-section for 1995-2008 (at point of rmbh9)

The cross section of the Bhogai-Kangsha River indicates that the river bed level has varied to some extent from 1995 to 2008, mainly because of the increased sedimentation. This implies that surrounding areas along the rivers of the proposed bridge site are prone to be affected by the sedimentation.

Figure 9 also indicates that the erosion level of the bank of the Kangsha River has not been so severe from 1995 to 2008. This implies that the soil conditions in the surrounding area of the proposed bridge site are relatively stable, and not exposed to the risk of severe soil erosion.

3.2 Biological environment

Field-level data and information on existing biological environment were collected mainly through focus group discussion (FGD) with local stakeholders. This section will provide the details of data and information on biological environment at or in the vicinity of the proposed bridge site.

3.2.1 Aquatic habitat and fish

The aquatic system around the proposed bridge site consists of the Gudaria River, including direct and indirect flow, inundation of the Kangsha River in the vicinity of the site, borrow pits, *beel* or low-level crop land, and ponds and other wetlands.

The aquatic life includes aquatic plants (flora) and animals (fauna). Aquatic flora includes Kochuri pana (water hyacinth), Dhol kalmi, Helencha, Shapla, Singara, Vat, etc. Among fauna, various kinds of fish, frogs, snail, tortoise and a few water birds are found in the area, although most of them are decreasing in numbers.

According to the local population, various kinds of fish are available in the Gudaria River, as a wide variety of fish migrate from the Kangsha River. In the cultivated areas, various fish species are also available, especially in the monsoon season. Some cultured species are also found in the river, which

come to the river from closed water bodies when flooded. A list of the fish species available in the area is enclosed in Table 7.

However, some fish species are on a decreasing trend. Local people including those catching fish by themselves pointed out that some fish species such as Nandail, Ritha (Rita rita), Bacha (Eutropiichthus vacha), Vetki (Lates calcarifer), Kaon and Mohashoul (Tor tor) are found on rare occasions.

According to the Fishery officer at Haluaghat Upazila, fish species like Shoul (Channa straitus), Shing (Heteropneustes fossilis), Magur (Clarius batrachus), Pabda (Ompok pabda), and Bacha (Eutropiichthys Vacha), have decreased. However, the officer also stated that the construction of the proposed bridge will not have a significantly adverse effect on fish production and availability.

3.2.2 Terrestrial habitat and life

The terrestrial system in the vicinity of the proposed bridge site has a variety of flora and fauna, but they are decreasing in general. Many species of wildlife have been decreasing as the area has been populated and developed for many years.

It is observed that quick growing timber trees such as mahogany, rain tree, and sissoo are extensively grown in the area for quick commercial returns. In terms of fruit trees, a few species like mango and jackfruit are increasing, but they are on a decreasing trend in general. Plantations of fruit species like olive, kola, and lebu are increasing. In general, the diversity of trees species has been decreasing.

3.2.3 Biodiversity

It is a common environmental understanding that biodiversity has been on a decreasing trend, threatening extinction of many species, and causing imbalance in the natural environment. During the FGD with the local population, it has been confirmed that the proposed bridge site has also seen a reduction trend of many species to some extent. For example, many amphibians, reptiles, mammals and birds, and some indigenous tree species like medicinal plants have been decreasing, because of overexploitation, excessive human habitation, development of agricultural lands, lack of local people's awareness, and other human-related factors.

A field survey has been carried out to find out the type and extent of existing flora and fauna at and in the vicinity of the proposed bridge construction site. Information on existing wildlife, such as amphibians, reptiles, birds, fish, and mammals as well as trees, flowers, and other plants, has been collected through FGDs with the local population. A total of 13 FGDs have been conducted in the vicinity of the proposed construction site, and flora and fauna which were listed by local people at more than 30% of FGDs were picked up in this section. Then, the information on flora and fauna has been cross checked with the IUCN Red List of Threatened Species[3] to confirm the conservation status.

Some fruit or timber trees, growing faster and bringing about economic benefits, are generally increasing. Those fruit trees include mango, jackfruit, peara, lichi, jalpai, and lebu, and such timber trees include mahogany, rain tree, akashmoni, shishu, and shegun.

Open water fish has been reducing in general, mainly because of the excessive catching by local people and reduction of fish habitat. Many fish species that can be cultured, on the other hand, are increasing in the area, as are common in other parts of the country.

The reduction trend of biodiversity can be reversed by increasing people's awareness on the importance

[3] IUCN (2012) *IUCN Red List of Threatened Species*. Version 2012.1. <www.iucnredlist.org> accessed on 31 August 2012.

on biodiversity and its preservation, and establishing eco-parks or sanctuaries.

Fish

Table 7 shows the list of fish species in the river, beel and other wetlands of the area. According to IUCN (2012), out of the listed fish species, only *Cyprinus carpio* or common carp is categorized as "Vulnerable." The wild population of *Cyprinus caipio* is considered vulnerable, but the species has also been widely domesticated in the area. The species have been introduced in the area mainly for fish culture. Thus extinction of the species in the area is unlikely.

Amphibians and other aquatic species

Table 8 is the list of amphibians and other aquatic species in the area. According to IUCN (2012), no threatened species are found in the area.

Table 7 List of fish species in the river, beel, and wetland of the area

Bangladesh name	Scientific name	English name
Kajli	*Ailiichthys punctata*	Jamuna ailia
Mula	*Ambltpharyngodon mola*	Indian carplet
Koi	*Anabas tesudineus*	Climbing perch
Catla	*Catla catla*	Major carp
Taki	*Channa punctatus*	Snakehead
Chanda	*Chanda ranga*	Glass perch
Shoul	*Channa striatus*	Snakehead
Magur	*Clarioas batrachus*	Catfish
Grass carp	*Ctenopharyngodon idellus*	Grass carp
Carpio	*Cyprinus carpio*	Common carp
Chapila	*Gadusia chapra*	Herrings
Shing	*Heteropneustes fossilis*	Stinging catfish
Silver carp	*Hypophthalmichthes molotrix*	Silver carp
Kali baus	*Labeo calbasu*	Major carp
Ghonia	*Labeo gonius*	Kuria labeo
Rui	*Labeo rohita*	Major carp
Chingri	*Macrobrabrachium malcolmsoni*	Prawn
Baem	*Mastacembelus armatus*	Zig zug eel
Ayre	*Mists aor*	Long whiskered catfish
Gulsha	*Mystus cavacius*	Gangetic mystus
Tengra	*Mystis vittatus*	Days mystus
Fali	*Natopterus notopterus*	Feather backs
Pabda	*Omok pabda*	Pabdha catfish
Chela	*Onygaster phulo*	Chela
Batashi	*Pscudeutropicus atberinoides*	Indian potashi
Puti	*Puntius stigma*	Barb
Rita	*Rita rita*	River catfish
Boal	*Wallago attu*	Giant catfish

Source: Field data collection through FGD conducted in August 2012

Table 8 List of amphibians and other aquatic species in the area

Bangladesh name	Scientific name	English name
Kuno Bang	*Bufo melanostictus*	Common Toad
Bang	*Rana cyanophytes*	Skipper Frog
Sona Bang	*Rana tigrina*	Bull frog
Joke	-	Leech
Shamuk	-	Snail

Source: Field data collection through FGD conducted in August 2012

Reptile

Table 9 is the list of reptiles found in the area. According to IUCN (2012), no endangered species are found except for *Ophiophagus hannah* or king cobra, which has been rated "Vulnerable." However, the habitat of the species is usually forest or densely vegetated area, and such area is not observed at the proposed bridge site. Thus it is considered that the risk of negative impacts of the proposed bridge construction on the species is almost nil.

Table 9 List of reptiles in the area

Bangladesh name	Scientific name	English name
Dudh raj	*Elapheradiata*	Trinket snake
Matia Sap	*Enhydris enhydris*	Water snake
Kochchop	*Kachuga tecta*	Tortoise
Kasim	*Lissemys punctata*	Flap-shell turtle
Gokhra sap	*Naja naja*	Cobra
Shonkho chura	*Ophiophagus hannah*	King kobra
Daraj sap	*Ptyas mucosus*	Rat snake
Gui shap	*Varanus bengalensis*	Monitor lizard
Dhora sap	*Xenochrophis piscator*	Water snake
Bhing raj	-	

Source: Field data collection through FGD conducted in August 2012

Mammal

Table 10 is the list of mammals in the proposed bridge construction site. No species have been found to be threatened according to IUCN (2012). However, a few local people pointed out that there were *Lutra lutra* or otters in the area. Habitats of these mammals should be carefully conserved.

Table 10 List of mammals in the area

Bangladesh name	Scientific name	English name
Shial	*Canis aurcus*	Jackal
Badur	*Cynoptwerus spinex*	Short nosed fruit bat
Beji	*Herpestes edwardsi*	Mongoose
Idur	*Mus booduga*	Field mouse
Chika	*Suncus murinus*	Shrew
Khatash	*Viverine malaccensis*	-
Khek shial	*Vulpes bengalensis*	Fox

Source: Field data collection through FGD conducted in August 2012

Bird

Table 11 shows the list of birds which can be observed in the area. According to IUCN (2012), no birds have been found to be threatened.

Table 11 List of birds in the area

Bangladesh name	Scientific name	English name
Jhuti salikh	*Acridotheres fuscus*	Jungle myna
Bhat salikh	*Acridotheres tristis*	Common myna
Mach ranga	*Alcedo atthis*	Common kingfisher
Kana bok	*Ardeola grayii*	Pond heron
Hutum	*Athena brama*	Spotted owlet
Pati kak	*Corvus splendens*	House crow
Boro kak	*Corvus macrorynchos*	Jungle crow
Doyel	*Copsychus saularis*	Magpie robin
Finge	*Dicrurus macrocercus*	Black drongo
Kokil	*Eudynamys scolopacca*	Koel
Moyna	*Gracula religiosa*	Indian myna
Sada bok	*Igretta garzetta*	Small heron
Holud pakhi	*Oriolus xanthornus*	Black-hooded oriole
Kutum pakhi	*Oriolus chinensis*	Black-naped oriole
Tuntuni	*Orthotomus sutorius*	Tailor bird
Choroi	*Passer domesticus*	House sparrow
Babui	*Ploceus philippinus*	Baya weaver bird
Tiya	*Psittacula krameri*	Parakeet
Bulbul	*Pycnonotus jacosus*	Red-vented bulbul
Ghugu	*Streptopelia chinensis*	Spotted dove
Gu Shalik	*Sturnus contra*	Pied myna
Pecha	*Tyto alba*	Owl
Kobutar	*Columba livia*	Pigeon
Sharosh	*Grus antigone*	Crane

Source: Field data collection through FGD conducted in August 2012

Trees

Table 12 and Table 13 are the lists of fruit trees and timber or other trees respectively. According to IUCN (2012), *Delonix regia* or flame tree has been identified as "Vulnerable." However, *Delonix regia* is endemic to Madagascar, and was introduced into the area by humans many years ago. Thus it is considered that there is the least concern of the extinction of the species.

Table 12 List of fruit trees in the area

Bangladesh name	Scientific name	English name
Aam	*Mangifera indica*	Mango
Jam	*Syjygium grandis*	Black berry
Kathal	*Artocarpus heterophyllus*	Jack fruit
Lichu	*Lichi cinensis*	Litchi
Jambura	*Citrus grandis*	Pomelo
Narikel	*Cocos nucifera*	Coconut

Bangladesh name	Scientific name	English name
Pepe	*Carica papaya*	Papaya
Kul	*Zizyphus mouritania*	Jujube
Khejur	*Phoenix sylvestris*	Date tree
Tal	*Borassus flabellifer*	Palm tree
Peara	*Psidium guajava*	Guava
Bel	*Aezle marmelos*	Wood apple
Supari	*Areca catechu*	Betel nut
Dalim	*Punica granatum*	Pomegranate
Kola	*Musa Spp.*	Banana
Amra	*Spondias Pinnata*	Hog-plum
Jalpai	*Elaeocarpus robustus*	Olive
Kamranga	*Averrhoea carmobola*	Star fruit
Tentul	*Tamarindus indicus*	Tamarind-tree
Lebu	*Citrus aurantifolia*	Lemon
Boroi	*Zizyphus jujuba*	Berry

Source: Field data collection through FGD conducted in August 2012

Table 13 List of timber or other trees in the area

Bangladesh name	Scientific name	English name
Akashmoni	*Acacea moniliformis*	Akashmoni
Koroi	*Albizia procera*	Koroi
Shil koroi	*Albizia lucida*	
Kadam	*Anthocephalus chinesis*	Kadam
Pitraj	*Aphanamixis polystachya*	
Kathal	*Artocarpus heterophylus*	Jack fruit tree
Shishu	*Dalbergia sisso*	Sissoo
Krishnachura	*Delonix regia*	Flame tree
Eucalyptus	*Eucalyptus citriodora*	Eucalyptus
Bot	*Ficus religiosa*	Banyan tree
Gamari	*Gmelina arborea*	
Mandar	*Rrythrina variegata*	Coral tree
Raintree	*Samanea saman*	Rain tree
Mehagony	*Swietenia mahogoni*	Mahogany
Jam	*Syjygium grandis*	Black berry tree
Shegun	*Tectona grandis*	Teak
Lombu	-	-

Source: Field data collection through FGD conducted in August 2012

Medicinal plant

Table 14 is the list of medicinal plants in the area. According to IUCN (2012), no medicinal plants have been found to be threatened.

Table 14 List of medicinal plants in the area

Bangladesh name	Scientific name	English name
Bel	*Aegle marmelos*	Wood apple
Nim	*Azadirachta Indica*	Margosa
Bandar lathi	*Cassia fistula*	
Jaistha modhu	*Glycyrrhiza*	
Tulshi	*Ocimumsanctum*	Holyn basil
Amlaki	*Phyllathus embelica*	
Arjun	*Terminalia arjuna*	Arjun
Bohera	*Terminalia belerica*	
Horitaki	*Terminalia chebula*	

Source: Field data collection through FGD conducted in August 2012

Crops and vegetables, and flowers

Table 15 and Table 16 are the lists of crops and vegetables, and flowers respectively. No such species has been threatened according to IUCN (2012).

Table 15 List of crops and vegetables in the area

Bangladesh name	Scientific name	English name
Dheros	*Abelmoschus esculentus*	Lady's finger
Lal shak	*Amaranthus*	
Pui shak	*Basella alba*	Pui shak
Chal kumra	*Benincasa hispida*	Gourd
Morich	*Capsimum frutescens*	Chili
Kochu	*Colocasia esculenta*	Kachu
Paat	*Corchorus olitorius*	Jute
Sosha	*Cumis sativus*	Cucumber
Misti kumar	*Cucurbita maxima*	Sweet gourd
Misti alu	*Ipomoea batatas*	Sweet potato
Lau	*Lagnaria siceraria*	Pumpkin
Khesari	*Lathyrus sativus*	Pigeon pea
Moshur	*Lens culinaris*	Lentil
Tishi	*Linum usitatissimum*	Lin seed
Korola	*Momordica chantea*	Bitter gourd
Paddy	*Oryza sativa*	Paddy
Akh	*Saccharum officinarum*	Sugarcane
Til	*Sesamum indicum*	Sesame
Palong shak	*Spinacea oleracea*	Spinach
Alu	*Solanum tuberosum*	Potato
Chichinga	*Trichosanthes anguina*	Snake gourd
Gom	*Triticum aestivum*	Wheat
Dhundul	*Xylocarpus granatum*	
Bhutta	*Zea mays*	Maize
Sorisha		Mustard

Source: Field data collection through FGD conducted in August 2012

Table 16 List of flowers in the area

Bangladesh name	Scientific name	English name
Shimul	*Bombax ceiba*	
Pata bahar	*Codiacum variegatum*	Croton
Gondho raj	*Gardenia jasminoides*	Gardenia
Joba	*Hibiscus rosa-sinensis*	China rose
Beli	*Jasminum sarrbac*	
Shapla	*Nymphaea nouchali*	Water lily
Nil padda	*Nymphaea stellata*	
Shefali/Sheuli	*Nyctanthes arboriristis*	
Golap	*Rosa centifolia*	Rose
Tagar	*Tabernaemontana divaricate*	
Ganda	*Tagetes patula*	Marigold
Rajani gondha	*Pollenthes tuberosa*	Tuberose

Source: Field data collection through FGD conducted in August 2012

3.3 Pollution control

3.3.1 Air quality

Air quality of the proposed bridge construction site is considered to be better at present as few motor vehicles, mainly motor cycles, pass through the area, which often go across the river via the ferry boats. Motor vehicles of the other types like cars or trucks seldom pass through the area, and they cannot go across the river for the lack of a ferrying facility. However, the number of motor vehicles may increase after the construction of the bridge.

At present there are some DTWs and shallow tubewells (STWs) for irrigating Boro, the paddy crops grown in winter or the dry season by irrigation. Most of tubewells are run by generators, and thus affect the air quality slightly. There is no brick-making field at or in the vicinity of the proposed bridge site.

Usually the motor vehicles emit carbon dioxide through fuel combustion. Some fuels remain un-burnt or partially burnt, resulting in the emission of hydrocarbons and other organic compounds, together with carbon monoxide and carbon soot. Some nitrogen is oxidized to form various forms of nitrogen oxides. Carbon monoxide and oxides of nitrogen have an adverse implication on health. The proposed bridge site is located in rural areas, and pollutants will be scattered over a wide range of rural area and will not be concentrated.

In the survey, air quality around the proposed bridge construction site was tested. Air was comparatively clear when sampled because of heavy rain in the previous night and morning. The average temperature during starting and ending of the sampling was 28.5^{o}C, and the average humidity was 91%. The result of air quality data is presented in Table 17.

Table 17 Air quality test results at the proposed bridge site and applicable air quality standards

Parameters of air quality	Sample location		Standard limit set by the ECR, 1997			
	Left bank	Right bank	For Different uses			
			Industrial	Commercial	Residential	Sensitive
PM 2.5 (mg/m^3)	0.015	0.018	-	-	-	-
PM 10 (mg/m^3)	0.035	0.018	-	-	-	-
SPM 10 (mg/m^3)	10.15	10.25	500	400	200	100
CO (mg/m^3)	750	755	5000	5000	2000	1000
NO (mg/m^3)	125	122	100*	100*	80*	30*
NO_2 (mg/m^3)	0	0				
SOx (mg/m^3)	65	66	120**	100**	80**	30**
Pb (ng/m^3)	0.85	0.85	-			

Source: Field collection and laboratory test
Note 1) Date of sampling is 8 August 2012.
Note 2) Sampling location on the right bank is latitude 25°1'391"N and longitude 90°29'097"E, and on the left bank is latitude 25°01.434'N and longitude 90°29.137'E
Note 3) *Values for NO_x; **Values for SO_2

It is found, by comparing with the standard limit set by the DOE, that SPM and CO are within permissible limits for all purposes. NO has higher value than NO_x, although NO_2 content is nil. The values for PM 2.5, PM 10 and Pb are yet to be set. These test data will be used as reference information when conducting the post-construction monitoring.

3.3.2 Water quality

The quality of surface water may be affected during and after construction of the proposed bridge. There is also a slight possibility that the construction work may change the quality of groundwater.

Considering such risks, tests of existing surface water and groundwater have been conducted on important parameters to verify their present qualities. A total of ten water samples were tested under this EIA. These test data will be baseline information which can be referred to in the post-construction monitoring at the proposed bridge site. The results are indicated for comparing in the future and their results are indicated in Table 18.

Table 18 Water quality test results of surface and ground sources at the proposed bridge site

Sample location		DO (mg/l)	BOD (mg/l)	COD (mg/l)	pH	EC (µs/cm)	TSS (mg/l)	TDS (mg/l)	Turbidity (JTU)
Left bank of the river	latitude 25°01.407'N longitude 90°29.124' E	6.52	10	16	5.61	94	128	41.6	39.02
HTW water in village Kailati	latitude 25°01.322'N longitude 90°29.116'E	7.34	5	8	5.83	262	0	86	50.00
Beel water in village Futkai	latitude 25°01.465'N longitude 90°29.23'E	6.81	10	12	6.33	231	64	77.1	12.60
Pond water in village Futkai	latitude 25°01.512'N longitude 90°29.212' E	5.59	12	13	6.30	291	71	95.8	9.29
HTW water in village Futkai	latitude 25°01.550'N longitude 90°29.174' E	7.35	6	9	6.28	366	0	126	4.23
Right bank of the river	latitude 25°01.434'N longitude 90°29.137'	7.04	10	13	6.45	92	112	44.7	16.74
Pond water in village Kailati	latitude-25°01.291N longitude 90°28.601'E	6.60	12	13	6.52	67	64	28.6	6.42
Fishery pond in village Kailati	latitude-25°01.124'N longitude 90°28.681'E	7.57	14	14	6.39	85	24	32.3	3.33
HTW water in village Kailati	latitude-25°01.048'N longitude 90°28.705'E	6.43	5	8	6.31	356	0	121	10.19
Pond water in village Kailati	latitude-25°01.048'N longitude 90°28.705'E	5.09	12	13	6.44	154	61	60.1	14.01

Source: Field collection and laboratory test
Note: Sampling date is 8 August 2012
Legend: BOD: biochemical oxygen demand; COD: chemical oxygen demand; DO: dissolved oxygen; EC: electrical conductivity; HTW: hand tubewell; JTU: Jackson Turbidity Unit; TDS: total dissolved solids; TSS: total suspended solids

Standards for surface water quality, which are set by the ECR, 1997, are indicated in Table 19.

Table 19 Standard for surface water quality set by the ECR, 1997

Parameters	Unit	Drinking water	Recreation purpose	Fishery purpose	Industrial use	Irrigation purpose	For animals and birds	Coastal water quality
DO	mg/l	6	4-5	4-6	5	5	4-6	6
BOD	mg/l	< 0.2	3	6	10	10	NYS	NYS
COD	mg/l	4	4	NYS	3-10	NYS	1000	NYS
pH	-	6.5-8.5	6.0-9.5	6.5-8.5	6.0-9.5	6.0-8.5	5.5-9.0	6.0-9.0
EC	ms/cm	0	500	800-1000	NYS	750	NYS	NYS
TSS	mg/l	10	20	25	75	NYS	NYS	75
TDS	mg/l	1000	NYS	NYS	1500	2000	5000	NYS
Turbidity	JTU	5	NYS	10	NYS	5	NYS	NYS

Source: ECR 1997

Legend: BOD: biochemical oxygen demand; COD: chemical oxygen demand; DO: dissolved oxygen; EC: electrical conductivity; HTW: hand tubewell; JTU: Jackson Turbidity Unit; NYS: not yet set; TDS: total dissolved solids; TSS: total suspended solids

Ten water samples in total were collected of which three were from HTWs used for drinking water mainly. According to the test results, it is found that water samples of all the HTWs exceed the standards for drinking water in DO, BOD, COD, and EC. In terms of pH, all samples indicate relatively acidic values. Two samples from HTWs have a higher turbidity level, although all have lower TSS and TDS contents within the standards. Thus, it is concluded that the water quality of the HTWs as drinking water is not totally good at present.

Four water samples from ponds were collected and tested. It has been found that DO of two pond samples are within the standards for fishery and for animals and birds. BOD of all pond water is above permissible limits for fishery. COD of all pond water exceed the standards except the one for animals and birds. The figures of pH are within permissible limits for fishery, animals and birds. TDS is within permissible limits for animals and birds, and turbidity of three ponds is within limits for fishery purpose.

Water of the Gudaria River has been collected at two sample locations. It is found that both samples have higher contents of DO for fishery, and irrigation, and use for animals and for birds. They also indicate higher BOD values for fishery, but within standards for irrigation. COD values indicate their suitability for animals and birds. Values of pH of both the sample are within the range for animals and birds, although one has a lower value for fishery and irrigation. EC of both samples are within the standards fishery and irrigation purposes. TSS of both samples fails to meet the standards for any purpose, whereas TDS are within the standards for irrigation and animals and birds. Test results of turbidity show that water of the Gudaria River has higher content for fish and irrigation purposes.

One sample from beel was collected. The sample has higher content of DO for fish, irrigation and for animals and birds. The sample water has higher value of BOD for fish, although within the standards for irrigation. Its COD value indicates that the water is suitable to be used for animals and birds. The value of pH is within the standards for fishery, irrigation, and for animals and birds. EC value of the sample is within the standards for fishery and irrigation. TSS is higher for fish and TDS value is within the standards for irrigation and for animals and birds. The turbidity of the beel water has higher value for both fish and irrigation purposes.

3.3.3 Noise level

The current noise level at the proposed bridge site is quite low, as few motor vehicles pass through the

area. Presently some motorcycles cross the river through the existing ferry boat service. Since no other motor vehicles like cars and busses can pass thorough the ferry service, very few of such vehicles are observed in the area. In addition, there are some DTWs, STWs and low-lift pumps (LLPs) in the area which operate in the irrigation season, mainly from January to April. However these have not created significant noise.

The noise level will become higher during bridge construction as the number of heavy machinery items used for the construction work will increase.

Moreover, the noise level will also become higher after the construction of the bridge since various types of vehicles will pass through the proposed bridge. The noise level will vary depending on the traffic volume, vehicle type, road surface conditions, and other factors.

The current noise level along the proposed bridge construction site on the Gudaria River has been measured. Four noise levels were measured, i.e., two each on both banks of the Gudaria River, and two each in the morning and the evening. Results of noise level measurement are presented in Table 20. The data can be used as a bench mark of noise level before the bridge construction, and can be referred to in the post-construction monitoring.

Table 20 The current noise level at the proposed bridge construction site

Sample location		Noise level (dBA) (measurement time)	Standard limit (dBA)	Observation
West side of Gudaria river	Latitude 25°01.407'N Longitude 90°29.124' E	45 (10.30 a.m.)	The standard limit ranges between 50 dBA at daytime and 40 dBA at night in the residential areas (the ECR, 1997).	The sound levels are within standard noise level.
East side of Gudaria river	Latitude 25°01.434'N Longitude 90°29.137'	48 (5.50 p.m.)		
Near village Kailati	Latitude 25°01.322'N Longitude 90°29.116'E	47 (11.00 a. m.)		
Near village Futkai	Latitude 25°01.434'N Longitude 90°29.137'	50 (6.00 p.m.)		

Source: Field collection and laboratory test
Note: Measurement date is August 7, 2012

Table 21 shows the standards of noise for different areas/classes as stipulated in the ECR, 1997.

Table 21 Tolerable limit of noise in Bangladesh

Area types	Unit	Tolerable limit at day time	Tolerable limit at night time
Areas require high level of silence like hospital, schools etc.	dBA	45	35
Residential areas	dBA	50	40
Mixed areas for residence, commercial and industrial purposes	dBA	60	50
Commercial areas	dBA	70	60
Industrial areas	dBA	75	70

Source: ECR 1997

The area largely belongs in the residential category. According to ECR, 1997, the maximum standard for residential areas is 50 dBA in the daytime and 40 dBA in the nighttime. The results of the noise measurement range between 40 to 50 dBA. Thus the area appears to be free from noise disturbance at present.

3.3.4 Bottom sediment quality

River bed materials will be re-excavated to some extent during construction of the proposed bridge, which would be used for the filling of the approach roads, and/or river training works, depending on the plan of construction works. Thus the quality of the river sediments should be suitable to be used for such purposes.

Moreover, sediments quality may change after the construction of the bridge. For the purpose to collect baseline information, two samples of river bed materials were collected. The concentrations of five heavy metals were tested. Their results are indicated in Table 22.

Table 22 River bed sediment quality at the proposed bridge site

Sample Location	Zn (mg/kg)	As (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Cd (mg/kg)
Eastern side of Gudaria River	45.5	2.15	0.15	621	0.65
Western side of Gudaria River	42.8	2.21	0.27	624	0.56
Standard limit	300.0	20.0	2.0	not yet set	2.0

Source: Field collection and laboratory test
Note 1: The standard limits of the United States Environmental Protection Agency are indicated here as a reference, as no standards for sediments have been set in Bangladesh
Note 2: Measurement date is August 8, 2012

No standard for river bed sediment has been set in the ECR, 1997 and other regulations in Bangladesh. Therefore, the standard limit set by the United States Environmental Protection Agency (USEPA) is quoted for this EIA, which is widely followed in Bangladesh.

The sample test result indicate that the contents of heavy metals of zinc, arsenic, mercury and cadmium in river bed sediments are found within the standard permissible limits, though the limit for manganese is not yet set.

3.4 Socioeconomic environment

3.4.1 Socioeconomic profile

The proposed bridge is to be constructed as part of the UZR subproject in Haluaghat Upazila. The bridge will connect the areas of Haluaghat Upazila with Dobaura Upazila, and significantly benefit the people living in Haluaghat Upazila, because they often commute to market, schools, and hospitals in Dobaura Upazila through the ferry service.

Various secondary data and information on Haluaghat Upazila are presented in Table 23. The information has been collected mainly from the Bangladesh Bureau of Statistics (BBS) and interviews conducted during the field survey.

Table 23 Socioeconomic profile of Haluaghat Upazila

Item	Data/information
Basic statistics	
Total area	358 km^2
Total population	290,043 (male:142,632; and female:147,411
Population of ethnic minority	14,071 (male: 7,130; and female: 6,941)
Population increase rate	1.53%
Population density/ km^2	811
Total number of Union	12
Total number of mouza/villages	mouza:146; village: 210
Drinking water and sanitation	
Number of operative HTWs	1,699
Number of tara pump	1,269
Number of super tara pump	9
Ring HTW	28
Sanitation latrine coverage	78.63%
Agricultural information	
Main agricultural crops	Paddy, wheat, jute, lentil (mushuri), potato, cucumber (shosha), and bitter gourd (korola)
Net agriculture land	27,100 ha
Areas of government-owned land	5,763 ha
Total irrigated area	22,100 ha
Number of irrigation equipment	DTW: 234; STW: 3,914; LLP :294
Total food production	156,293 MT
Total food demand	47,521 MT
Infrastructure status	
Total road length	927.45 km
Paved road (pucca)	125.55 km
Un-paved road (kutcha)	801.19 km
Railway and river ways	Nil
Number of hat or bazaar	30

Source: BBS and field data collection

Peoples' need for crossing the Gudaria River

The field survey and FGDs confirmed that many people living on the right bank in the Haluaghat Upazila will be benefitted from the proposed bridge construction. In fact, the proposed project site is closer to the center of Dobaura Upazila on the left bank than that of Haluaghat Upazila, and thus people frequently cross the Gudaria River through the ferry service. They are going to Dobaura Upazila for buying and selling agricultural or daily products, attending schools, and taking medical services. Thus, if the proposed bridge is constructed, these people will be able to visit Dobaura Upazila more conveniently.

With respect to schools, due to the existing gap over the Gudaria River, students face difficulties in going to local schools, madrashas, and a college, most of which are located in Goatola bazaar and the center of Dobaura Upazila. The students, especially female ones, can seldom attend their educational institutions in time due mainly to the shortage of boats, although no ferrying fee is taken from the students and the teachers. Timely and regular attendance in examination is also a concern for the

students living on the right bank. Therefore, severe dissatisfaction exists among them for the lack of a smooth transportation system over the Gudaria River.

The medical perspective may have severer implications. Patients cannot attend hospitals and health centers located on the right bank timely, as there is no ferry boat service after 10:00 p.m. There was a case in which a patient died consequently on the river bank recently. Such case is not uncommon in the area according to local people.

People living on the left bank, i.e., Dobaura Upazila, also have strong demand for the construction of a bridge over the Futkai ferry ghat in order to have direct road communication with Haluaghat Upazila. This will also contribute to the establishment of easy and time-saving road communication with the center of Mymensingh Pourashava. By the construction of the proposed bridge, local people will be able to transport various goods to the other side of the river more easily, e.g., transporting agricultural products to Sakuai and Batra bazaar.

The construction of the proposed bridge will, therefore, have significant positive impacts on socioeconomic conditions of local people on the both banks. Local people living in Bildora Union of Haluaghat Upazila will be able to easily communicate to Dobaura Upazila, and vice versa.
If the bridge is not constructed, the roadway transportation of goods and passengers from the right bank to the left, mainly from Bildora Union of Haluaghat Upazila to Goatola bazar and Dobaura Upazila bazar, will remain inconvenient. This will cause significant dissatisfaction among the local people.

Local people currently pay BDT 4 (BDT 2 for each way) for one person to cross the river. This results in higher costs for carrying goods and materials to the Goatola bazar on the right bank, and eventually affects the socioeconomic conditions of the local people.

According to the field survey and FGDs, a bridge over the Gudaria River is found as a long term demand of the local people living on both sides of the river. They expressed total support and cooperation for the construction of the proposed bridge.

3.4.2 Agriculture

The proposed bridge construction site and the surrounding areas are quite fertile with high productivity of agricultural crops. Paddy crops such as Aman (monsoon paddy) and Boro (winter paddy) are the main crops in the area. The other crops frequently observed in the area include wheat, jute, maize, mustard, lentil (mushuri), pigeon pea (khesari), potato, sweet potato and various kinds of vegetables like cucumber (shosha), bitter gourd (korola), snake gourd (chichinga), brinjal (begun), common gourd (lau), sweet gourd (kumra) and various leafy vegetables like amaranthus and spinach.

In particular, cucumber (shosha) is a popular crop in the area, mainly for selling to markets in Mymensingh and Dhaka. However, due to the lack of communication facility, local farmers find it hard to sell the crop.

Drought in the dry season is the major obstacle in agriculture production, when irrigation facilitates will be used for growing Boro. Seasonal flush flood in the monsoon season damages Aman almost every year, and the re-plantation of Aman is common in the area. The re-plantation increases the cost of cultivation, creating vulnerability for the farmers of the area.

3.4.3 Present mode of communication

Currently the ferry service operates at the proposed bridge construction site every day. Two boats operate at the Futkai ferry ghat, i.e., a large country boat and an engine boat. The former, which can

accommodate about 25 to 30 people, operates from 7:00 a.m. to 10:00 p.m. every day, while the latter operates only on weekly market days or hat days, i.e., Friday and Monday. The view of the Futkai ferry ghat is shown in Image 3.

Image 3 Present situation of Futkai ferry ghat at the right bank

At present, the Futkai ferry ghat is leased annually, and the lessee arranges one country boat for providing the ferry service. The fare for the ferry is BDT 2 per person each way. For motor cycles or rickshaws, the fare is BDT 5April to mid-February. In the dry season when the river gets dry, the ferry service ceases, and people cross the river by walking. After the drying, the lessee places some wood or bamboo planks on the muddy river bed, and people have to pay the same fare when they walk on the planks.

According to the information collected by FGD, many people and a variety of vehicles cross the Gudaria River from the left bank to the right and vice versa. The average numbers of people and various vehicles crossing the river by the ferry boats are given in Table 24.

On an average approximately 3,500 to 4,000 people move across the river in general, but the number increases to the range from 6,000 to 7,000 on weekly hat days of Friday and Monday. On these hat days, an engine boat also operates to provide ferrying service, in addition to the country boat.

Table 24 Average number of passengers and vehicles crossing the Gudaria River at Futkai ghat

Type	On general day	On weekly hat days (Friday and Monday)	Remarks
Passengers	3,500-4,000	6,000-7,000	Numbers of people and vehicles are the cumulative total numbers, moving from the left bank to the right and vise versa
Rickshaw	120-150	Higher than general days	
Motor cycle	100-120	Higher than general days	
Bicycle	400-500	Higher than general days	
Rickshaw van	40-50	Higher than general days	

Source: Field data collection through FGD conducted in August 2012

Six boatmen are currently engaged in boatmanship for ferrying, and they would lose their job after the proposed construction of the bridge. However, it is found that the lessee expressed satisfaction on the proposal for the bridge construction, and he stated that various businesses are possible after the construction of the bridge. Thus the impacts could be minimized.

Communication to other areas by boat is not a common practice in the area, although some large boats operate in the Gudaria River for buying and transporting agricultural crops. Road communication is the sole means of communication in the area.

Construction of the proposed bridge and the improvement of the UZR will bring about significant economic and social benefits to the local people. It helps the people by providing time-saving and easy travel means and lowering the transportation cost. Potential benefits will include but not be limited to increased access to markets, generation of employment opportunities, and improved access to educational and health services. Thus construction of the proposed bridge has various development effects on the area.

The proposed bridge construction will also establish direct road communication to nearby towns and economic centers. The communication with Mymensingh town as well as Dobaura Upazila in particular will significantly improve.

3.4.4 Land price

The price of land in the area is quite high as the availability of saleable land is scarce. The data collected through FGD is presented in Table 25.

Table 25 Land price of the area near the proposed bridge site

Land Types	Flooding category	Present price (BDT/decimal)
Agricultural land	High land (Flooded up to 0.3 m)	12,000-14,000
	Medium high land (Flooded from 0.3 to 0.9 m)	10,000-12,000
	Low land (Flooded >0.9 m)	6,000-10,000
Settlement land	High land (not flooded)	15,000-16,000

Source: Field data collection through FGD conducted in August 2012
Note 1: Flooding Classification is based on the nationally accepted land classification defined by the Ministry of Agriculture.
Note 2: Decimal is a unit of area approximately equal to 40.4686 m².

3.4.5 Cultural and religious heritage

No culturally and religiously important sites are found at the proposed bridge construction site, according to the FGDs conducted in August 2012.

4 Analysis of alternatives

In determining the location and detail design of the proposed bridge, various factors such as the existing road alignment, soil conditions of the embankments, river morphology, opinions of local people, expected financial return will be considered as well as environmental and social aspects. Points to consider in this EIA are discussed below.

4.1 Existing road communication network

The proposed bridge construction site is located at the gap of two UZRs on the Gudaria River. Both UZRs end at the gap. Thus, if the proposed bridge is constructed over the gap, the two UZRs will be directly connected by the bridge. Therefore, the place where the existing alignments of the two UZRs are linearly extended is selected for the proposed bridge construction site.

People in the area currently use the UZRs as the only means of road communication to the present ferry ghat. The right bank UZR is connected to Nagla bazar, which has direct connections to Mymensingh town in the south and Haluaghat in the north. On the other hand, the left bank UZR is connected to Goatola bazar and then to Dobaura Upazila. There exists no alternative road network for the people in the area to go to the adjacent two Upazila centers, and to Mymensingh town and other economic centers.

It is therefore concluded that, taking into account the existing road network, the proposed bridge site will be appropriate.

4.2 River morphological conditions and engineering design

The morphological survey, based on field observations of different sample points and changes in cross-section at a nearby river, revealed that the proposed bridge construction site is not an erosion prone area. The interviews with local people, in particular the elderly and teachers, also revealed that the streamline of the river has been relatively stable at the proposed bridge site.

Initial site observation by the engineering consultant also confirmed that the proposed site is the feasible location for the bridge construction, though the locations of the bridge abutments should be further studied at the detailed design phase.

It is therefore concluded that, from the engineering perspectives, the current proposed bridge site will be appropriate.

4.3 Local people's opinions

The Futkai ferry ghat is the only ferry ghat on the Gudaria River connecting the two UZRs. From both sides of the ghat, the UZRs will go to nearby Upazila centers, Mymensingh town, and other economic centers. Local people stated during FGDs and interviews that the proposed bridge site is the most suitable, and the sole site for bridge construction for connecting the two UZRs.

4.4 Recommendations

At present, the proposed bridge site is considered the most appropriate location of the bridge construction. This site was also accepted by the local population. Final selection of the site for the proposed bridge will be done at the detail design phase.

5 Identification of environmental and social impacts

Based mainly on the result of the IEE, field observations and literature surveys conducted during the EIA, environmental and social impacts to be caused by the proposed bridge construction have been identified. The identified environmental and social impacts cover physical, ecological and socioeconomic environment by phases of pre-construction, construction, and post-construction or operation and maintenance (O&M). The pre-construction activities include land acquisition and resettlement among others. The construction activities include construction of the main bridge and related facilities including approach roads, and river training works. The O&M activities involve the maintenance of the bridge and approach roads.

5.1 Potential environmental and social impacts

Summary of the high and moderate significant environmental impacts to be caused by the proposed bridge construction are presented in Table 26.

Table 26 Description of potential environmental and social impacts

Stage	Potential impact
Air quality	
Pre-construction	No or negligible impacts
Construction	Small amount of air pollutants will be emitted due mainly to the operation of vehicles and heavy machineries for construction works. Dust will be generated by construction work, especially earth moving work.
O&M	Air pollutants from motor vehicles will increase after the construction of the bridge, since the traffic volume of motor vehicles on the bridge and UZRs is expected to increase compared with the current traffic volume.
Water quality	
Pre-construction	No or negligible impacts
Construction	The quality of the river water is expected to be affected by the proposed bridge construction works. The works include the dredging activities, installment of bridge abutments, and construction of approach roads. They will cause soil runoff, and eventually turbid water. Such risk will increase if the works are carried out during the rainy season. There is also a risk of accidental spillage of fuels, lubricants, chemicals, solvents and construction waste into the river water, resulting in the pollution of the river.
O&M	There is a low risk of the accidental spillage of chemicals and resulting water quality deterioration during the periodic maintenance.
Soil erosion	
Pre-construction	No or negligible impacts
Construction	Bridge construction will involve dredging activities at the river bed, the construction of bridge abutments, and the construction of approach roads on the banks. These works will cause soil erosion unless appropriate measures are undertaken. The risk of soil erosion will significantly increase if the works are implemented in the rainy season.
O&M	Soil erosion may occur along the approach roads especially in the rainy season if the maintenance works are not properly undertaken.
Noise and vibration	
Pre-construction	No or negligible impacts
Construction	During the construction phase, noise and vibration will be generated. Noise from heavy machinery and construction vehicles, and works such as pile driving and dredging may temporarily disturb nearby residents, although the impacts are short-term.

Stage	Potential impact
O&M	A certain level of noise is anticipated at the operational phase, since the traffic volume of motor vehicles on the bridge and UZRs will increase to some extent after the construction of the bridge.
Bottom sediments	
Pre-construction	No or negligible impacts
Construction	Construction works will involve dredging activities and the installation of abutment bridges at the river bed. These works may cause disturbance of bottom sediments. There is also a risk of contamination of bottom sediments by accidental spilling of construction materials such as bituminous materials and other petro-chemicals.
O&M	There is a low risk of the accidental spillage of chemicals and resulting bottom sediment contamination during the periodic maintenance.
Waste	
Pre-construction	No or negligible impacts
Construction	Civil works for the bridge construction will generate a certain amount of wastes such as unused construction materials during the construction phase. Solid and liquid wastes will also be generated from labor camp. Such wastes may negatively affect the surrounding environment if they are left untreated at the construction sites or labor camp.
O&M	Small amount of wastes may be generated from periodic maintenance works, but the impacts are limited.
Ecosystem and wetland	
Pre-construction	No or negligible impacts
Construction	Construction work will inevitably involve the removal of trees and vegetation. The scale of tree and vegetation clearance is expected to remain limited. On the other hand, there is no risk of affecting valuable ecosystems such as primeval forests, protected areas, and others. Such ecosystems are not found in the vicinity of the proposed bridge site.
O&M	No or negligible impacts
Wildlife	
Pre-construction	No or negligible impacts
Construction	Construction works such as dredging and pile driving may cause the habitat loss or disturbance of some wildlife species. Many wildlife species are found during the field survey in the area. Although a few of them were found threatened according to IUCN (2012), all of them will not require significant considerations as described in Section 3.2.3.
O&M	Some adverse impacts on wildlife species around the bridge site may be anticipated due to the constructed bridge-related structures and increased traffic volumes. Such impacts, however, can be mitigated by re-vegetation and re-planting of trees.
Fish and aquatic life	
Pre-construction	No or negligible impacts
Construction	Construction works, in particular pile driving and dredging works, will disturb the movement of fish species temporarily. Habitats of some fishes may be affected by such works.
O&M	Low adverse impacts on fishes and aquatic life around the bridge site may be anticipated due to the constructed bridge-related structures and increased traffic volumes.
Regional hydrology and drainage	
Pre-construction	No or negligible impacts
Construction	Construction works will include dredging for river training and the construction of bridge structures over the river. This will have temporary influence on the regional hydrology mainly during the civil works. Storage of soils, sand, and construction materials along the river may impede natural drainage temporarily. This typically occurs if the works are undertaken during the rainy season.

Stage	Potential impact
O&M	There is minor risk of drainage congestion due to the approach roads if sufficient drainage capacity has not been ensured.
Topography and geology	
Pre-construction	No or negligible impacts
Construction	Topography will be slightly changed due to earth cutting works for the construction of approach roads and other related structures, but such impacts are considered very minor.
O&M	No or negligible impacts
Land acquisition and involuntary resettlement	
Pre-construction	No involuntary resettlement is expected as no residences and structures exit at the proposed bridge construction site. Small portions of agricultural land may need to be acquired due to the proposed bridge mainly for the construction of the approach roads, but the scale of the land acquisition will be confirmed after the determination of the detail design of the bridge. Land acquisition process should be completed prior to the commencement of construction activities.
Construction	There is a possibility that the temporal occupation of agricultural lands or other lands for the storage of construction materials and equipment, or construction of labor camps.
O&M	No or negligible impacts
Employment and poverty reduction	
Pre-construction	Land acquisition may adversely affect the livelihoods of local people.
Construction	Positive impacts on local employment and poverty reduction are expected in general. The proposed bridge construction will provide local people, in particular vulnerable groups, with employment opportunities. Ferry services are operating at the proposed bridge site, and six boatmen are working for the service. They will lose their current employment.
O&M	The proposed bridge will significantly improve access to nearby markets, schools, medical centers, and other necessary places. Thus the impacts of the bridge construction are generally considered positive. Local people will also benefit from the increased employment opportunities for the O&M of the bridge.
Agriculture	
Pre-construction	Acquisition of agricultural lands may be necessary depending on the detail design of the proposed bridge, and thus certain impacts are anticipated.
Construction	Some agricultural lands may be temporarily occupied for the storage of construction materials and equipment, and the construction of labor camps. This will negatively affect the agricultural production temporarily.
O&M	No or negligible impacts
Landscape	
Pre-construction	No or negligible impacts
Construction	The bridge structures to be constructed will change the landscape around the proposed site, but local people accept the change and no objections were raised in the FGDs.
O&M	After the construction of the bridge, there may be a risk of people's gathering and squatting on the embankments around the bridge, and this may affect the landscape beauty.
Religious and cultural heritage	
All phases	No or negligible impacts
Gender equity	
Pre-construction	No or negligible impacts
Construction	Positive impacts are expected due to the provision of employment opportunities to Labor Contracting Society (LCS) which mostly consists of local poor women.

Stage	Potential impact
O&M	The proposed bridge will improve the access of women and other local people to schools, medical centers and other various public services. Some poor women may have employment opportunities for the maintenance works.
Transport safety and road accidents	
Pre-construction	No or negligible impacts
Construction	The risk of road accidents will increase during the construction works because of 1) increased transport of construction materials and equipment, heavy machinery and construction vehicles, and construction labors, and 2) use of the machinery, vehicles and equipment at the construction site.
O&M	Due to the improved road connectivity between Haluaghat Upazila and Dobaura Upazila, the traffic volume on the UZRs will increase, and thus there is an increasing risk of road accidents.
Health, safety and hygiene	
Pre-construction	No or negligible impacts
Construction	Construction workers may be involved in any accidents at work sites. There is an increased risk that infectious diseases such as HIV/AIDS could spread as a result of the inflow of construction workers or the construction of labor camps. Hygienic conditions around the construction site may be deteriorated unless proper measures are undertaken.
O&M	As a result of the improved access of local people to the health services, there are positive impacts on the public health of local population.

5.2 Considerations for climate change

Bangladesh is one of the most vulnerable countries in the world to climate risks (World Bank 2010[4]). It is anticipated that climate change will cause increase in the frequency and intensity of floods and storm surge. At the proposed bridge construction site, climate change may pose the increased risk of damage to the bridge and related structures. To address such climate change impacts, the GOB endorsed the Climate Change Strategy and Action Plan (CCSAP) in 2009. The CCSAP is built on the following six themes: 1) food security, social protection and health; 2) comprehensive disaster management; 3) infrastructure; 4) research and knowledge management; 5) mitigation and low carbon development; and 6) capacity building and institutional strengthening.

Under the NRRDLGIP, the theme of infrastructure of the CCSAP should be taken into account particularly. Due considerations for increasing climate risks should be, therefore, given to the design of the proposed bridge so that the climate risk can be minimized or mitigated to the extent possible. More specifically, securing sufficient height of the bridge and approach road embankments, and ensuring sufficient stability for the bridge abutment places must be considered to adapt the increased risk of floods.

6 Environmental management plan

6.1 Concept of environmental management plan

The Environmental Management Plan (EMP) has been prepared based on the findings of the previous sections, as a critical component of the environmental management system, to ensure avoiding, minimizing, or mitigating all the identified environmental impacts. The methodology to be followed for the preparation of EMP will consist of the following steps.

[4] Economics of Adaptation to Climate Change: Bangladesh (World Bank, 2010)

- Identification of key environmental and social impacts to be caused by the proposed bridge construction
- Elaboration of mitigation measures for the identified impacts
- Development and clarification of environmental and social monitoring mechanism
- Establishment of the institutional mechanism to implement the mitigation measures and environmental and social monitoring
- Identifying responsibilities of various agencies involved in the bridge construction subproject
- Estimate of budget requirements for implementation of mitigation and monitoring measures

The EMP largely consists of three components: 1) action plan for mitigation measures against identified impacts caused by the subproject; 2) environmental and social monitoring plan; and 3) institutional mechanism for the EMP.

6.2 Important principles of EMP

In implementing the EMP, the following principles should be properly taken into account.

Information disclosure, consultation and participation
In the process of the detail design of the proposed bridge, subproject information should be disclosed to local stakeholders. A series of consultation meetings with stakeholders should be held to incorporate their perceptions into the subproject plans, and eventually to minimize or mitigate adverse impacts of the subprojects.

All information shall be presented in a local language which is understandable to local stakeholders. For illiterate people, suitable other communication methods such as briefing them, holding discussions and meetings, radio and television broadcasting shall be used.

As part of the mechanism to know the perception of local stakeholders, a grievance redress mechanism (GRM) shall be established at the LGED Haluaghat Upazila office to receive and address the grievances of local stakeholders about environmental and social issues. The focal person of the GRM will be appointed, and local stakeholders will be appropriately informed of the GRM.

Special consideration to vulnerable groups
Special attention will be given to vulnerable groups so that the proposed bridge construction will not significantly affect their livelihoods. Vulnerable groups include the female-headed households, households below the poverty line, elderly-headed households, the landless, and indigenous people.

Such vulnerable groups, especially women-headed households and the poor households, will be prioritized for the employment in construction and maintenance works

Implementation and monitoring
Implementation arrangement for the EMP shall be established to implement necessary mitigation measures and monitoring activities. The implementation arrangement will include adequate human resources and budget to implement the EMP.

Adequate budgetary support should be fully committed by the government, and made available to cover the costs for environmental and social management of the proposed subproject. Appropriate reporting, monitoring, and evaluation mechanisms regarding environmental and social considerations will be established and implemented as part of the project management system.

6.3 Action plan for implementing mitigation measures

For the implementation of the EMP for the proposed bridge construction, appropriate mitigation measures should be undertaken to avoid, minimize, and mitigate adverse environmental and social impacts. More specifically, the actions listed in Table 27 should be properly carried out.

Table 27 Action plan for implementing EMP of the proposed bridge construction

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Pre-construction phase					
Legal requirement	• Obtain all necessary clearances and approvals including Environment Clearance Certificate prior to the commencement of any construction work.	Dhaka	Before the commencement of construction	XEN, PMO, ES, RRS	PMO, ES, RRS
Land acquisition	• Complete all necessary land acquisition in accordance with the Resettlement Policy Framework prior to the commencement of any construction works. • Avoid or minimize the area of land to be acquired. • Provide compensation and other assistance to PAPs in accordance with the RPF.	Proposed bridge construction site	Before the commencement of construction	DC, XEN, UE, RRRE, INGO	PMO, RRS
Navigation	• Plan and design navigation clearance for boat pass under the bridge (approximately 3m above the highest flood level)	Proposed bridge construction site	Before the commencement of construction	XEN, PMO, ES	PMO, ES
Environmental clause in the contract	• Incorporate environmental clauses in bid and contract document	Dhaka	Before bidding or contract	XEN, ES	PMO, ES
Construction vehicles and machinery	• Trial run of contractor's vehicles and machinery to confirm that their conditions, and that pollutant emission and noise level will not cause serious damages to the surrounding environment.	Proposed bridge construction site, or vehicle depot	Before the commencement of construction	Contractor	PMO, ES, XEN
Construction phase					
Training for engineers and contractors	• Provide training on environmental and social considerations to concerned engineers and contractors.	LGED District office, LEGD Upazila office	Before the commencement of construction	XEN, REE, RRRE	PMO, ES, RRS

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Air quality	• Ensure that construction vehicles and heavy machineries to be used for the bridge construction are maintained periodically, and their exhaust gases are within acceptable limit. • Water should be sprayed on the construction site, in particular excavation sites, brick crushing site, asphalt mixing sites, to minimize the effects of dust. • Asphalt mixing plans and concrete batching plants should be sufficiently sealed, and be equipped with dust removal device. • Vehicles carrying construction materials shall be covered to prevent the spill off. • Provide masks to construction workers if dust content is high. • Monitor the air quality around the construction site every six months during the construction period. If the quality exceeds the air quality standards or baseline air quality data, take further preventive measures.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Water quality	• Train construction workers on safe handling of petro-chemicals such as bituminous materials to prevent spillage or leakage to the Gudaria River or other water bodies. • Vehicle maintenance and refueling should be confined to the designated areas with sealing to prevent the spillage of lubricants and fuels. Waste petro-chemicals must be properly collected, stored and disposed of, according to GoB regulations. • Restrict disposal of any construction waste into the river or nearby water bodies. • Monitor the surface water quality every six months during the construction period. If the quality exceeds the water quality standards or baseline water quality data, take further preventive measures. • Prevent soil erosion, which may result in water quality degradation, by implementing the measures described in the “soil erosion” section below.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Soil erosion	• Earthworks should be restricted to the dry season. • Minimize vegetation clearance at the construction site. • Test the embankment soil properly, and compact it to ensure stability. Grass turfing and tree-planting on batter slopes should be undertaken to prevent soil erosion. In particular, approach road embankments need to be properly compacted and covered by grass or trees. • Undertake measures against temporary or permanent erosion and sediment control measures, such as the installation of palasiding and placement of sand-filled bags, if any sites are identified vulnerable to erosion.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Noise and vibration	• Ensure that construction vehicles and heavy machineries to be used for the bridge construction are maintained periodically and their exhaust gases are within acceptable limits. • Carry out construction works during daytime hours. • Inform nearby residents in advance of the schedule of construction works. • Arrange ear plugging or ear muff if noise level at the construction site is severe. • Monitor the noise level every six months during the construction period. If the level exceeds the permissible levels or baseline noise level data, take further preventive measures.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Bottom sediments	• Undertake measures described in the “water quality” section to prevent spillage or leakage of petro-chemical materials to the Gudaria River. • Monitor the bottom sediment quality every six months during the construction period. If the level exceeds the permissible levels or baseline bottom sediment level data, take further preventive measures.	Proposed bridge construction site, in particular, the river bed of the Gudaria river	During construction period	Contractor, XEN, REE	PMO, ES, REE

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implemen-tation	Supervision/ Monitoring
Waste	• Clean up the construction waste and unused materials regularly during the construction works. All such waste shall be cleared and removed after the completion of construction works. It is necessary to incorporate an article regarding the appropriate disposal of wastes into the contract with contractors. • Prepare composting facilities of all green or biodegradable waste where appropriate.	Proposed bridge construction site, and work camp	During construction period	Contractor, XEN, REE	PMO, ES, REE
Ecosystem and wetlands	• Clearly mark the areas to be cleared before the clearing work commences. Clearing of vegetation shall not occur outside of the designated areas. • Minimize vegetation and tree clearance, and re-vegetate and re-plant trees over the cleared land. • Avoid disposal of any construction material including soils into nearby water bodies.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Wildlife	• Minimize vegetation and tree clearance to conserve habitats of wildlife, and re-vegetate and re-plant trees over the cleared land. • Create awareness on wildlife conservation among construction workers and local people.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Fish and aquatic life	• Avoid or minimize the construction activities, especially pile driving and dredging, during the peak fish migration and spawning period. i.e., April and May, and return period, i.e., September and October. • Earthwork should be restricted to the dry season. • Avoid complete closing of the river channel that affects migration and production of fish and aquatic life. Alternative drainage should be ensured. • Avoid or minimize the filling of low floodplain areas around the bridge site. • Prevent noise and disturbances by construction works to conserve the habitats of fish and other aquatic flora and fauna.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Regional hydrology and drainage	• Avoid complete closing of the river channel by providing alternative drainage, if dredging is necessary for river training. • Install a sufficient number and capacity of functional culverts and other drainage facilities. • Select the appropriate place for the storage of soils and other construction materials to avoid disturbance of natural drainage. • Dispose of construction materials and equipment appropriately so that they do not impede the local drainage.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Land acquisition	• Minimize temporal occupation of agricultural lands or other lands. • Provide compensation and other assistance to PAPs in accordance with the RPF.	Proposed bridge construction site	During construction period	Contractor, DC, XEN, UE, RRRE, INGO	PMO, RRS
Employment and poverty reduction	• Plan of bridge construction should be explained well in advance to ferry-related workers so that they have sufficient time to find new income generating means. • Provide employment opportunities, mainly for semi-skilled or unskilled labor, to local people under the LCS scheme. Priority will be given to PAPs and vulnerable groups. • Consult with local people on the mitigation measures against possible disturbance of local livelihoods, such as the restriction of work hours of construction activities. • Inform local people of the schedule of construction works.	Proposed bridge construction site	During construction period. Explanation to ferry-related workers should be done during detailed design phase.	Contractor, DC, XEN, UE, RRRE	PMO, ES, REE
Agriculture	• Same as the “land acquisition” section.	Same as the left	Same as the left	Same as the left	Same as the left
Gender equity	• Employ poor women, preferably in earthwork through the LCS scheme, which will contribute to women empowerment.	Proposed bridge construction site	During construction period	Contractor, XEN	PMO, ES
Transport safety and road accidents	• Provide construction workers with safety equipment such as gloves and protective gears. • Install warning signs, guards, speed breakers and other preventive facilities at the construction site. • Undertake road safety measures, including safety education to construction workers, to minimize road accident risks.	Proposed bridge construction site	During construction period	Contractor, XEN	PMO, ES, REE

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Health, safety and hygiene	• Provision of first aid box, safe drinking water and sanitary latrine for the construction workers. • Provide construction workers and local people with basic information on infectious diseases including HIV/AIDS.	Proposed bridge construction site	During construction period	Contractor, XEN	PMO, ES, REE
Post-construction phase					
Air quality	• Monitor air quality around the bridge and along the improved UZRs. The first monitoring should be done 6 months after the completion of the bridge. • If the monitoring result exceeds the air quality standards or baseline air quality data, periodical monitoring should be continued every year.	Near the bridge on the both banks	During O&M period	XEN, REE	PMO, ES
Water quality	• Monitor the water quality of the Gudaria river and other nearby water body. The first monitoring should be done 6 months after the completion of the bridge. • If the monitoring result exceeds the water quality standards or baseline water quality data, periodical monitoring should be continued every 6 months.	Near the bridge on the both banks	During O&M period	XEN, REE	PMO, ES
Noise and vibration	• Monitor the noise and vibration level around the bridge and along the improved UZRs. The first monitoring should be done 6 months after the completion of the bridge. • If the monitoring result exceeds the noise quality standards or baseline noise level data, periodical monitoring should be continued every year.				
Soil erosion	• Undertake proper maintenance work on the embankment of the approach roads and improved UZRs.	Road embankment	During O&M period	Contractor, XEN, REE	PMO, ES
Bottom sediment	• Monitor the bottom sediment quality of the river bed of the Gudaria river. The first monitoring should be done 1 year after the completion of the bridge. • If the monitoring result exceeds the bottom sediment quality standards of USEPA or baseline sediment quality data, periodical monitoring should be continued every year.	Road embankment	During O&M period	XEN, REE	PMO, ES
Waste	• Dispose of the wastes generated under the maintenance work.	Bridge	During O&M period	Contractor, XEN, REE	PMO, ES

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Tree-planting and re-vegetation	• Conduct tree-planting and turfing of all appropriate sites with trees and grasses in order to compensate the loss of biodiversity in course of construction activities. Selection of indigenous species is preferred. • Undertake proper measures for watering, fertilizing and nursing of trees/ plants/ grasses to till growing up sufficiently.	Near bridge and approach road	Immediately after the completion of construction work	Contractor, XEN, REE	PMO, ES
Wildlife	• Create awareness on wildlife conservation among local people. • Check the conditions of vegetation in the areas where re-vegetation and replanting of trees were conducted. If planted trees and vegetation are found decaying or in bad conditions, re-vegetation and replanting of trees should be done again.	Bridge	During O&M period	XEN, REE	PMO, ES
Fish and aquatic life	• Same as the "wildlife" section.	Bridge	During O&M period	XEN, REE	PMO, ES
Regional hydrology and drainage	• Conduct proper maintenance of the approach road and other structures on a regular basis to prevent the drainage congestion.	Approach road and bridge	During O&M period	XEN, REE	PMO, ES
Landscape	• Prevent road embankment and nearby vacant places from squatting or construction of commercial structure.	Bridge and approach road	During O&M period	XEN, REE	PMO, ES
Road transport and accident	• Provide traffic signs, speed breakers, marking, and other road safety facilities to prevent road accident. • Provide education and publicity of road safety to local people (as part of road safety activity under the NRRDLGIP).	Approach road and bridge	During O&M period	XEN, UE	PMO, ES

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implemen-tation	Supervision/ Monitoring
Cleaning and rehabilitation of work site	• Remove all construction materials from the construction site. Materials, including but not limited to unused construction materials, petro-chemicals, oil and lubricant, cement, and brick, and residues and packages of these materials. They should be carefully treated and removed from the site after the completion of the bridge construction. • Dispose of all wastes properly, including those from construction works and from the labor camp. Dumping into the nearby water bodies should be strictly prohibited. • Rehabilitate the labor camp site so that the area will not pose unhygienic risks for local residents. • All borrow pits should be rehabilitated by filling soils or other measures.	Bridge, approach road, and labor camp	Within 1 month of the completion of construction works	Contractor, XEN	PMO, ES

Note 1: DC: Deputy Commissioner; ES: Environmental Specialist; DOE: Department of Environment; INGO: Implementing NGO; LCS: Labor Contracting Society; PAP: Project affected persons; PMO: Project Management Office; REE: Regional Environmental Expert; RPF: Resettlement Policy Framework; RRRE: Regional Rehabilitation and Resettlement Expert; RSS: Rehabilitation and Resettlement Specialist; UE: Upazila Engineer; XEN: Executive Engineer

Note 2: The contractor of the construction work will take necessary actions with guidance and assistance of the LGED XEN, PMO, and ES and RRS.

The PMO is responsible for ensuring that 1) all required mitigation measures are properly informed to relevant Engineers and the Design, Supervision and Management (DSM) consultants; 2) bidding documents contains all required mitigation measures to be implemented during construction work; 3) no objection certificate from local stakeholders is obtained prior to granting any civil work contract; 4) monitoring on the progress of the EMP, and elaboration of progress reports; 5) additional measures against unexpected impacts if identified; 6) coordination with relevant government departments and local stakeholders; and 7) additional environmental assessment if there is significant changes in the subproject design and location.

In order to ensure the contractors' compliance with the EMP, the LGED needs to consider the following actions in the process of all construction bidding and contract: 1) a set of environmental pre-qualification for potential bidders; 2) budgeted items for the implementation of the EMP; 3) environmental and social factors to be taken into account by bid reviewers, 4) environmental clauses to be incorporated into contract, and 5) the full EIA and IEE reports to be made available for potential bidders.

6.4 Environmental and social monitoring

Based on the key environmental and social impacts and mitigation measures described in the previous sections, the environmental and social monitoring mechanism for the proposed bridge construction is proposed below.

6.4.1 Concept of environmental and social monitoring

Monitoring on adverse impacts and mitigation measures is a key component of the EMP. The objectives of the environmental and social monitoring are the following.

- Check environmental and social impacts caused by the proposed bridge construction
- Verify compliance with the mitigation measures proposed in the individual examinations of subproject sites as well as IEE and/or EIA
- Verify compliance with compensation and resettlement measures proposed in ARAPs and the RPF
- Check the effectiveness and adequacy of the proposed mitigation measures
- Take additional measures if the proposed measures are found to be inadequate
- Take necessary measures if unexpected problems emerge

(1) Key environmental and social monitoring items

Key environmental impacts to be monitored for the proposed bridge construction are described in Table 28.

Table 28 Environmental and social monitoring for the proposed bridge construction

Environmental Impact/ Issue	Mitigation Measures	Location	Timing	Responsible Organization	
				Implement -ation	Supervision/ Monitoring
Pre-construction phase					
Environmental clearance	• Verify compliance with the conditions attached to the ECC by DOE	Dhaka	Prior to the construction work	XEN, PMO, ES, RRS	PMO, ES, RRS
Land acquisition	• Confirm the scale of land acquisition • Check the compliance of the required land acquisition with the RPF • Check whether compensations are completed in accordance with the RPF	Bridge construction site	Prior to the construction work	DC, XEN, PMO, RRRE	PMO, ES, RRS
Construction phase					
Air quality	• Confirm whether measures to minimize dust such as spraying water are properly undertaken • Confirm the change in air quality in the vicinity of the proposed bridge construction sites every six months	Construction site for bridge and approach roads	During construction work	XEN, REE	PMO, ES
Water quality	• Check whether earthworks are undertaken in the dry season • Check whether bituminous materials and other construction materials are treated properly • Check whether construction wastes are properly collected, stored, and disposed of • Confirm the change in water quality in the vicinity of the proposed bridge construction sites every six months	The Gudaria river and other water bodies near bridge construction site	During construction work	XEN, REE	PMO, ES
Soil erosion	• Check whether earthworks are undertaken in the dry season • Check whether soil protection measures, e.g., such as soil compaction and minimization of vegetation clearance, are properly undertaken • Check whether regular maintenance of the protection measures is undertaken	Construction site for bridge and approach roads	During construction work	XEN, REE	PMO, ES
Noise and vibration	• Check whether construction works are conducted during daytime hours • Check whether local residents are informed of the work schedule • Confirm the change in noise level in the vicinity of the proposed bridge construction sites every six months	Construction site for bridge and approach roads	During construction work	XEN, REE	PMO, ES
Bottom sediment	• Check whether bituminous materials and other construction materials are treated properly • Confirm the change in substances contained in the bottom sediments in the vicinity of the proposed bridge construction sites at the pre- and post subproject phases	The Gudaria river and other water bodies near bridge construction site	During construction work	XEN, REE	PMO, ES
Wastes	• Check whether construction sites are cleaned by contractors • Check whether facilities such as garbage bins and waste disposal sites are installed properly • Check whether wastes are treated and disposed of properly by responsible entities	Construction site for bridge and approach roads	During construction work	XEN, REE	PMO, ES

Environmental Impact/ Issue	Mitigation Measures	Location	Timing	Responsible Organization	
				Implement -ation	Supervision/ Monitoring
Ecosystem	• Check whether conservation measures, such as minimization of vegetation clearance and re-vegetation, are properly undertaken	Construction site for bridge and approach roads	During construction work	XEN, REE	PMO, ES
Regional hydrology and drainage	• Check whether earthworks are undertaken in the dry season • Check whether construction materials are properly stored to avoid disturbance of local hydrology • Check whether the capacity of drainage facilities of approach roads is adequate • Check whether alternative drainage is provided when dredging works are implemented	The Gudaria river and bridge construction site	During construction work	XEN, REE	PMO, ES
Land acquisition	• Check whether the land acquisition process has been properly implemented, focusing on compensation, restoration and rehabilitation assistance, and special attention to vulnerable groups • Confirm the perceptions of PAPs on the proposed bridge construction, including grievances or any other request	Construction site for bridge and approach roads	During construction work	DC, XEN, REE	PMO, ES
Living and livelihoods	• Check whether there are people who may lose income sources, such as workers on ferries • Check whether such people are informed well in advance • Check whether consultations with such people are sufficiently held	Construction site for bridge and approach roads	During construction work	XEN, REE	PMO, ES
Safety and health	• Check whether potential safety hazards and health issues are explained to construction workers • Check adequate equipment to prevent accidents is provided to construction workers	Construction site for bridge and approach roads	During construction work	XEN, REE	PMO, ES
Unexpected impacts	• Check whether impacts which have not been expected are caused by the construction works	Construction site for bridge and approach roads	During construction work	XEN, REE	PMO, ES
Post-construction phase					
Environmental Monitoring	• Undertake a periodic environmental monitoring on air quality, water quality, noise level, sediments, 6 months after the completion of construction of the bridge. • If any of the monitoring results of the above parameters exceed environmental quality standards or baseline data, continue the monitoring on the parameter(s).	Bridge and connecting UZRs	6 months after the completion, and every year if required	XEN, Environmen -tal expert to be recruited	PMO, ES
Soil erosion	• Check the conditions of embankment to evaluate adequacy of soil protection measures	Approach roads	After the completion of the work	XEN, UE	PMO, ES
Regional hydrology and drainage	• Check whether regional hydrology is disturbed by the bridge construction • Check whether the capacity of drainage facilities is adequate	Bridge and connecting UZRs	After the completion of the work	XEN, UE	PMO, ES

Environmental Impact/ Issue	Mitigation Measures	Location	Timing	Responsible Organization	
				Implement -ation	Supervision/ Monitoring
Living and livelihoods	• Confirm the perceptions of PAPs on the bridge construction subproject	Bridge and connecting UZRs	6 months after the completion of the work	XEN, UE	PMO, ES
Land acquisition	• Confirm the perceptions of PAPs on the bridge construction subproject • Check whether PAPs have any complaints	Approach roads	6 months after the completion of the work	XEN, UE	PMO, RRS
Safety and health	• Check whether safety measures such as the installation of a sufficient number of warning signs are undertaken • Confirm the perceptions of local residents	Bridge and connecting UZRs	After the completion of the work	XEN, UE	PMO, ES
Operation and maintenance	• Check whether the bridge, approach roads, and other structures are properly maintained on a regular basis	Bridge approach roads	After the completion of the work	XEN, UE	PMO, ES

Source: Survey team

(2) Monitoring indicators for key environmental parameters

Environmental monitoring on key parameters is necessary, as described in the previous section, during the construction and post-construction phases. The monitoring aims to check the adverse impacts of the proposed bridge construction. Possible environmental parameters, including air, noise, water, and sediments, and location and sampling frequency are presented in Table 29.

Table 29 Environmental parameters to be monitored

Component	Parameters	Location	Sampling and testing year
Air quality	SPM, PM10, PM2.5, Pb, Cd, CO and NOx	At the junction points of entry of the bridge	• 6 months after the commencement of the construction work. The monitoring will continue every 6 months during the construction phase. • 6 months after the completion of the construction for 2 to 3 times every year, after which the monitoring may need to be continued if required
Noise quality	Noise level	At the junction points of entry of the bridge	• 6 months after the commencement of the construction work. The monitoring will continue every 6 months during the construction phase. • 6 months after the completion of the construction for 2 to 3 times every year, after which the monitoring may need to be continued if required
Water quality	DO, BOD, COD, pH, EC, TSS, TDS, Turbidity	Sampling points along the river and nearby water bodies	• 6 months after the commencement of the construction work. The monitoring will continue every 6 months during the construction phase. • 6 months after the completion of the construction for 3 to 4 times every 6 months, after which the monitoring may need to be continued if required
Sediment and soil	Zn, As, Hg, Mn, Cd	Area covered with sediment/ silt of the river	• 6 months after the commencement of the construction work. The monitoring will continue every 6 months during the construction phase. • 1 year after the completion of the construction for once, after which the monitoring may need to be continued if required

Source: Survey team

With respect to air quality and noise level, the proposed construction site is currently not suffering from these two parameters, since the site is basically located in the rural area where there are not many motor

vehicles and no industrial factories. The frequency of the monitoring on air and noise, therefore, does not need to be high.

For these two parameters, the environmental monitoring should be done after six months of the commencement of the construction work. The monitoring on air and noise during the construction work will, then, continue every six months until the completion of the bridge construction. After the completion of the bridge, the first post-construction monitoring will be implemented after six months of the completion. The monitoring activity will be conducted every year to obtain two or three samples. If all the monitoring results are found within the air or noise quality standards, or not significantly exceeding the baseline data collected during this EIA study, then it is unnecessary to continue the monitoring. If the monitoring results are beyond the standards or baseline data, then it is necessary to continue the monitoring, and explore further mitigation measures.

Similarly in terms of water quality, the water of the Gudaria River is not polluted by any industrial units, and the risk of water pollution by the construction work is not high. Therefore the frequency does not need to be high either. Thus, the monitoring on water quality at the construction phase is the same as those on air quality and noise level. However, in terms of post-construction monitoring on water quality, it is proposed that the frequency of the monitoring will be every six months. This is because the seasonal change of the water quality of the river is considered high, and both the dry and rainy seasons must be covered.

In terms of the sediments, since the influence on the sediments of the river bed will be usually emerged at the slower rate, the monitoring frequency regarding the sediments can be longer than the other three parameters. Thus the timing of the monitoring on the sediments at the post-construction phase is proposed one year after the completion of the bridge construction, while the monitoring during the construction phase will be conducted in the same manner as the other three parameters.

6.5 Institutional arrangement for environmental management system

6.5.1 Implementation mechanism

The LGED, as the executing agency, is responsible for the environmental and social considerations. However, few members in the LGED have sufficient capacity to handle environmental and social considerations. Therefore, the Project Management Office (PMO) shall establish an internal section for environmental and social considerations to ensure that proper environmental and social measures are undertaken. Consultants with expertise in environment and social considerations will be assigned to the internal section.

Table 30 presents the responsibilities of relevant entities at respective phases of the subproject in which the proposed bridge is constructed. The District Executive Engineer (XEN) of the LGED Mymensingh District Office bears the responsibility for environmental and social issues. The DSM consultant team, especially, the Environmental Specialist (ES) and Rehabilitation and Resettlement Specialist (RRS) to be assigned in the PMO, and the Regional Environmental Expert and Regional Rehabilitation and Resettlement Expert in Mymensingh region will assist the District XEN.

The Regional Deputy Project Director (RDPD) of Mymensingh area or XEN at the LGED Mymensingh Regional Office will supervise the activities of the Mymensingh District XEN, in terms of the identification of potential impacts, elaboration of mitigation measures, and monitoring. The Mymensingh District XEN and Haluaghat and Dobaura Upazila Engineers shall assist the consultants in conducting the

field surveys. These Upazila Engineers, the Haluaghat Upazila Engineer in particular, shall also be responsible for the supervision of contractors to ensure compliance with the Environmental Framework, RPF, IEE and/or EIA, and ARAP. Complaints from local residents should also be received by these Upazila Engineers and transferred to the PMO via the Mymensingh District XEN. The PMO, under the assistance of the ES and RRS, shall be responsible for supervising overall activities related to environmental and social issues.

In each quarter, the Mymensingh District XEN shall conduct monitoring and fill in the prescribed monitoring form. The District XEN will submit it to the Regional Deputy Project Director of Mymensingh Region, who will subsequently submit it to the PMO.

Table 30 Responsibilities of relevant entities for the subproject

Responsibility	Pre Construc-tion	Construc-tion	Operation
LGED District Office in Mymensingh			
District Executive Engineer in Mymensingh			
• Responsible for identification of potential impacts and elaboration of mitigation measures	X		
• Responsible for conducting environmental and social monitoring activities	X	X	X
• Supervise and assist UEs in supervising contractors		X	X
• Receive complaints transferred from UEs and send it to PMO		X	X
Project Management Office (PMO)			
Assistant engineer in charge of environmental and social monitoring			
• Supervise overall activities for identification of potential impacts and elaboration of mitigation measures	X		
• Supervise overall activities for environmental and social monitoring	X	X	X
• Supervise DSM consultants in elaborating an environmental and social monitoring plan	X		
• Supervise and assist DSM consultants in conducting activities for identification of impacts, elaboration of mitigation measures, and environmental and social monitoring	X	X	X
DSM consultants (Environmental Specialist and Resettlement & Rehabilitation Specialist)			
• Assist the PMO in supervising overall activities for identification of impacts, elaboration of mitigation measures, and of environmental and social monitoring activities	X	X	X
• Assist Mymensingh District XEN and Regional DSM consultants in conducting activities for identification of impacts, elaboration of mitigation measures, and monitoring	X	X	X
• Elaborate an environmental and social monitoring plan	X		
LGED Regional Office in Mymensingh			
Regional Deputy Project Director in Mymensingh			
• Supervise the monitoring activities of the Mymensingh District XEN	X	X	X
DSM consultants (Regional Environmental Specialists and Regional Resettlement Specialists)			
• Assist Mymensingh District XEN in conducting activities for identification of impacts, elaboration of mitigation measures, and monitoring	X	X	X
Haluaghat and Dobaura Upazila Offices			
Upazila Engineers (UEs) in Haluaghat and Dobaura Upazila			
• Supervise contractors to ensure compliance with IEE and/or EIA and ARAP		X	X
• Assist Mymensingh District XEN and DSM consultants in conducting activities for identification of impacts, elaboration of mitigation measures, and monitoring, especially in conducting sample field survey	X	X	X
• Receive complaints from local residents about environmental and social issues regarding the NRRDLGIP and send them to the Mymensingh District XEN		X	X

[Legend] DSM: Design, Supervision and Monitoring; ES: Environmental Specialist; PMO: Project Management Unit; RRS: Rehabilitation and Resettlement Specialist; UE: Upazila Engineer, XEN: Executive Engineer

6.5.2 Grievance redress mechanism

The LGED shall establish a mechanism to receive local people's grievances about the environmental and social issues, and to seek resolutions to them. The grievance redress mechanism (GRM) should address the grievances promptly, using an understandable and transparent process with special considerations to vulnerable groups including women, children, the elderly, the poor, minority groups at no cost and without retribution. The GRM should not impede access to the country's judicial or administrative remedies. Local stakeholders should be appropriately informed about the GRM.

Grievances shall be first brought to the LGED Haluaghat or Dobaura Upazila offices. The focal persons to receive grievances need to be appointed in these offices, and disclosed to the public. This GRM shall be informed to the PAPs and local stakeholders in such occasions as public consultations.

Grievances lodged at the LGED Haluaghat or Dobaura Upazila offices shall be first addressed by the Upazila Engineers supported by the Regional Environmental Expert or Regional Rehabilitation and Resettlement Expert. Grievances not resolved by the LGED Upazila offices shall be brought to the LGED Mymensingh District office. The Mymensingh District XEN under the assistance of the DSM consultants at the regional level will address those unresolved grievances. Grievances not redressed by the Mymensingh District XEN will be brought to the PMO, which shall address them with the assistance of the DSM consultants in the PMO. Grievances not redressed by the PMO, then, shall be sent to and addressed by the Inter-ministerial Steering Committee (ISC). Further grievances will be referred to the appropriate courts of law.

Generally, the grievances lodged at the ground level will be brought to the upper level on a quarterly basis, and included in the project quarterly reports. However, particularly important grievances should be immediately transferred to the upper levels when they are found not to be resolved at the present level.

6.5.3 Costs for implementation of EMP

The contractor will be responsible for playing active role for the implementation of the EMP. The Mymensingh District XEN and Regional Environmental Expert will also be responsible for the implementation of the EMP, such as mitigation measures, monitoring, and reporting.

The costs to comply with the EMP are presented in Table 31.

Table 31 Cost for implementation of EMP

No	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total (BDT)
1.	Training for construction workers	Lump sum	-	-	50,000
2.	Dust management by water sprayer	Lump sum	-	-	80,000
3.	Water supplying HTW	Number	2	15,000	30,000
4.	Sanitary latrines for construction workers	Number	2	10,000	20,000
5.	Proper disposal of camp site wastes	Lump sum	-	-	20,000
6.	First aid box at camp site	Number	1	5,000	5,000
7.	Tree planting and re-vegetation	Lump sum	3,000	50	150,000
8.	Rehabilitation of ancillary sites including stock pile sites, borrow pits, labor camp, and others	m^2	800	25	20,000
9.	Monitoring on air quality	Lump sum	-	-	300,000
10.	Monitoring on noise level	Lump sum	-	-	300,000
11.	Monitoring on water quality	Lump sum	-	-	300,000
12.	Monitoring on sediment	Lump sum	-	-	300,000
Total cost for EMP					1,575,000

Source: Data collected from field survey
Note: Cost may vary depending on changes of the current situations around the proposed bridge construction site

7 Public consultation

7.1 Conduct of public survey

Consultation with local people is an important part at all stages of development activities. It ensures people's participation at all levels, i.e., in planning, designing, implementation, and operation and maintenance of the subproject.

In light of this, a series of consultations with local people has been carried out on various environmental and social issues related to the proposed bridge construction. Detailed discussions were held with people residing in areas on both sides of the Gudaria River, who potentially benefit from and/or are affected by the construction of the proposed bridge. 13 FGDs in total have been carried out in the vicinity of the proposed bridge in August 2012. A list on location of FGDs with date/time, numbers of participants, their occupation patterns have been enclosed as Attachment 1 to this Supplementary Annex.

In addition to FGDs, detail discussions with local people were also made on the issues of suitable location of the proposed bridge, erosion and shifting status of the river during field verification at the site.

7.2 Findings of the public consultation

In almost all consultation meetings, when local people were informed about the plan of the proposed bridge construction, they were reluctant to believe initially since such promises were made on several occasions for the construction of a bridge on Futkai, in the past. However, after they were informed of and explained about the plan and the expected new project, they rendered all types of cooperation required for collecting data and information necessary for the EIA study. They had high expectations for the proposed bridge.

During the FGDs, local people were informed of various potential environmental and social hazards such as noise disturbance, dust and air pollution, temporary and permanent occupation of lands, and deployment of labor force, part of which they were already aware of. They stated that such negative impacts would not cause significant harm to their livelihoods. They also expected that the concerned authority would take proper measures to minimize or mitigate the severe adverse effects.

Local people demonstrated positive responses to the proposed bridge construction, irrespective of the rich and poor, young and old, and male and female. According to the local people, the proposal for bridge construction is a long-standing issue in the area, but it has never been realized, resulting in a big disappointment among them.

Local people also believed that the importance of the area would be elevated and various economic activities would be started in the area after the bridge construction. They expected increased opportunities for income generation, and the economic activities around the area would be accelerated. Moreover, local people also showed strong expectation for the increased opportunities for employment for physical unskilled or semi-skilled labor in the construction work.

The potential affected persons such as the boatmen and the lessee of the Futkai ferry ghat, expressed their opinions which are in favor of bridge construction. Even farmers owning the lands in the vicinity of possible construction site were in favor of the proposed bridge construction. However they also requested proper and sufficient compensation and other mitigation measures.

According to the local people, the banks of the Gudaria River have been stable, and the river has not been shifting for long. Thus the risk of erosion caused by the river flow is very small.

It has been mentioned that the Gudaria River is flashy in nature and the river banks go under water for 15-20 days almost every year. According to FGDs, during the high flood of 1988, surrounding homesteads were flooded up to 0.76 meter. Since the movement of larger size boat, having height of 1.5-1.8 meter, for purchasing agricultural products from the village areas to nearby markets is quite a common practice in the area. Thus, local people requested a reasonable bridge height so that the boat movement under the bridge is continued even during the high flood season.

Image 9.1 Public consultation in the vicinity of the proposed bridge site

Image 9.2 Public consultation in the vicinity of the proposed bridge site

Attachment 1 List of consultation meetings

Primary data and information on environmental and social issues were collected by the Survey Team in the village areas located near the proposed bridge construction site. Local people residing in both sides of the Gudaria River are consulted. The consultations were held mainly in the form of the Focus Group Discussion (FGD), as it is considered a good tool for people's participation. The locations, dates, time, number of respondents and their occupational patterns are given in Table A-1.

Table A-1 Location, date, and attendance number of FGDs

No	Location	Date & time	Number of attendance	Occupation			
1	Village- Kailati Ghoria Para Union- Bildora	03 Aug 2012 9.30 a.m.	16	Farmers: Businessmen: Service holder:	6 4 1	Students: Village Doctor:	4 1
2	Village- Futkai Union- Goatola	04 Aug 2012 10.00 a.m.	22	Farmers: Businessmen: Service holders:	8 5 1	Students: Fishermen: Social Workers:	4 2 2
3	Village-Izara Para	04 Aug 2012 12:00 a.m.	20	Farmers: Businessmen: Service holder:	8 5 1	Students: Retired Teacher: Imam:	4 1 1
4	Goatola UP	05 Aug 2012 10:00 a.m.	13	Farmers: Businessmen:	7 6		
5	Goatola Bazar (west)	05 Aug 2012 12:30 p.m.	16	Farmers: Businessmen: Service holder:	6 8 1	Wage labor:	1
6	Kailati Purba Para	06 Aug 2012 10:30 a.m.	11	Farmers: Businessman: Service holders:	4 1 2	Students:	4
7	Kailati bazar	08 Aug 2012 10:15 a.m.	16	Farmers: Businessmen: Service holders:	8 3 3	Teacher: Carpenter(wood):	1 1
8	Outi Chairman Bari, UP- Bildora	09 Aug 2012 11:30 a.m.	9	Farmers: Businessmen:	5 3	Driver:	1
9	Gobindapur Road Crossing	09 Aug 2012 1:30 p.m.	12	Farmers: Businessmen:	4 7	Carpenter(wood):	1
10	East Soluakanda, UP- Bildora	09 Aug 2012 3:30 p.m.	15	Farmers: Businessmen:	9 3	Students:	3
11	Village-Shaliakanda (Madhyapara)	10 Aug 2012 9:30 a.m.	18	Farmers: Businessman:	6 8	Student: Fishermen: UP Member:	1 2 1
12	Village-Naliakandi	10 Aug 2012	10	Farmers:	10		
13	Village-Shakuai	13 Aug 2012	11	Farmers: Businessmen:	8 2	Student:	1

Source: Field survey

Attachment 2 Images of river banks of the Gudaria River

Image A-1 Proposed bridge site (latitude 25°1.391'N and longitude 90°29.097'E)

Image A-2 River bank in 1000 m upstream (latitude 25°01.513'N and longitude 90°28.702'E)

Image A-3 River bank in 800 m upstream (latitude 25°01.455'N and longitude 90°28.785'E)

Image A-4 River bank in 600 m upstream (Latitude 25°01.416'N and longitude 90°29.872'E)

Image-A-5 River bank 400 m upstream (Latitude-25°01.416'N and longitude 90°28.969'E)

Image A-6 River bank 200m downstream (Latitude-25°01.390'N and longitude 90°29.193'E)

Image A-7 River bank in 350m Downstream (latitude 25°1.376'N and longitude 90°29.274E)

Image A-8 River bank in 500 m downstream (latitude 25°01.381'N and longitude 90°29.334'E)

Image A-9 River bank in 650 m downstream (Latitude 25°01.370'N and longitude 90°29.379'E)

Image A-10 River bank in 800 m downstream (latitude 25°01.455'N and longitude 90°28.785'E)

Supplementary Annex 2
Draft Initial Environmental Examination
for a 150-m bridge construction over Gudaria River
Haluaghat Upazila, Mymensingh District

Abbreviations and acronyms

ARIPO	Acquisition and Requisition of the Immovable Property Ordinance
BBS	Bureau of Bangladesh Statistics
BMD	Bangladesh Meteorological Department
BOQ	Bill of Quantity
CCSAP	Climate Change Strategy and Action Plan
DC	Deputy Commissioner
DEPC	Department of Environment Pollution Control
DG	Director General
DO	Dissolved Oxygen
DOE	Department of Environment
DPHE	Department of Public Health Engineering
DSM	Design, Supervision and Monitoring
EC	Electric Conductivity
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environment Conservation Rules
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQS	Environmental Quality Standard
ES	Environmental Specialist
FGD	Focus Group Discussion
GC	Growth Center
GHG	Greenhouse gas
GPP	Guidelines for People's participation
HTW	Hand tube well
IEC	Important Environmental Components
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
LGD	Local Government Division
LGED	Local Government Engineering Department
MLGRD&C	Ministry of Local Government Rural Development and Cooperatives
NEMAP	National Environmental Management Action Plan
NGO	Non-Government Organization
NOC	No Objection Certificate

NRRDLGIP	Northern Region Rural Development and Local Governance Improvement Project
NWMP	National Water Management Plan
O&M	Operation and Maintenance
PAPs	Project affected persons
PIA	Project Influence Area
PMO	Project Management Office
RDPD	Regional Deputy Project Director
REE	Regional Environmental Expert
RMRSU	Road Maintenance and Road Safety Unit
RPF	Resettlement Policy Framework
RRRE	Regional Rehabilitation and Resettlement Expert
RRS	Rehabilitation and Resettlement Specialist
SPM	Suspended Particulate Matter
TDS	Total Dissolved Solid
UE	Upazila Engineer
UNR	Union road
UZR	Upazila road
WAPRO	Water Resources Planning Organization
WHO	World Health Organization
XEN	Executive Engineer

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1 Introduction

A sample Initial Environmental Examination (IEE) is conducted for 150-m new bridge construction over the Gudaria River during July 2012 to September 2012, and the results are enclosed in this report.

The main objective of the IEE study is to identify the significant environmental impacts for the proposed 150-m new bridge construction over the Gudaria River located between village Kailati (latitude 25°01'23.1'' and longitude 90°29'5.6'') of Bildora union at Haluaghat Upazila and village Futkai (latitude 25°01'26.2'' and longitude 90°29'10.2'') of Goatola Union of Dobaura Upazila in Mymensingh, through R & H (Nagla)-Goatola GC via Sakuai GC (Haluaghat part) will be a pilot proposed bridge site under the NRRDLGIP by the requirements of the EIA guideline for industry (1997), Environmental Conservation Act (ECA) 1995, Environmental Conservation Rules (ECR) 1997 prepared by the Department of Environment (DOE) and JICA Guidelines for Environmental and Social Consideration (2010) (hereafter the "JICA Guidelines) and to assess the scope of the EIA for the proposed project.

1.1 Background

The target area of the Northern Region Rural Development and Local Governance Improvement Project (NRRDLGIP) is 14 Districts in total: eight in Rangpur Division (Dinajpur, Thakurgaon, Panchagarth, Rangpur, Lalmonirhat, Nilphamari, Kurigram, Gaibandha); and six in Mymensingh area of Dhaka Division (Jamalpur, Sherpur, Tangail, Mymensingh, Netrokona, Kishoreganj).

The analysis in the preparatory survey confirms that the intervention in the target area is broadly consistent with the key national policies, and is relevant since the intervention to invest in rural infrastructure and promote economic growth and poverty reduction is highly needed in the target area.

The target area is one of the most lagging rural areas in the country. First, the poverty rate of the 14 districts in the proposed target area is 51.1% on average, which is much higher than that of the national average of 40.0% in 2005 (measured by upper poverty line). In addition, the target area is predominantly rural with the rural population of 86.6%, which is also much higher than the national average of 74.5%.

Despite the high need to promote economic growth and poverty reduction, rural infrastructure such as roads and bridges in the target area is less developed than in the rest of the country. Nationwide, based on November 2011 data from the Local Government Engineering Department (LGED) Road Maintenance and Road Safety Unit (RMRSU), over 72% of Upazila roads (UZRs) have been improved to all-weather pavement standard, compared with less than 70% in the 14 Project Districts and only 65% in the six Mymensingh area Districts. For Union roads (UNRs), 40% of them nationwide have been improved to all-weather standard compared with 28% in the 14 Project Districts. Additional cross-drainage structures on UZRs and UNRs are needed, particularly in the Mymensingh area – nearly 4 m span per km of road compared with the national average of 2.6 m per km. rural transport infrastructure development therefore remains a high priority need in the target area.

The proposed 150-m bridge construction over the Gudaria River located between village Kailati (latitude 25001'23.1'' and longitude 90029'5.6'') of Bildora union at Haluaghat Upazila and village Futkai (latitude 25001'26.2'' and longitude 90029'10.2'') of Goatola Union of Dobaura Upazila in Mymensingh, through R & H (Nagla)-Goatola GC via Sakuai GC (Haluaghat part) will be a proposed bridge site under the NRRDLGIP.

1.2 Scope of the Project

The scope of IEE includes both natural and human/social environments. Of specific concern is the nature of human use of resources and how this changes as a result of the proposed project interventions. IEE aims to predict induced change as a result of the project, so that any negative impacts can be avoided or minimized and positive impacts can be enhanced. Of specific concern is the degree of negative impacts that cannot be avoided or mitigated for and that these be greatly outweighed by the predicted positive impacts of the project. The physical works of the project will comprise a large number of small and dispersed schemes involving the upgrading /improvement of the existing infrastructure rather than constructing 150-m new bridge. The environmental impacts are thus expected to be limited and localized. Hence, an Initial Environmental Examination (IEE) was carried out during the project preparation stage in accordance with the JICA and DOE criteria. The scope of works of IEE includes the following:

- Review of the GOB's environmental policy, legal and administrative framework.
- Project description from environmental aspect;
- Data collection and analysis to describe the physical environment, biological environment, social environment and environmental pollution;
- An identification of the relevant environmental parameters in the project area through screening and literature review;
- Consultation with the locals/stakeholder involving concerned people in order to identify and act on any undocumented or perceived environmental issues;
- Assessment of the potential environmental impacts of the project activities;
- Formulation of mitigation measures for potential negative impacts;
- Formulation of a program for the monitoring of environmental impacts of the project;
- Prepare an environmental management and monitoring plan;
- Prepare an institutional framework for the environmental management and monitoring plan;
- Prepare terms of reference for an environmental impact assessment; and
- Recommendations and conclusions in order to operate the project works in an environmentally safe and sound manner.

1.3 Purpose of the IEE report

The purpose of the study is to carry out a sample IEE of the proposed 150-m new bridge to identify environmental issues associated with project design, construction and post-construction stages and suggest requisite measures to mitigate them. The span of the existing gap shown in the LGED inventory is 112 m but the field survey team revealed that the span between abutments on the both sides of the riverbank needs to be 150m considering the risk of river erosion. So, we conducted IEE based on their findings. The impacts are identified for physical, biological (terrestrial, and aquatic) and social environment. The study also includes preparation of mitigation measures to minimize these impacts and sustain the benefits. It also identifies the applicable legislative requirements of the Government of Bangladesh and the JICA requirements and institutional mechanism for effective implementation of enhancement measures.

1.4 Extent of the IEE

The extent of IEE study has been considered based on the spatial extent (elaborated in project description chapter) of the project section and the proposed activities. The IEE is conducted at initial stage and as per the details provided by the executing LGED. Certain changes may occur in structural components but these changes are unlikely to cause significant environmental impacts.

The project of impact is considered as 1 km on either side from the project location including around

other development and activity areas like construction camps. Strip mapping indicating environmental features at project site up to 1km circle is carried out to assess the impact on existing environmental features/resources/utilities in the immediate vicinity.

1.5 Content of the IEE

This report is presented in nine chapters in line with the Government of Bangladesh Guidelines and the JICA requirements. The following chapters are included in the report:

Chapter 1: Introduction
Chapter 2: Approach and methodology
Chapter 3: Policy, legal and administrative framework
Chapter 4: Description of the Project
Chapter 5: Description of the baseline environment
Chapter 6: Potential impacts and mitigation measures
Chapter 7: Environmental management and monitoring plan
Chapter 8: Institutional requirements and capacity building
Chapter 9: Public consultation and information disclosure
Chapter 10: Conclusions and recommendations

2 Approach and methodology

2.1 Introduction

This section details the methods applied in the collection and analysis of the primary and secondary data used in this report. Primary and secondary information from LGED, government sources, non-government organizations (NGOs) and other project-related stakeholders has been collected to support the preparation of this report. The methodology for IEE was prepared according to the Term of Reference (TOR), and Environmental Law of the Government of Bangladesh and JICA Guidelines, and generally accepted good practice of IEE procedures on rural infrastructure development projects. The work was performed in close cooperation with the project preparatory survey team.

2.2 Screening

Screening is applied in order to determine if a project has the potential to pose significant environmental or social impacts and identifies potential public concern. The output from the screening process also plays a significant role in determining the requirements for an IEE. The main outcome from initial screening is the classification of the project according to its likely or potential environmental sensitivity. This conclusion will also assist in determining whether a full Environmental Impact Assessment (EIA) is needed and, if so, to what detail individual environmental and social aspects are required to be assessed.

Bangladesh legislation currently outlines the requirements for a potential EIA by way of Schedule 1 of the ECR. The first step in screening is to determine whether the project is listed as a Green, Orange A, Orange B or Red Category activity under this schedule.

Proposed projects from different industry activity categories undergo different approvals processes as stipulated in the ECR. All bridge projects over 100 m are ‘Red Category’ for which an IEE and an EIA are required to assist the DOE in its decision as to whether to issue an Environmental Clearance Certificate (ECC) for the activity. Following this process, initial screening under the ECR for the 150-m bridge construction over the Kangsha River shows that both an IEE and an EIA are required.

2.3 Scoping

The primary purpose of scoping is to identify significant potential impacts, undertake justification and alternative analysis, and to determine the framework or TOR for carrying out the EIA. Overall, scoping is a collaborative process involving all key disciplines of the project team including design, construction, supervision, and government and community relations.

A scoping exercise was carried out involving all the relevant project team disciplines with the aim of:

- Compiling all available project information including location, cost, proposed design, construction time-frames, on-ground activities and resources (labor, materials and equipment) required;
- Defining the potential 'zone of influence' of proposed activities and therefore the boundaries for the assessment of the project in line with DOE and JICA requirements;
- Describing, in broad terms, the existing environmental and social conditions within this zone and undertaking an initial assessment of potential impacts (both positive and negative);
- Reviewing the relevant legislative and regulatory framework applicable to the project;
- Undertaking a data gap analysis to determine what additional site data (environmental and social) would need to be collected, and consultation undertaken, in order to better quantify/qualify existing baseline site conditions as well as potential impacts and mitigation measures;
- Identifying if any potential insurmountable impacts may occur as a result of the project; and
- Identifying, at an early stage, potentially-significant impacts which are likely to require further assessment including specialist studies and the development of management and mitigation measures.

The content of this IEE report has been informed by the output from the scoping process, and, once complete, will provide the framework for the more comprehensive assessment undertaken in the EIA.

2.4 Methodology

This IEE has been prepared based on a review of secondary source information and field investigations, as well as consultation with relevant stakeholders in association with the LGED and DOE. This report provides an overview of existing environmental conditions, an initial assessment of potential environmental impacts, and a summary of recommended management, mitigation and monitoring measures, with the aim of identifying what aspects require additional, more detailed investigation, data collection and analysis within the EIA. The assessment methodology covers all activities associated with pre-construction, construction, and post-construction stages, as well as well abandonment and site demobilization. The following activities were undertaken during the preparation of this IEE:

- Detailed meetings and discussions of the Environmental Specialist were held with the preparatory survey team of the project in order to obtain project background, details of project features, present status, sources of secondary data/reports, guidance, etc. and to finalize the work plan.
- A review was conducted of the physical, ecological and legal literature relevant to the project. This preliminary literature review helps to identify the baseline situation which ultimately forms the basis for the impact assessment component of this IEE.
- Coordination with the LGED, and relevant environmental agencies, involving communications with DOE, Bangladesh. The aim was to enquire recent developments in IEE and related legislation in Bangladesh and to inform about ongoing activities of the project.
- Preparation of project description, definition of study area, collection of environmental baseline

data, similar reports, maps, but also documents of other relevant projects in the area or Bangladesh in general.

- Field surveys were carried out for the proposed bridge location in order to investigate physical, biological, and socioeconomic conditions of the proposed bridge construction site and identifying resources falling within the proposed bridge construction site.
- The baseline environmental conditions of the proposed bridge construction site were defined for physical environment, ecological environment, and socio-economic environment but also to the objects of cultural heritage. Based on the information obtained potential environmental impacts were identified.
- Consultation with knowledge people during field visit of the proposed bridge construction site, consultation with local communities through scoping sessions was carried out during the field surveys. These included general public residing along the proposed bridge construction site and targeting stakeholders that are likely to be affected directly by the implementation of the project. The purpose of the consultation meetings was to assess stakeholder's views on the existing condition of the proposed bridge construction site, concern stemming from the impact of construction and operation activities, as well as safety-related issues.
- Estimation of the magnitudes of environmental impacts and assessments of the significance of the impacts on all discussed bridge alternatives including economic, social and environmental considerations.

Acting upon the collected information and data, identification, prediction and evaluation of significant/potential impacts have been done using the standard 'Checklist Method'. Thereafter, possible mitigation measures to reduce negative impacts and enhancing measures for positive impacts have been identified and on the basis of findings of impact appraisal comprising the key elements embodied in this IEE study.

3 Policy, legal, and administrative frameworks

3.1 Government Environmental legislation, regulation and policies guidelines

Regulatory requirements towards protection and conservation of environment and various natural resources and also toward protection of social environment from adverse impact of projects and activities associated with them have been enunciated by the GOB and pertinent policies and regulations among these requirements are summarized as follows:

3.1.1 National Environmental Policy 1992

Bangladesh has adopted a national environmental policy in 1992 aimed at sustainable development. The policy sets out the basic framework for environmental action together with a set of broad sectoral guidelines to ensure environmental sustainability during development. Key elements of the policy are to:

- maintain the ecological balance for ensuring sustainable development;
- protect the country against natural disasters;
- identify and control activities which are polluting and destroying the environment;
- ensure environment-friendly development in all sectors;
- promote sustainable and sound management of natural resources; and
- active collaboration with international initiatives related to the environment.

The policy mentions that an EIA should be conducted before projects are undertaken.

3.1.2 National Environment Management Action Plan 1995

The National Environmental Management Action Plan (NEMAP) builds on the National Environmental Policy and was developed to address specific issues and management requirements for the period 1995-2005. The plan includes a framework within which the recommendations of a National Conservation Strategy are to be implemented. The NEMAP has been developed with the objectives to:

- identify key environmental issues affecting Bangladesh;
- identify actions to halt or reduce the rate of environmental degradation;
- improve management of the natural environment;
- conserve and protect habitats and bio-diversity;
- to promote sustainable development; and
- improve the quality of life.

To this end, it has grouped all the relevant necessary actions under four topics: institutional, sectoral, location-specific and long-term issues. The institutional aspects reflect the need of inter-sectoral cooperation to tackle environmental problems and need for new and appropriate institutional mechanisms at national and local levels. The sectoral aspects reflect the way the ministries and agencies are organized with recommended actions. The location-specific aspects focus on particularly acute environmental problems at local levels that need to be addressed on a priority basis. The long-term issues include environmental degradation at a degree that might become more serious and threatening if appropriate actions are not taken immediately.

3.1.3 Environmental Conservation Act 1995

This Act authorizes the DOE to undertake any activity to conserve and enhance the quality of environment and to control, prevent and mitigate pollution. The DOE is the regulatory body and enforcement agency of all environmental related activities. The Act includes amongst others the following:

- Declaration of Ecologically Critical Areas;
- Procedure for obtaining Environmental Clearance Certificates (ECC);
- Regulation with respect to vehicles emitting smoke harmful for the environment;
- Environmental regulations for development activities;
- Standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Acceptable limits for discharging and emitting waste; and
- Formulation of environmental guidelines to control and mitigate environmental pollution, conservation and improvement of environment.

3.1.4 Environmental Conservation Act 1995 (Amendment 2010)

The amendment 2010 of the ECA introduced the following areas:

- No individual or institution (Government/ Semi Government/ Non-Government Organization/ Self Governing) can cut any Hill and Hillock. In case of national interest; it can be done after getting clearance from the respective department;
- Owner of the ship breaking yard will be bound to ensure proper management of their hazardous wastes to prevent environmental pollution and Health Risk;
- No remarked water body cannot be filled up/changed; in case of national interest; it can be done after getting clearance from the respective department; and

- Emitter of any activities/incident will be bound to control emission of environmental pollutants that exceeds the existing emission standards.

3.1.5 Environmental Conservation Rules 1997 and Amendments 2005

The Environment Conservation Rules (ECR) provides a first set of rules under the Environment Conservation Act (ECA) 1995. These provide amongst others standards and guidelines for:

- Categorization of industries and development projects on the basis of actual and anticipated pollution load;
- Requirements for undertaking IEE and EIA, as well as formulating an EMP according to categories of industries/development projects/activities;
- Procedure for obtaining environmental clearance; and
- The National Environmental Quality Standards (EQS) for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust etc.;

Depending upon location, size and severity of pollution loads, projects/activities have been classified in ECR, 1997 into four categories: Green, Orange A, Orange B and Red covering no impacts, minor, medium and severe impacts on Important Environmental Components (IECs) respectively. Corresponding categories of bridge projects are based on lengths and are as under:

Orange List industries/projects fall into two categories. Category A industries or projects are required to submit general information, a feasibility report, a process flow diagram and schematic diagrams of waste treatment facilities along with their application for obtaining DOE environmental clearance. Category B industries/projects are required to submit an IEE report, along with their application and the information and papers specified for Category A industries.

Red List industries/projects are those which may cause 'significant adverse' environmental impacts and are therefore required to submit an EIA report. It should be noted that the may obtain an initial site clearance on the basis of an IEE report, and subsequently submit EIA report for obtaining environmental clearance along with other necessary papers, like the feasibility report, no objection from local authority.

As per ECR'97 all existing industries/projects in Orange B and Red category require an Environmental Management Plan (EMP) to be prepared and submitted along with necessary other papers while applying for environmental clearance.

Environmental standards in operation in Bangladesh also promulgated under the Environmental Conservation Rules' 1997. There are standards prescribed for varying water resources, ambient air, noise, odor, industrial effluent and emission discharges, vehicular emission, etc.

Red Category
Item 67: include construction / reconstruction / extension of Regional, National and International highways / Railways
Item 68: include construction / reconstruction / extension of bridges over 100 m in length.

Orange B Category
Item 63: include construction / reconstruction / extension of Feeder road (District road), local streets.
Item 64: include construction / reconstruction / extension of bridges under 100 m in length.

3.1.6 The EIA Guidelines for Industry 1997

The EIA Guidelines is a handbook for procedures for preparing the EIA and for reviewing them for the

benefit of the development partners, EIA Consultants, reviewers, and academicians. While preparing these guidelines, the present environmental status as well as the need for rapid economic development of Bangladesh has been kept in view. These considerations have essentially resulted in simpler procedures to be followed for preparing the EIA and their review.

3.1.7 National Conservation Strategy 1992 and National Environment Management Action Plan 1995

Both these documents recommend that new bridge construction should be planned with public participation, that new bridge should include adequate facilities for fish passages and waterway transport and that the existing rail network design should be reviewed to improve floodwater drainage.

3.1.8 Other relevant national polices

Table 1 presents an outline of the other national legal instruments that will have relevance to the proposed bridge construction with respect to the environmental and social considerations. The draft IEE has been prepared in compliance with these national policies.

Table 1 National legal instruments

Title	Responsible Agency	Key Features-Potential Applicability
Environment Court Act, 2000 and subsequent amendments in 2002	Ministry of Environment and Forest	GOB has given highest priority to environment pollution and passed 'Environment Court Act, 2000 for completing environment related legal proceedings effectively.
The National Water Policy,1999	Ministry of Water Resources	Protection, restoration and enhancement of water resources; Protection of water quality, including strengthening regulations concerning agro-chemicals and industrial effluent; Sanitation and potable water; Fish and fisheries; and Participation of local communities in all water sector development.
The Brick Burning (Control) Act, 1989 The Brick Burning (Control) Amendment Act, 1992 and 2001	Ministry of Environment and Forest	Control of brick burning; Requires a license from the MoEF for operation; and Restricts brick burning with fuel wood.
Water Supply and Sanitation Act, 1996	Ministry of Local Government, Rural Development and Cooperatives	Management and Control of water supply and sanitation in urban areas.
Bangladesh Labor 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.
National Land Use Policy, 2001	Ministry of Land	The policy deals with land uses for several purposes including agriculture (crop production, fishery and livestock), housing, forestry, industrialization, railways and roads, tea and rubber. The plan basically identifies land use constraints in all these sectors.

3.1.9 National Water Policy 1999

The National Water Policy promulgated in 1999 with the intension of guiding both public and private actions in the future for ensuring optimal development and management of water that benefit both individuals and the society at large. The policy aims to ensure progress towards fulfilling national goals of economic developments, poverty alleviation, food security, public health and safety, decent

standard of living for the people and protection of natural environment. According to the policy, all agencies and departments entrusted with water resource management responsibilities (regulation, planning, construction, operation, and maintenance) will have to enhance environmental amenities and ensure that environmental resources are protected and restored in executing their tasks. Environmental needs and objectives will be treated equally with the resources management needs.

The policy has several clauses related to the protection and prevention of the natural environment for ensuring sustainable development. Some of the relevant clauses are:

- **Clause 4.5b:** Planning and feasibility studies of all projects will follow the Guidelines for Project Assessment, the Guidelines for People's Participation (GPP), the Guidelines for Environmental Impact Assessment, and all other instructions that may be issued from time to time by the Government.
- **Clause 4.9b:** Measures will be taken to minimize disruption to the natural aquatic environment in streams and water channels.
- **Clause 4.9e:** Water development plans will not interrupt fish movement and will make adequate provisions in control structures for allowing fish migration and breeding.
- **Clause 4.10a:** Water development projects should cause minimal disruption to navigation and, where necessary, adequate mitigation measures should be taken.
- **Clause 4.12a:** Give full consideration to environmental protection, restoration and enhancement measures consistent with NEMAP and the National Water Management Plan (NWMP).
- **Clause 4.12b:** Adhere to a formal Environmental Impact Assessment process, as set out in the EIA guidelines and manuals for water sector projects, in each water resources development project or rehabilitation program of size and scope specified by the Government from time to time.
- **Clause 4.12c:** Ensure adequate upland flow in water channels to preserve the coastal estuary eco-system threatened by intrusion of salinity from the sea.
- **Clause 4.13b:** Only those water related projects will be taken up for execution that will not interfere with aquatic characteristics of those water bodies.

3.1.10 National Water Management Plan 2001 (Approved in 2004)

The National Water Resources Council approved on March 31, 2004 a 25-year National Water Management Plan. The plan provides a framework within which all concerned with the development, management and use of water resources water services in Bangladesh can plan and implement their own activities in a coordinated and integrated manner. The planned activity programs have been presented in the eight sub-sectoral clusters: i) Institutional Development, ii) Enabling Environment, iii) Main River, iv) Towns and Rural Areas, v) Major Cities; vi) Disaster Management; vii) Agriculture and Water Management, and viii) Environment and Aquatic Resources. Each cluster comprises of a number of individual programs, with overall a total of 84 sub-sectoral programs identified and presented in the investment portfolio. It was planned to implement in three phases. It was approved at the seventh meeting of the National Water Resources Council. It calls for a coordinated approach of concerned ministries and departments to stop water-logging and to incorporate the issues of arsenic mitigation, river administration, and dredging and fisheries resources. To mitigate the environmental risks of water sector project development, the plan suggested for a holistic view, which includes the environment itself as an important water sector stakeholder with an entire cluster of programs devoted to it. Furthermore, programs within the environment cluster are strategically timed in order that public awareness raising, the establishment and enforcement of regulatory mechanisms and long term planning are addressed as priority. Water Resources Planning Organization (WARPO) was assigned to monitor the national water management plan.

3.1.11 National Fisheries Policy 1999

The National Fisheries Policy 1999 was formulated following review and intent of the East-Bengal

Protection and Conservation of Fish Act 1950, which was updated by the Protection and Conservation of Fish (Amendment) Ordinance 1982 and further refined by the Protection and Conservation of Fish (Amendment) Act 1995. These Acts and ordinance provide provisions for the protection and conservation of fish in fresh water and brackish water bodies.

The Fisheries Policy highlights the need to conserve fish breeding grounds and habitats, especially in the development of water management infrastructure. It intends to promote fisheries development and conservation in all water bodies.

The Project should consider these policies to protect the habitats, migration and connectivity of fish and fisheries resources around the Project area. Measures to reduce any potential negative impacts on local fish populations will be incorporated into all stages of the Project.

3.2 JICA Guidelines for Environmental and Social Considerations

To ensure the environmental and social sustainability of its funded projects, JICA has formulated the Guidelines for Environmental and Social Considerations (hereafter "JICA Guidelines") in April 2010. The objectives of the JICA Guidelines are to: 1) encourage the executing agency to have appropriate considerations for environmental and social impacts; and 2) ensure that JICA's support for, and examination of, environmental and social considerations are conducted accordingly. The JICA Guidelines specify requirements that all executing agencies of JICA-funded projects must meet. The key requirements include, but are not limited to, the following:

1) Assessment of potential environmental and social impacts and elaboration of mitigation measures in the earliest possible planning stage, and incorporation of them into the project plan
2) Examination of multiple alternatives to avoid or minimize adverse impacts, and to select better project options
3) Sufficient consultations with local stakeholders with disclosure of information at the earlier stage
4) Compliance with laws, standards, and plans
5) No significant adverse impacts on ecosystem and biota
6) Avoidance and minimization of involuntary resettlement, where feasible, and preparation and implementation of RAP, where involuntary resettlement is unavoidable
7) Special considerations for indigenous people
8) Sufficient monitoring to check the performance and effectiveness of mitigation measures

Thus, the LGED and Pourashavas, as the executing agencies of subprojects of the NRRDLGIP, shall satisfy the above requirements as well as the others described in the JICA Guidelines, even if the national laws and policies do not fully prescribe for these issues.

3.3 LGED's Guidelines and Environmental Code of Practices

The LGED published the "Environmental Guidelines for the LGED Projects" (hereinafter the "LGED Guidelines") in 2008, aiming to implement all of its development projects in an environmentally sound and sustainable manner. Following the LGED Guidelines would meet all the requirements of the GOB and its financing partners including JICA. They provide necessary procedures and formats for the IEE and EIA of rural infrastructure development and urban sector projects. For example, analysis of alternatives, public consultations and preparation of the EMP are included in the suggested outline of the EIA report. Thus it can be concluded that conducting an IEE and EIA in accordance with the LGED Guidelines generally satisfies the requirements of the JICA Guidelines.

4 Background of the NRRDLGIP

4.1 Background of the NRRDLGIP

JICA plans to assist the NRRDLGIP with the objective to expand access to rural and urban infrastructures and services, and improve urban governance in the northern region. The NRRDLGIP will have two main components: Component 1 (rural infrastructure development); and Component 2 (Pourashava infrastructure and governance improvement).

Component 1 will include the following infrastructure development: 1) upgrading of UZRs and UNRs including bridges and culverts; 2) rehabilitation of UZR; 3) improvement of Growth Centers (GC) and rural markets; and 4) improvement of *ghats* or boat landing stages.

Subprojects under Subcomponent 2-1 will not be determined at the preparatory survey phase. They will be selected through participatory approaches in the implementation phase of the Project. The eligible types of infrastructure works under the subcomponent may include: 1) improvement and rehabilitation of Pourashava roads, bridges, and culverts; 2) repair, rehabilitation, and expansion of drains; 3) improvement of municipal markets; 4) construction of slaughter houses; 5) rehabilitation and expansion of water distribution network and tubewells; 6) construction of public and community toilets; 7) construction of solid waste management facilities; 8) construction of bus and truck terminals; 9) installation of streetlights; 10) establishment of parking areas; and 11) basic infrastructures for the poor.

The target area of the NRRDLGIP covers eight Districts in Rangpur Division, namely Dinajpur, Thakurgaon, Panchagarh, Rangpur, Lalmonirhat, Nilphamari, Kurigram and Gaibandha, and six Districts in Mymensingh area of Dhaka Division, namely, Jamalpur, Sherpur, Tangail, Mymensingh, Netrokona and Kishoreganj. The Bangladesh counterpart agencies are the Local Government Division (LGD) and the Local Government Engineering Department (LGED) of the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C).

Under Component 1 of the NRRDLGIP, the LGED has proposed the construction of a bridge as part of a subproject under the NRRDLGIP. The proposed subproject is the improvement of the UZR of "R&H (Nagla) - Goatola GC via Sakuai GC (Road Code: 361242003)" in Haluaghat Upazila, Mymensingh District, Dhaka Division. The bridge is proposed to be constructed at the Futkai ferry ghat, or the ending point of the UZR to connect the different UZR in Dobaura Upazila in Mymensingh District. The length of the proposed bridge is expected to be approximately 150 m, though the length will be finalized after the determination of the detailed design. The location map is presented in Figure 1 and Figure 2.

4.2 Proposed bridge location

The proposed bridge construction site is at Futkai ferry ghat, which is located between Kailati village (latitude-25°01.391'N and longitude 90°29.097'E) of Bildora Union of Haluaghat Upazila (right bank) and Futkai village (latitude 25°01.439'N and longitude 90°29.447'E) of Goatola Union of Dobaura Upazila (left bank) in Mymensingh District, Dhaka Division. The site is located about 17.5 km east of Nagla bazar, which is about 40 km north from the center of Mymensingh Pourashava and 11 km south of Haluaghat Upazila center.

Figure 1 and Figure 2 demonstrate the location of the proposed bridge construction site, and Figure 3 shows the simplified drawing of the site. The bridge will be constructed over the Gudaria River. The Gudaria River connects with the Kangsha River at 0.7 km south-east downstream from the bridge construction site.

Current road condition

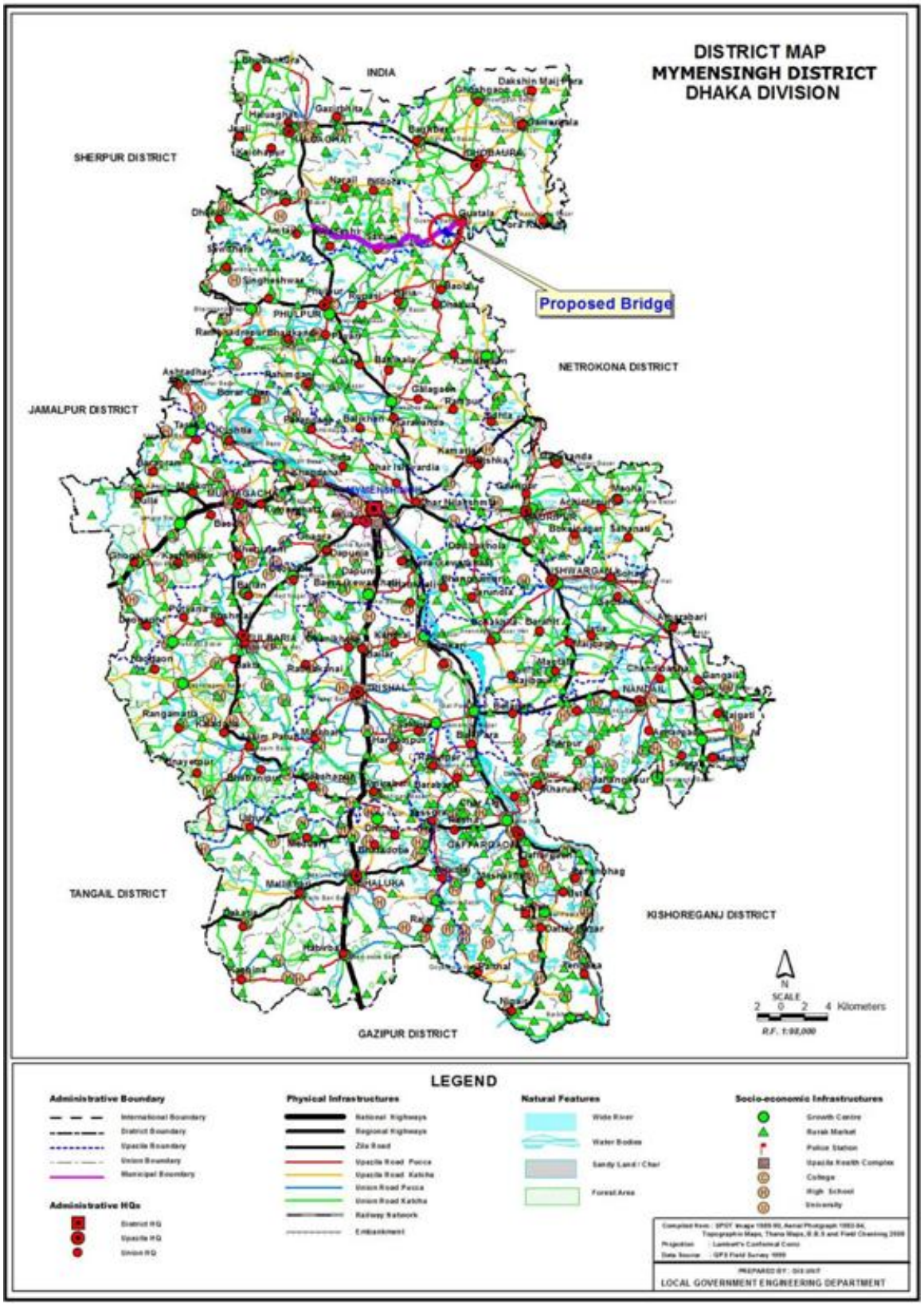
The UZR passes from Nagla bazaar to Futkai ferry ghat. The length of the UZR is approximately 17.5 km, of which about 3.84 km is earthen in the portion adjacent to the Futkai ferry ghat. About 10.20 km of the road has bituminous carpeting, and 3.47 km of the road is paved by brick. The crest width of the UZR is 5.03m on average. This UZR will be improved under the NRRDLGIP, and the proposed bridge will be constructed as part of the UZR improvement works.

On the left bank of the Futkai ferry ghat, there is another UZR going to the Goatola bazar or GC. The road is then connected to Dobaura Upazila. The portion from the Futkai ferry ghat and the Goatola GC is earthen, and the remaining part is paved by bitumen.

As described earlier, there is a small ferry ghat, called the "Futkai ferry ghat", at the proposed bridge site over the Gudaria River. Many people living in Bildora Union of Haluaghat Upazila, situated on the right bank, routinely cross the Gudaria river to reach Goatola GC located on the left bank. They cross the river by ferry service for selling and buying agricultural products and groceries, attending educational institutions, going hospitals and clinics, and other various socioeconomic reasons. Therefore, the proposed bridge construction will contribute to the improved connectivity between the both banks, and to the enhancement of the livelihood conditions.

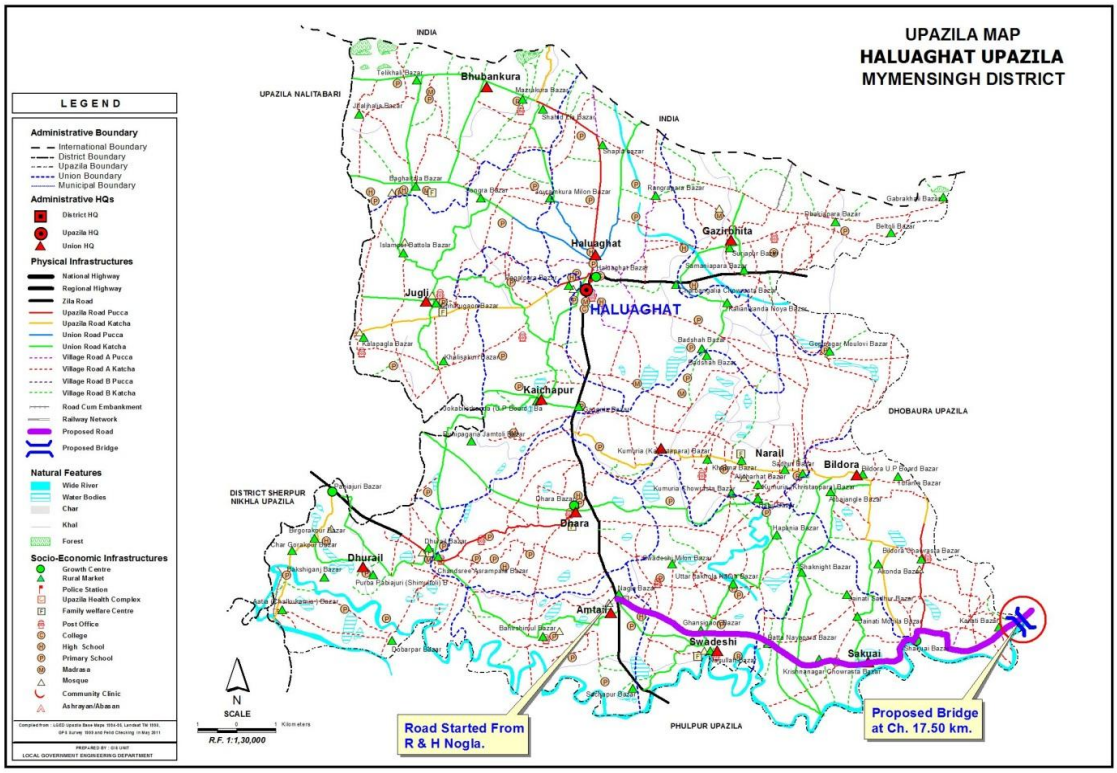
No residential house and settlement have been found nearby the ghat along the existing alignment of the UZR, though some agricultural land and wetlands are found along the alignment. A view of the proposed bridge construction site is shown in Image 1.

Image 1 View of the proposed bridge construction site



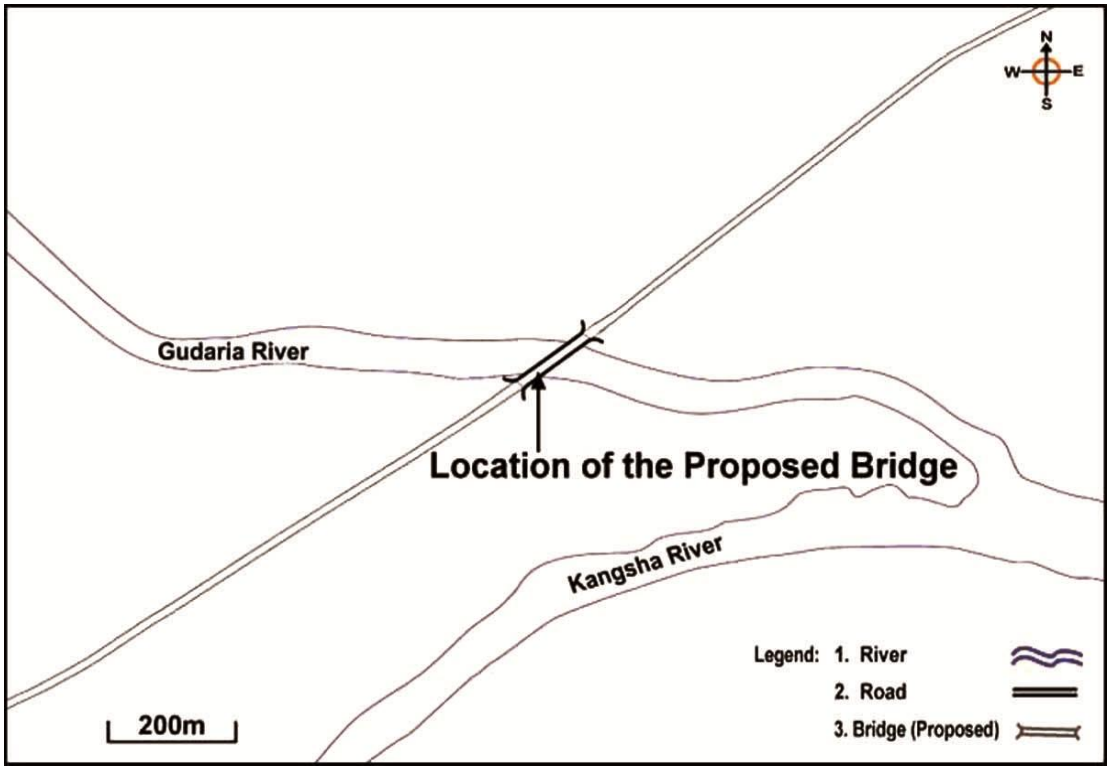
Source: LGED and Survey team

Figure 1 Location of the proposed bridge



Source: LGED and Survey team

Figure 2 Location of the proposed bridge



Source: Survey team

Figure 3 Simplified drawing of the proposed bridge construction site

Proposed bridge

The width of the Gudaria River at the proposed bridge construction site is 112 m according to the LGED road inventory. However, the field survey observed that the possible length of the proposed bridge would be approximately 150 m, taking into account the expected specifications of the proposed bridge, possible locations of bridge abutments, and soil and geological conditions of the bank.

The alignment of the bridge is expected to be almost linear connecting the existing road alignments of the two UZRs on both banks of the river. Along the alignment, approach roads will be constructed for the proposed bridge. The bridge will be constructed basically in accordance with the LGED road design standards for rural roads. The LGED Design Unit has also provided the Survey Team with the guidance on the current bridge design practices. The latest guidance on bridge design is shown in Table 2.

Table 2 Latest guidance on bridge design

Design loading criterion	AASHTO-LFRD-HL-93 – this supersedes the H20S16 loading specified previously
Carriageway width	5.5 m, i.e., double lane, is standard to allow for future growth of traffic 7.32 m to be used for more important roads with higher traffic levels
Footpath	0.65 m width on each side of the carriageway. Increased to 1.0 m width on each side of the carriageway for more important roads
Girder web width	450 mm
Deck slab thickness	200 mm
Railings	1,050 mm height, posts 200 mm x 200 mm reinforced cement-concrete (RCC), bars 150 mm x 150 mm RCC
Cast-in-situ piles	Minimum diameter 500 mm, maximum diameter 1,200 mm Minimum pile depth 15 m, maximum pile depth 55 m Pile cap should be 500 mm above the lowest water level
Pier geometry	For normal water flow, two circular columns Where skewed, one column For height greater than 12 m, single H type
Concrete strength	25 MPa, except for pre-stressed girders 35 MPa
Mild steel reinforcement rod	60 grade

Source: Communication with LGED Design Unit

However, it should be noted that the detailed design of the proposed bridge has not been determined yet at the preparatory survey phase. The detailed design will be determined after the commencement of the NRRDLGIP.

5 Description of the baseline environment

5.1 Physical environment

This section describes the physical environment of the proposed bridge construction site. The area-specific conditions pertaining to meteorology, topography, physiographic and soil, geology and seismicity, hydrology and drainage, air quality, noise quality, and flooding are featured. According to the EIA Guidelines for Industry issued by the DOE, the Project Influence Area (PIA) has to be 5 km radius of the development of the project activities. The PIA for the bridge construction subproject has been confined within a radius of 1 km from the construction site since most of the potential adverse impacts are likely to occur within this area, taking into account the nature of the subproject.

5.1.1 Atmosphere and climate

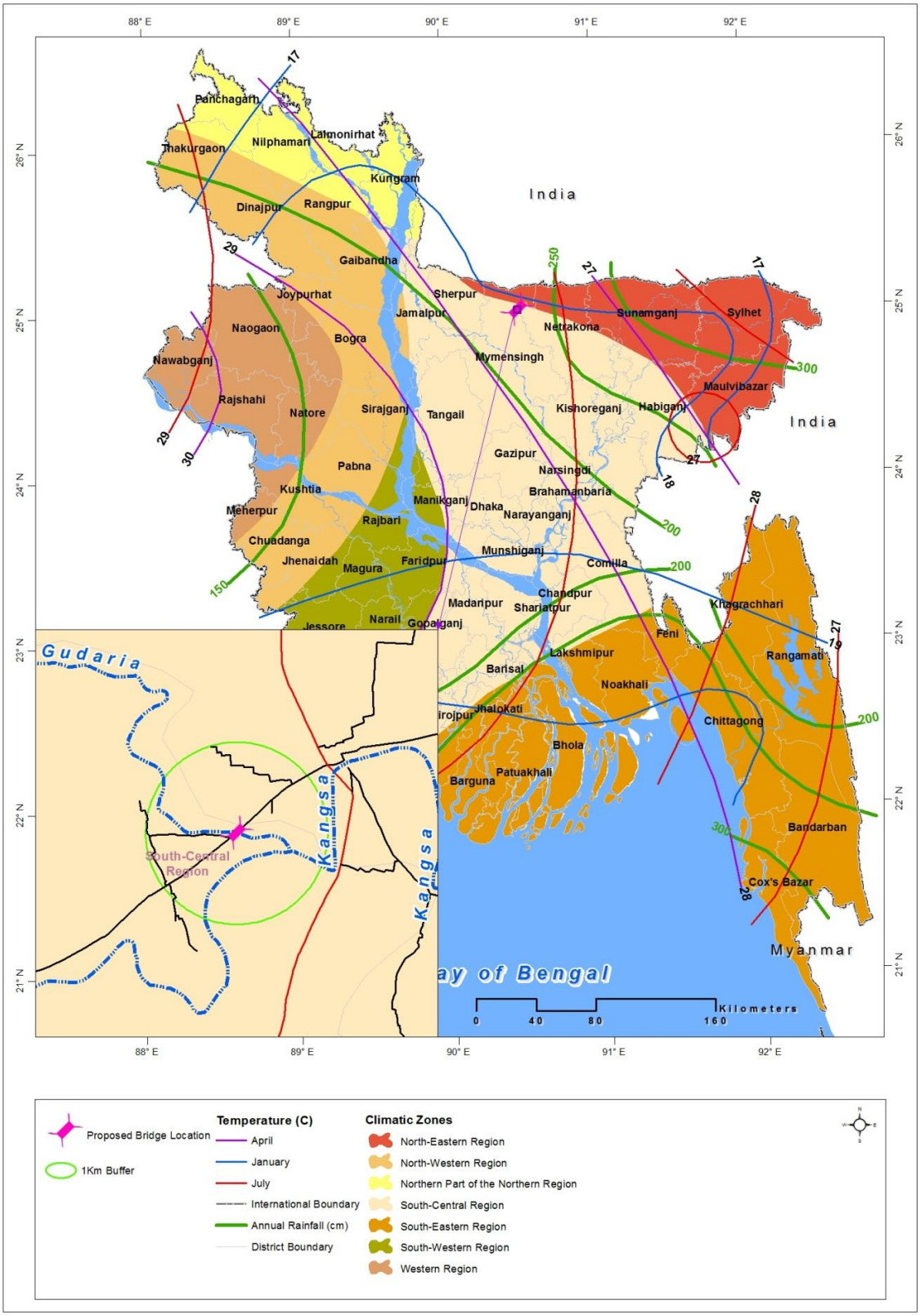
Bangladesh can be divided into seven climatic zones (Rashid 1977). The proposed bridge construction

site is within the South-Central region (Figure 4). Like other parts of the country, the site is heavily influenced by the Asiatic monsoon, and it has three seasons: 1) Pre-monsoon hot season (from March to May), 2) Rainy monsoon season (from June to October), and 3) Cool dry winter season (from November to February).

The pre-monsoon hot season is characterized by high temperatures and thunderstorms. April is the hottest month in the country with mean temperatures ranging from 27°C in the east and south, to 31°C in the west-central part of the country. After April, increasing cloud-cover reduces the temperature. Wind direction is variable during this season, especially during the early part. Rainfall, mostly caused by thunderstorms, at this time can account for 10 to 25 % of the annual total.

The rainy monsoon season is characterized by southerly or south-westerly winds, very high humidity, heavy rainfall and long periods of consecutive days of rainfall. The monsoon rain is caused by a tropical depression that enters the country from the Bay of Bengal. About 80% of the annual precipitation occurs during the five-month monsoon season from May to September.

The cool dry season is characterized by low temperatures, cool air blowing from the west or northwest, clear skies and meager rainfall. The average temperature in January varies from 17°C in the northwest and northeastern parts of the country to 20°C to 21°C in the coastal areas. Minimum temperatures in the extreme northwest in late December and early January reach between 3°C to 4°C.

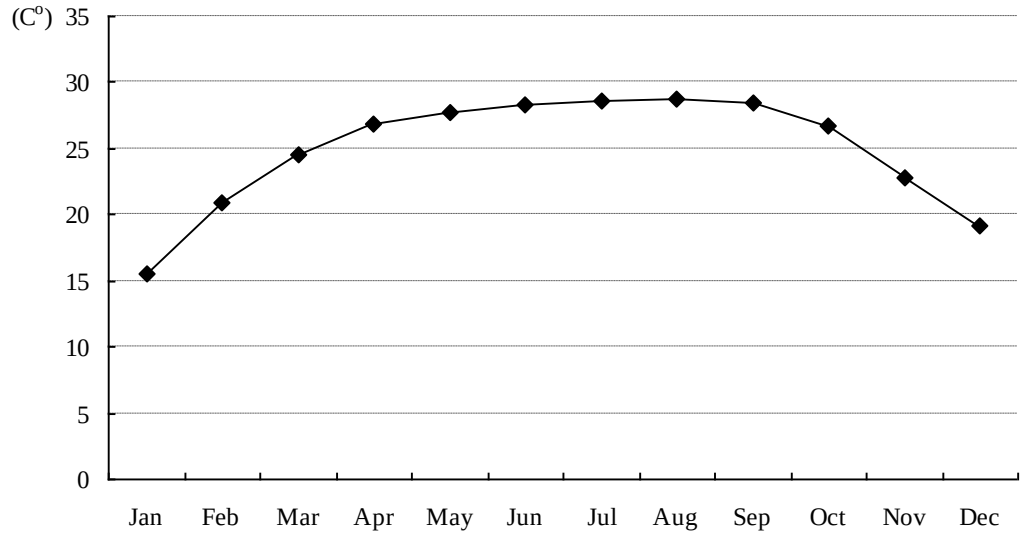


Source: Rashid (1991)

Figure 4 Climatic zones of Bangladesh

a) Temperature

Mean monthly temperature in Mymensingh in the last 10 years (2002-2011) is given in Figure 5. December and January are the coolest months with average monthly temperature of below 20º C, while the period from May to September is the hottest with average monthly temperatures ranging from 26 to 30°C. The maximum monthly temperatures recorded at Mymensingh are 37.5°C (May, 2006). The minimum monthly temperatures recorded at Mymensingh are 5.4°C (January, 2001 and January, 2003).



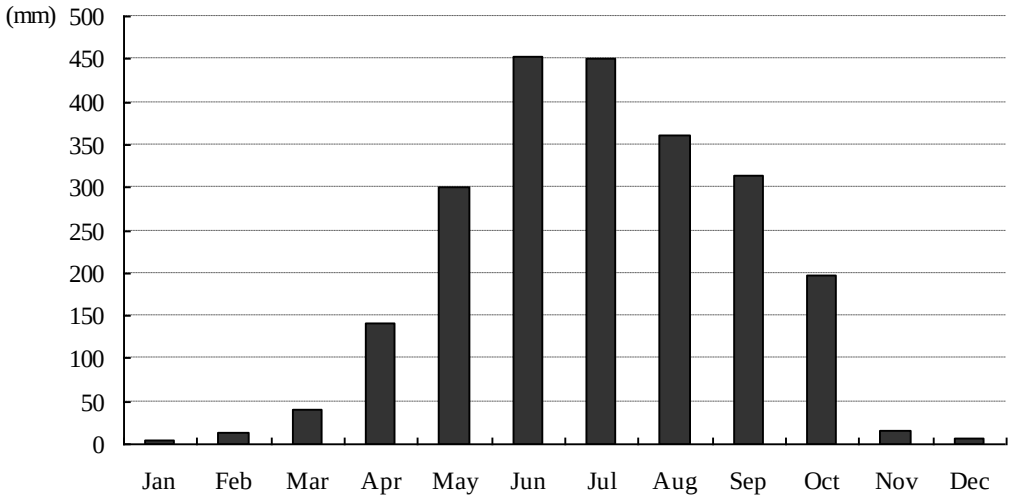
Source: Bangladesh Meteorological Department

Figure 5 Mean monthly temperature in Mymensingh in last 10 years (2002-2011)

b) Rainfall

The climate (precipitation), the regular annual variation (monsoon), and other meteorological conditions significantly affect the environmental impact of the project. For instance, there is frequent flooding in the rainy season and an almost total lack of rain in the dry season.

Annual rainfall of Mymensingh varies from 1,662 to 3,193 mm, during 2001 to 2011. Average monthly rainfall data in the last ten years in Mymensingh is given in Figure 6. In general, May to October is the rainy season, and the maximum rainfall takes place during June and August. June and July are the wettest months with the highest monthly rainfall of about 450 mm on average, but the rainfall during these months sometimes exceeds 750 mm. From November to February is the driest period with almost no rainfall.

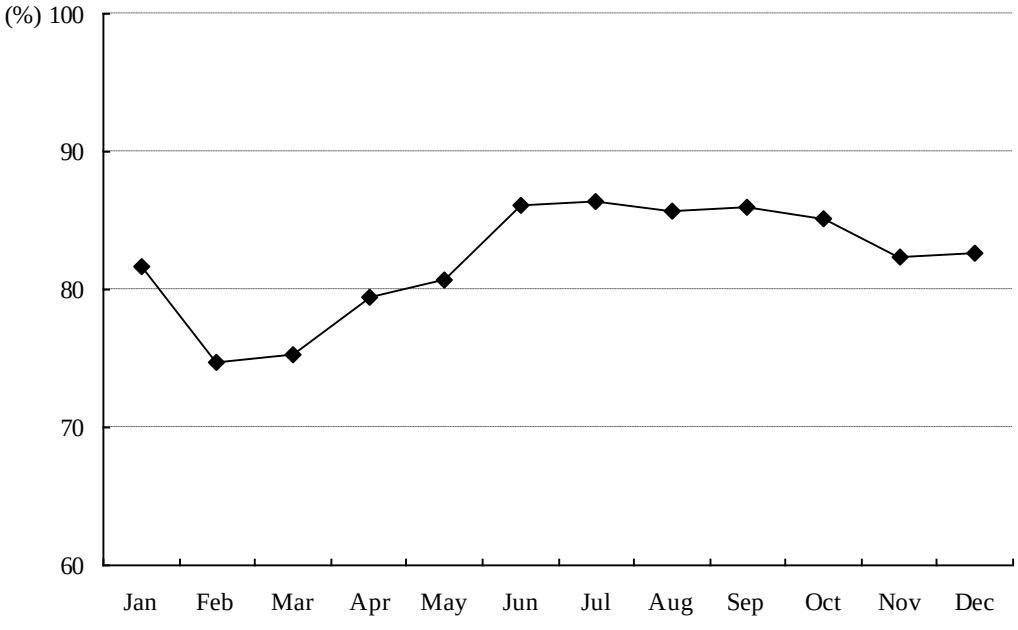


Source: Bangladesh Meteorological Department

Figure 6 Mean monthly rainfalls in Mymensingh in last 10 years (2002-2011)

c) Humidity

Annual humidity of Mymensingh is quite static from June to January, ranging from 80% to 90% during 2001 to 2011. The highest humidity corresponds to the rainy season between June and October. The maximum monthly humidity was about 90%, recorded in July 2002, August 2008 and September 2004. Low humidity prevails in February and March, and the mean monthly humidity was less than 80%.



Source: Bangladesh Meteorological Department

Figure 7 Mean monthly humidity in Mymensingh in last 10 years (2002-2011)

d) Wind speed

Prior to the onset of the monsoon in March and April, hot conditions and thunderstorms prevail while winds gradually start blowing from the south or southwest - a pattern that continues throughout the monsoon period. Winds are generally stronger in the summer than they are in winter. The direction of

prevailing winds is generally consistent during the winter and monsoon seasons and more variable during the transition periods. Himalayan mountains influence the flow of air and disturb the vertical stratification of the atmosphere by acting as physical barriers and as sources or sinks of heat. Recirculation of winds during the monsoon season under the influence of the Himalayas can result in winds circling to the east–southeast in the northern parts of the country.

Annual wind speed and direction in Mymensingh have variability each month. April, May and June have the highest mean wind speed than the other months of the year. On the other hand, the low wind flow was observed during October to February. Wind flows mainly from east and north-east during November to January with some from north-west, whereas it flows from east to south-east during February to October. The highest wind was recorded as 4.5 knots/hour in April 2001.

5.1.2 Topography

The topography of the proposed bridge construction site is flat and the ground elevation is about 5 m in the active floodplain on the right river bank and there is micro relief consisting of higher charland dissected by gullies or channels. On the left bank the relief is a result of the deposition and erosion features of abandoned meandering rivers, in the past tributaries of the Kangsha River. The topography of the left river bank is, however, largely adapted by the local population using the area for agricultural crop production, mainly paddy.

The proposed bridge site is agricultural land, villages and minor towns, and passes over the Gudaria River. The site represents an undulated topography slightly elevated from the adjacent active floodplain (Image 2). It is located on the floodplain of the Gudaria and Kangsha River. The left and right-banks of the Gudaria River contain large areas that are part of the river's floodplain.

The topography of chars and diyaras varies considerably. Some of the largest ones have point bars and swales. The elevation between the lowest and highest points of these accretions may be as much as 5 m. The difference between them and the higher levees on either bank can be up to 6 m. Some of the ridges are shallowly flooded but most of the ridges and all the basins of this floodplain region are flooded more than 0.91 m deep for about four months (mid-June to mid-October) during the monsoon.

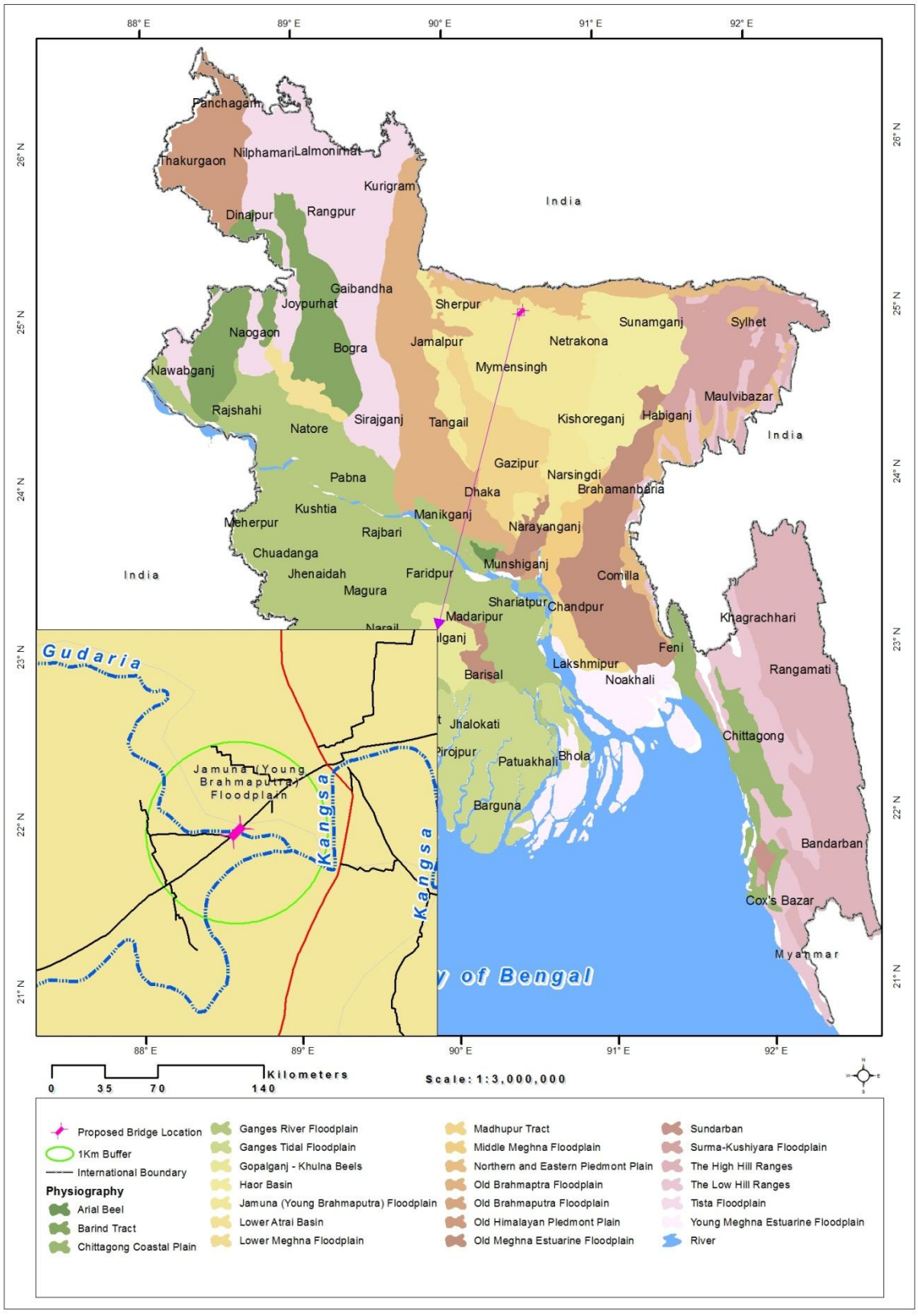
Image 2 Overview of Goatola portion of proposed bridge construction site

5.1.3 Physiography and geology

The term "physiography" refers to the form of the earth's surface. The physiography of Bangladesh may be classified into three distinct regions: 1) floodplains, 2) terraces, and 3) hills, each having distinguishing characteristic and has been divided into 24 sub-regions and 54 units (Figure 8). The proposed bridge construction sites are within the Jamuna (Young Brahmaputra) floodplain region. This region occupies a large area of Brahmaputra sediments before the river was diverted to its present Jamuna channel about 200 years ago. The region has broad ridges and basins. Soils of the area are predominantly silt loams to silty clay loams on the ridges and clay in the basins. General soil types predominantly include dark grey floodplain soil. Organic matter content is low on the ridges and moderate in the basins, topsoils moderately acidic and subsoils neutral in reaction. General fertility level is low. However, the status of P and CEC is medium and K status is low. Jamuna (Young Brahmaputra) floodplain a dual name is used for the mighty Brahmaputra, because the Jamuna channel is comparatively new and this course must be clearly distinguished from that of the older Brahmaputra. Before 1787, the Brahmaputra's course swung east to follow the course of the present Old Brahmaputra. In that year, apparently, a severe flood had the effect of turning the course southwards along the Jenai and Konai rivers to form the broad, braided Jamuna channel. The change in course seems to have been completed by 1830. Due to the uplift of the two large Pleistocene blocks of Barind and Madhupur, the zone of subsidence between those turned to a rift valley and became the new course of the Brahmaputra and came to be known as the great Jamuna. Both the left and right banks of the river are included in this sub-region. The Brahmaputra-Jamuna floodplain can again be subdivided into the Bangali-Karatoya floodplain, Jamuna-Dhaleshwari floodplain, and diyaras and chars.

Soils examined along the banks of the Gudaria River, in contrast, were observed to be somewhat sandy with a mixture of clays and a medium level of porosity, and they were generally found to be in a friable and moist condition. Examples of these differing soil types have been shown in Image 3.

Image 3 Typical bank profile in proposed bridge site at Gudaria River ghat showing (L) sandy clay soil type, and (R) evidence of stiff clay soil near proposed bridge location



Source: SRDI (1997)

Figure 8 Physiographic subregions of Bangladesh

5.1.4 Seismicity

Bangladesh is situated in one of the most tectonically active regions in the world. Here is where three major plates meet (the Indian Plate, the Tibet Sub-Plate, and the Burmese Sub-Plate). The proposed bridge construction site is located over the Indian Plate, which is moving north. However due to the location of relevant plates, fault lines and hinge zones, Bangladesh itself is divided into three seismic zones, based on the ranges of the seismic coefficient (note: the seismic coefficient is a measure of how strong an earthquake has the potential to be based on a combination of the mass of the plate and the seismic forces acting on it, as well as how frequently these quakes are likely to occur). Zone 3 is in the most seismically active area with a seismic coefficient on 0.25, and Zone 1 is the least active with a significantly lower seismic coefficient of 0.075 (Zahiruddin, 1993).

As shown in Figure 9, the proposed bridge construction site falls within Zone 1, which is defined as being seismically least probability of an earthquake occurring. The proposed bridge must therefore be designed in such a way that it can withstand maximum earthquake severity.

Source: Hossain (1998) & Zahiruddin (1993)

Figure 9 Seismic zones within Bangladesh

5.1.5 Water resources and hydrology

a) Surface water

Bangladesh is subject to yearly flooding during the monsoon season. Usually floodwaters inundate 18-40 % of the country, although severe floods, such as in 1998, have inundated flooding of up to 60 % of the land.

Source of surface water in the proposed bridge construction site is mainly river, khal and pond. Usually surface water in the proposed bridge construction site is used for external use like bathing, washing etc. The Gudaria River is the main of the river that will need a new bridge for rural communication. The Gudaria is a distributary of the Kangsha River. The river has changed course frequently in the last 20 years.

The hydrological regime in the proposed bridge construction site is governed by the rivers Gudaria and Kangsha. The Gudaria and Kangsha Rivers dominate the 150 m new construction bridge area hydrological regime. The Kangsha River originates from the Meghalaya inter Sherpur District and passing through to the Nalitabari and Haluaghat Upazila and fall into the Kushiara River (Figure 5.7).

Typical of most low-lying floodplains of Bangladesh, the Kangsha-Gudaria Rivers runs through numerous lowlands on either side of the river. At the beginning of the rainy season, as floodwaters enter the upstream portions of the Kangsha, water spills over the riverbanks through canals/khals that connect the river to those adjacent beels. Fish, for the most part, move from the rivers to the Khals/floodplain areas for spawning or nursing and then into the deeper perennial portions of the beels or back into the river as water recedes after the rains. Dry season water level reduction in khal and canal is caused by the ground and surface water extraction for boro rice irrigation, and reduced flows due to deforestation in local and upper-watershed areas (MACH, 2001).

The hydrology of the Kangsha-Gudaria flood plain, like those of similar areas of Bangladesh, is determined principally by the monsoon occurring from May-October followed by a dry period from November-April. Approximate length of the Goatola Bazar via Saluyai Bazar is 17.50 km rural road over the Gudaria River. The average bank to bank width and depth of the Gudaria River is 120 m and 10 m respectively. The water depth during dry period varies from 2 m to 6 m. The flow velocity during monsoon is high (about 1.5 m/sec) and during dry period is very low (about 0.5 m/sec). The river is meandering but stable. However, bank erosion and siltation occur at some locations slightly. The availability of water determines fish production, agriculture cycle and life style of the people in the area.

As other parts of the country, this cluster also receives sufficient amount of rainfall (average annual rainfall is 2,267 mm). The Gudaria and Kangsha Rivers are the major surface water body in the Haluaghat cluster under the Mymensingh district. During site visit it was observed that there were not such types of waste water discharge into the river.

In August 2012, surface water samples were collected by environmental specialist from pond, river and beel in the proposed bridge construction site and Dhaka University analyzed the samples. The result of the surface water samples and the GOB standards for fishing water (ECR, 1997) are shown in Table 3. The concentration levels of pH, dissolved oxygen (DO), electric conductivity (EC), total dissolved solid (TDS) and Turbidity for surface water were found within the acceptable limit set by the DOE, GoB for fishing water except DO and Turbidity for River Gudaria and Beel water. So although high temperatures can influence dissolved oxygen levels, temperature is not the only cause of low-oxygen areas found in the Gudaria River. However, the overall good quality of surface water is available in the subproject site.

Table 3 Results of sampling surface water test

Parameters	Unit	River Gudaria	Beel Water, Village Kailati	Pond Water, Futkai Village	Bangladesh Standard
pH	-	5.61	6.33	6.30	6.5-8.5
DO	Mg/l	6.52	6.81	5.59	6
EC	µS/cm	94	231	291	1200
TDS	Mg/l	41.6	77.1	95.8	1000
Turbidity	JTU	39.02	12.60	9.29	10

Sources: Field Survey, 2012

b) Groundwater

Bangladesh is located over a subsiding basin of tectonic origin overlain with a great thickness of sedimentary strata. This sedimentary stratum is an unconsolidated alluvial deposit of recent age overlaying marine sediments. The recent delta and alluvial plains of the Ganges, Brahmaputra and the Meghna Rivers constitute the upper formation. The near surface Quaternary alluvium contains good aquifer characteristics (transmission and storage coefficients). The groundwater storage reservoir has three divisions: upper clay and silt layer, a middle composite aquifer (fine to very fine sand) and a main aquifer consisting of medium to coarse sand. The Ground water level is at or very close to the surface during the monsoon; whereas, it is at maximum depth during the months of April and May.

In response to bacterial contamination concerns about surface water supplies in the proposed bridge construction site, the supply is now predominantly groundwater dependent. Ground water is mainly used for drinking, washing and bathing purposes in the proposed bridge construction site ground water is contaminated due to pollution of soil and surface water by waste, spillage of hazardous chemicals etc. However, in 1993 Department of Public Health Engineering (DPHE) first detected arsenic in hand tube wells (HTW's) and arsenic contamination has become one of the most pressing environmental issues in Bangladesh. The levels of arsenic in groundwater in Bangladesh are considered to be some of the highest in the world (Smith et al 2000). At present, occurrence of arsenic in drinking water has been identified in 272 Upazilas under 61 Districts of the country (DPHE, 2009). But arsenic is not problem in the Haluaghat Upazila under Mymensingh District as like as other areas in Bangladesh (Figure 11). The World Health Organization's (WHO) has been defined the tolerance limit of arsenic (As) for drinking water is 0.01mg/L while the Bangladesh standard for arsenic in drinking water is 0.05mg/L.

The DPHE has tested the presence of Chloride (Cl), arsenic (As) and iron (Fe) in groundwater at a depth of 60-90m during the year of 2011, in the proposed bridge construction site. The result shows that groundwater in the proposed bridge construction site is not contaminated by excessive As (<0.01mg/l) and Chloride (Cl) but iron (Fe) for the proposed bridge construction site is higher than the Bangladesh standard. Table 4 shows the groundwater quality around the proposed bridge construction site.

Table 4 Quality of Groundwater at the depth of 60-90m

Test No.	Parameters (mg/l)		
	Chloride (Cl)	Arsenic (As)	Iron (Fe)
1	15	0.004	0.34
2	13	0.003	0.41
3	10	0.003	0.80
4	11	0.003	0.21
5	15	0.004	0.80
Bangladesh Standard	150-600	0.05	0.3

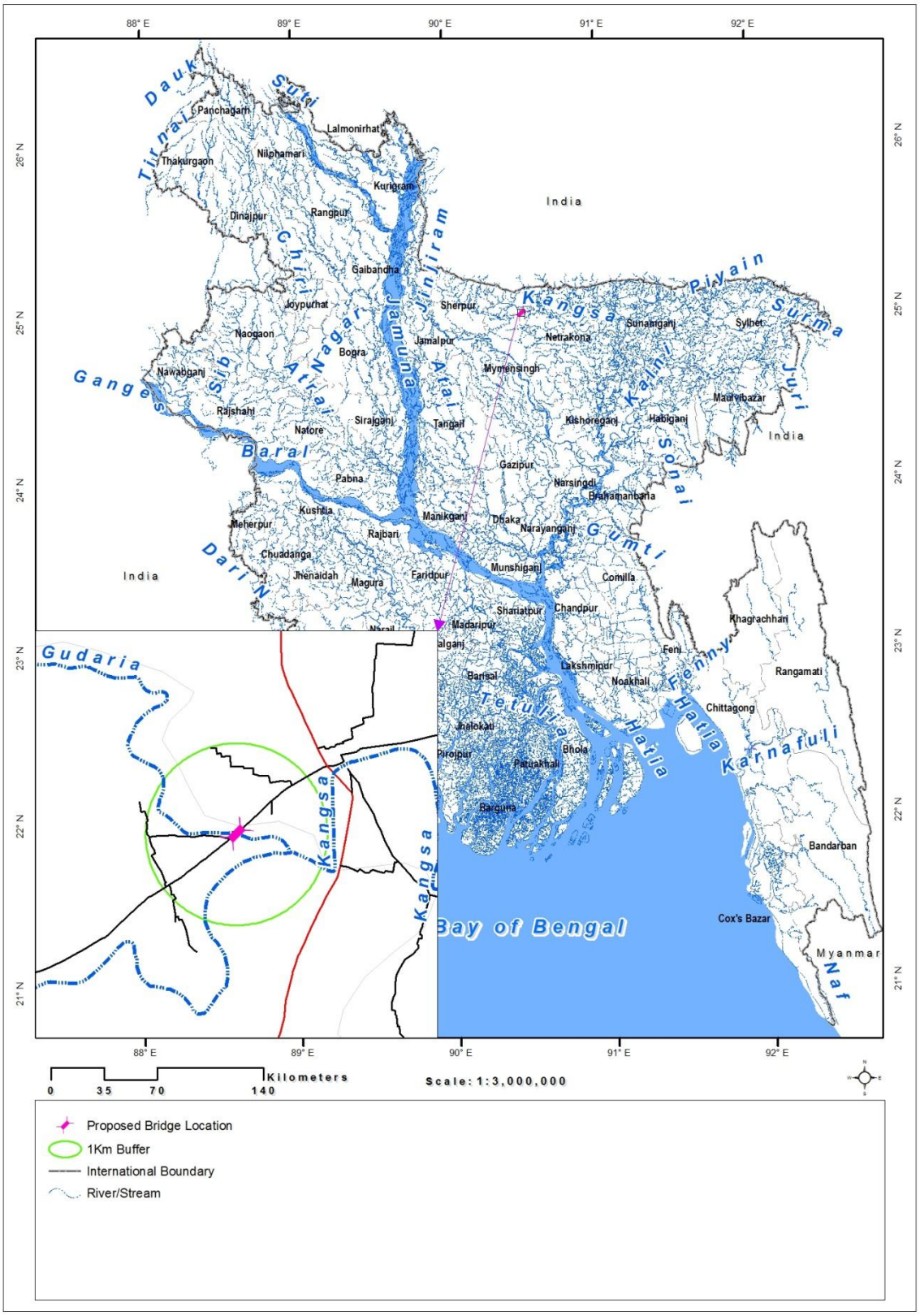
Source: DPHE, August, 2012

In August 2012, groundwater samples were collected by the Environmental Specialist from HTWs in the proposed bridge construction site and Dhaka University analyzed the samples. The result of the groundwater samples and the GOB standards for potable water (ECR, 1997) are shown in Table 5. The concentration levels of pH, EC, TDS and Turbidity for hand tube wells were found within the acceptable limit set by the DOE, GOB for drinking water except DO. The high temperatures can influence dissolved oxygen levels, temperature is not the only cause of low-oxygen areas found in the HTWs water. According to the overall water quality data, good quality and quantity of ground water is available in and around the project site.

Table 5 Results for groundwater field samples from hand tube wells

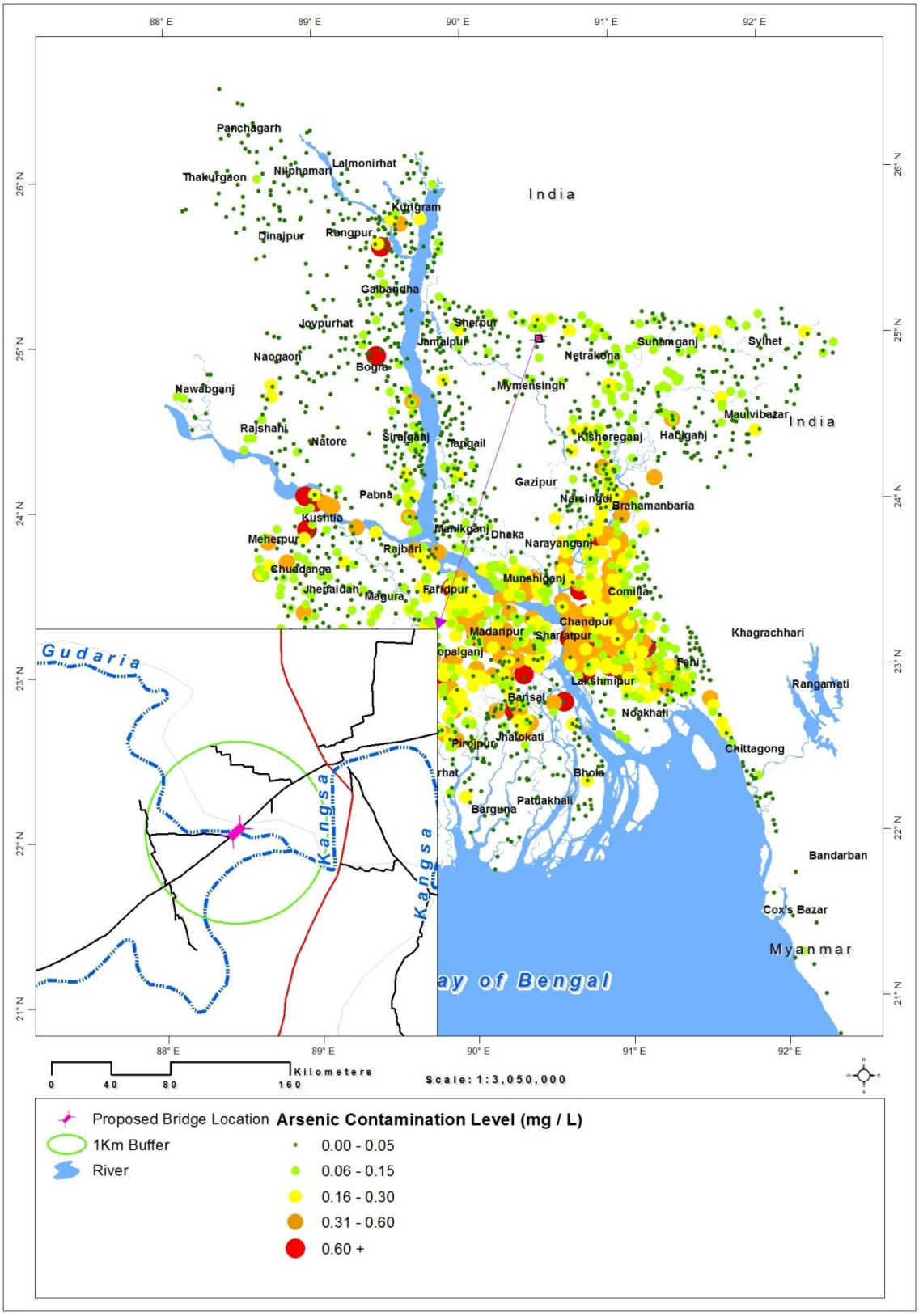
Parameters	Unit	Kailati Village	Futkai Village	Bangladesh Standard
pH	-	5.83	6.28	6.5-8.5
DO	Mg/l	7.34	7.35	6
EC	µS/cm	262	366	1200
TDS	Mg/l	86	126	1000
Turbidity	JTU	50	4.23	10

Source: Field Survey, 2012



Source: Rahman et al (2000)

Figure 10 River network map of Bangladesh



Source: BGS (2001)

Figure 11 Arsenic in ground water of Bangladesh

5.1.6 River morphology

Geomorphologically, all the river basin areas are changing due to the erosion and accretion characteristics of the Rivers. Many Charland (sand bars) are eroded and formed due to this process. Physical characteristics of the rivers and its distributaries are changing due to oscillation of the Riverbanks, levee breaching and formation of mid-channel bars. River depths became shallower at places. The dominating rive region is the Gudaria River (distributaries of the Kangsha River). The Gudaria River is a flashy one, usually flooded with the combined inflow of numerous rivulets originated from Meghalaya State of India.

Although the river banks are flooded, there is no change of river course during last 10, 20 and 30 years, as found from discussion with the local people and according to them the river banks are stable and no erosion is visible within 1,000 m upstream and 750 m downstream when it meets the Kangsha as observed from the images taken.

For verification of status of river erosion and river stability, images of 6 sample points are given in Image 4, Image 5, and Image 6.

Depth of river Gudaria has been taken at 4 spots starting from the eastern bank and depths are given in Table 6.

Table 6 Data on depth of river Gudaria

Distances from eastern side of the Gudaria river bank	Location	Depth	Date of measurement
80 feet (24.46m)	latitude-25°01.428'N and longitude 90°29.149'E	13.00 feet (3.98m)	30 August 2012
116 feet (35.47m)	latitude-25°01.419'N and longitude 90°29.144'E	15.00 feet (4.59m)	30 August 2012
180 feet (55.05m)	latitude-25°01.418'N and longitude 90°29.134'E	10.42 feet (3.19m)	30 August 2012
280 feet (85.63m)	latitude-25°01.412'N and longitude 90°29.122'E	3.75 (1.15m)	30 August 2012

Source: Field Survey, 2012

Considering the existing road network and requirements of the local people, the location has been proposed in preliminary stage. The proposed bridge location is also has little or no river bank erosion. In meandering stretch, there is always a possibility of oblique flow, which in turn poses threat of bank erosion.

According to site observation, there are little erosion has been observed at both banks near the proposed site (Image 4, Image 5, and Image 6). Considering the morphological conditions of the preliminary selected bridge site, and at upstream and downstream of the site, it is recommended that the project location is suitable for the bridge location (Figure 12Figure 12 River bank stability map).


Image 4 River morphology of 800 m from upstream (left) and 800m from downstream (right)

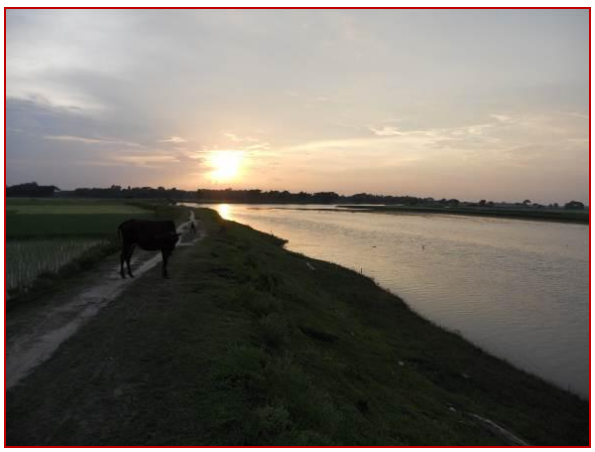
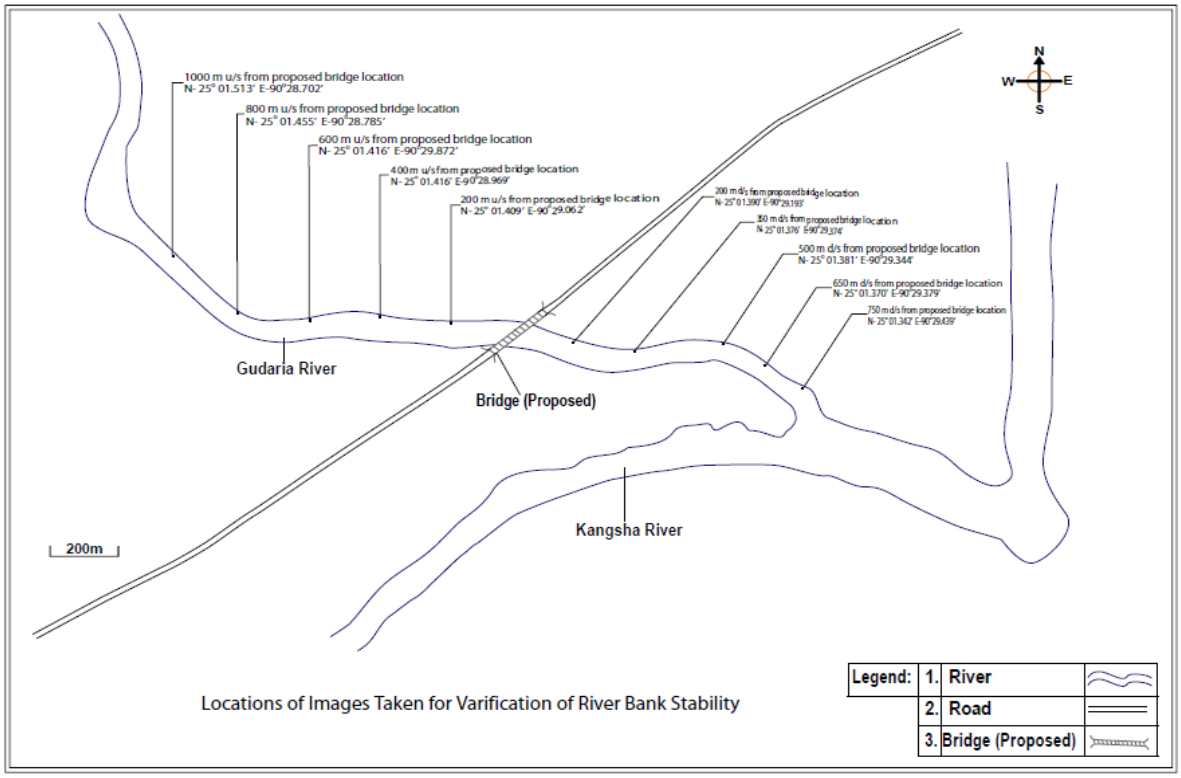



Image 5 River morphology of 400 m from upstream (left) and 350m from downstream (right)


Image 6 River morphology of 600 m from upstream (left) and 650m from downstream (right)



Source: Field Survey, 2012

Figure 12 River bank stability map

5.1.7 Air quality

No measures with respect to air quality are known to exist for this part of the country. The river-bank area is located in the peripheral area of Mymensingh District, the comparatively large city in Bangladesh. Although located in a low-lying area, largely inappropriate for human habitation, the air pollution levels from the city and the approach road to the 150-m new bridge area are minor considerable.

Only a few small factories are located in the proposed bridge construction sites; therefore, air pollution is comparatively less than in other areas of Bangladesh. Generally, air pollution in the proposed bridge construction site is from road dust, black smoke from diesel engines, construction dust, windblown dust from agricultural lands, domestic heating and cooking, and brick kilns. The EQS for Bangladesh (DOE 1997) has set ambient air quality guidelines Table 7 for Bangladesh. Most parts of the proposed bridge construction sites fall under Category 3.

Table 7 Bangladesh standard for ambient air quality

Category	Area	SPM	SO_2	CO	NOx
1	Industrial and mixed	500	120	5000	100
2	Commercial and mixed	400	100	5000	100
3	Residential and rural	200	80	2000	80
4	Sensitive	100	30	1000	30

Source: ECR of DOE, Bangladesh, 1997
Note: 1) National monuments, Health-centers/Hospitals, Archeological sites, Educational Institutions and areas declared by government (if applicable) are included under Sensitive.
2) Industrial units not located in designated industrial area shall not discharge or emit any pollutant which may deteriorate the air quality in the areas (c) and (d) of above Table.
3) Suspended Particulate Matter (SPM) means airborne of diameter of 10 microns of less.

5.1.8 Noise and vibration

Excessive noise is a potential issue for both human and biological receivers and can result in a range of negative issues, from mild annoyance and moderately elevated levels of aggression to significant disturbance of behavioral patterns and – in severe cases – hearing loss. According to the World Health Organization's Guidelines for Community Noise (1999), daily sound pressure levels of 50 decibels (dB) or above can create discomfort amongst humans, while ongoing exposure to sound pressure levels over 85 dB is usually considered the critical level for temporary hearing damage.

Noise levels vary at the given locations according to ambient noise, including movement of engine country boats, road-traffic noise, general community noise, and noise from birds and insects. The background noise level at the proposed bridge construction site is low, due to an absence of heavy industries, large urban development and other significant noise sources. Low noise occurs in the proposed bridge construction site mainly due to movement of engine boats, community, rice/wheat mills at the bazar areas and road sides and road traffic. No secondary data was identified to determine the existing vibration conditions at the proposed bridge construction site. However, no significant vibration-sources were observed during site visit. Intermittent, small-scale, and localized vibration from road vehicles was the only observed vibration source. The Bangladesh Standard of Noise level is given in Table 8.

Table 8 Bangladesh standard for noise level

No.	Area Category	Standards Values (dBA)	
		Day	Night
1	Silent zone	45	35
2	Residential area	50	40
3	Mixed area (basically residential together with areas used for commercial and industrial purposes)	60	50
4	Commercial area	70	60
5	Industrial area	70	70

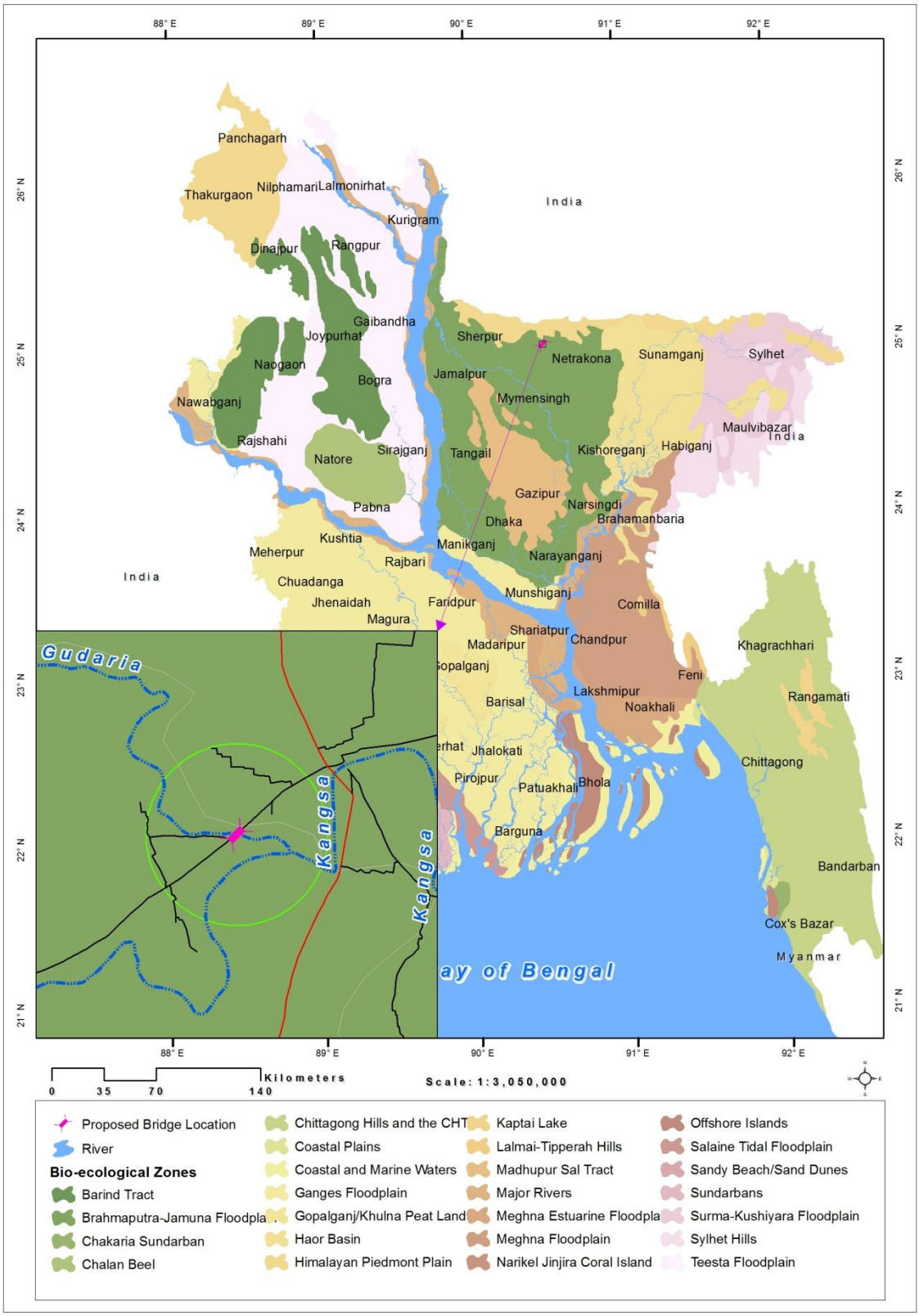
Source: Schedule 4, Rule-12, Environment Conservation Rules 1997. (Page 3127, Bangladesh Gazette, 28 August 1997).
Note: 1) Day time is considered from 6 am to 9 pm. 2) Night time is considered from 9 pm to 6 am. 3) Areas within 100 m of hospitals, educational institutions or government designated/to be designated/specific institutions/establishments are considered Silent Zones. Use of motor vehicle horns or other signals and loudspeakers are forbidden in Silent Zones.

5.2 Ecological environment

The ecological environment generally refers to flora and fauna, their present status, description and habitats based on the nature and type of the project activities. The status of the flora and fauna of the proposed bridge construction site was determined by specific assessment of both the terrestrial and aquatic environments, review of literature relevant to the location, and identification of species through primary (transit walk, interviews) and secondary sources.

The ecological settings of the cluster are mostly with wetland, homestead and roadside vegetation etc. The homestead vegetation has a positive effect on improvement of soil moisture through shading and mulching process. The trees growing at homesteads also ensure for easy access to the fuel wood, fodder and other products. The most common among them are jackfruit, mango, lemon, banana etc. Two major types of fauna viz., terrestrial and aquatic fauna have been identified in and around the cluster.

The ecosystems of Bangladesh can be placed under four broad types: coastal and marine ecosystem, inland freshwater ecosystem, terrestrial forest ecosystem and man-made ecosystem (Daniels, 2003). Twenty-five (25) bio-ecological zones have been delineated within Bangladesh by the IUCN. Six parameters were used to determine the areas including: physiography, soil, rainfall and temperature, floral distribution, faunal distribution and flood depth (IUCN 2002). The proposed bridge construction site occurs in Brahmaputra-Jamuna Floodplain as illustrated in Figure 13. The Brahmaputra floodplain situated in greater Mymensingh and Dhaka districts comprises the active channel of the Brahmaputra River and the adjoining areas of the young floodplain lands formed since about 1780, when the river shifted to its present course (i.e., the Jamuna River) to the south of Dewanganj in Jamalpur district. The main river course is strongly braided and consists of several interconnecting channels. This floodplain possess a unique variety of plants, medicinal herbs, fruit yielding trees, many jungle shrubs, creepers and climbers, flowering trees etc., many of which yield valuable products. Bushes of reeds and canes are also found here. The faunal diversity in this zone is also rich. Leopard was frequently cited in this zone. The most common poisonous snake is the Banded krait in this area, which could easily be identified by its broad black and yellow bands.



Source: IUCN (2002)

Figure 13 Bio-ecological zones of Bangladesh

5.2.1 Flora

Wetland flora plays a vital role for biodiversity conservation. The wetland habitat is characterized by anaerobic conditions, which inhibits normal plant growth. The cluster supports two types of wetland e.g., 1) permanent wetland and 2) seasonal wetland. The permanent wetland includes rivers and perennial water bodies. This wetland provides refuge and shelter for the most of the aquatic flora. The seasonal wetland serves as the cultivated land. Aquatic flora in the cluster can be divided into communities based on a set of environmental conditions. The communities are as follows:

- Free-floating plants
- Sub merged floating plants
- Rooted floating plants
- Sedges and meadows
- Marginal vegetation

The proposed bridge construction site is located on the highland and it is not in use. The surrounding area is also highland with mixed vegetation and crops. Crops cultivated in the surrounding land mainly include rice, rabi crops (winter crops) and homestead vegetables. A sizeable number of fruit trees with economic value have been observed in the PIA. The fruit trees include jackfruit and mangoes. Considerable number of trees and bushes in the PIA site provide habitat for birds and some other animals. The composition of plant community includes low growing grasses, herbs, shrubs and trees. The data collected from the environmental reconnaissance survey suggests that the predominant species in the area are those of cultivated vegetables and trees. A detailed list of floral species found in the proposed bridge construction site in Table 5.8 to Table 5.12.

Trees
Table 9 and Table 10 demonstrate the lists of fruit trees and timber or other trees respectively. According to IUCN (2012), *Delonix regia* or flame tree has been identified as “Vulnerable”. However, *Delonix regia* is endemic to Madagascar, and has been introduced into the area by humans many years ago. Thus, it is considered that there is the least concern of the extinction of the species.

Table 9 List of fruit trees in the area

Bangladesh name	Scientific name	English name
Aam	*Mangifera indica*	Mango
Jam	*Syjygium grandis*	Black berry
Kathal	*Artocarpus heterophyllus*	Jack fruit
Lichu	*Lichi cinensis*	Litchi
Jambura	*Citrus grandis*	Pomelo
Narikel	*Cocos nucifera*	Coconut
Pepe	*Carica papaya*	Papaya
Kul	*Zizyphus mouritania*	Jujube
Khejur	*Phoenix sylvestris*	Date tree
Tal	*Borassus flabellifer*	Palm tree
Peara	*Psidium guajava*	Guava
Bel	*Aezle marmelos*	Wood apple
Supari	*Areca catechu*	Betel nut
Dalim	*Punica granatum*	Pomegranate
Kola	*Musa Spp.*	Banana
Amra	*Spondias Pinnata*	Hog-plum

Bangladesh name	Scientific name	English name
Jalpai	*Elaeocarpus robustus*	Olive
Kamranga	*Averrhoea carmobola*	Star fruit
Tentul	*Tamarindus indicus*	Tamarind-tree
Lebu	*Citrus aurantifolia*	Lemon
Boroi	*Zizyphus jujuba*	Berry

Source: Field data collection through FGD conducted in August 2012

Table 10 List of timber or other trees in the area

Bangladesh name	Scientific name	English name
Akashmoni	*Acacea moniliformis*	Akashmoni
Koroi	*Albizia procera*	Koroi
Shil koroi	*Albizia lucida*	
Kadam	*Anthocephalus chinesis*	Kadam
Pitraj	*Aphanamixis polystachya*	
Kathal	*Artocarpus heterophylus*	Jack fruit tree
Shishu	*Dalbergia sisso*	Sissoo
Krishnachura	*Delonix regia*	Flame tree
Eucalyptus	*Eucalyptus citriodora*	Eucalyptus
Bot	*Ficus religiosa*	Banyan tree
Gamari	*Gmelina arborea*	
Mandar	*Rrythrina variegata*	Coral tree
Raintree	*Samanea saman*	Rain tree
Mehagony	*Swietenia mahogoni*	Mahogany
Jam	*Syjygium grandis*	Black berry tree
Shegun	*Tectona grandis*	Teak
Lombu	-	-

Source: Field data collection through FGD conducted in August 2012

Medicinal plant

Table 11 shows the list of medicinal plants in the area. According to IUCN (2012), no medicinal plants have been found threatened.

Table 11 List of medicinal plants in the area

Bangladesh name	Scientific name	English name
Bel	*Aegle marmelos*	Wood apple
Nim	*Azadirachta Indica*	Margosa
Bandar lathi	*Cassia fistula*	
Jaistha modhu	*Glycyrrhiza*	
Tulshi	*Ocimumsanctum*	Holyn basil
Amlaki	*Phyllathus embelica*	
Arjun	*Terminalia arjuna*	Arjun
Bohera	*Terminalia belerica*	
Horitaki	*Terminalia chebula*	

Source: Field data collection through FGD conducted in August 2012

Crops and vegetables, and flowers

Table 12 and Table 13 indicate the lists of crops and vegetables, and flowers respectively. No such species has been threatened according to IUCN (2012).

Table 12 List of crops and vegetables in the area

Bangladesh name	Scientific name	English name
Dheros	*Abelmoschus esculentus*	Lady's finger
Lal shak	*Amaranthus*	
Pui shak	*Basella alba*	Pui shak
Chal kumra	*Benincasa hispida*	Gourd
Morich	*Capsimum frutescens*	Chili
Kochu	*Colocasia esculenta*	Kachu
Paat	*Corchorus olitorius*	Jute
Sosha	*Cumis sativus*	Cucumber
Misti kumar	*Cucurbita maxima*	Sweet gourd
Misti alu	*Ipomoea batatas*	Sweet potato
Lau	*Lagnaria siceraria*	Pumpkin
Khesari	*Lathyrus sativus*	Pigeon pea
Moshur	*Lens culinaris*	Lentil
Tishi	*Linum usitatissimum*	Lin seed
Korola	*Momordica chantea*	Bitter gourd
Paddy	*Oryza sativa*	Paddy
Akh	*Saccharum officinarum*	Sugarcane
Til	*Sesamum indicum*	Sesame
Palong shak	*Spinacea oleracea*	Spinach
Alu	*Solanum tuberosum*	Potato
Chichinga	*Trichosanthes anguina*	Snake gourd
Gom	*Triticum aestivum*	Wheat
Dhundul	*Xylocarpus granatum*	
Bhutta	*Zea mays*	Maize
Sorisha		Mustard

Source: Field data collection through FGD conducted in August 2012

Table 13 List of flowers in the area

Bangladesh name	Scientific name	English name
Shimul	*Bombax ceiba*	
Pata bahar	*Codiacum variegatum*	Crontons
Gondho raj	*Gardenia jasminoides*	Gardenia
Joba	*Hibiscus rosa-sinensis*	China rose
Beli	*Jasminum sarrbac*	
Shapla	*Nymphaea nouchali*	Water lily
Nil padda	*Nymphaea stellata*	
Shefali/Sheuli	*Nyctanthes arboriristis*	
Golap	*Rosa centifolia*	Rose
Tagar	*Tabernaemontana divaricate*	
Ganda	*Tagetes patula*	Marigold
Rajani gondha	*Pollenthes tuberose*	Tuberose

Source: Field data collection through FGD conducted in August 2012

5.2.2 Fauna

Fresh water fish habitat such as river, pond and ditches exist in and around the cluster, which provide shelter, feeding, and spawning ground for different types of fresh water fish species (such as carp, catla, pabda, tengra, boal, etc.). Small-scale human intervention for catching fresh water fishes from their natural habitat/Gudaria River has been observed. The reproduction, breeding and multiplication of aquatic fishes are very finely tuned and adjusted to the rhythm and amplitude of monsoon flooding in and around the proposed bridge construction site. There are few fishermen within the cluster whose income source is mainly fishing from the Gudaria and Kangsha River as well as natural canals.

Leaving aside the common birds like crows, sparrows, shaliks, cuckoos, and some domestic cattle, no other wild animals inhabit the area. The wildlife that fully depends on the terrestrial land throughout their whole life, their existence, shelter, food, nesting, breeding and also producing own offspring is called terrestrial fauna. Core components of the terrestrial fauna are amphibian, reptile, birds and mammals.

A number of avian species were observed in the PIA. These species are typical inhabitants of urban fringes and considered as common on both at local and regional levels. In addition to the avian species, the area is habitat to a variety of reptiles, mammals and invertebrates.

Amphibians and other aquatic species

Table 14 shows the list of amphibians and other aquatic species in the area. According to IUCN (2012), no threatened species are found in the area.

Table 14 List of amphibians and other aquatic species in the area

Bangladesh name	Scientific name	English name
Kuno Bang	*Bufo melanostictus*	Common toad
Bang	*Rana cyanophytes*	Skipper frog
Sona Bang	*Rana tigrina*	Bull frog
Joke	-	Leech
Shamuk	-	Snail

Source: Field data collection through FGD conducted in August 2012

Reptile

Table 15 shows the list of reptiles found in the area. According to IUCN (2012), no endangered species are found except for *Ophiophagus hannah* or king cobra, which has been found as "Vulnerable". However the habitat of the species is usually forest or densely vegetated area, and such area is not observed at the proposed bridge site. Thus, it is considered that there is the least risk of negative impacts of the proposed bridge construction on the species.

Table 15 List of reptiles in the area

Bangladesh name	Scientific name	English name
Dudh raj	*Elapheradiata*	Trinket snake
Matia Sap	*Enhydris enhydris*	Water snake
Kochchop	*Kachuga tecta*	Tortoise
Kasim	*Lissemys punctata*	Flap-shell turtle
Gokhra sap	*Naja naja*	Cobra
Shonkho chura	*Ophiophagus hannah*	King cobra
Daraj sap	*Ptyas mucosus*	Rat snake
Gui shap	*Varanus bengalensis*	Monitor lizard
Dhora sap	*Xenochrophis piscator*	Water snake
Bhing raj	-	

Source: Field data collection through FGD conducted in August 2012

Mammal

Table 16 demonstrates the list of mammals in the proposed bridge construction site. No species have been found threatened according to IUCN (2012). However, a few local people pointed out that there were *Lutra lutra* or otters in the area. Habitats of these mammals should be carefully conserved.

Table 16 List of mammals in the area

Bangladesh name	Scientific name	English name
Shial	*Canis aurcus*	Jackal
Badur	*Cynoptwerus spinex*	Short nosed fruit bat
Beji	*Herpestes edwardsi*	Mongoose
Idur	*Mus booduga*	Field mouse
Chika	*Suncus murinus*	Shrew
Khatash	*Viverine malaccensis*	-
Khek shial	*Vulpes bengalensis*	Fox

Source: Field data collection through FGD conducted in August 2012

Bird

Table 17 shows the list of birds which can be observed in the area. According to IUCN (2012), no birds have been found threatened.

Table 17 List of birds in the area

Bangladesh name	Scientific name	English name
Jhuti salikh	*Acridotheres fuscus*	Jungle myna
Bhat salikh	*Acridotheres tristis*	Common myna
Mach ranga	*Alcedo atthis*	Common kingfisher
Kana bok	*Ardeola grayii*	Pond heron
Hutum	*Athena brama*	Spotted owlet

Bangladesh name	Scientific name	English name
Pati kak	*Corvus splendens*	House crow
Boro kak	*Corvus macrorynchos*	Jungle crow
Doyel	*Copsychus saularis*	Magpie robin
Finge	*Dicrurus macrocercus*	Black drongo
Kokil	*Eudynamys scolopacca*	Koel
Moyna	*Gracula religiosa*	Indian myna
Sada bok	*Igretta garzetta*	Small heron
Holud pakhi	*Oriolus xanthornus*	Black-hooded oriole
Kutum pakhi	*Oriolus chinensis*	Black-naped oriole
Tuntuni	*Orthotomus sutorius*	Tailor bird
Choroi	*Passer domesticus*	House sparrow
Babui	*Ploceus philippinus*	Baya weaver bird
Tiya	*Psittacula krameri*	Parakeet
Bulbul	*Pycnonotus jacosus*	Red-vented bulbul
Ghugu	*Streptopelia chinensis*	Spotted dove
Gu Shalik	*Sturnus contra*	Pied myna
Pecha	*Tyto alba*	Owl
Kobutar	*Columba livia*	Pigeon
Sharosh	*Grus antigone*	Crane

Source: Field data collection through FGD conducted in August 2012

5.2.3 Fisheries

Fisheries at the proposed construction site include capture fisheries in river, beel and aquaculture in closed water bodies such as pond, dighi and ditches. Capture fisheries in Bangladesh and at the project site declined due to over exploitation, pollution and shrinking of wetlands while more and more people being poverty stricken adapted fishing as profession in recent years. Construction of the proposed bridge will impact capture fishery as the project activities does involve change in hydrology of wetlands and the flow of tide in open water bodies instead if borrow pits for collection of filling materials for embankment are dug big enough size that will support fish stocking and aquaculture if leased to the PAPs. There are few fishermen within the cluster whose income source is mainly fishing from the Gudaria and Kangsha River as well as natural canals. Field survey has been carried out to find out the fisheries within the proposed bridge construction site and data.

Table 18 demonstrates the list of fish species in the river, beel and other wetlands of the area. According to IUCN (2012), out of the listed fish species, only *Cyprinus carpio* or common carp is categorized as "Vulnerable". The wild population of *Cyprinus caipio* is considered vulnerable, but the species has also been widely domesticated in the area. The species have been introduced in the area mainly for fish culture, and thus there is a least concern on the extinction of the species in the area.

Table 18 List of fish species in the river, beel, and wetland of the area

Bangladesh name	Scientific name	English name
Kajli	*Ailiichthys punctata*	Jamuna ailia
Mula	*Ambltpharyngodon mola*	Indian carplet
Koi	*Anabas tesudineus*	Climbing perch
Catla	*Catla catla*	Major carp
Taki	*Channa punctatus*	Snakehead

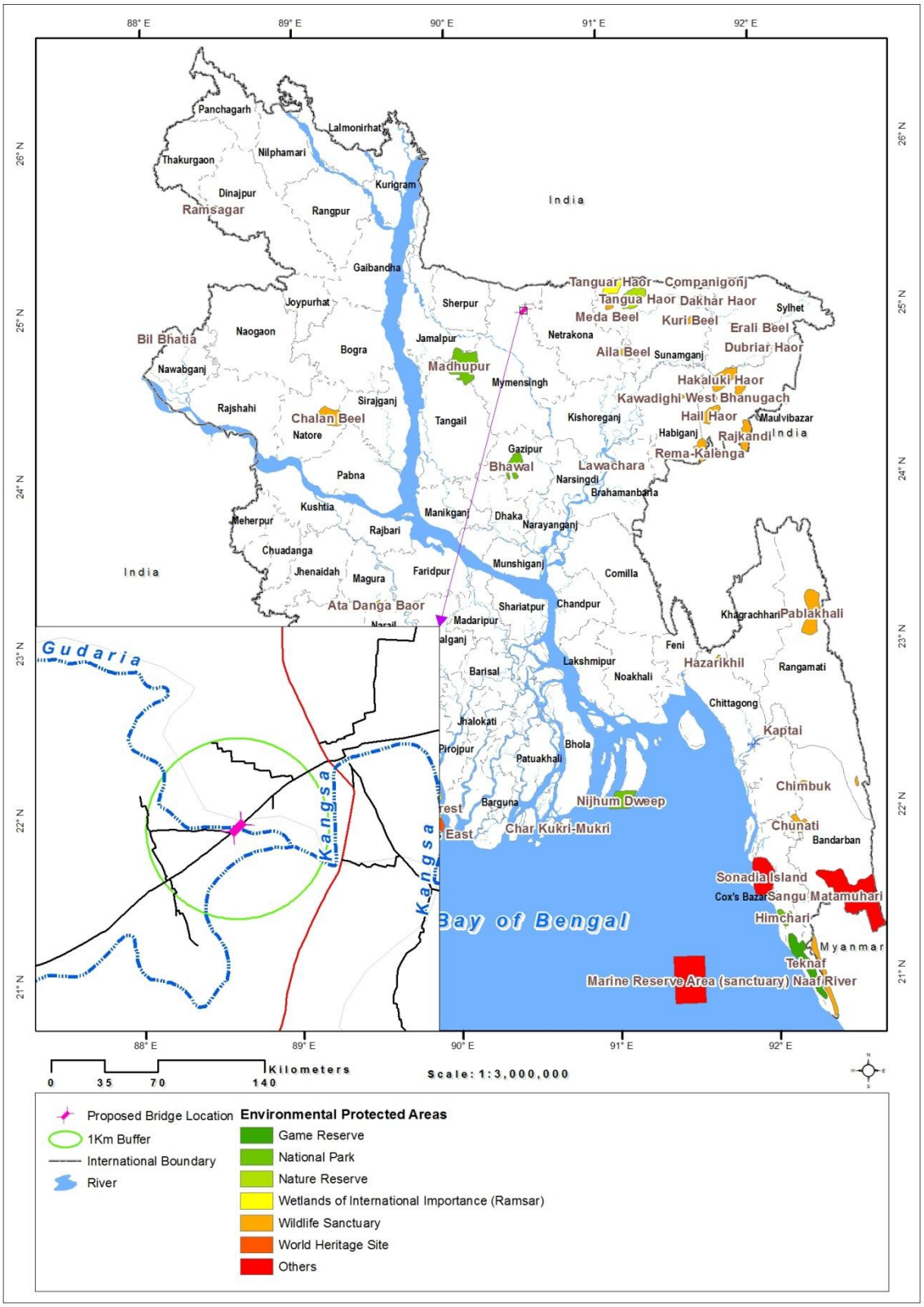
Bangladesh name	Scientific name	English name
Chanda	*Chanda ranga*	Glass perch
Shoul	*Channa striatus*	Snakehead
Magur	*Clarioas batrachus*	Catfish
Grass carp	*Ctenopharyngodon idellus*	Grass carp
Carpio	*Cyprinus carpio*	Common carp
Chapila	*Gadusia chapra*	Herrings
Shing	*Heteropneustes fossilis*	Stinging catfish
Silver carp	*Hypophthalmichthes molotrix*	Silver carp
Kali baus	*Labeo calbasu*	Major carp
Ghonia	*Labeo gonius*	Kuria labeo
Rui	*Labeo rohita*	Major carp
Chingri	*Macrobrabrachium malcolmsoni*	Prawn
Baem	*Mastacembelus armatus*	Zig zug eel
Ayre	*Mists aor*	Long whiskered catfish
Gulsha	*Mystus cavacius*	Gangetic mystus
Tengra	*Mystis vittatus*	Days mystus
Fali	*Natopterus notopterus*	Feather backs
Pabda	*Omok pabda*	Pabdha actfish
Chela	*Onygaster phulo*	Chela
Batashi	*Pscudeutropicus atberinoides*	Indian potashi
Puti	*Puntius stigma*	Barb
Rita	*Rita rita*	River catfish
Boal	*Wallago attu*	Giant catfish

Source: Field data collection through FGD conducted in August 2012

5.2.4 Forest, ecologically sensitive areas, and protected areas

Many wildlife species are in stress in Bangladesh, and increasing number of species are endangered or threatened, and a large number already faced extinction. The status of faunal species in Bangladesh has been published by IUCN (2000). According to the IUCN findings, this country has lost 10% of its mammalian fauna, 3% avifauna and 4% reptiles over the last 100 years. More than 50 species are presently critically endangered in Bangladesh of which 23 species are already declared as endangered in the Red Data Book of IUCN.

Any construction must consider impacts on the rate of deforestation, loss of habitat, habitat fragmentation, and interruption of wildlife migration patterns. According to the available data, there are no formerly or presently specially protected areas in the vicinity or in the influence are of the project (Figure 14).



Sources: SRDI (1997); IUCN (2011)

Figure 14 Environmental protected area of Bangladesh

5.3 Socioeconomic environment

5.3.1 Demography

This section provides a profile and analysis of the socio-economic characteristics that currently exist within the proposed bridge construction site. The data analyzed in this section has been collected from a number of primary and secondary sources. Haluaghat Upazila with an area of 356.07 km^2, is bounded by Garo Hills of the Meghalaya state of India on the north, Phulpur Upazila on the south, Dobaura Upazila on the east and Nalitabari Upazila on the west. Main rivers are the Kangsha, Memong and Bhogai. Haluaghat Upazila has a population of 9,727: male 52.04% and female 47.96%, and only 5% ethnic group has been identified in Haluaghat Upazila (BBS, 2006).

5.3.2 Settlement pattern

The proposed bridge construction site exists within the rural villages and flood land areas. A number of these areas are covered with cultivated land. There are some villages within the 1 km buffer zone such as Goatola, Bildora, Baola and Hagla. There will be an insignificant number of tress also affected by the new bridge construction. In general, most of the structures within the proposed bridge construction site are tin shed and semi-pacca houses. The rural people along the road alignment are involved in agriculture, day labor, fishing and transportation workers. The proposed bridge construction site is covered by private land and community lands. Basic amenities of life e.g., water supply, sanitation facility, natural gas and telephone, are lacking in the areas.

Generally, a strong social bondage exists in villages within the project site among the members of immediate kins living either in the same homestead or in close proximity, and families in the immediate neighborhood. Several clusters of homesteads, based mostly on kinship, comprise a village. Cultural aspects comprising social and economic interactions within the villages is generally based on the concept of kinship and neighborhood practices. Villages are socially stratified based on land ownership, financial status and lineage position.

5.3.3 Land use and water use patterns

The proposed bridge construction site comprises of agricultural land, homestead land, homestead vegetation and water bodies. Agriculture is major land use on both sides of the Gudaria River due to the presence of alluvial fertile lands.

Agricultural crops dominate within the proposed bridge construction site and there are another river Kangsha within the cluster. The main crops are rice, wheat, potatoes, garlic, chili, onion and other vegetables. There are many seasonal fruits e.g., Jackfruit, mango, etc. Some lands are used for seasonal cultivations.

Groundwater plays a vital role in the socio-economic activities of rural people as the source of agricultural and potable water supplies. The depth to the aquifer differs from place to place depending on soil texture, local elevation, relief, hydro-geological conditions, local hydrology, etc., of a particular place. The local people along the project use their ponds and lakes for aquaculture. The local communities are allowed to generate income from capture fisheries and fish culture in the open water bodies.

5.3.4 Water supply and sanitation

Majority of the households at the proposed bridge construction site own hand tube wells. Those who do not own tubewells use the tubewell of their neighbors for collecting drinking water. Many of the rural households use surface water, or sometimes water from small ponds, for washing clothes and for

bathing. Villagers unless possess their own tubewells suffer due to no or insufficient availability of quality water for household use purposes. Presence of iron in tubewells is a major problem in many villages within the proposed project location.

Use of sanitary latrine if treated as the index of sanitation it can be said that the rural sanitation in Bangladesh and at the subproject site has improved recently. This was possible due to the active interceptions of MLGDR&C, DPHE, and concerted activities of several NGOs.

5.3.5 Occupational pattern

Many people in the survey area are either underemployed or unemployed, though most people disguise their unemployment by minor involvement in economic activities (underemployment). On a holistic scale, of the 25 people surveyed, 22 of them are engaged in some kind of value adding productive work including about 4 women. This also includes a share of more than 90% female who are engaged in household activities. Connected to this, while the level of occupation for male in Goatola area is clearly dominating with a share of more than 75%, being the area as classified as commercial and business services remain the biggest employment source of the community with nearly 33% of the people engaged in it. More importantly, this is the only occupation, which has both male and female share in it. It is also to be noted that a good number of students, both male and female has been identified in Goatola village area.

5.3.6 Sociocultural, religious and archeological sites

There are some educational institutions, hospitals or health centers, religious structures, burial grounds, cremation yards, and cemeteries, few of which might be affected directly and indirectly through implementation of the subproject (Figure 15). Such sites could be termed as environmental hotspots in relation to subproject activities and, hence, need to be dealt carefully during the construction phase.

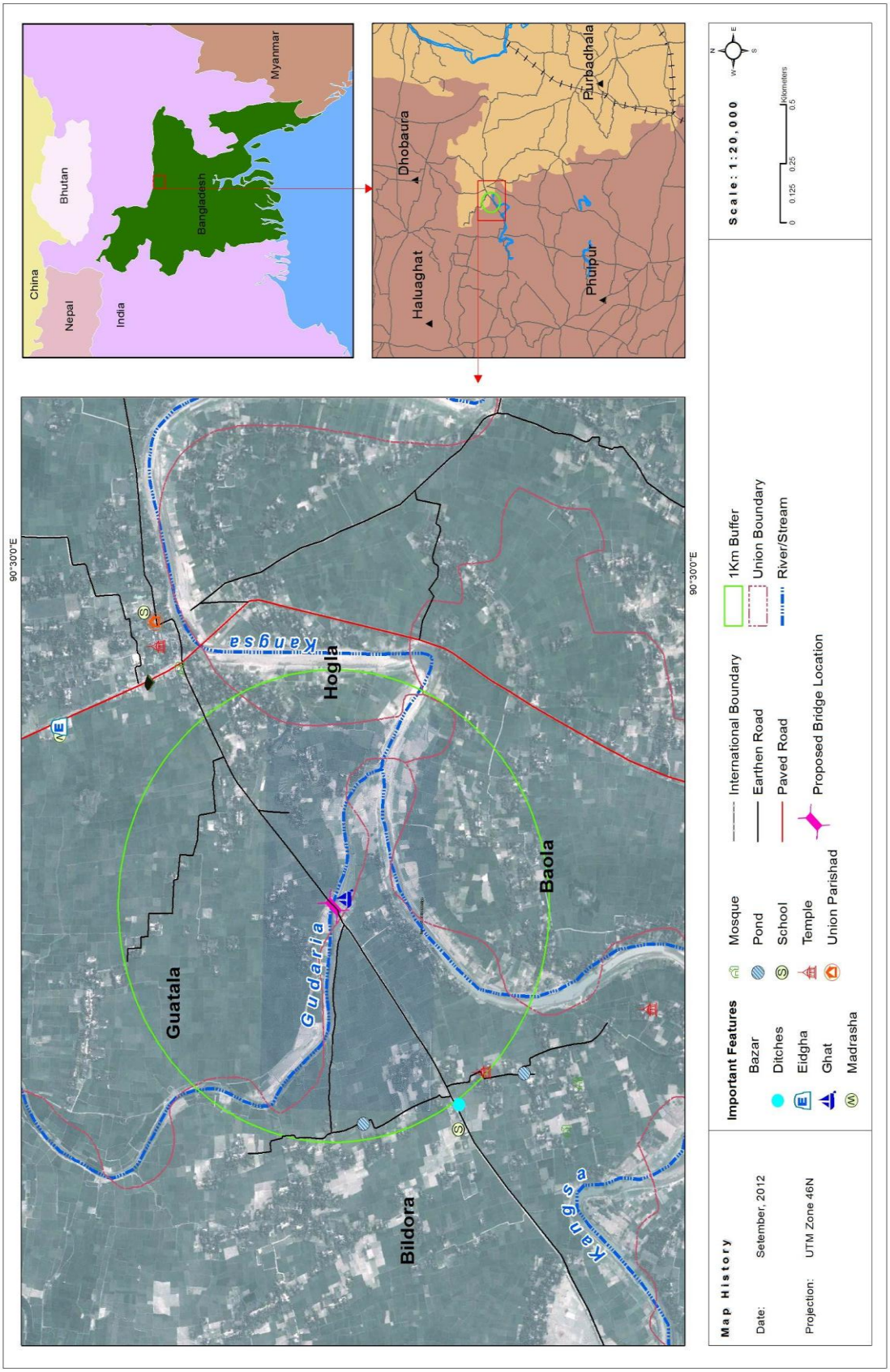


Figure 15 Environmental hotspot within the 1 km buffer zone

Sources: Field Survey, 2012

6. Potential impacts and mitigation measures

6.1 Screening of potential impacts

Table 19 shows the results of environmental and social screening based on the IEE study. The important environmental components (IECs) were first identified, and the potential impacts of each IEC were confirmed during the IEE study.

Table 19 Screening matrix regarding IEE for the proposed bridge construction

Environmental Components/ Parameters		Magnitude of Impacts			
		None	Insignificant	Medium	Significant
Pre-construction phase					
Ecological components	Tree felling and wildlife	√			
	Wildlife	√			
Social environment	Land acquisition		−		
	Agricultural loss		−		
	Involuntary resettlement	√			
Construction phase					
Pollution	Air quality		−		
	Water quality			−	
	Ground/ drinking water pollution		−		
	Soil contamination			−	
	Noise and vibration			−	
	Waste			−	
Ecological components	Tree felling		−		
	Wildlife			−	
	Endangered species	√			
	Fisheries			−	
Physical components	Hydrology/ flooding			−	
	Drainage congestion		−		
	Erosion and siltation		−		
Social environment	Land acquisition/ involuntary resettlement		−		
	Income and employment		−		+
	Cultural heritage	√			
	Ethnic minorities/ indigenous people	√			
	Women empowerment				+
	Road transport and accident			−	
	Health & safety/ accidents			−	
Post-construction phase					
Pollution	Air quality		−		
	Water quality		−		
	Noise and vibration		−		
	Bottom sediment		−		
	Waste		−		
Ecological components	Tree planting and re-vegetation			+	
	Wildlife			+	
	Fisheries			+	
Physical components	Drainage congestion		−		
	Landscape		−		
Social environment	Income and employment			+	
	Health & safety/ accidents			−	

Legend: (−) Negative Impact, (+) Positive Impact

Environmental impact analysis during the screening process consists of comparing the expected

changes in the biophysical and socioeconomic environment with and without the subproject. For each type of potential impact or environmental concern, the IEE predicts the characteristics and significance of the expected impacts, or explain why no significant impact is anticipated. The PIA for the proposed bridge construction has been confined within a radius of 1 km, since most of the potential impacts are likely to occur within this area, taking into considerations the characteristics of the subproject. In predicting the potential impacts, residual impacts are also considered, which are defined as those remaining after the implementation of mitigation measures.

As shown in Table 19, the potential impacts of the bridge construction will include those related to air and water quality, soil contamination, noise, tree felling and wildlife, regional hydrology, drainage, land acquisition, loss of agricultural production, and income loss. Details of the screening results of each IEC are presented in the following sections. Mitigation measures against the potential impacts are also discussed by respective phases.

6.2 Pre-construction stage

6.1.1 Social environment

a) Land acquisition and impacts on agriculture

Impact
The proposed bridge construction will require some portion of agricultural land mainly for the construction of the approach roads. If required, limited hectares of agriculture land will be required during the construction stage for implementation of the project and would go beyond agricultural uses temporarily.

The proposed bridge construction will impact upon the agricultural activities and outputs along the command areas resulting in significant dimensions of crop loss. The subproject, due to loss of minor agricultural land, has initial negative impacts on agriculture.

Movement of survey teams and the related activities might have cause minor damages of field crops and would cause economic loss at individual levels.

Mitigation
Mitigation should be the following two stages: 1) design considerations to avoid and/or minimize land acquisition; and 2) proper compensation should be determined after the detailed design. The compensation should be completed before the commencement of the civil works.

Avoid the peak season for conducting the survey activities. The loss may be mitigated through payment of adequate cash compensation to incumbents.

Moreover, consultants responsible for resettlement and land acquisition will calculate the compensation amount for the loss of land and other assets, income loss, and other losses. However, acquisition of land should be minimal as possible to prevent loss of productive crop land.

Residual impact
Persistent, and cumulative impacts on food production.

b) Psychological impacts

Impact
Movement of the surveyors and other related specialists' team at the proposed bridge construction site may disturb people psychologically because of the apprehensions of losing the crop lands.

Mitigation
The related workers should try to defuse tension of the local people stating the real situation only, and try to avoid peak season for conducting survey activities. Conduct public consultation on the subproject activities before starting field work.

Residual impact
Minor, but emotional aspects of such issue might persist.

6.2 Construction stage

6.2.1 Environmental pollution

a) Air quality

Impact
The impact on air quality during construction will be limited to the immediate vicinity of the work area which could be expected to extend 500 m on either side of the construction site. Increased dust and particulate matter is expected during dry seasons and windy days. Dust from construction activities, and pollutants from vehicles and heavy machineries, and bituminous plants are anticipated. The anticipated air quality problem will be short lived, localized and minor lasting during the construction stage.

Mitigation
Soil surfaces on the worked sites during construction shall be regularly watered, and trucks should be covered by sheet during transporting construction materials to minimize dust. All machines and plants used for construction purposes of the bridge must follow manufacturers' specifications to prevent or minimize gaseous emission.

Residual impact
Minimal and temporary.

b) Surface water

Impact
Surface water quality at the subproject site might degrade due to the disposal of construction wastes, sewage effluents, and dredged materials into the Gudaria River and nearby canal, ponds, and due to spillage of petroleum products and noxious chemicals into these bodies. The surface water at three locations in the proposed bridge construction site has been sampled and tested. The test results show that almost all the parameters of surface water satisfy the fishing and irrigation inland surface water quality standards of the ECR, 1997.

Mitigation
Surface water pollution due to disposal of waste and effluents, spillage of petroleum products and other contaminants should be reduced and mitigated by planned disposal, storage, handling and transportation of these materials during the construction stage. Surface water quality will require to be monitored periodically during construction stage.

Residual impact
Medium and temporary.

b) Ground water quality

Impact
There will have no major impacts on ground water quality. Local information indicated that the groundwater at the subproject site is free of faecal coliform (DPHE Upazila office). However, there is a minor risk of ground water pollution due to the spillage of chemicals, petroleum products, and bituminous materials, or other construction materials and wastes.

Mitigation
The ground water in the site has been used for different purposes like drinking and irrigation, hence proper mitigation measures must be ensured at construction sites to avoid any spillage and leakage of oil and other construction materials and wastes. All the staffs at construction areas must be refrained of discharge any liquid wastes on the ground.

Residual impact
Low and temporary.

c) Soil contamination

Impact
There is a minor risk of soil contamination due to the accidental spillage of chemicals, petroleum products, and bituminous materials, and unplanned disposal of solid wastes and effluents at camp and work sites.

Mitigation
Handling, operation and storage of noxious chemicals, petroleum products, bituminous materials, and other construction materials should be done cautiously. Accidental spillage needs to be carefully avoided. Waste and effluents from camp and construction sites should be disposed of cautiously in pits dug for the purpose at service areas or elsewhere properly.

Residual impact
Persistent but localized.

d) Noise and vibration

Impact
Construction works will cause noise nuisance which will be generated from the movement of construction vehicles, running of generators, operation of ballasting and concrete mixing plants, piling operations, movement of plants and earthmoving equipment, and others. Vibrations caused by movements of heavy construction equipment, pile driving operations, operation of crushing, ballasting and aggregating plants, and power generation plants will disturb the local residents unless proper measures, such as the fixing of operation times, are taken.

Mitigation
Construction activities have to be confined to daylight hours in the vicinity of the construction site, e.g., where houses are located within 200 m of a construction site. Heavy noise generating machines and equipment should be avoided for the construction work to the extent possible. To reduce night time disturbance from construction noise, work will be restricted to between 6:00 am to 21:00 pm. In addition, a limit of 50 dB(A) will be applied to the subproject site according to the ECR.1997 as the site is mostly residential areas. The standards should be strictly followed at the site boundary. Construction machinery and vehicles should be serviced at regular intervals, in order to keep their operational noise to a minimum.

Residual impact
Medium but temporary.

f) Wastes

Impact
Solid wastes such as concrete, brick chips, and broken metal from the construction works will cause environmental degradation if not properly managed. Wastewater from labor camp will pollute the nearby water bodies if discharged without proper treatment.

Mitigation
Solid waste (refuse, garbage, etc.) should be collected regularly and stored in covered containers. Final disposal should be done by sanitary landfill sites. Waste water generated at labor camp needs to be treated prior to disposal to open water bodies using a septic system or a secondary wastewater treatment facility. The contractors will also require providing adequate drainage at camp and working sites to eliminate any possible public health hazards.

Residual impact
Temporary and localized.

6.2.2 Ecological environment

a) Tree felling

Impact
The proposed project implementation activities will involve tree felling, removal of bushes and other vegetations, but a few of trees may be felled for the construction of the proposed bridge.

Mitigation
To compensate the loss of trees from the subproject activities, trees should be planted nearby places by the rate of two seedlings per each tree fell after the project construction activities are completed. Trees will be planted at the lower slopes and berm areas of the newly built bridge embankment.

The suitable species for flooded lower slopes and berm areas are jarul, pitali, barun, mander, simul, karz, hijal, palash, and others. Tree species suitable for planting on non-flooded embankment sides are eucalypts, sil koroi, ipil-ipil, shisoo, khejur, shegun, neem, goraneem, and several other timber species.

Residual impact
Temporary and would cast positive impact on ecology and economy after establishment of the planted trees.

b) Wildlife

Impact
The proposed area is not significant habitat for wildlife and bird species. Wildlife species present in the project location are common to other floodplain areas, and are likely to be disturbed to some extent. Habitat loss caused due to the felling of trees may shrink the living environment, but the noise and vibration from movement of heavy vehicles, construction machineries, crushing plants, increased human movements might also disturb and dislocate the terrestrial wildlife species temporarily. Dredging and pile driving operations during construction stage will disturb fisheries and aquatic animal species at bridge sites.

Mitigation
Although no biodiversity enriched areas are identified in the vicinity of the proposed construction site, it is necessary to pay due attention to the habitat loss of wildlife and bird species. Staffs and workers of the project should be sensitized to refrain of catching any wildlife. No tree or vegetation shall be cut unless absolutely necessary. The trees may be planted in the lower slopes and berm areas of the newly built bridge embankment to compensate the habitat loss. The wildlife species would gradually return to the old habitats once it is restored due to planting of trees at subproject site.

Residual impact
Minimal and temporary.

c) Endangered species

Impact
No impact is anticipated as no habitat of endangered species exists at the proposed bridge construction site.

Mitigation
No mitigation measures are required.

d) Fisheries

Impact
Bridge construction activities, particularly during pile driving operations, would impact movement of fishes locally and temporarily.

Mitigation
Special consideration requires during building the bridge as though existing fish habitats get less disturbance. The spill from pier sites, solid wastes, construction junks, and effluents from construction sites must not be disposed in water bodies.

Residual impact
Minimal and localized.

6.2.3 Physical environment

a) Hydrology and flooding

Impact
The earthwork for embankment construction along the bridge construction might affect crop production, hinder drainage, nd modify local hydrology within the command area and in the vicinity. Direct impacts of embankment construction are erosion on embankment slopes, deposition of silt on crop fields, dust blowing, noise and vibration to disturb the local people. The project related structures, e.g., long embankment, bridges, approach roads, and underpasses, might affect the regional hydrology creating drainage impedance locally.

Mitigation
Sufficient numbers of cross drain structures need to be constructed along the bridge embankment to offset drainage congestion and impedance. Most of the embankment fill material will be obtained from river dredging minimizing the local borrow area. Cutting and filling of land for the development of the proposed bridge construction site will be done in such a way that the slope of the area is not disrupted and there will be no water logging or drainage problems.

Residual impact
Medium but localized.

b) Drainage congestion

Impact
Earthwork activities during construction phase may induce water logging locally creating drainage congestion at the channel mouths at various locations. Stockpiling of fill materials dredged from the riverbeds for construction of the embankment may result in erosion and subsequent deposition in the adjacent crop fields.

Mitigation
Project area, with the provision of additional cross-drainage capacity there will be sufficient numbers of cross-drains and openings for flood water movement, and the rehabilitation and proper maintenance of these structures will bring moderate positive impacts on the regional drainage conditions. Drainage works can also be designed with the provision of lower volume of water to drain in other low-lying areas, but the regulators are to be provided in such cases to permit controlled drainage rates and the consequent water levels. Embankments will be provided with chutes and drains to minimize river bank erosion, and vegetation on the slope of the embankment will prevent erosion and sedimentation to the surface water body.

Residual impact
Minimal or nil.

c) Erosion and siltation

Impact
The project site, located at the sedimentation zone of the River Gudaria, has the least risk of bank erosion that may be induced due to the construction activities. Erosion on embankment slope and consequent siltation in nearby agriculture lands may happen in the rainy season causing damage to the field crops temporarily.

Mitigation
The adverse impacts should be avoided by planning earthwork activities of the project at construction stage during the dry season. Cross drainage should be developed wherever the construction engineers deem necessary. The road embankment slopes should be protected from gully erosion by grass carpeting as per the provision of design.

Residual impact
Minimal and temporary.

6.2.4 Social environment

a) Land acquisition and involuntary resettlement

Impact
Limited scale of lands may be acquired as described in the section of “pre-construction stage”. All acquisition process shall be completed before the construction, and thus no additional impacts are anticipated.

Mitigation
Same as described in the section of “pre-construction stage”.

Residual impact
Persistent, and cumulative impacts on food production.

b) Income and employment

Impact
Normal living of the local people will be affected for a certain period. Income loss in a limited scale could occur due to the loss of agricultural lands. The existing crop cultivation pattern adjacent to the bridge site may be changed. On the other hand, the project activities will generate employment opportunity for the non-skilled or semi-skilled labors. Workers for the ferry service will lose their job after the completion of the bridge.

Mitigation
Loss of income caused due to agriculture land will require to be compensated duly. The contractor must be careful for doing construction works so that the adjacent agricultural practices do not hamper to the extent possible.

In order to minimize the income loss, contractors as far as practicable will recruit construction workers from amongst the locals where possible, and shall maintain gender equity while employing the locals. Priority shall always be given to people from amongst the PAPs and from those unemployed and belong to the lower income group.

The plan for the construction of the bridge should be fully explained to workers for the ferry service well in advance of the commencement of the construction work so that they could have sufficient time to look for alternative livelihood means.

Residual impact
Temporary and positive.

c) Cultural heritage

Impact
No cultural sites will be affected due to the construction of the proposed bridge project. There is no direct impact on cultural, religious and archeological sites.

Mitigation
No mitigation measures are required.

d) Ethnic minorities and indigenous peoples

Impact
No groups of ethnic minorities and indigenous peoples have been found in the vicinity of the proposed bridge site during the field survey.

Mitigation
No mitigation measures are required.

Residual impact
Temporary and positive.

e) Women empowerment

Impact
The project will create direct opportunities for women empowerment because of increased opportunities for trade and access to health and education facilities. Local women may have employment opportunities in construction work.

Mitigation
No mitigation measures are required.

Residual impact
Temporary and positive.

f) Health and safety, and accident

Impact
Construction workers may face occupational health hazards such as minor or major injuries due to lack of general safety requirements and precautions applicable for such sites, malfunctioning equipment, careless use of equipment and vehicles, and so on.

Local people will also face the increased risk of road accidents because the traffic volume on the bridge and connecting roads is expected to increase.

Labor camp may be constructed for accommodation of workers in the vicinity of the proposed project site. There is a risk of transmission of communicable diseases including the venereal diseases like HIV amongst the labor camp dwellers that may in the long-run spread amongst the villagers.

Unless the drainage and sewerage systems are properly developed and safe water supply ensured, waterborne diseases may spread in the workers' camps and adjacent villages. Improper disposal of wastes, e.g., rubbish, garbage, and construction rubbles, may create disease risk and nuisance at the subproject site.

Waste water from washing, bathing, kitchen from the camp, unless treated separately and infiltration of excreta in the subsoil or if directly disposed into water bodies, would pollute the surface water.

Mitigation
The Contractor shall be responsible to provide the personal protection equipment for workers, e.g., boats, helmet, gloves, goggles, ear defender, and clothing, and arrange the first aid facility, ambulance, and other health services required at the working sites.

Road safety measures, such as the installment of traffic signs, speed breakers, marking, and other road safety facilities, should be undertaken to prevent road accidents. Road safety education to local people is also effective.

Toilets for workers must be fitted with water seals connected to the septic tanks so that effluents are treated through subsoil infiltration and absorption trenches or soak pits to prevent the groundwater contamination. The septic tanks are to be inspected regularly and de-slugged when necessary.

Workers should also be advised of their responsibility to adhere to correct procedures to minimize accidents from occurring. All workers must receive adequate and appropriate information, instruction, training and supervision in relation to safe working practices appropriate to the work performed.

Residual impact
Temporary and localized.

6.3 Post-construction stage

6.3.1 Environmental pollution

a) Air quality, and noise and vibration

Impact
Traffic volume of motor vehicles on the bridge and UZRs is expected to increase following the completion of the proposed bridge. This increase may cause the degradation of air quality, and increase the noise level at and the surrounding areas of the bridge.

Mitigation
Monitoring on air quality and noise level after the completion of the bridge will be required to confirm the air pollution impacts.

Residual impact
Persistent.

b) Water quality, and bottom sediment

Impact
Quality of surface water and bottom sediment may be deteriorated due to the accidental spillage of petro-chemicals during the periodic maintenance.

Mitigation
Monitoring on surface water and bottom sediment near the bridge after the completion of the bridge will be required to confirm the impacts of the bridge construction activities on these parameters.

Residual impact
Persistent, but minimal.

c) Waste

Impact
Waste may be generated during periodic maintenance work, and such waste may cause the degradation of the surrounding areas. The impacts are anticipated to be limited.

Mitigation
Waste to be generated during the maintenance phase should be properly handled and disposed of.

Residual impact
Persistent, but minimal.

6.3.2 Ecological environment

a) Tree planting

Impact
Removal of trees will make stress on the natural ecosystem functions. Wildlife may be dislocated due to construction activities. Planting trees on bridge sites and road embankment sides will alleviate the adverse effects caused due to tree felling during the construction stage and enhance the environmental condition greatly.

Mitigation
Tree planting program has to be undertaken in order to compensate for the loss of trees due to the proposed implementation of the bridge.

Residual impact
Persistent and positive.

b) Wildlife

Impact
The wildlife habitat at the bridge site after the bridge construction will improve due to the tree planting and vegetation cover activities at bridge and along the road.

The operation of the bridge at the Gudaria River may have the potential of ecological impacts associated with noise disturbance, atmospheric pollution, abstraction and discharge of effluents, disposal of solid wastes, and so on

Mitigation
Trees planted along the embankment of the bridge site should be monitored regularly to ensure proper habitat for the wildlife. At the same time, attention must be given as if no one can illegally catch or disturb the wildlife.

Residual impact
Positive and persistent.

6.3.3 Physical environment

a) Drainage congestion

Impact
Water levels in the local channels connected by the Gudaria River structures should be monitored periodically during and after the construction stage to confirm the changes in drainage conditions caused by the bridge construction.

Mitigation
Additional drainage openings may be arranged to mitigate the adverse impacts of changed drainage conditions caused by the bridge construction.

Residual impact
Persistent, but minimal.

b) Landscape

Impact
The subproject site after completion of construction will attract settlements and undesired structures including commercial facilities particularly near the bridge site. Growth of settlement on vacant RoW spaces by squatters is likely to damage landscape beauty and increase accident risk.

Mitigation
The road slopes and vacant places near the bridge should be protected from squatter settlements and commercial structures through monitoring by the LGED.

Residual impact
Persistent, but minimal.

6.3.4 Social environment

a) Income and employment

Impact
The bridge will improve the local transport communications, such as the improved access to nearby markets, schools, and others. The impacts on socioeconomic development are considered significantly positive.

ResidualiImpact
Persistent, and positive.

b) Health & safety/ accidents

Impact
Increased traffic volume after the bridge construction will increase the risk of traffic accidents near the bridge.

Mitigation
Appropriate road safety measures, such as the installment of traffic signs, speed breakers, marking, and others, should be conducted near the bridge site.

6.5 Considerations for climate change

Climate change considerations are important since in Bangladesh the climate change impacts, including increased intensity and frequency of flooding and storm, have recently become severer. For the proposed bridge, damages of such flooding and storm to the bridge should be properly taken into considerations. On the other hand, the emission of greenhouse gases (GHGs) from the construction work will be negligible. The main sources of the GHG emission regarding the bridge construction are construction vehicles and heavy machinery used for civil works, but the emission amount is too small compared with the country's total emission of 53 million tonnes of CO_2 equivalent[1].

The focus of the climate change study in this proposed bridge construction will be, therefore, on the adaptation against the increasing climate risks. The specific objectives are:

- help LGED to manage the potential risk posed by the impacts of the climate change;

[1] Emission amount in 2005, based on the Bangladesh Climate Change Strategy and Action Plan 2009

- help the decision-makers to address climate change implications in risk management context; and
- to provide assurance to the local people that appropriate safeguard against probable disasters due to climate changes have been provided.

The adaptation measures against climate change impacts will be incorporated into the EIA study.

7 Environmental management and monitoring plan

7.1 General consideration

An Environmental Management Plan (EMP) has been prepared for all the identified environmental impacts during pre-construction, construction and post-construction stages due to implementation of construction works for the proposed bridge. The methodology followed for preparing the EMP consists of the following steps:

- Identify environmental and social impacts of the anticipated construction works;
- Recommend mitigation, compensation and enhancement measures for each identified impacts and risks;
- Develop a mechanism for monitoring on the proposed mitigation measures;
- Estimate budget requirements for the implementation of mitigation measures and monitoring; and
- Identify responsibilities of relevant entities involved in the proposed bridge construction for the implementation of EMP.

The EMP prepared in the IEE study is given in Section 7.2.

7.2 Environmental Management Plan

The Environmental Management Plan (EMP) is shown in Table 20. The EMP will serve as a guideline for incorporating environmental measures to be carried out by the LGED, contractors, and other parties concerned for mitigating possible impacts associated with the project activities. The EMP needs to be updated based on the EIA study, detailed locations and frequency of monitoring can be defined in more practical ways. The EMP will also need to be updated when the final engineering design is determined.

The LGED is responsible for ensuring that 1) all required mitigation measures are passed on to the engineering consultant, 2) the bidding document for contractors contains all required mitigation measures to be implemented and obligations of contractor to implement EMP, 3) the no objection certificate (NOC) is obtained prior to granting any civil work contract, 4) monitoring of EMP implementation is undertaken on a regular basis as required, and the progress reports of EMP is well documented; 5) coordination with other parties and government agencies to effectively implement EMP at all project stages; 6) remedial actions are undertaken for unpredicted environmental impacts; and 7) additional environmental assessment is undertaken if any change in project location or project design is made.

To ensure that contractors will comply with the EMP, the following specifications should be incorporated in all construction bidding procedures: 1) a set of environmental prequalification conditions for potential bidders, 2) a list of environmental items budgeted by the bidders in their proposal, 3) environmental evaluation factors for bid reviewers, 4) environmental clauses for contract conditions and specifications, and 5) the full EIA report made available for potential bidders.

Table 20 EMP of the proposed bridge construction

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implemen-tation	Supervision/ Monitoring
Pre-construction phase					
Legal requirement	• Obtain all necessary clearances and approvals including Environment Clearance Certificate prior to the commencement of any construction works.	Dhaka	Before the commencement of construction	XEN, PMO, ES, RRS	PMO, ES, RRS
Land acquisition	• Complete all necessary land acquisition in accordance with the Resettlement Policy Framework prior to the commencement of any construction works. • Avoid or minimize the area of land to be acquired. • Provide compensation and other assistance to PAPs in accordance with the RPF.	Proposed bridge construction site	Before the commencement of construction	DC, XEN, UE, RRRE, INGO	PMO, RRS
Navigation	• Plan and design navigation clearance for boat pass under the bridge (approximately 3m above the highest flood level)	Proposed bridge construction site	Before the commencement of construction	XEN, PMO, ES	PMO, ES
Environmental clause in the contract	• Incorporate environmental clauses in bid and contract document	Dhaka	Before bidding or contract	XEN, ES	PMO, ES
Construction vehicles and machinery	• Trial run of contractor's vehicles and machinery to confirm that their conditions, and that pollutant emission and noise level will not cause serious damages to the surrounding environment.	Proposed bridge construction site, or vehicle depot	Before the commencement of construction	Contractor	PMO, ES, XEN
Construction phase					
Training for engineers and contractors	• Provide training on environmental and social considerations to concerned engineers and contractors.	LGED District office, LEGD Upazila office	Before the commencement of construction	XEN, REE, RRRE	PMO, ES, RRS

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implemen-tation	Supervision/ Monitoring
Air quality	• Ensure that construction vehicles and heavy machineries to be used for the bridge construction are maintained periodically, and their exhaust gases are within acceptable limit. • Water should be sprayed on the construction site, in particular excavation sites, brick crushing site, asphalt mixing sites, to minimize the effects of dust. • Asphalt mixing plans and concrete batching plants should be sufficiently sealed, and be equipped with dust removal device. • Vehicles carrying construction materials shall be covered to prevent the spill off. • Provide masks to construction workers if dust content is high. • Monitor the air quality around the construction site every six months during the construction period. If the quality exceeds the air quality standards or baseline air quality data, take further preventive measures.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Water quality	• Train construction workers on safe handling of petro-chemicals such as bituminous materials to prevent spillage or leakage to the Gudaria river or other water bodies. • Vehicle maintenance and refueling should be confined to the designated areas with sealing to prevent the spillage of lubricants and fuels. Waste petro-chemicals must be properly collected, stored and disposed of, according to GoB regulations. • Restrict disposal of any construction waste into the river or nearby water bodies. • Monitor the surface water quality every six months during the construction period. If the quality exceeds the water quality standards or baseline water quality data, take further preventive measures. • Prevent soil erosion, which may result in water quality degradation, by implementing the measures described in the “soil erosion” section below.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Soil erosion	• Earthworks should be restricted to the dry season. • Minimize vegetation clearance at the construction site. • Test the embankment soil properly, and compact it to ensure stability. Grass turfing and tree-planting on batter slopes should be undertaken to prevent soil erosion. In particular, approach road embankments need to be properly compacted and covered by grass or trees. • Undertake measures against temporary or permanent erosion and sediment control measures, such as the installation of palasiding and placement of sand-filled bags, if any sites are identified vulnerable to erosion.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Noise and vibration	• Ensure that construction vehicles and heavy machineries to be used for the bridge construction are maintained periodically and their exhaust gases are within acceptable limit. • Carry out construction works during daytime hours. • Inform nearby residents in advance of the schedule of construction works. • Arrange ear plugging or ear muff if noise level at the construction site is severe. • Monitor the noise level every six months during the construction period. If the level exceeds the permissible levels or baseline noise level data, take further preventive measures.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Bottom sediments	• Undertake measures described in the “water quality” section to prevent spillage or leakage of petro-chemical materials to the Gudaria river. • Monitor the bottom sediment quality every six months during the construction period. If the level exceeds the permissible levels or baseline bottom sediment level data, take further preventive measures.	Proposed bridge construction site, in particular, the river bed of the Gudaria river	During construction period	Contractor, XEN, REE	PMO, ES, REE
Waste	• Clean up the construction waste and unused materials regularly during the construction works. All such wastes shall be cleared and removed after the completion of construction works. It is necessary to incorporate an article regarding the appropriate disposal of wastes into the contract with contractors. • Prepare composting facilities of all green or biodegradable wastes where appropriate.	Proposed bridge construction site, and work camp	During construction period	Contractor, XEN, REE	PMO, ES, REE

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Ecosystem and wetlands	• Clearly mark the areas to be cleared before the clearing work commences. Clearing of vegetation shall not occur outside of the designated areas. • Minimize vegetation and tree clearance, and re-vegetate and re-plant trees over the cleared land. • Avoid disposal of any construction material including soils into nearby water bodies.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Wildlife	• Minimize vegetation and tree clearance to conserve habitats of wildlife, and re-vegetate and re-plant trees over the cleared land. • Create awareness on wildlife conservation among construction workers and local people.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Fish and aquatic life	• Avoid or minimize the construction activities, especially pile driving and dredging, during the peak fish migration and spawning period. i.e., April and May, and return period, i.e., September and October. • Earthworks should be restricted to the dry season. • Avoid complete closing of the river channel that affects migration and production of fish and aquatic life. Alternative drainage should be ensured. • Avoid or minimize the filling of low floodplain areas around the bridge site. • Prevent noise and disturbances by construction works to conserve the habitats of fish and other aquatic flora and fauna.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Regional hydrology and drainage	• Avoid complete closing of the river channel by providing alternative drainage, if dredging is necessary for river training. • Install a sufficient number and capacity of functional culverts and other drainage facilities. • Select the appropriate place for the storage of soils and other construction materials to avoid disturbance of natural drainage. • Dispose of construction materials and equipment appropriately so that they do not impede the local drainage.	Proposed bridge construction site	During construction period	Contractor, XEN, REE	PMO, ES, REE
Land acquisition	• Minimize temporal occupation of agricultural lands or other lands. • Provide compensation and other assistance to PAPs in accordance with the RPF.	Proposed bridge construction site	During construction period	Contractor, DC, XEN, UE, RRRE, INGO	PMO, RRS

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Employment and poverty reduction	• Plan of bridge construction should be explained well in advance to ferry-related workers so that they have sufficient time to find new income generating means. • Provide employment opportunities, mainly for semi-skilled or unskilled labor, to local people under the LCS scheme. Priority will be given to PAPs and vulnerable groups. • Consult with local people on the mitigation measures against possible disturbance of local livelihoods, such as the restriction of work hours of construction activities. • Inform local people of the schedule of construction works.	Proposed bridge construction site	During construction period. Explanation to ferry-related workers should be done during detailed design phase.	Contractor, DC, XEN, UE, RRRE	PMO, ES, REE
Agriculture	• Same as the "land acquisition" section.	Same as the left	Same as the left	Same as the left	Same as the left
Gender equity	• Employ poor women, preferably in earthwork through the LCS scheme, which will contribute to women empowerment.	Proposed bridge construction site	During construction period	Contractor, XEN	PMO, ES
Transport safety and road accidents	• Provide construction workers with safety equipment such as gloves and protective gears. • Install warning signs, guards, speed breakers and other preventive facilities at the construction site. • Undertake road safety measures, including safety education to construction workers, to minimize road accident risks.	Proposed bridge construction site	During construction period	Contractor, XEN	PMO, ES, REE
Health, safety and hygiene	• Provision of first aid box, safe drinking water and sanitary latrine for the construction workers. • Provide construction workers and local people with basic information on infectious diseases including HIV/AIDS.	Proposed bridge construction site	During construction period	Contractor, XEN	PMO, ES, REE
Post-construction phase					
Air quality	• Monitor air quality around the bridge and along the improved UZRs. The first monitoring should be done six months after the completion of the bridge. • If the monitoring result exceeds the air quality standards or baseline air quality data, periodical monitoring should be continued every year.	Near the bridge on the both banks	During O&M period	XEN, REE	PMO, ES

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Water quality	• Monitor the water quality of the Gudaria river and other nearby water body. The first monitoring should be done six months after the completion of the bridge. • If the monitoring result exceeds the water quality standards or baseline water quality data, periodical monitoring should be continued every six months.	Near the bridge on the both banks	During O&M period	XEN, REE	PMO, ES
Noise and vibration	• Monitor the noise and vibration level around the bridge and along the improved UZRs. The first monitoring should be done six months after the completion of the bridge. • If the monitoring result exceeds the noise quality standards or baseline noise level data, periodical monitoring should be continued every year.				
Soil erosion	• Undertake proper maintenance work on the embankment of the approach roads and improved UZRs.	Road embankment	During O&M period	Contractor, XEN, REE	PMO, ES
Bottom sediment	• Monitor the bottom sediment quality of the river bed of the Gudaria River. The first monitoring should be done one year after the completion of the bridge. • If the monitoring result exceeds the bottom sediment quality standards of USEPA or baseline sediment quality data, periodical monitoring should be continued every year.	Road embankment	During O&M period	XEN, REE	PMO, ES
Waste	• Dispose of the wastes generated under the maintenance work.	Bridge	During O&M period	Contractor, XEN, REE	PMO, ES
Tree-planting and re-vegetation	• Conduct tree-planting and turfing of all appropriate sites with trees and grasses in order to compensate the loss of biodiversity in course of construction activities. Selection of indigenous species is preferred. • Undertake proper measures for watering, fertilizing and nursing of trees/ plants/ grasses to till growing up sufficiently.	Near bridge and approach road	Immediately after the completion of construction work	Contractor, XEN, REE	PMO, ES
Wildlife	• Create awareness on wildlife conservation among local people. • Check the conditions of vegetation in the areas where re-vegetation and replanting of trees were conducted, and if planted trees and vegetation are found decaying or in bad conditions, re-vegetation and replanting of trees should be done again.	Bridge	During O&M period	XEN, REE	PMO, ES
Fish and aquatic life	• Same as the “wildlife” section.	Bridge	During O&M period	XEN, REE	PMO, ES

Issues/ Environmental impact	Mitigation measure/ action	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Regional hydrology and drainage	• Conduct proper maintenance of the approach road and other structures on a regular basis to prevent the drainage congestion.	Approach road and bridge	During O&M period	XEN, REE	PMO, ES
Landscape	• Prevent road embankment and nearby vacant places from squatting or construction of commercial structure.	Bridge and approach road	During O&M period	XEN, REE	PMO, ES
Road transport and accident	• Provide traffic signs, speed breakers, marking, and other road safety facilities to prevent road accident. • Provide education and publicity of road safety to local people (as part of road safety activity under the NRRDLGIP).	Approach road and bridge	During O&M period	XEN, UE	PMO, ES
Cleaning and rehabilitation of work site	• Remove all construction materials from the construction site. Materials, including but not limited to unused construction materials, petro-chemicals, oil and lubricant, cement, and brick, and residues and packages of these materials. They should be carefully treated and removed from the site after the completion of the bridge construction. • Dispose of all wastes properly, including those from construction works and from the labor camp. Dumping into the nearby water bodies should be strictly prohibited. • Rehabilitate the labor camp site so that the area will not pose unhygienic risks for local residents. • All borrow pits should be rehabilitated by filling soils or other measures.	Bridge, approach road, and labor camp	Within 1 month of the completion of construction works	Contractor, XEN	PMO, ES

Note 1: DC: Deputy Commissioner; ES: Environmental Specialist; DOE: Department of Environment; INGO: Implementing NGO; LCS: Labor Contracting Society; PAP: Project affected persons; PMO: Project Management Office; REE: Regional Environmental Expert; RPF: Resettlement Policy Framework; RRRE: Regional Rehabilitation and Resettlement Expert; RSS: Rehabilitation and Resettlement Specialist; UE: Upazila Engineer; XEN: Executive Engineer

Note 2: The contractor of the construction work will take necessary actions with guidance and assistance of the LGED XEN, PMO, and ES and RRS.

7.3 Environmental monitoring plan

Environmental monitoring is an essential tool for the environmental management. To ensure the effective implementation of mitigation measures, an effective monitoring program needs to be designed and carried out. Compliance monitoring is also critical part of the monitoring program. Aspects to be monitored are as follows:

- Pre-project implementation: inclusion of environmental clauses in bid and contract documents.
- During Construction: environmental performance of contractors with regard to control measures pertaining to material handling and storage, location of work camp, noise control, waste disposal, worker's safety, and others.
- Post-construction: operation and maintenance practices and environmental effects including, environmental parameters, soil erosion, regional hydrology, and others.

The Design, Supervision and Management (DSM) consultants in cooperation with the Project Management Office (PMO) will be responsible for the environmental and social monitoring. The DSM consultants, especially the Environmental Specialist, will develop an environmental auditing protocol for the during work period, formulate a detailed monitoring and management plan, supervise the environmental monitoring regularly, and submit quarterly reports based on the monitoring data. The environmental monitoring reports will include mitigation measures undertaken, environmental monitoring activities undertaken, details of monitoring data collected, analysis of monitoring results, recommended actions to be undertaken. The environmental monitoring reports will be submitted to the PMO.

Pre-construction phase
Compliance monitoring during the pre-construction comprises:

- Checking that the project's design incorporates appropriate measures to avoid or minimize negative impacts.
- Incorporation of appropriate protective clauses in the contract documents that will be obliged by contractors.

Construction phase
To ensure environmental safety, the following parameters should be observed to ensure the effectiveness of mitigation measures:

- Contractor's compliance to the environmental issues in their day-to-day activities.
- Air quality will be monitored regularly by direct measurement of sensitive air pollution parameters like dust pollution, particulate matters, NOx and SOx.
- Noise will be monitored regularly in the vicinity of the construction site.
- Water quality test will be carried out at the sample points to determine the requirement and extent of treatment.
- Collection, transportation and disposal of solid waste of work site and camp will be monitored.
- The Environmental Specialist and the Regional Environmental Experts will monitor whether construction activities disturb the flora and fauna.
- Health and safety training program will be developed for the awareness of workers to prevent any environmental hazards and accidents.
- Provision of first aid facilities and use of personal protection devices like helmets, ear plugs and safety boots will be monitored.
- The contractor should ensure the health and safety of the construction workers.

Post-construction phase

The Environmental Specialist will compile and maintain the environmental data and records gathered during the operation phase. The Specialist will coordinate with relevant government departments and agencies, LGED in particular, for monitoring on various environmental parameters.

- The Regional Environmental Expert in collaboration with the Mymensingh District XEN will conduct monitoring on air quality. Parameters to be monitored include NO_2, SO_2, and particulate matters. Necessary measures will be undertaken to keep them within the limits set by the government.
- The noise levels will be monitored to see whether they are within the limits. When they are found to exceed these limits and disturb the nearby settlements, noise abatement measures, like plantation of trees and construction of sound barriers, will be implemented.
- The Regional Environmental Expert will monitor whether flora and fauna are disturbed by the increase in population and other activities. Tree-planting activities will be carried out.

As there will be limited emission and discharges of harmful pollutants, the monitoring is needed for the bridge project during pre-construction, construction and operation stages. Possible parameters are given in Table 21.

Table 21 Parameter to be monitored

Components	Parameters	Location	Sampling number/ year
Air quality	SPM, Particulate Matter, Pb, NOx, SOx, and Cd	At the junction points of entry of the bridge	to be determined as per the site conditions
Noise quality	Noise level	At the junction points of entry of the bridge	to be determined as per the site conditions
Surface water	pH, SPM, TDS, DO, BOD, COD	Close to bridge site	to be determined as per the site conditions

7.4 Environmental budget for implementation of EMP

The contractor will be responsible for playing active role for the implementation of the EMP. The Mymensingh District XEN and Regional Environmental Expert will also be responsible for the implementation of the EMP, such as mitigation measures, monitoring, and reporting.

The costs to comply with the EMP are presented in Table 22. Detailed items will be prepared during EIA preparation and it will be included in the Bill of Quantities (BOQ) for the civil works and the contractor will quote rate for these items.

Table 22 Cost for implementation of EMP

No	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total (BDT)
1.	Training for construction workers	Lump sum	-	-	50,000
2.	Dust management by water sprayer	Lump sum	-	-	80,000
3.	Water supplying HTW	Number	2	15,000	30,000
4.	Sanitary latrines for construction workers	Number	2	10,000	20,000
5.	Proper disposal of camp site wastes	Lump sum	-	-	20,000
6.	First aid box at camp site	Number	1	5,000	5,000
7.	Tree planting and re-vegetation	Lump sum	3,000	50	150,000
8.	Rehabilitation of ancillary sites including stock pile sites, borrow pits, labor camp, and others	m^2	800	25	20,000
9.	Monitoring on air quality	Lump sum	-	-	300,000

No	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total (BDT)
10.	Monitoring on noise level	Lump sum	-	-	300,000
11.	Monitoring on water quality	Lump sum	-	-	300,000
12.	Monitoring on sediment	Lump sum	-	-	300,000
Total cost for EMP					1,575,000

Source: Data collected from field survey
Note: Cost may vary depending on changes of the current situations around the proposed bridge construction site

8 Institutional arrangements

The EMP implementation requires an organization support structure in the form of organizational requirements, training needs and plan, and information management system. The following section captures these institutional arrangements for EMP implementation by concerned officials of LGED, their consultant and working contractors. An organizational structure shall be developed at the corporate, regional and site level to aid effective implementation of the EMP document.

The LGED, as the executing agency, is responsible for the environmental and social considerations. However, few members within the LGED have sufficient capacity to handle environmental and social considerations. Therefore, the PMO shall establish an internal section for environmental and social considerations to ensure that proper environmental and social measures are undertaken. Consultants with expertise in environment and social considerations will be assigned to the internal section.

Table 23 presents the responsibilities of relevant entities at respective phases of the subproject in which the proposed bridge is constructed. The District Executive Engineer (XEN) of the LGED Mymensingh District Office bears the responsibility for environmental and social issues. The DSM consultant team, especially, the Environmental Specialist (ES) and Rehabilitation and Resettlement Specialist (RRS) to be assigned in the PMO, and the Regional Environmental Expert and Regional Rehabilitation and Resettlement Expert in Mymensingh region will assist the District XEN.

The Regional Deputy Project Director (RDPD) of Mymensingh area or XEN at the LGED Mymensingh Regional Office will supervise the activities of the Mymensingh District XEN, in terms of the identification of potential impacts, elaboration of mitigation measures, and monitoring. The Mymensingh District XEN and Haluaghat and Dobaura Upazila Engineers will need to assist the consultants in conducting the field surveys. These Upazila Engineers, the Haluaghat Upazila Engineer in particular, shall also be responsible for the supervision of contractors to ensure compliance with the Environmental Framework, RPF, IEE and/or EIA, and ARAP. Complaints from local residents should also be received by these Upazila Engineers and transferred to the PMO via the Mymensingh District XEN. The PMO, under the assistance of the ES and RRS shall be responsible for supervising overall activities related to environmental and social issues.

In each quarter, the Mymensingh District XEN shall conduct monitoring and fill in the prescribed monitoring form. The District XEN will submit it to the Regional Deputy Project Director of Mymensingh Region, who will subsequently submit it to the PMO.

Table 23 Responsibilities of relevant entities for the subproject

Responsibility	Pre Construc-tion	Construc-tion	Operation
LGED District Office in Mymensingh			
District Executive Engineer in Mymensingh			
• Responsible for identification of potential impacts and elaboration of mitigation measures	X		
• Responsible for conducting environmental and social monitoring activities	X	X	X
• Supervise and assist UEs in supervising contractors		X	X
• Receive complaints transferred from UEs and send it to PMO		X	X
Project Management Office (PMO)			
Assistant engineer in charge of environmental and social monitoring			
• Supervise overall activities for identification of potential impacts and elaboration of mitigation measures	X		
• Supervise overall activities for environmental and social monitoring	X	X	X
• Supervise DSM consultants in elaborating an environmental and social monitoring plan	X		
• Supervise and assist DSM consultants in conducting activities for identification of impacts, elaboration of mitigation measures, and environmental and social monitoring	X	X	X
DSM consultants (Environmental Specialist and Resettlement & Rehabilitation Specialist)			
• Assist the PMO in supervising overall activities for identification of impacts, elaboration of mitigation measures, and of environmental and social monitoring activities	X	X	X
• Assist Mymensingh District XEN and Regional DSM consultants in conducting activities for identification of impacts, elaboration of mitigation measures, and monitoring	X	X	X
• Elaborate an environmental and social monitoring plan	X		
LGED Regional Office in Mymensingh			
Regional Deputy Project Director in Mymensingh			
• Supervise the monitoring activities of the Mymensingh District XEN	X	X	X
DSM consultants (Regional Environmental Specialists and Regional Resettlement Specialists)			
• Assist Mymensingh District XEN in conducting activities for identification of impacts, elaboration of mitigation measures, and monitoring	X	X	X
Haluaghat and Dobaura Upazila Offices			
Upazila Engineers (UEs) in Haluaghat and Dobaura Upazila			
• Supervise contractors to ensure compliance with IEE and/or EIA and ARAP		X	X
• Assist Mymensingh District XEN and DSM consultants in conducting activities for identification of impacts, elaboration of mitigation measures, and monitoring, especially in conducting sample field survey	X	X	X
• Receive complaints from local residents about environmental and social issues regarding the NRRDLGIP and send them to the Mymensingh District XEN		X	X

[Legend] DSM: Design, Supervision and Monitoring, ES: Environmental Specialist, PMO: Project Management Unit, RRS: Rehabilitation and Resettlement Specialist, UE: Upazila Engineer, XEN: Executive Engineer

9 Public consultation and information disclosure

The purpose of this stakeholder consultation is to identify the views of major institutional and project affected persons (PAPs) stakeholders to the proposed bridge location being examined, and to identify issues of relevance to the study, as well as any impacts which the project may have on project planned by the stakeholders, and to assess any mitigation measures which may be undertaken to minimize any adverse impacts of the proposals under consideration. This project will indeed be helpful for socio-economic development for Haluaghat Upazila by timely transporting of essential goods and products required for agricultural and industrial development. In order to implement the project a pilot report, as a part of it an IEE is essential. Subsequently, stakeholder consultation is one of the important parts of the IEE to address the environmental aspects as well as socio-economic issues from stakeholders' point of view.

The Project staff members carried out a series of stakeholder consultations at different locations of the project. Altogether three such meetings were held in August 2012. 56 participants in total from different locations have taken part in the consolations. The schedules, venues and the major feedbacks or queries from the participants are summarized in Attachment 1.

Image 7 Public consultations

Most of the stakeholders anticipate that the proposed bridge project will not affect their areas negatively. The concerns that surfaced during the consultation are summarized below.

- Noise pollution and its impacts on health and also on education in nearby villages
- Air pollution mainly dust during the construction phase is another concern of the people living around the sites

In order to mitigate the concerns and impacts of the project, the following are the suggestions from the consultations:

- There should be an effective and acceptable mitigation measures for the people living in the proposed bridge site;
- Local employment need to be created and contractors should employ local working force during the construction phase;
- Water could be sprayed at the construction site in order to reduce dust, particularly during the construction phase; and
- To protect the soil condition of the agricultural field, soil and sand should be brought from other places.

The proposed bridge will certainly improve the socioeconomic condition of the people of Haluaghat Upazila under Mymensingh District. This project will save the commuting time of the people and thus can save their time & money which can ultimately improve their livelihood. Moreover, this proposed bridge will open a new opportunity for solving the unemployment problem, because a number of new jobs will be created for the people.

10 Conclusions and recommendations

10.1 Conclusions

It is widely recognized that any infrastructure development project like new large bridge construction over the Gudaria River will be of immense benefits to the improvement of overall socioeconomic conditions of a the region. From the consideration of the beneficial impacts of the subproject on local people at large, a meaningful and sustainable development through implementation of the subproject would be possible provided the adverse effects can be minimized or mitigated through adoption of the control measures properly. This would need vigilant care, subsequent management practices and adequate financial involvements.

The proposed bridge construction is not expected to have significant negative environmental and social impacts, and will make a significant contribution to environmental and social enhancements. The conceptual framework of the overall proposed subproject allows a planning and implementation process to be established that can ensure interventions are environmentally sound and sustainable. The process can be set up so that negative impacts can be minimized and positive impacts enhanced. All predicted negative impacts could be avoided or adequately mitigated for, although this will require detailed plans to be drawn up to adequately address the environmentally sensitiveness.

The overall project shows that it is classified as a “Red Category” under the ECR, 1997. A full scale EIA will be carried out immediately after approval of the Project. Mitigation measures to solve the potential adverse short-term and long-term impacts shall be ensured during the design, construction, operation and maintenance stages by the LGED, with assistance of the Environmental Specialist, and the Regional Environmental Expert.

10.2 Findings and recommendations

The impact assessment carried out under the IEE indicates that there will be no significant negative environmental and social impacts due to the implementation of the subproject, and that the subproject will make a significant contribution to environmental and social enhancement. Mitigation measures to address the limited potential adverse short-time impacts of the construction works and long-term impacts of the improved infrastructure, and to ensure that the environmental benefits are sustained,

will be required at the design, construction, operation and maintenance stages by LGED project staff, assisted by the environmental consultants. The PMO, will be primarily responsible for the mitigation measures. Some loss of agricultural land is inevitable, but it will be minimized through ensuring prompt and adequate compensation of affected persons for their losses.

Environmental monitoring of the effectiveness of measures to mitigate short-term and long-term adverse impacts and to identify the any unforeseen impacts should be carried out, utilizing data collected for other purposes complemented by periodic field surveys including participatory assessments with local people and infrastructure users. Monitoring will be the responsibility of the PMO, drawing on LGED's institutional capability on environmental issues. A periodical environmental monitoring report should be prepared.

Based on the findings of this IEE, the following studies are recommended within the EIA preparation:

- Surface water analysis: Surface water analysis is desirable for existing baseline condition. Test parameters should include pH, EC, Cl, TSS, TDS, Total Coliform, Fecal Coliform, DO, BOD, COD, and oil and grease.
- Dredged material test: Since there is a possibility to use the dredge material excavated for river works for the construction of bridge and approach road, a good number of samples from different depth should be analyzed in detail. Sources of filling materials should be mentioned in the EIA report. Test parameter should include Zn, Cu, Hg, Mn, Pb, Cd, Cr, Se and volatile solid.
- Noise level: Noise sampling is required to establish the baseline noise level.
- Air quality: Primary sampling is needed to evaluate the existing air quality. Test parameters should include SOx, NOx, CO, SPM and Pb.
- Fish migration: The production of fish in the country is in decline for various reasons. Further decline should be avoided to the extent possible. The cumulative impact of these bridges is desirable to be studied. Study on migration pattern of fish can recommend proper mitigation measures.
- Social investigation: In the detail design stage, the scale of the land acquisition must be confirmed. Information on land acquisition and other indirect loss should be compensated.

Attachment 1 Public consultation findings

Public consultation 1
Site : South Kailati (N-25°00.919, E- 090°28.720)
Date : 7 August 2012
Time : 12:00 noon
Upazila : Haluaghat

(1) Outcome of the public consultation

A consultation meeting was held at 12:00 noon on 7 August, 2012 at South Kailati (N-25°00.919, E-090°28.720). Most of the participants were people living in and around the concerned proposed bridge construction site. Around 25 people participated in the meeting. Most of the people were farmers, some were students, and two were local school teachers.

In the consultation, environmental issues were examined. The main focus was to dig out information on how the project may affect the existing natural environment and what will be the mitigation measures. People were asked about the availability of wildlife species and Environmental Protected Area (if any) in the proposed bridge construction site.


Image 1 Public consultation at South Kailati

During the consultation, the participants welcomed the bridge under the project, stressing the importance of the bridge. They assured participation and cooperation in construction of the proposed bridge, which had been their unfulfilled demand for a long times.

Most of the people said that there would be no major environmental impacts due to the project except a temporary impact of noise and dust during construction period. Most of the people argued that they would endure the temporary negative impact for the sake of the improvement of the communication system and their livelihood.

During the focus group discussion, people said that there would be no impacts on surface water. They cited common wild birds such as crow, king stock, and dove. They also said that there was no Environmental Protected Area in the proposed bridge construction site. Finally, all of them were in favor of the project.

(2) Suggestions:

- There should be effective mitigation measures in order to reduce noise pollution. Tree plantation and construction of noise protection walls are suggested.

- Water could be sprayed at the construction site in order to reduce dust, particularly during the construction phase.
- Construction camp and labor shed should not be located in a density area and the project staff should refrain from disturbing the local wild life species.

(3) List of participants

No.	Name	Occupation
1	Sree Birendra Basu	Agriculture
2	Md. Moktar (Teacher)	Teaching
3	Sree Ranjan Sarker	Agriculture
4	Md. Khaleque Mia	Agriculture
5	Sree Tonmoy Sarker	Agriculture
6	Md. Liton Mia	Business
7	Md. Saiful Islam	Teaching
8	Md. Abu Taher Mondal	Agriculture
9	Md. Suruz (Teacher)	Teaching
10	Md. Nazrul Islam	Agriculture
11	Sree Lobu Nandi	Agriculture
12	Sree Kushwa Nandi	Agriculture
13	Sree Lantu Sen	Agriculture
14	Md. Sohel Mondal	Student
15	Md. Asar Uddin	Agriculture
16	Md. Ripon Mondal	Agriculture
17	Md. Selim Mia	Agriculture
18	Md. Sobhan	Agriculture
19	Md. Akbar Ali	Agriculture
20	Md. Sabed Ali	Agriculture
21	Md. Alim Mia	Agriculture
22	Md. Humayun Mia	Agriculture
23	Md. Mirash Uddin	Agriculture
24	Md. Shafique Mia	Business
25	Md. Harun Mia	Agriculture

Public consultation 2
Site : North Kailati, Nurani Madrasha
Date : 7 August 2012
Time : 2:00 p.m.
Upazila : Haluaghat

(1) Outcome of the public consultation

In the presence of 16 local people, a consultation meeting was held at North Kailati, Nurani Madrasha (N-25°01.515, E- 090°28.385) on 7 August 2012 at 2:00 p.m. The consultation was conducted with the people engaging in agriculture. In the consultation, environmental issues were examined. The main focus was to find out how the proposed project may affect the existing natural environment and what, if any, would be mitigation measures. The participants were asked about flooding propensity and the availability of wildlife species and Environmental Protected Area (if any) in and around the proposed bridge construction site.

During the consultation, the participants stated that the construction of the proposed bridge would connect a large population (approximately 1 million people) of five Upazila mainly- Bildora union of Haluaghat Upazila to important places of Dobaura Upazila. Moreover, people of both sides of the river expressed total support for the construction of the bridge.

All the participants desired the road and bridge under the project, stressing the importance of the bridge. The bridge will improve various socioeconomic, educational and livelihood conditions of these areas, they said. Moreover, they said, they can quickly move their patients to the hospital and their business sectors will greatly benefit from the improvement of the communication system.

Image 2 Public consultation at North Kailati, Nurani Madrasha

Most of the participants said that there would be no major environmental impacts due to the project. Most of the people argued that they would endure the temporary negative impact of noise and dust for the sake of the improvement of the communication system and, consequently, their livelihood.

According to the participants, common wild lives in the local area include snake, crow, king stock, and dove. They thought that a few wildlife species would migrate to other places due to the noise of the construction work.

(2) Suggestions

- Construction camps and labor sheds should not be located in a rich biodiversity area, and the project staff should refrain from disturbing the local wildlife species.

- There should be effective mitigation measures in order to reduce noise pollution. Improved technology can be used to mitigate noise pollution.
- Water could be sprayed at the construction site in order to reduce dust, particularly during the construction phase.

(3) List of Participants

No.	Name	Occupation
1	Abul Kashem	Agriculture
2	Abdul Aziz	Agriculture
3	Md. Anis Ur Rahman	Service
4	Md. Jalil	Agriculture
5	Md. Idris	Agriculture
6	Md. Joynal	Agriculture
7	Md. Khokon	Agriculture
8	Md. Hazi Iman Ali	Agriculture
9	Md. Mirash Uddin	Agriculture
10	Md. Abu Taleb	Agriculture
11	Md. Harun Ur Rashid	Agriculture
12	Md. Atikur Rahman	Student
13	Md. Dulal	Agriculture
14	Md. Hafez Uddin	Business
15	Md. Bazlur Rashid	Agriculture
16	Md. Foyez Ahmad	Service

Public consultation 3
Site : Saluakanda (N-25°01.439, E- 090°29.147)
Date : 9 August 2012
Time : 2:30 p.m.
Upazila : Haluaghat

(1) Outcome of the public consultation

A consultation meeting was held at 2:30 p.m. on 9 August 2012 at Saluakanda, Bildora (N-25°01.439, E- 090°29.147). Most of the participants were people living in and around the concerned proposed bridge construction site. Around 15 people participated in the meeting. In the consultation, environmental issues were examined. The main focus was to dig out information on how the project may affect the existing natural environment and possible mitigation measures.

During the consultation, the participants welcomed the bridge under the project, stressing the importance of the bridge. The construction of the proposed bridge shall connect a large population (approximately 1 million people) of five Upazila mainly Bildora Union of Haluaghat Upazila to important places of Dobaura Upazila. The bridge will improve various socioeconomic, educational and livelihood conditions of these area. Moreover, people of both sides of the river expressed total support for the construction of the bridge. They assured participation and cooperation in construction of the proposed bridge, which had been their unfulfilled demand for a long time.


Plate 3: Public consultation at Saluakanda

Moreover, business sectors will greatly benefit from the improvement of the communication system, they said.

Most of the participants said that there would be no major environmental impacts due to the project except a temporary impact of noise and dust during the construction period. Most of them argued that they would endure the temporary negative impact for the sake of the improvement of the communication system, and consequently, their livelihood. They also said that there was no Environmental Protected Area in the proposed bridge construction site. Finally, they answered that all of them were in favor of the project.

(2) Suggestions

- There should be effective mitigation measures in order to reduce noise pollution. Tree plantation and construction of noise protection walls are suggested.
- Water could be sprayed at the construction site in order to reduce dust, particularly during the construction phase.

(3) List of participants

No.	Name, Address & Telephone No.	Occupation
1	Md. Sultan	Agriculture
2	Sharif Uddin	Agriculture
3	Anil Basak	Business
4	Abdul Hakim	Agriculture
5	Chanu Basak	Business
6	Mozaffar Ali	Agriculture
7	Ranjan Chandra Barman	Agriculture
8	Sohel Rana	Student
9	Ujjal Barman	Student
10	Subhash Barman	Business
11	Mangal Basak	Student
12	Dulal Basak	Agriculture
13	Pranesh Basak	Agriculture
14	Sazzad Hossain	Agriculture
15	Ershad Mia	Agriculture

Supplementary Annex 3

Draft Abbreviated Resettlement Action Plan

Mallikbari Bazar-Borchona Upazila Road in Bhaluka Upazila, Mymensingh District (Road Code: 361132004)

Abbreviations and acronyms

ARAP	Abbreviated Resettlement Action Plan
DC	Deputy Commissioner
DSM	Design, Supervision, and Monitoring
EC	Entitlement Card
FGD	Focus Group Discussion
GOB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HH	Household
INGO	Implementing Non-Government Organization
JICA	Japan International Cooperation Agency
JVT	Joint Verification Team
LGED	Local Government Engineering Department
MLGRD&C	Ministry of Local Government Rural Development & Cooperatives
NRRDLGIP	Northern Region Rural Development Local Government Improvement Project
PAH	Project Affected Household
PAP	Project Affected Person
PD	Project Director
PIU	Project Implementation Unit
PMO	Project Management Office
PVAT	Property Valuation Advisory Team
RPF	Resettlement Policy Framework
RRRE	Regional Rehabilitation and Resettlement Expert
RRS	Rehabilitation and Resettlement Specialist
SFYP	Sixth Five Year Plan
SMO	Supervision and Monitoring Office
UE	Upazila Engineer
UNR	Union road
UP	Union Parishad
UZR	Upazila road
XEN	Executive Engineer
ha	hectare
km	kilometer
m^2	square meter

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1 Background

1.1Background and rationale of the NRRDLGIP

The Government of Bangladesh requested the Government of Japan to provide funds for the project entitled the Northern Region Rural Development and Local Governance Improvement Project (NRRDLGIP). Accordingly, an agreement has been signed between the Government of Bangladesh and the Japan International Cooperation Agency (JICA) on November 21, 2011 to conduct a study towards preparation of the above project for implementation. The NRRDLGIP will be implemented by the Local Government Engineering Department (LGED) under the Local Government Division Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C). It is expected that successful implementation of this project will help to achieve poverty reduction target of the Sixth Five-Year Plan (SFYP) with substantially minimizing the regional disparities at a large extent. The proposed project area of the NRRDLGIP comprises of 14 Districts covering eight Districts under Rangpur Division, i.e., Dinajpur, Thakurgaon, Panchagarth, Rangpur, Lalmonirhat, Nilphamari, Kurigram, and Gaibandha, and six Districts in Mymensingh area of Dhaka Division, i.e., Jamalpur, Sherpur, Tangail, Mymensingh, Netrokona, and Kishoreganj.

The NRRDLGIP largely consists of two main components. Component 1 will develop basic rural infrastructures. Component 2 is further divided into two subcomponents. Subcomponent 2-1 will improve basic infrastructure and service delivery of Pourashavas, and Subcomponent 2-2 will enhance local governance and capacity development of Pourashavas. Component 1 and Subcomponent 2-1 will involve physical infrastructure work which may cause land acquisition and involuntary resettlement.

Component 1 will include the following infrastructure development: 1) upgrading of Upazila roads (UZR) and Union roads (UNR) including bridges and culverts; 2) rehabilitation of UZR; 3) improvement of Growth Centers (GCs) and rural markets; and 4) improvement of ghats.

Subprojects under Subcomponent 2-1 will not be determined at the preparatory survey phase. They will be selected through participatory approaches in the implementation phase of the Project. The eligible types of infrastructure works under the subcomponent may include: 1) improvement and rehabilitation of Pourashava roads, bridges, and culverts; 2) repair, rehabilitation, and expansion of drains; 3) improvement of municipal markets; 4) construction of slaughter houses; 5) rehabilitation and expansion of water distribution network and tubewells; 6) construction of public and community toilets; 7) construction of solid waste management facilities; 8) construction of bus and truck terminals; 9) installation of streetlights; 10) establishment of parking areas; and 11) basic infrastructures for the poor.

As part of the Preparatory Survey for the proposed NRRDLGIP, land acquisition and resettlement impacts have been investigated for two sample subprojects under Component 1, i.e., 1) Mallikbari Bazar-Borchona UZR in Bhaluka Upazila, Mymensingh District, and 2) UZR passing Rampura Habibpur More-Mongalpur via Ketra & Ekoir GC in Birampur Upazila, Dinajpur District. The draft Abbreviated Resettlement Action Plans (ARAPs) have been prepared for the two. This ARAP is the one for the former sample subproject.

1.2 Overview of the ARAP

1.2.1 Background of the ARAP

The UZR subproject of Bhaluka Upazila has been surveyed covering at a length of about 9.75 km in August 2012. As a result of the preliminary screening, the subproject has been found to cause involuntary resettlement of less than 200 people and some land acquisitions. Therefore, this draft

ARAP has been prepared in accordance with the JICA guidelines for Environmental and Social Considerations (hereinafter the "JICA Guidelines") as well as other international good practices and the national laws and regulations.

To prepare this draft ARAP, a census and socioeconomic survey, targeting 100% of project affected households (PAHs), on their land and asset losses had been carried out using structured questionnaires in August 2012. During the surveys, detailed information on PAPs has been collected. Furthermore, additional information was collected and analyzed through consultations with local stakeholders including the PAPs.

It is noted that the precise impacts and relocation requirements due to the road subproject would be defined when the detailed design of the subproject has been completed. Since the detailed design of the UZR has not been determined yet at the preparatory survey phase, the losses of land and other assets and the extent of resettlement have been assessed based on the assumption that the UZR would be improved as per the LGED's design standards for rural roads, i.e., additional 1.8 m widening is required. This draft ARAP, therefore, needs to be updated in accordance with the actual designs to be determined after the commencement of the NRRDLGIP.

1.2.2 Objective of the ARAP

The objective of this draft ARAP is to ensure proper mitigation for all unavoidable negative impacts caused by the subproject implementation. This will include compensation for loss of assets, and assistance for the restoration and rehabilitation of the livelihoods of project affected persons (PAPs). The ARAP also provides a guideline on implementation of land acquisition in accordance with the JICA Guidelines and the national relevant laws and policies. The issues identified and addressed in this ARAP are as follows:

- Assessment of the type and extent of loss of land and other assets, loss of livelihood or income opportunities, and collective losses such as common property resources and social infrastructure;
- Identification of impacts on vulnerable groups and assessment of other social issues related to the subproject;
- Public consultation and people's participation in the subproject preparation and implementation;
- Development of entitlement matrix, and provisions for restoration and rehabilitation assistance;
- Estimated cost for land acquisition, and resettlement and rehabilitation; and
- Clarification of institutional framework for the implementation of the ARAP including grievance redress, and monitoring and evaluation mechanism.

2 Scope of land acquisition and resettlement impacts

2.1 Description of the subproject

The Mallikbari Bazar-Borchona UZR subproject is located in Dakatia Union Parishad under Bhaluka Upazila of Mymensingh District. The subproject covers the length of about 9.75 km in existing UZR that connects several markets and GCs, schools, and villages, and is even connected to the other District. Figure 1 demonstrates the location of the road, and Figure 2 shows the current conditions of the Upazila road.

The existing road is fully earthen, and its present condition makes it difficult for traffic movement, especially in the rainy season. Proposed improvements of the road include 1) widening of the current 5.5 m embankment crest width up to 7.3 m as per the LGED's road standard, and 2) construction of a new all-weather bitumen-surfaced pavement. These improvements will require additional land resulting from an average widening of 1.8-m crest width of the road. Widening of the road will be made either

along one side of the present road alignment or on both sides of the alignment, depending on the road conditions. To avoid or minimize the resettlement impacts, appropriate ways of widening will be chosen at the detailed design phase.

Much of the additional lands required for the proposed development are government-owned land. This subproject development will require relocation of some temporary small shops, and other structures along the road. Trees are also required to be removed in some places.

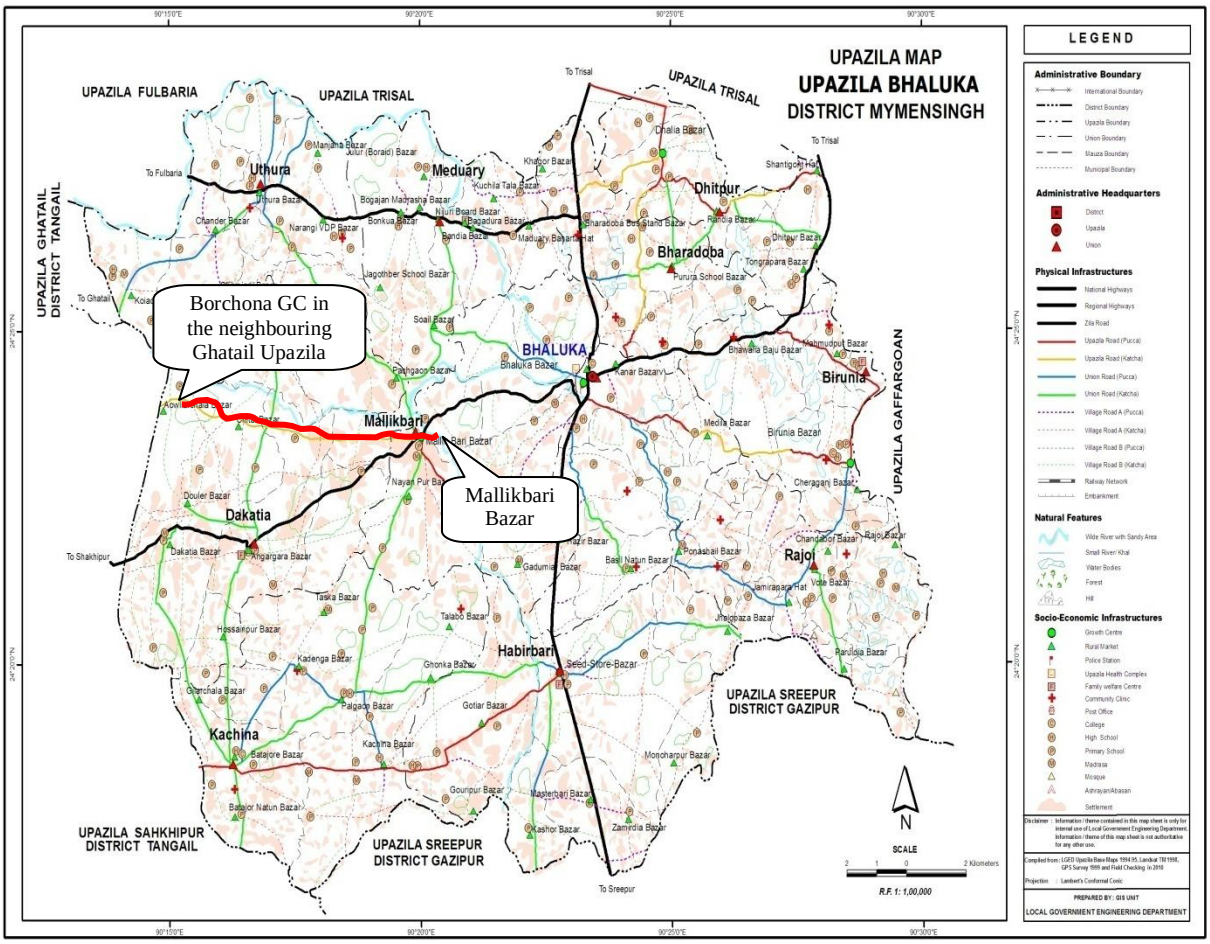

Figure 1 Location map of Mallikbari Bazar-Borchona UZR


Figure 2 Views of Mallikbari Bazar-Borchona UZR

2.2 Minimizing resettlement impact through design optimization

This sample subproject will have some adverse socioeconomic impacts, because a number of business structures or shops are expected to be relocated or shifted. The initial survey, without optimization of the design to minimize impacts, found that 17 small structures, including 16 business structures and one office of the business owners' association may be fully or partially affected. No residential structures were found to be affected, and there is no possibility of population displacement or relocation from their residences. However, by the optimization of the road design, it may be feasible to reduce the number of structures to be affected.

2.3 Scope of land acquisition and associated impacts

The civil works for the subproject would be carried out on the existing 9.75-km long road alignment. The works will require additional lands mostly from the government-owned land and from the private land owners in a few cases. Considering the LGED's road design standard, the embankment crest width of the upgraded road should be 7.3 m. However, the existing crest width of the concerned road on an average is about 5.5 m. Hence, the average widening of 1.8 m will be required for the subproject.

The total land requirement for the proposed improvement of the road has been estimated at 2.44 hectares, comprising both government-owned and private land. Conservatively assuming, 2,500 m^2 per km will be required for the road improvement.

This sample ARAP has been prepared based on field surveys including a census and a socioeconomic survey on the PAHs and other establishments. The socioeconomic survey found that a number of commercial shops, businesses, trees and other assets would potentially be affected due to the proposed improvement of the road.

A summary of these potential impacts based on the current surveys is indicated in Table 1.The list of PAPs with the inventory of affected assets is provided in Attachment 1 to this Supplementary Annex 3. It is expected that 16 households with 70 people in total would be affected, and 2.44 ha of lands at most would be acquired by the road improvement.

Table 1 Summary of potential impacts from the subproject

Length of the road (km)	Crest width (m)	Area of affected land (decimal)	Number of affected structures	Number of households losing land	Number of households losing residence	Number of affected commercial structures	Number of affected trees	Number of PAPs
9.75	7.3	0	17	0	0	16	23	70

Source: Census & socioeconomic survey conducted in August 2012

3. Results of relevant necessary surveys

A PAP census and a socioeconomic survey have been conducted in August 2012 to prepare this draft ARAP. A survey for inventory of losses and a market price survey were also carried out. Below are the major results and findings of these surveys.

3.1 Details of the project-affected persons

3.1.1 Types of the PAHs and impacts

The implementation of the subproject is expected not to require acquisition of any land from the private owners. This is because under the resettlement survey, 16 households and one business owners' association office were found to be affected, but all of them have been squatting on the government-owned land along the road, and do not own the land. Table 2 summarizes the ownership status of PAHs.

Table 2 Ownership of affected land

Type of land ownership	No of PAHs
Titleholder	0
Squatters/occupants of government land	17
Total	17

Source: Census & socioeconomic survey conducted in August 2012

Among the total 17 PAHs, 16 PAHs operate small shops and/or businesses, and will be physically displaced from their shops and/or businesses. Out of the 16 PAHs, 15 PAHs are owners of the structures of the shop and/or businesses, and one PAH rents a shop. In addition, the surveys found that one women-headed household is operating a business in one structure. Table 3 summarizes the number of PAHs by the categories of impact.

Table 3 Number of the PAHs by impacts

Impact category	Male	Female	Total
Impacts on homestead land and houses	0	0	0
Impacts on commercial land and structure	0	0	0
Impacts on commercial structure (squatting on government-owned land)	15	1	16
Impacts on business owner's association	1	0	1
Total	16	1	17

Source: Census & socioeconomic survey conducted in August 2012

3.1.2 Impacts on land and other assets

(1) Land

The subproject will not affect any PAH in terms of land, since all the 17 PAHs are squatting on

government-owned land. They do not have the ownership of land on which the shops and/or businesses, and business owner's association office are located. Table 4 summarizes the area of affected land.

Table 4 Area of affected land

Type of land ownership	Affected land area (decimal)
Homestead land	0
Commercial land	0
Total	0

Source: Census & socioeconomic survey conducted in August 2012

(2) Structure

The census found that a total of 16 structures using for commercial and business purpose and one for business owners' association office would be affected. None of the residential structures have been affected. Structure areas in total of 154.09 m^2 associated with the 17 structures have been found to be affected.

With respect to the construction materials of the affected structures, the survey identified all of the structures are temporarily constructed with mud, wood, thatch and/or tin. Details of these affected structures are given in Table 5.

Table 5 Affected structures by use and construction materials

Type of structure	Unit	Type of structure						Total PAHs	Total quantity (m^2)
		Temporary (mud, wood, thatched and tin)		Semi-permanent (tin roof, wall, and floor concrete)		Permanent (concrete)			
		PAHs	Quantity	PAHs	Quantity	PAHs	Quantity		
Shops and businesses	m^2	16	145.31	0	0	0	0	16	145.31
Business owners' association	m^2	1	8.78	0	0	0	0	1	8.78
Total		17	154.09	0	0	0	0	17	154.09

Source: Census & socioeconomic survey conducted in August 2012

(3) Trees

The census found that 10 fruit trees and 13 timber and wood trees would be affected by the subproject. Different sizes of trees, i.e. small, medium, and large, were counted separately. Details are shown in Table 6.

Table 6 Number of affected trees

Type and size of trees	Number of affected trees
Fruit Trees	
Small	3
Medium	4
Large	3
Total	10

Timber/wood trees	
Small	8
Medium	4
Large	1
Total	13

Source: Census & socioeconomic survey conducted in August 2012

3.1.3 People associated with business

Out of the 17 PAHs, 16 are the owners of the structures. The remaining one PAH operates the business on a rental basis as shown in Table 7. Both groups will be provided with entitlements as per the entitlement matrix presented in the Resettlement Policy Framework (RPF).

All the owners of these shops and businesses will be entitled to compensation for their structures at replacement cost as per the entitlement matrix. In the context of compensation for the business loss, cash compensation equivalent to three month-net income from their businesses will be provided based on the entitlement matrix.

The business operator of the rental shop will be entitled to the compensation for the business loss as per the entitlement matrix. The compensation will be equivalent to three months-net income from the shop or three-month minimum wage rates. The owner of the rental premises will also be compensated for his/her loss of rental income.

Table 7 Types of affected businesses and commercial activities

Type of Business	Number of PAHs
Owner operated shop	16
Rented shop	1
Total	17

Source: Census & socioeconomic survey conducted in August 2012

3.1.4 Details of vulnerable households

The PAHs headed by female or disabled persons, or persons below the poverty line are considered as vulnerable households[1]. The survey found that out of 16 PAHs, five are vulnerable. Details of vulnerable households are given in Table 8. Among the vulnerable households, only one of them is the female headed. These vulnerable households will be entitled to receive vulnerability allowance/assistance as per provisions of the RPF.

Table 8 Details of vulnerable households

Type of Vulnerability	Number of vulnerable PAHs
Women headed PAHs	1
Households headed by disabled person	2
Households below poverty line by income	2
Total Vulnerable PAHs	5

Source: Census & socioeconomic survey conducted in August 2012

[1] Income less than BDT 5,000 per household per month (BBS, 2001)

3.1.5 Need for relocation

The proposed road subproject improvements will not require relocation of any residence from their present place. However, there are 16 business structures and one business owners' association office that will be affected. Relocation will be required for these structures. All efforts will be made, based on this ARAP, to mitigate negative social impacts on the PAPs and communities by supporting relocation of PAHs and by providing support to restoration of pre-project level of income.

3.1.6 Resettlement and compensation

(1) Land

Although none of the PAPs were found to lose any land under the current survey, the current land price has been collected for future reference, if any case is found in which the loss of land is identified at the detail design stage. Land value to determine replacement cost at this stage has been calculated based on the census and socioeconomic survey as well as the land market price survey conducted in August 2012.

Based on the survey data, current prices of different types of land have been tentatively estimated as stated in Table 9. Average rates of homestead land, commercial land, and orchard/garden are BDT 50,000 and BDT 50,000, respectively[2].

Table 9 Tentative prices of affected land

Type of land	Unit	Average rate (BDT)
Homestead land	Decimal	50,000
Commercial land	Decimal	50,000

Source: Census & socioeconomic survey conducted in August 2012

The exact land values will be determined by the Property Valuation Advisory Team (PVAT) during the implementation of the subproject.

(2) Structures

All the affected structures are temporarily constructed with mud, wood, tin or thatch. The current replacement cost of structure has been calculated based on the census and socioeconomic survey. The tentative price of such structures per square meter considering construction materials is BDT 2,680. However, the exact cost of replacing structure by type or construction materials will be determined by the PVAT during the implementation stage. Details of tentative unit rate of structures are given in Table 10.

Table 10 Tentative values of affected structures

Item	Unit	Rate (BDT)
Temporary structure (mud/wood/tin/ thatched)	m^2	2,680
Semi-permanent (tin roof, wall/floor concrete)	m^2	-

Source: Census & socioeconomic survey conducted in August 2012

[2] A decimal is a unit of area approximately equal to 40.46 m².

(3) Trees

Average current market prices for each tree considering their sizes and types have been collected during the survey. The result is given in Table 11. The prices of trees will require updating through the appropriate authority during the implementation stage.

Table 11 Number and tentative values of affected trees

Type and size of trees	Unit	Average value per tree (BDT)
Fruit Trees		
Small	Number	750
Medium	Number	2000
Large	Number	5334
Timber/wood trees		
Small	Number	500
Medium	Number	3500
Large	Number	5000

Source: Census & socioeconomic survey conducted in August 2012

3.1.7 Income compensation

16 businesses will be affected under the subproject, and most of them are small shops. Their monthly average income has is BDT 8,238. Among them, the monthly average income of three PAHs are below the national poverty line, i.e., USD 2 per day, while that of the remaining 13 PAHs are exceeding the line..Compensation will be given to each business operator equivalent to three months' net income, based on the entitlement matrix, in addition to any other entitlements such as compensation for structure loss and shifting allowances.

3.1.8 Special allowance for vulnerable affected households

Five PAHs have been identified as vulnerable based on the survey. They should be given special entitlements in accordance with the RPF. More specifically, allowance equivalent to BDT 3,000 will be provided to these PAHs in addition to the other entitlements.

3.1.9 Significantly affected households

All the 16 PAHs are considered as severely affected since their business structures are to be relocated. Due to the relocation, their business activities must be temporarily suspended, and eventually they lose their income sources.

All of the PAHs will receive entitlements, i.e., compensation equivalent to three months' net income based on the entitlement matrix. Shifting allowances for their business structures will also be given. In addition, they are entitled to the restoration and rehabilitation assistance where required.

3.2 Socioeconomic profile of the PAPs

During the implementation phase of the NRRDLGIP, the DSM consultants will carry out a suitably optimized detailed design for the road improvement works in consultation with the executing agency, i.e., the LGED. This draft ARAP needs to be updated based on the latest information, since this has been prepared based on the assumption that the UZR will be widened by 1.8 m on average, taking into account the LGED's design standards for rural roads. Based on the assumption, a census and socioeconomic survey, which covered 100% of potential PAHs, have been conducted, and the results

were consolidated into this ARAP.

The objective of the surveys was to identify and quantify the number of potential PAPs, common property resources, and loss of land and other properties. The ultimate purposes of the surveys was to assess potential socioeconomic impacts on the people, identify different types of property losses, and restoration and rehabilitation assistance needs, and estimate the values of the losses in order to prepare the ARAP.

The information collected during the surveys includes 1) a wide range of data including demographic variables; 2) socioeconomic profiles of the PAPs; 3) data on different types of land likely to be acquired, and their uses; 4) ownership status of affected properties, 5) market prices of land and other properties for the calculation of replacement costs; 6) community and civic facilities; 7) views, opinions and suggestions of the PAPs and local stakeholders; and 8) detailed information on the households and physical assets to be affected.

3.2.1 Population, religion and ethnicity of affected households

The census and socioeconomic survey identified 16 PAHs associated with a total of 70 PAPs. Half of them, i.e., 35, are males, and the other half are females. The average family size of the PAHs is about 4.4 persons. The detailed demographic information is shown in Table 12.

Table 12 Population of project-affected households

Category	PAHs	Population		Total
		Male	Female	
Squatters with business structures	15	33	30	67
Rented business	1	2	5	7
Squatters with structures of business owners' association	1	0	0	0
Total	17	35	35	70

Source: Census & socioeconomic survey conducted in August 2012

The survey found that Muslim is the dominant religious group comprising 15 households (97.3%) Regardless of the religion, they have full and equal access to institutions and economic opportunities, as with the rest of the population of the country. No indigenous people or ethnic minority people were found to be affected by the subproject.

3.2.2 Age and sex of the affected population

The survey found an equal share of sex ratio among the total population. However, the sex ratio is widely varied among different age brackets. The ratio of males is higher than the one of females in the age brackets of 6-15 years and above 60 years, while the female ratio is higher than the male one in the age bracket of below five years and 16-60 years. The survey also found that 58.6% of the population belongs to the working age group (16-60 years). Details of the age and sex of the PAPs are shown in Table 13.

Table 13 Gender and age distribution of affected population

Age group	PAPs by age and sex					
	Male	%	Female	%	Total	%
< 5	1	1.4	5	7.1	6	8.6
6-15	10	14.3	6	8.6	16	22.9
16-60	18	25.7	23	32.9	41	58.6
>60	6	8.6	1	1.4	7	10.0
Total	35	50.0	35	50.0	70	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.3 Educational status of PAPs

In assessing the educational levels of the PAPs, only the population aged above seven has been considered. The survey reveals that the PAPs are mostly literate and only 21% is illiterate. The literacy rate among the males is higher than the one among females: 85% among males against 72.4% among females. Details of educational levels of the PAPs by location and sex are presented in Table 14.

Table 14 Level of literacy of PAPs by sex (population aged above 7)

Level of Education	Education of affected population by sex					
	Male	%	Female	%	Total	%
Illiterate	5	8.1	8	12.9	13	21.0
Can sign only	13	21.0	11	17.7	24	38.7
Can read and write	1	1.6	1	1.6	2	3.2
Primary	10	16.1	7	11.3	17	27.4
Below secondary	3	4.8	1	1.6	4	6.5
Secondary	0	0.0	0	0.0	0	0.0
Higher secondary	1	1.6	1	1.6	2	3.2
Graduation	0	0.0	0	0.0	0	0.0
Post graduation	0	0.0	0	0.0	0	0.0
Total	33	53.2	29	46.8	62	100.0

Source: Census & socioeconomic survey conducted in August 2012
Note: Some total figures are not the exact sum of their elements, as some figures have been rounded off.

3.2.4 Occupations

The heads of PAHs identified during the socioeconomic survey earn their livelihood from different sources. The principal occupation of the affected household head is business, which constitutes 87.5% of the PAPs. Other important occupations are agriculture accounting for 12.5%. Out of the total population of the PAHs, 42% of them are engaged in some sort of income earning activities. The female population is mostly involved in household works except one female found involved in business. Table 15 presents an overview of the occupational profiles of the affected household heads and population of the households by sex.

Table 15 Occupational profile of the PAPs by sex (population aged above 7)

Occupation	PAH		Population of the affected households					
	No of PAH	%	Male	%	Female	%	Total	%
Agriculture	2	12.5	8	12.9	0	0.0	8	12.9
Poultry/Hatchery	0	0.0	3	4.8	0	0.0	3	4.8
Business	14	87.5	14	22.6	1	1.6	15	24.2
Domestic Work	0	0.0	0	0.0	22	35.5	22	35.5
Student	0	0.0	8	12.9	6	9.7	14	22.6
Total	16	100.0	33	53.2	29	46.8	62	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.5 Income and poverty dimensions of PAPs

Based on the total stated income, the PAHs have been classified broadly into five income groups. Table 16 shows the monthly household income of PAHs.

The survey found that out of the 16 affected households, two PAHs (12.5%) belong to the lowest income group of less than BDT 5,000 per month[3] and seven PAHs (43.8%) belong to the upper poverty line within the income level between BDT 5,001 to BDT 7,500. The survey found that the remaining seven households (43.8%) had income in the range BDT 7,501 to 15,000 per month. However, none of the PAHs was found earning income more than BDT 15,000. The survey shows that more than two thirds of the PAH accounting for about 68.8% belong to the low income group, earning less than BDT 10,000 per month.

Table 16 Monthly household income and economic status

Particulars	Number of PAHs	%
Indebted households	8	50.0
Non indebted households	8	50.0
Total	16	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.6 Indebtedness of the households

The socioeconomic survey on 16 PAHs found that indebtedness is significant. 50% of the PAHs are reported that they take loans from different sources. Details are given in Table 17.

Table 17 Status of indebtedness

Particulars	Number of PAHs	%
Indebted households	8	50.0
Non indebted households	8	50.0
Total	16	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.7 Possession of assets

Details of various types of common household assets possessed by the sampled PAHs are stated in Table 18. The main common household assets possessed by the PAHs are chicken/poultry (81.3%) followed by cycle (68.8%), mobile phone (62.5%), cow (50.0%), solar panel (43.8%).

Table 18 Possession of durable goods

Goods under possession	Number of PAHs	%
Radio	4	25.0
Cycle	11	68.8
TV	2	12.5
Vehicle/ Thelagari	1	6.3
Rickshaw/ Van	2	12.5
Power Tiller	1	6.3
Phone/ Mobile	10	62.5
Solar Panel	7	43.8
Cow/bullock	8	50.0
Goat/sheep	3	18.8
Poultry	13	81.3
Others	1	6.3

Source: Census & socioeconomic survey conducted in August 2012

[3] The approximate Bangladesh hard core poverty line (equivalent to USD 2 per person per day)

3.2.8 Sources of drinking water and sanitation facilities of PAPs

The main sources of drinking water in the subproject area are hand tubewells used by 15 households, and only one using the other sources. In connection to sanitation facilities, the survey reveals that 10 PAHs comprising 62.5%, are using hygienic sanitary latrine, and the remaining six are using open latrine and using open space. Details of sanitation facilities of the PAHs are given in Table 19.

Table 19 Type of sanitation facilities of the PAHs

Type of Latrine	Numbert of PAHs	%
Sanitary	10	62.5
Open	3	18.8
No latrine	3	18.8
Total	16	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.9 Illness

In connection with major illnesses of the PAH's members, the survey found that 15 out of 16 PAHs are reported to experience some sort of illness in the previous year. The illnesses included fever, diarrhea, dysentery, diabetics, hypertension, blood pressure, backache, heart/cardiac problem, kidney problem, and hepatitis.

3.2.10 Type of fuel use by PAPs

Among the surveyed PAHs, all of them reported that they use firewood as the main source of fuel for cooking.

3.3 Gender issues

Consultations with the PAPs and the survey findings indicate that women play a vital role in household activities. Women said that they are unable to utilize their time fully due to indifference of the male members and lack of support for income-generating activities. Women are mainly housewives, and are not recognized income earners although they are extensively involved in household chores. Women have limited opportunities to work, and hardly any women are found involved in any gainful employment. However, a good number of women reported that they have good understanding with the male members of the households in making decisions of family affairs.

Although the survey and consultations with the PAPs reveal that the women play a vital role in household activities, and that only one woman was found involved in business activities, many women members of the PAHs (81.3%) were found helping male members in agriculture and crop processing, and 31.5% involved in poultry and dairy rearing as an allied occupation in addition to household work. Details of women activities are shown in Table 20.

Table 20 Type of women's activities

Actives	Number of PAHs	%
Agricultural activities	13	81.3
Allied activities (diary/poultry rearing)	5	31.5
Trade & business	0	0
Agriculture labor	0	0
Non-agriculture labor	0	0
Handicrafts/ manufacturing	0	0
Service	0	0

Source: Census & socioeconomic survey conducted in August 2012
Note: The total number of households is 16

Following the survey findings, it may be assumed that women members of the community need assistance for more involvement in economic activities to support their families. The assistance may be required in the form of skill development training for rearing poultry and dairy, kitchen gardening, tailoring, small business, and handicrafts. Moreover, during the implementation of the ARAP, the INGO will conduct a needs assessment survey of the women in connection to income generating support, and support for them may be provided based on their needs as per the policy under the RPF.

4 Resettlement policy framework and entitlement

Adverse impacts identified in the survey as well as those which might be identified in the implementation phase shall be mitigated by following the principles and guidelines presented in the RPF. Several important issues on the field level including eligibility criteria, categories of PAPs, types of losses, and entitlement matrix are provided in this section for easy reference during the implementation of this ARAP.

4.1 Eligibility criteria

PAPs eligible to receive compensation and assistance to restore livelihood under the NRRDLGIP are individuals, households, communities, and private and public entities, regardless of the possession of legal title, who are residing, working or cultivating lands and other assets that are acquired for subprojects as of the cut-off date. Furthermore, those who may be affected due to temporary land acquisition and resettlement are also eligible for compensation for disruptions in their livelihood activities.

A detailed inventory of PAPs and scope of impacts need to be prepared during the detailed design phase of subprojects, and finalized after the subproject sites and detailed designs are determined.

4.2 Categories of PAPs and types of losses

The PAPs under the NRRDLGIP are listed below.

- Persons whose land is being used for agricultural, residential, or commercial purposes and is in part or in total affected (temporarily or permanently)
- Persons whose structure is being used for residential, commercial, or worship purposes in part or in total affected (temporarily or permanently)
- Persons whose assets, other than land or structure, are partly or fully affected (temporarily or permanently)
- Persons whose business or source of income is in part or in total affected (temporarily or permanently)
- Persons whose annual or perennial crops and/or trees are affected

- Persons whose access to common property resources is affected (temporarily or permanently)
- Persons affected who belong to socially and economically vulnerable groups

It should be noted that the lack of legal rights to the affected assets does not hinder the entitlements under the NRRDLGIP.

4.3 Entitlement matrix

Based on the national laws and policies related to land acquisition, and the JICA Guidelines, the entitlement matrix for the NRRDLGIP is prepared. Table 21 shows the details of possible losses of PAPs and their entitlements and compensations for such losses.

Table 21 Entitlement matrix for the NRRDLGIP

No	Type of loss	Entitled Persons	Entitlement/ Compensation policy	Implementation issues/ Guidelines	Responsible organization
Loss of land					
1	Loss of agricultural land, pond, ditches, orchards and other lands or water bodies for production	- Legal owner of land	- Provision of replacement land with equal productive capacity satisfactory to PAPs - Cash compensation equivalent to replacement cost, and additional grant to cover the market value of land at market price - Refund of registration cost incurred for replacement land purchase at the replacement value* - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Assessment of type, quantity and quality of land or water body by JVT b) Assessment of replacement value of lands or water bodies by PVAT c) Updating of titles of the PAPs d) Refund of all taxes, registration costs, and other fees if land or water body is purchased within one year from the date of receiving full compensation for land e) Explanation to PAPs about their entitlements and procedures f) Identification of vulnerable households	a) DC, JVT b) EA, PVAT c) DC, EA, JVT d) EA e) EA f) EA
2	Loss of homestead, residential or commercial plots	- Legal owner of land	- Provision of replacement land with equal productive capacity satisfactory to PAPs - Cash compensation equivalent to replacement cost, and additional grant to cover the market value of land at market price - Provision of all taxes, registration costs, and other fees incurred for replacement land purchase at the replacement value - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Assessment of type, quantity and quality of land by JVT b) Assessment of replacement value of lands by PVAT c) Updating of titles of the PAPs d) Refund of all taxes, registration costs, and other fees if land is purchased within one year from the date of receiving full compensation for land e) Explanation to PAPs about their entitlements and procedures f) Identification of vulnerable households	a) DC, JVT b) EA, PVAT c) DC, EA, JVT d) EA e) EA f) EA

Loss of crops and trees					
3	Loss of perennial and seasonal crops, trees, or fish stocks	- Person with legal ownership of the land - Socially recognized owner - Unauthorized occupant of trees or fishes	- For seasonal crops, 60-day advance notice to harvest them. If harvest is not possible, cash compensation for crops (or share of crops) equivalent to prevailing market price - For perennial crops and fruit bearing trees, cash compensation based on annual net product market value multiplied by remaining productive years - For non-fruit trees for timber, cash compensation equivalent to prevailing market price of timber - For fish stocks, cash compensation equivalent to prevailing market price of fish	a) Formulation of work schedule to allow PAPs to harvest seasonal crops b) Identification of ownership of perennial and seasonal crops, trees, or fish by JVT c) Assessment of type, size, and quantity of trees, crops, or fish by JVT d) Determination of values of trees, crops or fish through market surveys by PVAT	a) EA b) EA, JVT c) EA, JVT d) EA, PVAT, Departments of Agriculture, Forest, and Fishery
Loss of structure					
4	Loss of residential or commercial structure by owners	- Legal titleholder, owner of the structure	- Cash compensation equivalent to replacement value of the whole or part of structure - Right to salvaged materials from structure for free - Provision of all taxes, registration costs, and other fees incurred for replacement structure - Transfer and subsistence allowance of BDT 4,000 - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of ownership of structure by JVT b) Assessment of type, size, and quantity of structure by JVT c) Determination of values of structure through market surveys by PVAT d) Identification of vulnerable households	a) EA, JVT b) EA, JVT c) EA, DC, PVAT d) EA
5	Loss of residential or commercial structure by squatters and unauthorized occupants	- Squatters, informal settlers, and other unauthorized occupants	- Cash compensation equivalent to replacement value of the whole or part of structure - Right to salvaged materials from structure for free - Provision of all taxes, registration costs, and other fees incurred for replacement structure - Transfer and subsistence allowance of BDT 4,000 - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of ownership of structure by JVT b) Assessment of type, size, and quantity of structure by JVT c) Determination of values of structure through market surveys by PVAT d) Identification of vulnerable households	a) EA, JVT b) EA, JVT c) EA, DC, PVAT d) EA
Loss of livelihood					
6	Loss or decrease of business or rental income	- Proprietor of business - Owner of commercial structure	- Cash compensation equivalent to three months' net income from business or rental	a) Identification of proprietor or owner of commercial structure by JVT b) Assessment of business or rental income by JVT	a) EA, JVT b) EA, DC, JVT

7	Loss of income and work days due to displacement	- Household head or employees identified	- Cash compensation for lost income based on three months' lost income or minimum wage rates - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of proprietor or owner of commercial structure by JVT b) Assessment of business or rental income by JVT c) Identification of vulnerable households	a) EA, JVT b) EA, DC, JVT c) EA
8	Relocation of community structure	- Community representative	- Compensation to reconstruct or relocate community structure	a) Identification of community structure by JVT b) Assessment of community structure by JVT	a) EA, JVT b) EA, DC, JVT
Impacts on vulnerable PAPs					
9	Impacts on vulnerable households	- Vulnerable households, including informal settlers, squatters, women headed household	- Additional allowance equivalent to BDT 3,000 for loss of land or structure - Prioritized employment under the NRRDLGIP	a) Identification of vulnerable households	a) EA
Temporary loss					
10	Temporary loss of access to cultivable land by owner cultivator. tenant/ sharecropper	- Legal owner of land - Tenant, sharecropper, and lessee - Unauthorized occupant such as squatter and encroacher	- 60-day advance notice - Provision of cash compensation equivalent to expected income earned from land during the duration of access loss - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of owners or other stakeholders by JVT b) Assessment of net income earned from land during the duration of access loss by JVT c) Identification of vulnerable households	a) EA, JVT b) EA, DC, JVT c) EA
11	Temporary loss of access to residential houses/ commercial structures by owners, rented or leased	- Legal owner of land - Tenant, sharecropper, and lessee - Unauthorized occupant such as squatter and encroacher	- 60-day advance notice - Provision of land rental value during the duration of access loss - Restoration and enhancement of affected land, structures and other assets. - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of owner or other stakeholders by JVT b) Assessment of rental value of structure with equal livelihood level by JVT c) Identification of vulnerable households	a) EA, JVT b) EA, DC, JVT c) EA
Any other loss not identified					
12	Unforeseen impact		- Documentation of unforeseen impacts, and elaboration of mitigation measures in accordance with this RPF	a) Identification of unforeseen impacts through periodical monitoring	a) EA

Legend: EA=Executing Agency (i.e., LGED); DC=Deputy Commissioner; JVT=Joint Verification Team; PAP=Project affected person; PVAT=Property Valuation Advisory Team
Note: * Registration cost is usually about 10% of the sale value for the rural area

5 Stakeholders' consultation, participation and information disclosure

5.1 Consultation and participation

During the Preparatory Survey for the NRRDLGIP, a series of consultation meetings were held with various stakeholders in both formal and informal settings in the vicinity of the proposed subproject site.

Women and other vulnerable groups were also consulted on the subproject impacts and their livelihood aspects. The consultations aimed to identify the present status of the subproject site and the perceptions of the PAPs and other local stakeholders, and promote participation of the stakeholders in the implementation of the subproject. The feedback and observations from the stakeholders at the consultation meetings have been used in preparing the ARAP.

5.2 Stakeholder meetings

In the stakeholder meetings, the concept of the NRRDLGIP, the possible subproject plans, and land acquisition requirements as per various options were discussed with the potential PAPs. They were consulted for their perceptions on risks and consequences of the road development, views on alternative options, and beneficiary participation in the subproject cycle. The potential PAPs along with local community leaders and other stakeholders were consulted through focus group meetings and personal interviews. The inputs from them have been used to develop appropriate mitigation measures. This interactive approach must continue during the implementation of the ARAP through the INGO. At this stage, three consultation meetings were held at three different places along the road alignment. The average number of participants in each meeting was 53. The record of consultation meetings and major findings of them are presented in Table 22.

Table 22 Summary of consultation meetings

Information on consultation	Issues discussed	Major findings of the consultation
Consultation Meeting # 1 Village: Angerggara Upazila: Bhaluka District: Mymensingh Date: 03 August 2012 Number of participants: 23 **Consultation Meeting # 2** Village: Chitalgram Upazila : Bhaluka District: Mymensingh Date: 03 August 2012 Number of participants: 30 **Consultation Meeting # 3** Village: Chitalpara Kaker Moor Upazila : Bhaluka District: Mymensingh Date: 05 August 2012 Number of participants: 106	- Project information dissemination & briefed about the proposed NRRDLGIP project; - Goals and objectives of the project; - Different components of the project; - Necessity of the proposed road development; - People's perception of change impacts and their consequences in the area; - Name, location, and nature of the proposed subproject; - Importance of the subproject in light of the subproject influenced area; - Roles of the local people in smooth implementation of the subproject; - Land availability for the subproject development; - Both negative and positive likely impacts; - Losses from the proposed subproject development; - Land acquisition issues; - Existing communication/transport/market facilities, problems, prospects, etc. - Number of houses, community facilities, and social infrastructures likely to be affected/impacted; - People's attitudes/views regarding different losses and other associated impacts likely to be incurred, and consideration of measures to mitigate those impacts; - Expected benefits from the project in the short and long term; - Local people's needs and aspirations; and - Socioeconomic, demographic, poverty, living condition, quality of life aspects of the people under the subproject area.	- Almost all participants understood the project and showed keen interest and welcomed the project and also assured to provide necessary cooperation; - Participants understood the different losses that could occur because of the proposed subproject improvement works; - In spite of the losses, they are interested in the subproject. Even the majority of the participants expressed that they are willing to donate land for the roads development without any compensation. - The people expect new sources of livelihood of people after the road improvement; - Participants/people demanded to construct road properly using good quality materials to ensure longevity of the road; - People of subproject area in general want to participate in different project activities as much as possible and showed much enthusiasm on the subproject and its potential benefits; - Employment opportunities are expected to increase for local people particularly for construction workers and service providers; - Improved/better road will reduce travel time and reduce use of diesel/petrol. It will increase mobility and improve access to bigger market centers for sale and purchase of goods, facilities, etc.; - The people expect proper training for different income generating activities and understand that this will be provided under the livelihood restoration program; - The people wanted local workforce to be involved in construction and development of the subproject; and this has been accommodated in the ARAP; - Women are economically inactive due to restricted social system; - Women required necessary support in the form of providing training and credit to involve in income earning activities directly to support family; - If there is any provision of compensation for lost land and properties, the payment of compensation is expected properly in time; - Proper resettlement and rehabilitation of the affected persons/families to be ensured by the project authority.

In general, there were strong support and positive responses, especially among the people of the subproject area, towards the proposed subproject development. The subproject will bring benefit to the people of this area in the form of improved communication and road connectivity, enhanced transportation of goods to the market, better access to different community facilities, and easier traffic movement under all weather conditions. It was perceived that the subproject will contribute to increase the employment and incomes of people in different ways, therefore helping to improve the poverty situation.

This interactive community consultation approach will continue during the implementation of this ARAP through the INGO. For information disclosure to the PAPs, a brochure about resettlement information will be prepared for the subproject, and then distributed among the PAPs, providing background information on the subproject, entitlement matrix, and the due processes in receiving resettlement benefits. The INGO will be responsible for distributing the brochure among the PAPs, and will place copies of the information brochure at the concerned Union Parishad Office.


1 Meeting with the PAPs & stakeholders


2 Meeting with the PAPs & stakeholders


3 Meeting with the PAPs & stakeholders


4 Interview with a PAP


5 Interview with a PAP


6 Interview with a PAP

Figure 3 Pictures of stakeholders meetings and interviews

5.3 Steps to ensure stakeholders consultation

The LGED will constitute several committees or organizations for the implementation of the ARAP. They include the Joint Verification Team (JVT), PVAT, and the Grievance Redress Committee (GRC). PAP representatives will be involved in the GRC to review and resolve disputes concerning compensation and other resettlement benefits.

The INGO will distribute brochures to explain the impact of the subproject, compensation policies for the PAPs including resettlement options and strategies, and the tentative implementation schedule of the subproject. Further steps will be taken 1) to keep the PAPs informed about resettlement and land acquisition plan, compensation policy and payments, and 2) to ensure that the PAPs will be involved in making decisions concerning relocation and implementation of the ARAP.

5.4 Public consultation and information disclosure

The ARAP will be made available to the PAPs and other stakeholders. It shall be disclosed at the convenient place for PAPs, i.e., the District, Upazila, and Union offices. A summary of the ARAP will be prepared for the distribution to PAPs and other stakeholders. The status of disclosure will be reported to JICA.

6 Relocation and income restoration

6.1 Scope of displacement and relocation

According to the PAP census and socioeconomic survey, implementation of the subproject will require physical displacement of 16 businesses and one business owners' association office. Among the affected businesses, most of them are small businesses with temporary sheds made of corrugated iron sheet, and wood, bamboo, and thatch. 70 people are associated with the 16 PAHs.

6.2 Relocation of housing and establishment

The households, and shops and business owners or operators affected by the subproject will be provided with compensation and other entitlements including restoration and rehabilitation assistance. The entitlements will be provided as per the entitlement matrix. The LGED, with assistance of the Design, Supervision, and Monitoring (DSM) consultants, i.e., Rehabilitation and Resettlement Specialist (RRS) and the Regional Rehabilitation and Resettlement Experts (RRREs), and the INGO, will provide the PAPs with entitlements, and may help them minimize the adverse impacts.

Several options can be considered for the resettlement, e.g., shifting the affected structures onto the remaining unaffected portion of the land, or shifting to new plots. Whether the PAPs will need the LGED's assistance in relocation should also be confirmed. This will be confirmed and agreed with the PAPs in the series of the consultation meetings and interview sessions.

6.3 PAPs' preference for relocation

During the census survey, the relocation choices of the PAPs were surveyed. Most PAHs prefer to be relocated with assistance from the NRRDLGIP, and only one household opted for self relocation through purchasing new land in the adjoining area of the road to continue their present livelihood. Details are given in Table 23.

Table 23 Relocation choice of PAHs

Relocation choice of PAHs	Number of PAHs	%
Self relocation through purchasing new land	1	6.3
Self relocation on residual land	0	0
Project assisted resettlement	15	93.7
Total	16	100.0

Source: Census & socioeconomic survey conducted in August 2012

6.4 Restoration and rehabilitation assistance

Mitigation of loss of assets and livelihood is the main focus of the ARAP. In addition to the compensation, additional support will be provided to the livelihood restoration of PAHs, as identified in the census and socioeconomic survey (Table 24). Some PAHs will be relocated and will lose income from their business operation. Adequate compensation and other entitlements will be awarded to these PAHs before relocation. In addition, vulnerable PAHs will receive additional support, and get preference for employment in civil works under the subproject.

Table 24 Preferred income restoration assistance by the PAPs

Type of assistance	Number of PAHs	%
Employment in construction works	10	62.5
Loan/credit for income generating activities	4	25.0
Vocational training	1	6.3
Others (free input for production or at low cost)	1	6.6
Total	16	100.0

Source: Census & socioeconomic survey conducted in August 2012

In compliance with the ARAP, the LGED will provide income restoration assistance, in addition to compensation. This will be provided as part of the gender and livelihood component of the NRRDLGIP. Other initiatives will also be considered, including the other ongoing government programs such as LGED's rural road maintenance including the labor contracting society scheme, or NGO's programs including micro credit, vocational training, and other income generating activities.

Under the ARAP, the income restoration assistance will be provided especially for the vulnerable PAHs. The eligible members of such PAHs will get training on income generation programs such as small business, sewing and tailoring, handicrafts, poultry rearing, cow fattening and others. The LGED, with assistance of the RRRE and the INGO, will conduct a needs assessment survey among the vulnerable PAHs. Based on their needs, training programs for the particular groups will be selected. Special attention will be given to women headed households or vulnerable households having no adult male members to shoulder household responsibility, or vulnerable households losing more than 10% of their income sources due to the subproject development.

6.4.1 Approaches to income generation

A detailed plan for the income generation program will be designed by the INGO under the guidance of the PMO and the DSM consultants. The needs for skill development, capital support and marketing facilities will also be part of the income restoration program.

The short-term objectives of the income restoration program are to restore income of the PAPs during the periods immediately before and after the subproject implementation. The measures as per the ARAP include:

- Replacement of acquired property with market price at replacement cost;
- Employment in civil construction works;
- Employment on a priority basis in construction, transportation and maintenance of civic amenities; and
- Employment in the resettlement program to be implemented by the INGO

In addition to the income restoration assistance support mentioned above, the INGO may undertake income generation activities for the restoration of income of the PAPs in the long run, depending on their needs. Such support will be provided as follows:

- Identification of target groups;
- Identification of involuntary resettlement activities;
- Training need assessment
- Identification of trainers or training agencies;
- Provision of training; and
- Participatory monitoring of the PAPs engaged in new vocations.

For the additional support, the INGO will specifically undertake the assessment of the needs and skill base of vulnerable PAPs whose ages are between 15 to 60 years old. Based on the assessment, the INGO will prepare a list of eligible members of vulnerable PAHs with their profile, and send the list to the RRS of the DSM consultants to arrange training programs for them. The short-term livelihood and income regeneration assistance under the ARAP and long-term income generation program under the livelihood restoration program may be organized as shown in Table 25.

Table 25 Livelihood restoration options

Eligible PAPs	Income Restoration Options
1. Members of poor PAHs earning maximum BDT 60,000 per year to be relocated due to the subproject	1-1. Short-term: Compensation for structure, shifting allowance, reconstruction assistance, and priority in employment in construction 1-2. Long-term: Needs and capacity identification, human development and skill training on income generation activities
2. Members of poor female-headed PAHs having no adult male members to shoulder household responsibility	2-1. Short-term: In addition to support described as 1.1, additional subsistence allowance 2-2. Long-term: As 1.2 above
3. Members of poor PAHs losing more than 10% of their income sources	3-1. Short-term: Compensation for lost assets, payment of other resettlement benefits, and employment in construction 3-2. Long-term: As 1.2 above

The INGOs responsible for the implementation of the income restoration program will work under the guidance of the PMO, the RRS, and the RRRE. The budget for the program is estimated as BDT 0.5 million.

6.4.2 Employment in construction

The PAHs will get preference in employment associated with the subproject construction works. The PAPs will be able to participate in or form a labor contracting society (LCS) with the help of the INGO, and may be deployed by the contractor in any suitable works. The employment opportunities in the semi-skilled and unskilled category shall be offered to the PAPs in preference to others. A clause is to be incorporated in the contract requiring contractors to provide the PAPs with the employment in the construction works.

6.5 Common property resources

According to the census and socioeconomic survey, no common property resources such as mosques, schools, and other religious or cultural properties have been affected by the subproject.

6.6 Social issues and development needs

According to the census and socioeconomic survey, 68.8% of PAHs belong to the low income group. In addition, almost all of them are squatting on government-owned land, without land titles. Their social and economic status is thus considered unstable, and careful attention should be given to them in the resettlement and land acquisition process. In particular, five vulnerable PAHs will need special assistance on income restoration. The INGO will prepare both the short-term and long-term income restoration assistance depending on the PAP's needs.

7 Grievance redress mechanism

7.1 General

The LGED shall establish a Grievance Redress Mechanism (GRM) to receive PAPs' grievances about the implementation of the ARAP. The GRM is intended to seek resolutions of the grievances promptly without resorting to expensive and time-consuming legal procedures. This will enable PAPs to resolve any problems associated with the subprojects in a short time. However, it should be noted that the GRM shall not impede access of PAPs to the existing judicial or administrative remedies. PAPs shall be informed properly that they have a right to raise grievances against adverse impacts under the GRM.

7.2 Grievance Redress Committee

Under the GRM, a GRC shall be established for each or group of subproject that requires land acquisition and resettlement. The GRC receives all the grievances related to land acquisition and resettlement impacts such as right of ownership, entitlement to compensation and other assistance, and any other issues raised by the PAPs. The GRC for the subproject shall comprise the following members:

- Bhaluka Upazila Engineer, LGED - Convener
- INGO - Member Secretary
- Chairman of Dakatia Union Parishad (UP), or designated UP member - Member
- Female UP member of Dakatia Union - Member
- One representative from PAPs - Member

7.3 Procedure

Grievances of PAPs will first be brought to the RRRE or INGO. If any grievance is lodged only in verbal form, the RRRE or INGO shall write it down at no cost. Grievances not redressed by the RRREs and INGO shall be brought to the GRC. The GRC will meet every month, and determine the responses to individual grievances within 15 days upon the date of receipt.

If PAPs are not satisfied with the decision of the GRC, they can attend the next meeting to appeal for the reconsideration of the GRC decision. Grievances not redressed by the GRC will be sent to and addressed by the Inter-ministerial Steering Committee (ISC). If they are related to land acquisition, the Deputy Commissioner (DC) of Mymensingh District will address them. Further grievances will be referred by the PAPs to the appropriate courts of law. All grievances received shall be recorded, and the record shall include contact details of complainant, the date of receipt of grievance, nature of grievance, agreed corrective actions and the date when the actions were effected, and final outcome. All expenses incurred in arranging grievance negotiations and meetings of GRC as well as logistics required, shall be arranged by the LGED.

Table 26 Procedures for grievance redress

	Concerning Land	Concerning structures and other assets
Step 1	PAP lodges a grievance to RRRE/INGO, who resolve it within 15 days upon receipt.	
	If no resolution is reached, then…	
Step 2	PAP lodges the grievance to GRC for resolution within 15 days. PAP can appeal in the next GRC if not satisfied with the decision of GRC.	
	If no resolution is reached, then…	
Step 3	PMO, PIU and/or GRC assists the PAP in lodging the grievance to ISC or DC. DC appoints an arbitrator under Section 27 of the ARIPO.	PMO, PIU, and /or GRC guide the PAP in lodging the grievance to the District Court.
Step 4	Arbitrator hears the grievances and renders decision within 30 days upon appointment. If the PAP is not satisfied with the decision of arbitrator, DC forms an Arbitration Appellate Tribunal.	The District Court will assess the merit of grievance and schedule the hearing. The decision of the District Court is final and binding.
Step 5	Arbitration Appellate Tribunal hears and assesses the merit of grievance. The decision is final and binding.	Not applicable.

[Legend: ARIPO: Acquisition and Requisition of Immovable Property Ordinance 1982; DC: Deputy Commissioner; GRC: Grievance Redress Committee; INGO: Implementing Non-Government Organization; ISC: Inter-ministerial Steering Committee; PIU: Project Implementing Unit; PMO: Project Management Office; PAP: Project-affected Persons; RRRE: Regional Rehabilitation and Resettlement Expert

8 Monitoring and reporting

8.1 Monitoring system

Under the NRRDLGIP, a monitoring system needs to be established to ensure the effective and efficient implementation of land acquisition and resettlement. More specifically, the objectives of the monitoring are to: 1) check if compensation, restoration and rehabilitation assistance, and other entitlements are sufficiently provided; 2) see if the standards of living of PAPs are restored or improved; 3) ascertain whether land acquisition and resettlement are implemented as per the schedule; and 4) identify problems and resolve them.

The two-tier monitoring mechanism will be established for the subproject in Mymensingh District. The first tier of the mechanism is at the field level. The Executive Engineer (XEN) of LGED Mymensingh District Office is responsible for the field-level monitoring. Field-level data and information will be collected by them, and the RRRE and INGOs will help them collect necessary data and information.

The second tier of the monitoring mechanism will be established at the PMO at the LGED headquarters. The PMO, under the assistance of the RRS at the PMO, will be in charge of overall monitoring and will check the compliance of field-level activities with the RPF and other relevant laws and guidelines. The PMO is also responsible for the reporting to JICA on the progress of land acquisition and involuntary resettlement.

In addition, an external independent monitoring will be conducted to see the social impacts of the subproject, in particular whether entitlements are timely and sufficiently provided. This external monitoring will contribute to increase in the objectiveness and transparency of the monitoring and evaluation. For this purpose, an independent external monitoring agency (EMA) with experience in resettlement and rehabilitation and restoration assistance will be engaged.

8.2 Monitoring at the LGED District Offices

The LGED Mymensingh District Office will monitor the implementation status of land acquisition and resettlement activities. The RRRE and INGOs will help them with the monitoring.

The INGO, with guidance from the RRRE, will collect information on the progress of the ARAP. The progress of each activity listed in the ARAP will be checked by interviews and consultations with PAPs, sample on-site investigations, and other appropriate means. The collected information will be consolidated in a quarterly progress report by the LGED District Offices, and then the report will be submitted to the PMO. The report will contain the following: 1) accomplishments to-date; 2) objectives attained and not attained during the period of subprojects; 3) problems and challenges regarding land acquisition and resettlement; and 4) proposed countermeasures for the next quarter. Such information shall be described in a quantitative way as much as possible. The monitoring report will be integrated by the PMO into the progress reports of the NRRDLGIP to be submitted to JICA.

The indicators to be covered by the monitoring activities at the LGED Mymensingh District Office are listed in Table 27.

Table 27 Monitoring indicators

Monitoring Issues	Monitoring Indicators
Budget and timeframe	- Have all land acquisition and resettlement staff been appointed and mobilized for field and office work on schedule? - Have capacity building and training activities been completed on schedule? - Are resettlement implementation activities being achieved against agreed implementation plan? - Are funds for land acquisition and resettlement being allocated to the executing agency on time? - Have funds been disbursed according to ARAP? - Has the land made encumbrance free and handed over to the contractor in time for subproject implementation?
Delivery of PAP entitlements	- Have all PAPs received entitlements according to numbers and categories of loss set out in the entitlement matrix? - How many affected households relocated and built their new structure at new location? - Are activities related to income and livelihood restoration being implemented as planned? - Have affected businesses received entitlements? - Have the squatters and encroachers displaced due to the subproject been compensated? - Have the community structures (e.g., mosque, community organization) been compensated for and rebuilt at new site? - Have all processes been documented?
Consultations, grievances, and special issues	- Have resettlement information brochures/leaflets been prepared and distributed? - Have consultations taken place as scheduled, including meetings, groups, and community activities? - Have any PAPs used the grievance redress procedures? - What grievances were raised? - What were the outcomes? - Have conflicts been resolved? - Have grievances and resolutions been documented? - Have any cases been taken to court?
Benefit monitoring	- What changes have occurred in patterns of occupation compared to the pre-project situation? - What changes have occurred in income and expenditure patterns compared to pre-project situation? - Have PAPs income kept pace with these changes? - What changes have occurred for vulnerable groups?

Source: Modified and adapted from ADB (2005). *Resettlement Planning Document: Second Rural Infrastructure Improvement Project.*

8.3 Monitoring by the PMO

The PMO is responsible for the overall monitoring on the progress of land acquisition and involuntary resettlement activities. It will verify the monitoring activities by the LGED Mymensingh District Office.

The PMO will basically check the compliance with the ARAP and other relevant laws and guidelines. In particular, under such monitoring the PMO shall assess: 1) subproject compensation and entitlement policies; 2) adequacy of organizational mechanism for implementing the ARAP; 3) restoration and rehabilitation assistance to PAPs; 4) complaints and grievances; and 5) provisions for adequate budgetary support by the LGED for implementing the ARAP. In the context of 3) above, the RRS at the PMO will assess whether PAPs have been received sufficient compensation and other entitlements, and whether they have reestablished their structures and livelihoods. The restoration of their incomes up to the pre-project levels will be focused in particular. The RRS will also appraise the accounting documents which record the payments of compensation to PAPs by the LGED.

8.4 External Monitoring

The external monitoring, which will be conducted by the EMA will focus on social impacts of the subproject on the PAPs, and status of entitlement provision to the PAPs. The EMA will be recruited from an independent consult, academic research institution, or NGO which has enough experience in monitoring on land acquisition and involuntary resettlement.

The timing of the external monitoring are proposed as post-subproject phase, since the expected scale of land acquisition and resettlement are considered small. Such monitoring should be conducted six month-after the completion of land acquisition or resettlement.

Through consultations with the PAPs and on-site investigations, the EMA will assess the socioeconomic conditions of the PAPs, and aftermath impacts. Perceptions of the PAPs on their received entitlements are also confirmed. Baseline information on PAPs' income and livelihood level will be properly referred in the post-subproject monitoring. Based on the monitoring, lessons learned from the land acquisition and resettlement activities will be derived, and they will provide important feedback for future subprojects involving land acquisition and resettlement.

The RRS and the PMO shall provide necessary assistance, including the provision of field data and information and arrangement of field surveys, to the EMA.

8.5 Reporting Requirements

The Project Director (PD) will periodically prepare and send status reports to JICA on the ARAP implementation by incorporating them in the Quarterly Project Progress Reports. A sample monitoring report format is given in the draft RPF. All relevant documents listed below shall be submitted, together with the Reports, by the PMO to JICA.

- A draft ARAP approved by the LGED before subproject appraisal
- The final ARAP approved by the LGED after the PAP census has been completed
- An updated ARAP if updated during subproject implementation phase
- Monitoring reports on land acquisition and resettlement

The RRS at the PMO will assist the PD in periodic reviews and supervision during the implementation stage. The RRS will assess the quarterly progress reports, which will be submitted by the LGED

Mymensingh District Office through the LGED Mymensingh Regional office, and check the progress of all activities related to land acquisition and resettlement. The RRS will report the assessment results to the PD, and recommend necessary actions as appropriate.

The EMA is responsible for the post-subproject monitoring, and will elaborate a monitoring report. The report shall be submitted to both the PMO and JICA directly.

9 Institutional arrangements and implementation mechanism

9.1 Entities responsible for resettlement and land acquisition

For the effective and efficient implementation of the ARAP, it is critical to institute a firm implementation arrangement. The LGED Mymensingh District Office is primarily responsible for the implementation of activities related to land acquisition and involuntary resettlement for the subproject in Bhaluka Upazila, Mymensingh District. It needs to take necessary actions, including constituting various organizations and mobilizing INGOs.

Relevant entities in relation to the preparation, implementation, and monitoring of the ARAP are presented below.

(1) LGED

The LGED is primarily responsible for overall activities related to involuntary resettlement and land acquisition. The PMO established in the LGED headquarters needs to perform primary responsibilities for activities related to the involuntary resettlement and land acquisition. It will recruit the DSM consultant team, especially the Rehabilitation and Resettlement Specialists. INGOs will be also recruited for the implementation of activities on the ground, especially household surveys and consultations with PAPs. The DSM consultant will assist the PMO in overseeing the activities of INGOs.

The PMO will have supervisory roles, whilst the XEN of Mymensingh District will be responsible for the actual implementation of resettlement and land acquisition activities. The PMO will recruit a RRS at the PMO, and three RRREs who will assist the Mymensingh District XEN in preparing and implementing the ARAPs.

The Mymensingh District XEN, with assistance of the RRS, RRRE, and INGOs, will implement the necessary actions. They will include disclosure of subproject information, detailed surveys on PAPs and other stakeholders, and consultation with PAPs, preparation and implementation of ARAPs. The monitoring reports on the progress of resettlement and land acquisition activities need to be elaborated by the Mymensingh District XENs, and be submitted to the LGED Mymensingh Region offices, which will subsequently submit it to the PMO. The reports will then be submitted to JICA for its approval.

The Upazila Engineers of Bhaluka Upazila will also support the Mymensingh District XEN, the RRREs and INGOs in conducting detailed surveys and providing other field-level assistance.

(2) DSM Consultants

The DSM Consultants will be recruited by the PMO to provide assistance to the PMO. They include a RRS at the PMO, and three RRREs at the Regional level. The RRREs will be based in the Supervision and Monitoring Office (SMO), and will be in charge of land acquisition and resettlement issues. The RRREs shall support the PMO to ensure that all subprojects comply with the requirements of the JICA

Guidelines in terms of involuntary resettlement and land acquisition. They are responsible for regular reviewing and updating of the RPF, assisting LGED Mymensingh District Office in the preparation and implementation of the ARAPs, and monitoring on activities related to involuntary resettlement and land acquisition.

(3) Implementing Non-Government Organization

The INGOs with guidance and supervision of the RRS and RRRE will engage in the preparation and implementation of the ARAPs. The INGOs will work at the level of grassroots as a catalyst to interact with PAPs. They should have enough capacity to identify problems or complaints at the grassroots level, and assess the needs of PAPs for the restoration of income and livelihoods.

The roles of the INGOs are basically to assist the LGED at the field level in accordance with the guidance from the RRREs. The INGOs will assist in: 1) disclosure of subproject information; 2) public consultation meetings; 3) socioeconomic surveys on PAPs including those on the inventory of losses and replacement cost; 4) consultation with PAPs and other stakeholders; 5) processing the collected data for the preparation of ARAPs; 6) implementation of ARAPs including payment of compensation and entitlements, and restoration and rehabilitation assistance; and 7) monitoring on the implementation of the ARAPs. The sample questionnaires to be used in the surveys are presented in the RPF.

(4) Deputy Commissioners

The office of DC, Mymensingh District will be responsible for land acquisition, in particular the assessment of affected assets under the ARIPO. It will appoint representatives as member of the JVT and PVAT for quantifying losses and determining valuation of affected properties. The LGED, RRS, RRREs and INGOs shall liaise with concerned DC offices to take necessary procedures.

(5) Relevant organizations for implementation of ARAP

The LGED shall constitute several committees or organizations for the implementation of the ARAP. They include the JVT, PVAT, and GRC.

a) Joint Verification Team

A Joint Verification Team (JVT) will be formed. The major responsibility of the JVT is to review the field data collected by the INGO together with the DCs' assessment on the loss of physical assets. The JVT will scrutinize the list of PAPs and affected assets, and verify and finalize the list through conducting joint verification activities. The entitlements of PAPs will be determined by using the assessment result of the JVT as one of the important determinants. The JVT will be a three-member body and be comprised as follows:

- Mymensingh District XEN: Convener
- Representative of DC office, Mymensingh District: Member
- INGO: Member Secretary

b) Property Valuation Advisory Team

A Property Valuation Team (PVAT) will be formed. The PVAT will determine the market price and replacement cost of lands or other affected properties. Based on the assessment of the PVAT, the compensation amount will be finalized. The PVAT will be comprised as follows:

- Mymensingh District XEN: Convener
- Representative of DC office, Mymensingh District: Member
- INGO: Member Secretary

c) Grievance Redress Committee

A Grievance Redress Committee (GRC) will be formed. Representatives of the PAPs will be involved in the GRC to review and resolve disputes related to compensation and other resettlement entitlements. Details of the GRC are presented in Section 7.2.

9.2. Roles and responsibilities of relevant entities

Details on activities and responsibilities of relevant entities described above related to the ARAP activities are presented in Table 28.

Table 28 Institutional roles and responsibilities

	Activity	Implementing/ Responsible entity
1.	**Detailed design phase**	
	Recruitment of RRS and RRREs	PMO
	Recruitment and mobilization of INGO	PMO, RRS
	Information disclosure on details of subprojects	D-XEN, RRS, RRRE, INGO
	Preliminary screening of land acquisition and resettlement	D-XEN, UE, RRRE, INGO
	Consultation with potential PAPs and local stakeholders	D-XEN, UE, RRRE, INGO
2.	**ARAP preparation phase**	
	PAP census and socioeconomic survey	D-XEN, UE, RRRE, INGO
	Preparation of inventory of losses	D-XEN, UE, RRRE, INGO
	Market price survey	D-XEN, UE, RRRE, INGO
	Consultation with PAPs and other stakeholders	D-XEN, UE, RRRE, INGO
	Preparation of draft ARAP	D-XEN, RRS, RRRE
	Disclosure of final entitlement packages and of draft ARAP	D-XEN, RRS, RRRE, INGO
	Finalization of ARAP and its submission to JICA	PMO, D-XEN, RRS, RRRE
3.	**ARAP implementation phase**	
	Budget allocation and approval	PMO, RRS
	Disbursement of funds	PMO
	Payment of compensation to PAPs for land and other properties	D-XEN, RRS, RRRE, INGO
	Commencement of restoration and rehabilitation assistance	D-XEN, RRRE, INGO
	Advance notice to PAPs on schedule of clearing of land and resettlement	D-XEN, RRRE, DC, INGO
	Clearance of lands, and resettlement	DC, D-XEN, RRRE, INGO
	Monitoring of implementation status of ARAP	D-XEN, RRS, RRRE, INGO, EMA
	Overall monitoring of progress of land acquisition and resettlement activities	PMO, RRS
	Resolution of grievances of PAPs	GRC, RRS, RRRE, INGO
	Preparation of quarterly monitoring report	D-XEN, RRS, RRRE
	Submission of monitoring report to JICA	PMO

Legend: ARAP: Abbreviated Resettlement Action Plan; DC: Deputy Commissioner of Mymensingh District; D-XEN: Mymensingh District Executive Engineer; EMA: External Monitoring Agency; GRC: Grievance Redress Committee; INGO: Implementing Non-Government Organization; PAP: Project affected person; PIU: Project Implementing Unit; PMO: Project management Office; RRS: Rehabilitation and Resettlement Specialist; UE: Upazila Engineer

9.3 Implementation schedule

The standard implementation schedule of an ARAP is presented in Table 29. It is expected to take about nine months to complete the ARAP preparation and implementation, except for the external monitoring. At the detail design stage, the implementation schedule, with concrete date, for the subproject should be prepared.

Table 29 Implementation schedule of Abbreviated Resettlement Action Plan

No	Land Acquisition and Resettlement Activities	Start Date	Complet-ion Date	Duration (days)
1	Hiring, mobilization and deployment of INGO	1st of Month 1	30th of Month 1	30
2	Information campaign on a subproject and possible resettlement	1st of Month 2	30th of Month 8	240
3	Consultation and focus group discussion	1st of Month 2	30th of Month 8	240
4	Organization of internal monitoring team	1st of Month 1	15th of Month 1	15
5	Formation of GRC and other committees and teams	15th of Month 2	30th of Month 2	15
6	Preliminary screening survey based on detailed design of subproject	1st of Month 2	7th of Month 2	7
7	Implementation of a census survey, socioeconomic survey, and other surveys	15th of Month 2	15th of Month 3	30
8	Identification of entitled PAPs	15th of Month 2	15th of Month 3	30
9	Data processing, fixation of property value, and determination of individual entitlements	1st of Month 3	30th of Month 3	30
10	Agreement of entitlements with PAPs, and preparation of land acquisition documents, and an ARAP if necessary.	1st of Month 3	30th of Month 3	30
11	Preparation and submission of land acquisition and/or resettlement budget	15th of Month 3	15th of Month 4	30
12	Approval of land acquisition and/or resettlement budget by the LGED	15th of Month 4	30th of Month 4	15
13	Release of funds for compensation, and payment of compensation to PAPs, and provision of restoration and rehabilitation assistance	1st of Month 5	30th of Month 8	120
14	Documentation and resolution of grievances from PAPs	1st of Month 2	30th of Month 8	240
15	Consultation with PAPs on schedule of clearing lands, or relocation if necessary	1st of Month 5	30th of Month 5	30
16	Clearing of lands, or relocation if necessary	15th of Month 5	30th of Month 5	105
17	Training and income generation programs if necessary	1st of Month 5	30th of Month 8	120
18	Elaboration and submission of the completion report by INGO to the PMO	1st of Month 9	15th of Month 9	15
19	Award of civil work contract to subproject contractor, and the mobilization of the contractor	15th of Month 9	-	-
20	Post-resettlement and acquisition monitoring on the impacts of subprojects, and adequacy of the compensation and other entitlements	180 days after the 30th of Month 8		

Source: Survey team

10 Costs and budget

At the Preparatory Survey phase, it is not practical to accurately estimate land acquisition and resettlement costs for the subproject because a detailed design of the proposed UZR has not yet been determined. Provisional budget estimates for this ARAP, therefore, have been prepared based on the survey results. Provisional quantities of land, structures, and trees to be affected are indicated in the budget.

The budget includes: 1) compensation for land, structure, and trees, and relocation, and livelihood and income restoration and improvement; 2) administrative costs; 3) ARAP implementation cost; 4) all training costs for the PAPs including capacity building of LGED personnel; 5) monitoring cost; and 6) contingencies. This budget shall be updated by PMO under the assistance of the DSM consultants at the implementation stage. The total estimated budget for resettlement is BDT 3.59 million as shown in Table 30.

During the implementation stage, the INGO will help the DSM consultants and LGED to prepare the resettlement budgets for the subproject, covering all eligible losses and entitlements confirmed through the joint verification and determination of replacement price of properties by PVAT. This budget will be approved by the LGED through appropriate authorities and made available for the placement with the resettlement account of the LGED- PMU as per a requisition from the PD.

The LGED will be responsible for the timely allocation of the funds for the implementation of the ARAP. All costs for land acquisition, compensation, relocation and rehabilitation, administrative expenses, monitoring, consultant and INGO, and income and livelihood restoration assistance will be considered as an integral component of project costs, and timely disbursement of funds will be required for efficient ARAP implementation. The costs for consultations and the GRM will be covered under the operation cost of the INGO.

Table 30 Resettlement budget for the Mallikbari Bazar-Borchona Upazila road subproject

	Category of loss	Unit	Quantity	Rate in BDT	Amount in BDT
A. Compensation for land					
A-1	Homestead land	Decimal	0	0	0
A-2	Commercial land	Decimal	0	0	0
B. Compensation for structure					
B-1	Temporary structure	m^2	154.09	2,680	412,961
B-2	Semi-permanent structure	m^2	0	0	0
C. Compensation for trees					
C-1	Fruit trees				
	Small	Number	3	750	2,250
	Medium	Number	4	2,000	8,000
	Large	Number	3	5,334	16,002
C-2	Timber-wood trees				
	Small	Number	8	500	4,000
	Medium	Number	4	3,500	14,000
	Large	Number	1	5,000	5,000
Sub-Total (A-C)					**462,213**
D. Taxes/Fees @ 10% of the subtotal (A-C)					46,221
E. Other resettlement benefit					
E-1	Structure moving grants @10%/ m^2	m^2			41,296
E-2	Business restoration grant (3 month' net income)		16	15,000	240,000
E-3	Additional grant for vulnerable households	Number	5	5,000	25,000
Sub-total E					**306,296**
F. Rehabilitation cost					
F-1	Income restoration program			Lump sum	350,000
F-2	Training on IGA for vulnerable households			Lump sum	50,000
Sub-total F					**400,000**
G. EA capacity building training				Lump sum	200,000
H. Operation cost for INGO				Lump sum	1,500,000
I. Operation cost for EMA				Lump sum	500,000
Sub-total A-I					**3,414,730**
J. Contingency @ 5% of the subtotal (A-I)					170,737
Grand Total					**3,585,467**

Note: Price of the land, structure and tree are based on the PAP census, socioeconomic survey, and market price survey.

Attachment 1 List of project affected households with inventory of affected assets

	Name of Household Head	Father's name	Type of Impact					Land holding status	Vulnerability status
			Area of own land affected (decimals)	Number of own structure affected	Use of affected structure	Number of Rented Households	Number of trees affected		
1	Md. Shajahan	Late Jabed Ali Fakir	0	1	Shop/ business	0	5	Squatting on government land	Below poverty line
2	Gazi Maeen Uddin	Late Zoeen Uddin	0	1	Shop/ business	0	0	Squatting on government land	
3	Zulhash Uddin Khan	Late Moslem Uddin	0	1	Shop/ business	0	0	Squatting on government land	
4	Sunil Robi Das	Kalu Robi Das	0	1	Shop/ business	0	0	Squatting on government land	
5	Md. Abdul Aziz	Late Imtiaz Ali	0	1	Shop/ business	0	0	Squatting on government land	Below poverty line
6	Taj Uddin	Late Zoeen Uddin	0	1	Shop/ business	0	0	Squatting on government land	
7	Abdus Samad	Late Intaz Ali Bhuiya	0	1	Shop/ business	0	0	Squatting on government land	Disabled
8	Ashraf Ali	Md. Abdus Samad	0	0	Shop/ business	1	0	Squatting on government land	
9	Firoza Begum	Mojibor Rahman	0	1	Shop/ business	0	0	Squatting on government land	Woman
10	Md. Mayen Uddin	Late Shakim Uddin	0	1	Shop/ business	0	0	Squatting on government land	
11	Abdul Barek Hazi	Late Shukur Mahmud Hazi	0	1	Shop/ business	0	0	Squatting on government land	
12	Asgor Ali	Late Foyez Uddin	0	1	Shop/ business	0	0	Squatting on government land	Disabled
13	Md. Eshak Ali	Md. Afaz Uddin	0	1	Shop/ business	0	1	Squatting on government land	
14	Bonik Bohumukhi Somobai Somity	Anowar Hossen	0	1	Business owner association office	0	0	Squatting on government land	
15	Md. Abul Kashem	Eunous Ali Munshi	0	1	Shop/ business	0	0	Squatting on government land	
16	Md. Mostafa	Md. Abdus Sattar	0	1	Shop/ business	0	16	Squatting on government land	Below poverty line
17	Md. Romzan Ali	Md. Nazrul Islam	0	1	Shop/ business	0	1	Squatting on government land	

Supplementary Annex 4

Draft Abbreviated Resettlement Action Plan

Rampura Habibpur More-Mongalpur via Ketra GC and Ekoir GC Upazila Road in Birampur Upazila, Dinajpur District (Road Code: 127102002)

Abbreviations and acronyms

ARAP	Abbreviated Resettlement Action Plan
DC	Deputy Commissioner
DSM	Design, Supervision, and Monitoring
EC	Entitlement Card
FGD	Focus Group Discussion
GOB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HH	Household
INGO	Implementing Non-Government Organization
JICA	Japan International Cooperation Agency
JVT	Joint Verification Team
LGED	Local Government Engineering Department
MLGRD&C	Ministry of Local Government Rural Development & Cooperatives
NRRDLGIP	Northern Region Rural Development Local Government Improvement Project
PAH	Project Affected Household
PAP	Project Affected Person
PD	Project Director
PIU	Project Implementation Unit
PMO	Project Management Office
PVAT	Property Valuation Advisory Team
RPF	Resettlement Policy Framework
RRRE	Regional Rehabilitation and Resettlement Expert
RRS	Rehabilitation and Resettlement Specialist
SFYP	Sixth Five Year Plan
SMO	Supervision and Monitoring Office
UE	Upazila Engineer
UNR	Union road
UP	Union Parishad
UZR	Upazila road
XEN	Executive Engineer
ha	hectare
km	kilometer
m^2	square meter

List of local terms

Decimal	A unit of area approximately equal to 40.4686 m^2

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1 Background

1.1Background and rationale of the NRRDLGIP

The Government of Bangladesh requested the Government of Japan to provide funds for the project entitled the Northern Region Rural Development and Local Governance Improvement Project (NRRDLGIP). Accordingly, an agreement has been signed between the Government of Bangladesh and the Japan International Cooperation Agency (JICA) on November 21, 2011, to conduct a study towards preparation of the above project for implementation. The NRRDLGIP will be implemented by the Local Government Engineering Department (LGED) under the Local Government Division Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C). It is expected that successful implementation of this project will help achieve the poverty reduction target of the Sixth Five-Year Plan (SFYP) with substantially minimizing the regional disparities at a large extent. The proposed project area of the NRRDLGIP comprises of 14 Districts covering eight Districts under Rangpur Division, i.e., Dinajpur, Thakurgaon, Panchagarth, Rangpur, Lalmonirhat, Nilphamari, Kurigram, and Gaibandha, and six Districts in Mymensingh area of Dhaka Division, i.e., Jamalpur, Sherpur, Tangail, Mymensingh, Netrokona, and Kishoreganj.

The NRRDLGIP has two main components. Component 1 will develop basic rural infrastructures. Component 2 is further divided into two subcomponents. Subcomponent 2-1 will improve basic infrastructure and service delivery of Pourashavas, and Subcomponent 2-2 will enhance local governance and capacity development of Pourashavas. Component 1 and Subcomponent 2-1 will involve physical infrastructure work which may cause land acquisition and involuntary resettlement.

Component 1 will include the following infrastructure development: 1) upgrading of Upazila roads (UZR) and Union roads (UNR) including bridges and culverts; 2) rehabilitation of UZR; 3) improvement of Growth Centers (GCs) and rural markets; and 4) improvement of ghats.

Subprojects under Subcomponent 2-1 will not be determined at the preparatory survey phase. They will be selected through participatory approaches in the implementation phase of the Project. The eligible types of infrastructure works under the subcomponent may include: 1) improvement and rehabilitation of Pourashava roads, bridges, and culverts; 2) repair, rehabilitation, and expansion of drains; 3) improvement of municipal markets; 4) construction of slaughter houses; 5) rehabilitation and expansion of water distribution network and tubewells; 6) construction of public and community toilets; 7) construction of solid waste management facilities; 8) construction of bus and truck terminals; 9) installation of streetlights; 10) establishment of parking areas; and 11) basic infrastructures for the poor.

As part of the Preparatory Survey for the proposed NRRDLGIP, land acquisition and resettlement impacts have been investigated for two sample subprojects under Component 1, i.e., 1) Mallikbari Bazar-Borchona UZR in Bhaluka Upazila, Mymensingh District, and 2) UZR passing Rampura Habibpur More-Mongalpur via Ketra & Ekoir GC in Birampur Upazila, Dinajpur District. The draft Abbreviated Resettlement Action Plans (ARAPs) have been prepared for the two. This ARAP is the one for the latter sample subproject.

1.2 Overview of the ARAP

1.2.1 Background of the ARAP

The UZR subproject of Birampur Upazila has been surveyed covering at a length of about 9.98 km in August 2012. As a result of the preliminary screening, the subproject has been found to cause involuntary resettlement of less than 200 people and some land acquisitions. Therefore, this draft

ARAP has been prepared in accordance with the JICA guidelines for Environmental and Social Considerations (hereinafter the "JICA Guidelines") as well as other international good practices and the national laws and regulations.

To prepare this draft ARAP, a census and socioeconomic survey, targeting 100% of project affected households (PAHs), on their land and asset losses had been carried out using structured questionnaires in August 2012. During the surveys, detailed information on PAPs has been collected. Furthermore, additional information were collected and analyzed through consultations with local stakeholders including the PAPs.

It is noted that the precise impacts and relocation requirements due to the road subproject would be defined when the detailed design of the subproject has been completed. Since the detailed design of the UZR has not been determined yet at the Preparatory Survey phase, the losses of land and other assets and the extent of resettlement have been assessed based on the assumption that the UZR would be improved as per the LGED's design standards for rural roads, i.e., additional 1.8 m widening is required. This draft ARAP, therefore, must be updated in accordance with the actual designs to be determined after the commencement of the NRRDLGIP.

1.2.2 Objective of the ARAP

The objective of this draft ARAP is to ensure proper mitigation for all unavoidable negative impacts caused by the subproject implementation. This will include compensation for loss of assets, and assistance for the restoration and rehabilitation of the livelihoods of project affected persons (PAPs). The ARAP also provides a guideline on implementation of land acquisition in accordance with the JICA Guidelines and the national relevant laws and policies. The issues identified and addressed in this ARAP are as follows:

- Assessment of the type and extent of loss of land and other assets, loss of livelihood or income opportunities, and collective losses such as common property resources and social infrastructure;
- Identification of impacts on vulnerable groups and assessment of other social issues related to the subproject;
- Public consultation and people's participation in the subproject preparation and implementation;
- Development of the entitlement matrix, and provisions for restoration and rehabilitation assistance;
- Estimated cost for land acquisition, and resettlement and rehabilitation; and
- Clarification of the institutional framework for the implementation of the ARAP including grievance redress, and monitoring and evaluation mechanism.

2 Scope of land acquisition and resettlement impacts

2.1 Description of the subproject

The Rampura Habibpur More-Mongalpur via Ketra GC and Ekoir GC UZR subproject (road code: 127102002) is located in Birampur Upazila of Dinajpur District. The subproject covers the existing approximately 9.98-km long UZR that connects several markets and GCs, schools, and villages, and the other Upazilas of Dinajpur District. Figure 1 demonstrates the location of the road, and Figure 2 shows the current conditions of the UZR.

Out of the total 9.98 km of roads, about 2.23 km is earthen and the remaining 7.75 km is flexible pavement, most of which will require improvement with necessary widening for proper traffic movement. Proposed improvements of the road include 1) widening of the current 5.5 m embankment crest width up to 7.3 m as per the LGED's road standard, and 2) construction of a new all-weather

bitumen-surfaced pavement. These improvements will require additional land resulting from an average widening of 1.8-m crest width of the road. Widening of the road will be made either along one side of the present road alignment or on both sides of the alignment, depending on the road conditions. To avoid or minimize the resettlement impacts, appropriate ways of widening will be chosen at the detailed design phase.

Much of the additional lands required for the proposed development are both private and government land along the road. This subproject development will require relocation of some temporary small shops, and residential structures along the road. Trees are also required to be removed in some places.

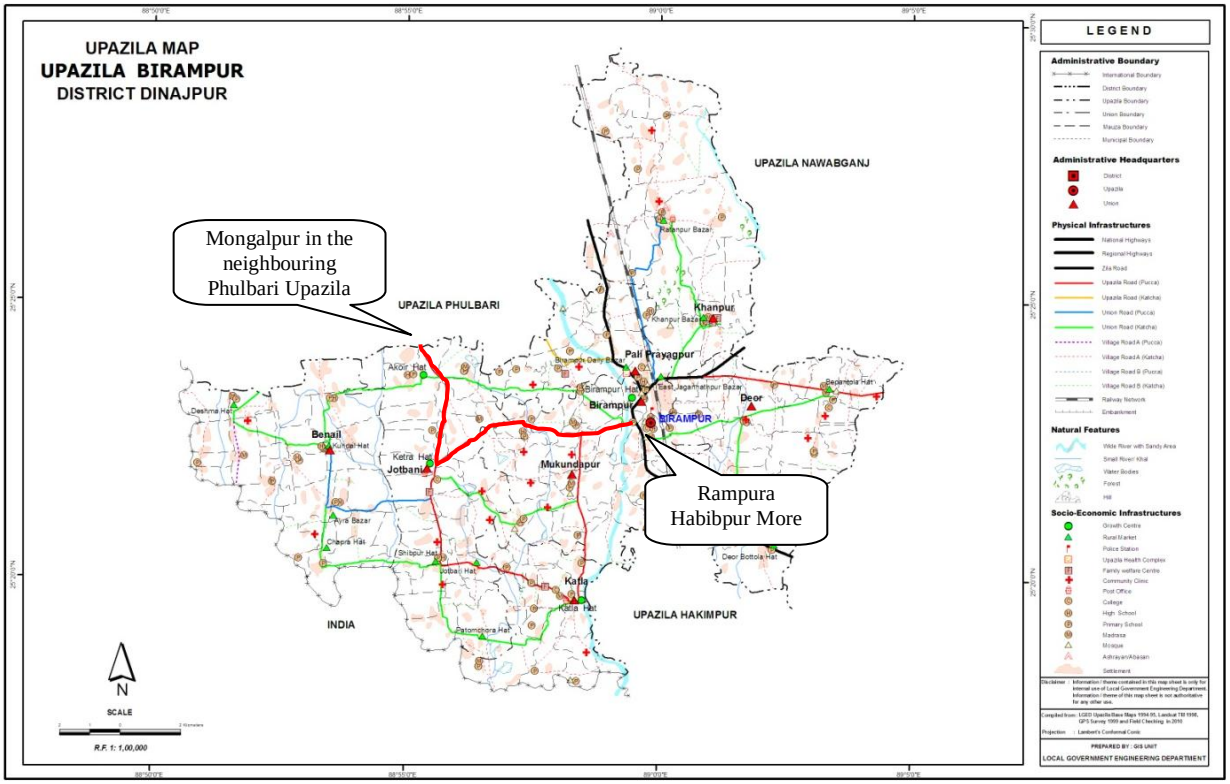

Figure 1 Location map of Rampura Habibpur More-Mongalpur via Ketra & Ekoir GC UZR

Figure 2 Views of Rampura Habibpur More-Mongalpur via Ketra GC and Ekoir GC UZR

2.2 Minimizing resettlement impact through design optimization

This sample subproject improvement works will have some adverse socioeconomic impacts, because a number of residence and small business structures and/or shops are expected to be relocated. The initial survey without optimization of the design to minimize impacts on structures and people found that 23 structures comprising 16 residential and seven business structures may be fully or partially affected. As a result, the development of subproject will require population displacement or relocation from their residences. However, by optimization of the design such as specifying widening on one side of the existing road, it may be feasible to reduce the number of structures to be affected, substantially reducing displacement of people from their residences and businesses.

2.3 Scope of land acquisition and associated impacts

The civil works for the subproject would be carried out on the existing 9.98-km long road alignment. The works will require additional lands mostly from the government-owned land and from the private land owners in a few cases. Considering the LGED's road design standard, the embankment crest width of the upgraded road should be 7.3 m. However, the existing crest width of the concerned road on an average is about 5.5 m. Hence, the average widening of 1.8 m will be required for the subproject.

The total land requirement for the proposed improvement of the road has been estimated at 2.5 hectares, comprising both government-owned and private land. Conservatively assuming, 2,500 m^2 per km will be required for the road improvement.

This sample ARAP has been prepared based on field surveys including a census and a socioeconomic survey on the PAHs and other establishments. The socioeconomic survey found that a number of residences, small shops and businesses, trees and other assets would potentially be affected due to the proposed improvement of the road.

A summary of these potential impacts based on the current surveys is indicated in Table 1.The list of PAPs with the inventory of affected assets is provided in Attachment 1 to this Supplementary Annex 4. It is expected that total 23 households with 101 people would be affected, and 2.5 ha of lands at most would be acquired by the road improvement.

Table 1 Summary of potential impacts by the subproject

Length of the road (km)	Crest width (m)	Area of affected land (decimal)	Number of affected structures	Number of households losing land	Number of households losing residence	Number of affected commercial structures	Number of affected trees	Number of PAPs
9.98	7.3	8.9	23	19	16	7	55	101

Source: Census & socioeconomic survey conducted in August 2012

3. Results of relevant surveys

A PAP census, a socioeconomic survey, a survey for inventory of losses, and a market price survey have been conducted to prepare this ARAP. Below describes the major results and findings of these surveys.

3.1 Details of the project-affected persons

3.1.1 Types of the PAHs and impacts

The implementation of the subproject is expected to require the acquisition of both private and

government-owned lands. As a result of the surveys, 19 households were found to be affected with their lands, and government-owned land along the road is to be acquired for the road improvement. There are four PAHs squatting on the government-owned land. Table 2 summarizes the ownership status of PAHs.

Table 2 Ownership of affected land

Type of land ownership	No of PAHs
Titleholder	19
Squatters/occupants of government land	4
Total	23

Source: Census & socioeconomic survey conducted in August 2012

Among the total 23 PAHs, 16 PAHs were found to be affected with their residences, and the remaining seven will be affected with their small shops and/or businesses. All of them must be physically displaced from their residences or shops and/or businesses.

In the context of small shops and businesses, three PAHs own the land and structure to be affected, and four PAHs are squatting on government-owned land having their business structures. Further details are in Table 3.

Table 3 Number of the PAHs by impact

Impact category	Male	Female	Total
Impacts on homestead land and houses	16	-	16
Impacts on commercial land and structure	3	-	3
Impacts on commercial structure (squatting on government-owned land)	4	-	4
Total	23	-	23

Source: Census & socioeconomic survey conducted in August 2012

3.1.2 Impacts on land and other assets

(1) Land

The subproject will affect 19 households having titled land ownership with total 8.9 decimal (0.036 ha)[1], which comprises 7.8 decimal homestead and 1.1 decimal commercial land. No agricultural lands or crop has been identified. Details of land to be affected are given in Table 4.

Table 4 Area of affected land

Type of land ownership	No of PAHs	Affected land area (decimal)
Titleholder	19	8.9
Squatters/occupants of government land	4	-
Total	23	8.9

Source: Census & socioeconomic survey conducted in August 2012

(2) Structure

The census found that 16 residential structures and seven small shops and/or businesses will be affected by the subproject. Structure areas of 123.0 m² in total associated with the 23 structures have

[1] Decimal is a unit of area commonly used in Bangladesh. One decimal is equal to approximately 0.004047 ha or 40.4686 m².

been found to be affected.

With respect to the construction materials of the affected structures, the survey identified that 12 structures, comprising 66.3 m², are temporary ones which are constructed with mud, wood and/or thatch. The remaining 11 structures, comprising about 56.7 m^2, are semi permanent ones constructed with tin roof wall and floor concrete. However, no permanent structure has been found among the 23 structures to be affected under the survey. Details of the affected structures are given in Table 5.

Table 5 Affected structures by use and construction materials

Use of Structures	Unit	Type of structure						Total PAHs	Total quantity (m^2)
		Temporary (mud, wood /thatched and tin)		Semi-permanent (tin roof ,wall/ floor concrete)		Permanent (concrete)			
		PAHs	Quantity	PAHs	Quantity	PAHs	Quantity		
Residence	m^2	10	56.0	6	28.8	0	0	16	84.8
Shops and business	m^2	2	10.3	5	27.9	0	0	7	38.2
Total		12	66.3	11	56.7	0	0	23	123.0

Source: Census & socioeconomic survey conducted in August 2012

(3) Trees

The census found that nine fruit trees and 55 timber and wood trees would be affected by the subproject. Different sizes of trees, i.e. small, medium, and large, were counted separately. Details are shown in Table 6.

Table 6 Number of affected trees

Type and size of trees	Number of affected trees
Fruit Trees	
Small	4
Medium	4
Large	1
Total	9
Timber/wood trees	
Small	2
Medium	51
Large	2
Total	55

Source: Census & socioeconomic survey conducted in August 2012

3.1.3 People associated with business

Out of the seven PAHs operating shops and businesses, five PAHs, including four squatters, are the owners of the structures. The remaining two PAHs are operating shops on a rental basis. Both groups will be provided with entitlements as per the entitlement matrix presented in the Resettlement Policy Framework (RPF). The entitlement matrix is enclosed in Section 4.3 in this ARAP.

All the owners of these shops and business structures will be entitled to compensation for their structures at replacement cost as per the entitlement matrix. In the context of compensation for the business losses, cash compensation equivalent to three month-net income from their businesses will be

provided based on the entitlement matrix.

The business operators who are renting their shops will also be entitled to the compensation for the business losses as per the entitlement matrix. The compensation will be equivalent to three months' net income from their shops or three months' minimum wage rates. The owners of the rental premises will also be compensated for his/her loss of rental income.

All the shops and businesses were family-run, and no employees are expected to be affected. However, this needs to be verified during the detailed design. Details of the affected businesses are in Table 7.

Table 7 Types of affected businesses and commercial activities

Type of Business	Number of PAHs
Owner operated shop	5
Rented shop	2
Total	7

Source: Census & socioeconomic survey conducted in August 2012

3.1.4 Details of vulnerable households

The PAHs headed by female or disabled persons, or persons below the poverty line are considered as vulnerable households[2]. The survey found that out of 23 PAHs, five are vulnerable. Four of them are PAHs below poverty line by income, and only one PAH is vulnerable due to physical disability. The surveys found no women-headed household among the 23 PAHs.

Table 8 Details of vulnerable households

Type of Vulnerability	Number of vulnerable PAHs
Women headed PAHs	0
Households headed by disabled person	1
Households below poverty line by income	4
Total Vulnerable PAHs	5

Source: Census & socioeconomic survey conducted in August 2012

3.1.5 Need for relocation

The proposed road subproject improvements will cause the dislocation of residences. The relocation of 16 households will be required due to the subproject.

In addition, there are seven business structures that will be affected, and the relocation of them will also be necessary. All efforts will be made, based on this ARAP, to mitigate negative social impacts on the PAPs and communities by supporting relocation of PAHs and by providing support to restoration of the pre-project level of income.

3.1.6 Resettlement and compensation

(1) Land

As described earlier, 19 PAHs are found to be affected with the loss of their lands. Land value to

[2] Income less than BDT 5,000 per household per month (BBS, 2001)

determine replacement cost at this stage has been calculated based on the census and socioeconomic survey as well as the land market price survey conducted in August 2012.

Based on the survey data, current prices of different types of land have been tentatively estimated as stated in Table 9. Average rates of homestead land and commercial land are BDT 96,250 and BDT 281,142, respectively[3]

Table 9 Tentative land prices of affected land

Type of land	Unit	Average rate (BDT)
Homestead land	Decimal	96,250
Commercial land	Decimal	281,142

Source: Census & socioeconomic survey conducted in August 2012

The exact land values will be determined by the Property Valuation Advisory Team (PVAT) during the implementation of the subproject.

(2) Structures

The current replacement cost of structure has been calculated based on the census and socioeconomic survey as well as the land market price survey. The tentative prices of temporary and semi-permanent structures per square meter considering construction materials are BDT 7,138 and BDT 20,903, respectively. However, the exact cost of replacing structure by type or construction materials will be determined by the PVAT during the implementation stage. Details of tentative unit rate of structures are given in Table 10.

Table 10 TDetails of tentative structure values of affected structures

Item	Unit	Rate (BDT)
Temporary structure (mud/wood/tin/ thatched)	m^2	7,138
Semi-permanent (tin roof, wall/floor concrete)	m^2	20,903

Source: Census & socioeconomic survey conducted in August 2012

(3) Trees

Average current market prices for each tree considering their sizes and types have been collected through the census and socioeconomic survey as well as the land market price survey. The results are in Table 11. The prices of trees would require updating through the appropriate authority during the implementation stage.

[3] A decimal is a unit of area approximately equal to 40.46 m².

Table 11 TNumber and tentative values of affected trees

Type and size of trees	Unit	Average value per tree (BDT)
Fruit Trees		
Small	Number	550
Medium	Number	1250
Large	Number	2000
Timber/wood trees		
Small	Number	550
Medium	Number	1494
Large	Number	1750

Source: Census & socioeconomic survey conducted in August 2012

3.1.7 Income compensation

Seven businesses will be affected under the subproject and most of them are small shops. Their monthly average income is BDT 15,166 with each value exceeding the national poverty line, i.e., USD 2 per day. Compensation will be given to each business operator equivalent to three months' net income, based on the entitlement matrix, in addition to any other entitlements such as compensation for structure loss and shifting allowances.

3.1.8 Special allowance for vulnerable affected families

Five PAH has been identified as vulnerable based on the survey. They should be given special entitlements in accordance with the RPF. More specifically, allowance equivalent to BDT 3,000 will be provided to these PAHs in addition to the other entitlements.

3.1.9 Significantly affected households

A total of 16 households will be affected in their residences, and seven will be affected in their shops and/or businesses. Their impacts are considered as significant, since their residential and business structures are to be relocated. Due to the relocation of residences, the PAHs must reconstruct their residences and may need to rebuild their livelihood basis in different places. Similarly, due to the relocation of shops and/or business structures, the business activities of the PAPs will be temporarily suspended, and eventually they will lose their income sources.

The PAHs affected with their residences or shops and/or business structure will be provided with compensations including cash compensation based on the market price of the structures, right to salvaged materials from structure for free, provision of all taxes, registration costs, and other fees incurred for replacement structure, and transfer and subsistence allowance of BDT 4,000.

In addition, the PAHs affected in their business structures will receive compensation equivalent to three months' net income. All PAHs may be entitled to the restoration and rehabilitation assistance where required.

3.2 Socioeconomic profile of PAPs

During the implementation phase of the NRRDLGIP, the DSM consultants will carry out a suitably optimized detailed design for the road improvement works in consultation with the executing agency, i.e., the LGED. This draft ARAP must be updated based on the latest information, since this has been prepared based on the assumption that the UZR will be widened by average 1.8 m, taking into account the LGED's design standards for rural roads. Based on the assumption, a census and a socioeconomic

survey, which covered 100% of potential PAHs, have been conducted, and the results were consolidated into this ARAP.

The objective of the surveys was to identify and quantify the number of potential PAPs, common property resources, and loss of land and other properties. The ultimate purposes of the surveys was to assess potential socioeconomic impacts on the people, identify different types of property losses, and restoration and rehabilitation assistance needs, and estimate the values of the losses in order to prepare the ARAP.

The information collected during the surveys includes the following: 1) a wide range of data including demographic variables; 2) socioeconomic profiles of the PAPs; 3) data on different types of land likely to be acquired, and their uses; 4) ownership status of affected properties; 5) market prices of land and other properties for the calculation of replacement costs; 6) community and civic facilities; 7) views, opinions and suggestions of the PAPs and local stakeholders; and 8) detailed information on the households and physical assets to be affected.

3.2.1 Population, religion and ethnicity of affected households

The census and socioeconomic survey identified 23 PAHs associated with a total of 101 PAPs. 52 (51.5%) are males, and 49 (48.5%) are females. The average family size of the PAHs is about 4.4 persons. The detailed demographic information is shown in Table 12.

Table 12 Population of project affected households by impact category.

Impact category	PAHs	Population		Total
		Male	Female	
Households with dwelling structures	16	33	34	67
Households with business structures	1	3	2	5
Rented business	2	5	3	8
Squatters with structures of business owners association	4	11	10	21
Total	23	52	49	101

Source: Census & socioeconomic survey conducted in August 2012

The survey found that all the PAHs belong to Muslim community. No indigenous people or ethnic minorities were found to be affected by the subproject.

3.2.2 Age and sex of the affected population

The survey found that sex ratio of the PAPs is 106:100, i.e., 106 men against 100 women. The survey found an equal sex ratio among all the age groups except the one belonging to the age below five. The survey also found that 63.4% of the population belongs to the working age group (16–60 years). Details of the age and sex of the PAPs are shown in Table 13.

Table 13 Gender and age distribution of the PAPs

Age group	Affected population by age and sex					
	Male	%	Female	%	Total	%
< 5 years	6	5.9	3	3.0	9	8.9
6-15 years	11	10.9	11	10.9	22	21.8
16-60 years	32	31.7	32	31.7	64	63.4
>60 years	3	3.0	3	3.0	6	5.9
Total	52	51.5	49	48.5	101	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.3 Educational status of the PAPs

In assessing the educational levels of the PAPs, only the population aged above seven has been considered. The survey reveals that the PAPs are mostly literate and only 14% are illiterate. The literacy rate among men is higher than the one among women: 88.4% for men against 83.7% for women. Details of educational levels of the PAPs are presented in Table 14.

Table 14 Level of education of the PAPs (population aged above seven).

Level of Education	Education of affected population by sex					
	Male	%	Female	%	Total	%
Illiterate	5	5.8	7	8.1	12	14.0
Can Sign Only	13	15.1	12	14.0	25	29.1
Can Read and Write	1	1.2	1	1.2	2	2.3
Primary	8	9.3	8	9.3	16	18.6
Below Secondary	10	11.6	9	10.5	19	22.1
Secondary	3	3.5	3	3.5	6	7.0
Higher Secondary	1	1.2	2	2.3	3	3.5
Graduation	2	2.3	1	1.2	3	3.5
Post Graduation	0	0.0	0	0.0	0	0.0
Total	43	50.0	43	50.0	86	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.4 Occupations

The heads of PAHs identified during the socioeconomic survey earn their livelihood from different sources. The principal occupation of the PAHs is business and agricultures, which constitute 34.8% and 26.1% of the PAHs, respectively. Other important occupations are day labor accounting for 17.4%, followed by driver and carpentry (8.7% each) and service (4.4%). Out of the total population of the PAHs, 38.4% was engaged in some sort of income earning activities. No women were found to be involved in any income earning activities. Table 15 presents an overview of the occupational profiles of the heads of PAHs and population of the households by sex.

Table 15 Occupational profile of the PAPs by sex (population aged above seven)

Occupation	PAH		Population of the affected households					
	Number of PAH	%	Male	%	Female	%	Total	%
Agriculture	6	26.1	10	11.6	0	0.0	10	11.6
Poultry/Hatchery	0	0.0	0	0.0	0	0.0	0	0.0
Business	8	34.8	10	11.6	0	0.0	10	11.6
Service	1	4.4	2	2.3	0	0.0	2	2.3
day labor	4	17.4	4	4.7	0	0.0	4	4.7
Rickshaw/Vanpooler	0	0.0	0	0.0	0	0.0	0	0.0
Electrician/Mechanic	0	0.0	1	1.2	0	0.0	1	1.2
Domestic Work	0	0.0	0	0.0	32	37.2	32	37.2
Student	0	0.0	10	11.6	11	12.8	21	24.4
Driver	2	8.7	2	2.3	0	0.0	2	2.3
Carpentry	2	8.7	4	4.7	0	0.0	4	4.7
Retired/Old age/Jobless	0	0.0	0	0.0	0	0.0	0	0.0
Others	0	0.0	0	0.0	0	0.0	0	0.0
Total	23	100.0	43	50.0	43	50.0	86	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.5 Income and poverty dimensions of the PAPs

Based on the total stated income, the PAHs have been classified broadly into five income groups. Table 16 shows the monthly household income of PAHs.

The survey found that out of 23 PAHs, four PAHs (17.4%) belong to the lowest income group of less than BDT 5,000 per month[4], and seven PAHs (30.4%) belong to the upper poverty line within the income level between BDT 5,001 to BDT 7,500. The survey also found that the remaining 12 households (52.1%) had income above BDT 10,000 per month with a little bit better income. The survey shows that nearly half of the PAHs comprising 47.8% belong to the low income group, earning less than BDT 7,500 per month.

Table 16 Monthly household income and economic status

Level of income	Number of PAHs (survey)	%
< 5,000	4	17.4
5,000–7,500	7	30.4
7,501–10,000	0	0.0
10,001–15,000	7	30.4
>15,000	5	21.7
Total	23	100.00

Source: Census & socioeconomic survey conducted in August 2012

3.2.6 Indebtedness of the households

The socioeconomic survey on 23 PAHs found that indebtedness is significant. 47.8% of the PAHs take loans from different sources. Details are given in Table 17.

Table 17 Status of indebtedness

Particulars	No. of AHs (survey)	%
Indebted Households	11	47.8
Non Indebted Households	12	52.2
Total	23	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.7 Assets possessions

Details of common household assets possessed by the sampled PAHs are stated in Table 18. The main common household assets possessed by the PAHs are mobile phone (65.2%) followed by cow (60.9%), chicken/farm/poultry (56.5%), TV (52.2%), cycle (43.5%), goat (34.8%), and rickshaw and/or van (30.4%).

[4] The approximate Bangladesh hard core poverty line (equivalent to USD 2 per person per day)

Table 18 Possession of durable goods (multiple responses)

Goods under possession	No. of PAHs	%
Radio	2	8.7
Cycle	10	43.5
TV	12	52.2
Computer	2	8.7
Freeze	2	8.7
Gas cylinder	1	4.4
Motor bike/scutter	2	8.7
Rickshaw/ Van	7	30.4
Boat/trawler	1	4.4
Phone/ Mobile	15	65.2
Solar Panel	1	4.4
Cow/bullock	14	60.9
Goat/sheep	8	34.8
Poultry	13	56.5
Others	3	13.0
Total Sample H/Hs	23	100.0

Source: Census & socioeconomic survey conducted in August 2012

3.2.8 Sources of drinking water and sanitation facilities of the PAPs

The main source of drinking water in the subproject area is hand tubewell used by all the 23 households. In connection to sanitation facilities, the survey reveals that 18 PAHs, comprising 78.3%, are using hygienic sanitary latrines, but most of the remaining five (17.3%) are using open latrine, and one PAH (4.4%) have no latrine. Details of sanitation facilities of the PAHs are given in Table 19.

Table 19 Type of sanitation facilities of the PAHs

Type of latrine use by PAPs	No. of AHs	%
Sanitary	18	78.3
Open	4	17.3
No Latrine	1	4.4
Total	23	100.00

Source: Census & socioeconomic survey conducted in August 2012

3.2.9 Illness

In connection with major illness of the PAH's members, the survey found that 18 out of 23 PAHs are reported to experience some sort of illness in the previous year. These illnesses included fever, diarrhea, dysentery, diabetics, hypertension, blood pressure, backache, heart/cardiac problem, kidney problem, and hepatitis. Details are given in Table 20.

Table 20 Illness among the family members of the PAHs

Illness of family members In the previous year	No. of AHs	%
Yes	18	78.3
No	5	21.7
Total	23	100.00

Source: Socioeconomic Survey, 2012

3.2.10 Type of fuel use by the PAPs

Among the surveyed PAHs, all of them have reported that they use firewood as the main source of fuel for cooking.

3.3 Gender issues

Consultations with the PAPs and the survey findings indicate that women play a vital role in household activities. Women said that they are unable to utilize their time fully due to indifference of the male members and absence of support for income-generating activities. Women are mainly housewives, and are not recognized income earners though they are extensively involved in household chores. Women have limited opportunities to work and there are hardly any women found involved in any gainful employment. However, a good number of women reported that they have good understanding with the male members of the households in making decisions of family affairs.

The survey and consultations with the PAPs reveals that the women play a vital role in household activities, and some women members of the PAHs are also found helping male members in agriculture, business, poultry and dairy rearing as an allied occupation in addition to household work. Moreover, an insignificant number of women were also found working as agriculture and daily labor, and a woman was found doing service. Details of women activities are stated in Table 21.

Table 21 Type of women's activities

Actives	No. of PAHs	%
Agricultural activities	7	30.4
Allied activities (diary/poultry rearing)	10	43.5
Trade and business	4	17.4
Agriculture labor	1	4.3
Non-agriculture labor	2	8.7
Handicrafts/ manufacturing	1	4.3
Service	1	4.3

Source: Census & socioeconomic survey conducted in August 2012
Note: The total number of households is 23.

The survey findings imply that women members of the community need assistance for more involvement in economic activities to support their families. The assistance may be required in the form of skill development training for rearing poultry and diary, kitchen gardening, tailoring, small business, and handicrafts. Moreover, during the implementation of the ARAP, the INGO will conduct needs assessment survey of the women in connection to income generating support, and support for them may be provided based on their needs as per the policy under the RPF.

4 Resettlement policy framework and entitlement

Adverse impacts identified in the survey as well as those which might be identified in the implementation phase shall be mitigated by following the principles and guidelines presented in the RPF. Several important issues on the field level including eligibility criteria, categories of PAPs, types of losses, and entitlement matrix are provided in this section for easy reference during the implementation of this ARAP.

4.1 Eligibility criteria

PAPs eligible to receive compensation and assistance to restore livelihood under the NRRDLGIP are individuals, households, communities, and private and public entities, regardless of the possession of legal title, who are residing, working in or cultivating lands and other assets that are acquired for subprojects as of the cut-off date. Furthermore, those who may be affected by temporary land acquisition and resettlement are also eligible for compensation for disruptions in their livelihood activities.

A detailed inventory of PAPs and scope of impacts must be prepared during the detailed design phase of subprojects, and finalized after the subproject sites and detailed designs are determined.

4.2 Categories of PAPs and types of losses

The PAPs under the NRRDLGIP are listed below.

- Persons whose land is being used for agricultural, residential, or commercial purposes and is in part or in total affected (temporarily or permanently)
- Persons whose structure is being used for residential, commercial, or worship purposes in part or in total affected (temporarily or permanently)
- Persons whose assets, other than land or structure, are partly or fully affected (temporarily or permanently)
- Persons whose business or source of income is in part or in total affected (temporarily or permanently)
- Persons whose annual or perennial crops and/or trees are affected
- Persons whose access to common property resources is affected (temporarily or permanently)
- Persons affected who belong to socially and economically vulnerable groups

It should be noted that the lack of legal rights to the affected assets does not hinder the entitlements under the NRRDLGIP.

4.3 Entitlement matrix

Based on the national laws and policies related to land acquisition, and the JICA Guidelines, the entitlement matrix for the NRRDLGIP is prepared. Table 22 shows the details of possible losses of PAPs and their entitlements and compensations for such losses.

Table 22 Entitlement matrix for the NRRDLGIP

No	Type of loss	Entitled Persons	Entitlement/ Compensation policy	Implementation issues/ Guidelines	Responsible organization
Loss of land					
1	Loss of agricultural land, pond, ditches, orchards and other lands or water bodies for production	- Legal owner of land	- Provision of replacement land with equal productive capacity satisfactory to PAPs - Cash compensation equivalent to replacement cost, and additional grant to cover the market value of land at market price - Refund of registration cost incurred for replacement land purchase at the replacement value* - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Assessment of type, quantity and quality of land or water body by JVT b) Assessment of replacement value of lands or water bodies by PVAT c) Updating of titles of the PAPs d) Refund of all taxes, registration costs, and other fees if land or water body is purchased within one year from the date of receiving full compensation for land e) Explanation to PAPs about their entitlements and procedures f) Identification of vulnerable households	a) DC, JVT b) EA, PVAT c) DC, EA, JVT d) EA e) EA f) EA
2	Loss of homestead, residential or commercial plots	- Legal owner of land	- Provision of replacement land with equal productive capacity satisfactory to PAPs - Cash compensation equivalent to replacement cost, and additional grant to cover the market value of land at market price - Provision of all taxes, registration costs, and other fees incurred for replacement land purchase at the replacement value - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Assessment of type, quantity and quality of land by JVT b) Assessment of replacement value of lands by PVAT c) Updating of titles of the PAPs d) Refund of all taxes, registration costs, and other fees if land is purchased within one year from the date of receiving full compensation for land e) Explanation to PAPs about their entitlements and procedures f) Identification of vulnerable households	a) DC, JVT b) EA, PVAT c) DC, EA, JVT d) EA e) EA f) EA
Loss of crops and trees					
3	Loss of perennial and seasonal crops, trees, or fish stocks	- Person with legal ownership of the land - Socially recognized owner - Unauthorized occupant of trees or fishes	- For seasonal crops, 60 days advance notice to harvest them. If harvest is not possible, cash compensation for crops (or share of crops) equivalent to prevailing market price - For perennial crops and fruit bearing trees, cash compensation based on annual net product market value multiplied by remaining productive years - For non-fruit trees for timber, cash compensation equivalent to prevailing market price of timber - For fish stocks, cash compensation equivalent to prevailing market price of fish	a) Formulation of work schedule to allow PAPs to harvest seasonal crops b) Identification of ownership of perennial and seasonal crops, trees, or fish by JVT c) Assessment of type, size, and quantity of trees, crops, or fish by JVT d) Determination of values of trees, crops or fish through market surveys by PVAT	a) EA b) EA, JVT c) EA, JVT d) EA, PVAT, Departments of Agriculture, Forest, and Fishery

No	Type of loss	Entitled Persons	Entitlement/ Compensation policy	Implementation issues/ Guidelines	Responsible organization
Loss of structure					
4	Loss of residential or commercial structure by owners	- Legal titleholder, owner of the structure	- Cash compensation equivalent to replacement value of the whole or part of structure - Right to salvaged materials from structure for free - Provision of all taxes, registration costs, and other fees incurred for replacement structure - Transfer and subsistence allowance of BDT 4,000 - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of ownership of structure by JVT b) Assessment of type, size, and quantity of structure by JVT c) Determination of values of structure through market surveys by PVAT d) Identification of vulnerable households	a) EA, JVT b) EA, JVT c) EA, DC, PVAT d) EA
5	Loss of residential or commercial structure by squatters and unauthorized occupants	- Squatters, informal settlers, and other unauthorized occupants	- Cash compensation equivalent to replacement value of the whole or part of structure - Right to salvaged materials from structure for free - Provision of all taxes, registration costs, and other fees incurred for replacement structure - Transfer and subsistence allowance of BDT 4,000 - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of ownership of structure by JVT b) Assessment of type, size, and quantity of structure by JVT c) Determination of values of structure through market surveys by PVAT d) Identification of vulnerable households	a) EA, JVT b) EA, JVT c) EA, DC, PVAT d) EA
Loss of livelihood					
6	Loss or decrease of business or rental income	- Proprietor of business - Owner of commercial structure	- Cash compensation equivalent to three months' net income from business or rental	a) Identification of proprietor or owner of commercial structure by JVT b) Assessment of business or rental income by JVT	a) EA, JVT b) EA, DC, JVT
7	Loss of income and work days due to displacement	- Household head or employees identified	- Cash compensation for lost income based on three months lost income or minimum wage rates - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of proprietor or owner of commercial structure by JVT b) Assessment of business or rental income by JVT c) Identification of vulnerable households	a) EA, JVT b) EA, DC, JVT c) EA
8	Relocation of community structure	- Community representative	- Compensation to reconstruct or relocate community structure	a) Identification of community structure by JVT b) Assessment of community structure by JVT	a) EA, JVT b) EA, DC, JVT
Impacts on vulnerable PAPs					
9	Impacts on vulnerable households	- Vulnerable households, including informal settler, squatters, women headed household	- Additional allowance equivalent to BDT 3,000 for loss of land or structure - Prioritized employment under the NRRDLGIP	a) Identification of vulnerable households	a) EA

No	Type of loss	Entitled Persons	Entitlement/ Compensation policy	Implementation issues/ Guidelines	Responsible organization
Temporary loss					
10	Temporary loss of access to cultivable land by owner cultivator. tenant/ sharecropper	- Legal owner of land - Tenant, sharecropper, and lessee - Unauthorized occupant such as squatter and encroacher	- 60-day advance notice - Provision of cash compensation equivalent to expected income earned from land during the duration of access loss - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of owner or other stakeholders by JVT b) Assessment of net income earned from land during the duration of access loss by JVT c) Identification of vulnerable households	a) EA, JVT b) EA, DC, JVT c) EA
11	Temporary loss of access to residential houses/ commercial structures by owners, rented or leased	- Legal owner of land - Tenant, sharecropper, and lessee - Unauthorized occupant such as squatter and encroacher	- 60-day advance notice - Provision of land rental value during the duration of access loss - Restoration and enhancement of affected land, structures and other assets. - Additional compensation and assistance for the vulnerable households (see No. 9)	a) Identification of owner or other stakeholders by JVT b) Assessment of rental value of structure with equal livelihood level by JVT c) Identification of vulnerable households	a) EA, JVT b) EA, DC, JVT c) EA
Any other loss not identified					
12	Unforeseen impact		- Documentation of unforeseen impacts, and elaboration of mitigation measures in accordance with this RPF.	a) Identification of unforeseen impacts through periodical monitoring	a) EA

Legend: EA=Executing Agency (i.e. LGED); DC=Deputy Commissioner: JVT=Joint Verification Team; PAP=Project affected person; PVAT=Property Valuation Advisory Team
Note: * Registration cost is usually about 10% of the sale value for the rural area

5 Stakeholder consultation, participation and information disclosure

5.1 Consultation and participation

During the Preparatory Survey for the NRRDLGIP, a series of consultation meetings were conducted with various stakeholders through formal and informal meetings in the vicinity of the proposed subproject site. Women and other vulnerable groups were also consulted on the subproject impacts and their livelihood aspects. The consultations aimed to identify the present status of the subproject site and the perceptions of the PAPs and other local stakeholders, and promote participation of the stakeholders in the implementation of the subproject. The feedback and observations from the stakeholders at the consultation meetings have been used in preparing the ARAP.

5.2 Stakeholder meetings

In the stakeholder meetings, the concept of the NRRDLGIP, the possible subproject plans, and land acquisition requirements as per various options were discussed with the potential PAPs. They were consulted for their perceptions on risks and consequences of the road development, views on alternative options, and beneficiary participation in the subproject cycle. The potential PAPs along with local community leaders and other stakeholders were consulted through focus group meetings and personal interviews. The inputs from them have been used to develop appropriate mitigation measures. This interactive approach need to continue during the implementation of the ARAP through the INGO. At this stage, three consultation meetings were held at three different places along the road alignment. The average number of participants in each meeting was about 20 people. The records of consultation meetings, and major findings of them are presented in Table 23.

Table 23 Summary of consultation meetings

Information on consultations	Issues discussed	Major findings of the consultations
Consultation Meeting # 1 Location: Habibpur Bi-Leteral High School Upazila: Birampur District: Dinajpur Date: 12 August 2012. Number of participants: 15 **Consultation Meeting # 2** Location: Betdighi UP Office Upazila: Birampur District: Dinajpur Date: 13 August 2012. Number of participants: 30 **Consultation Meeting # 3** Village: Vhellerpara Upazila: Birampur District: Dinajpur Date: 12 August 2012. Number of participants: 15	- Project information dissemination & briefed about the proposed NRRDLGIP project; - Goals and objectives of the project; - Different components of the project; - Necessity of the proposed road development; - People's perception about change impacts and their consequences in the area; - Name, location and nature of the proposed subproject; - Importance of the subproject in light of the subproject influenced area; - Roles of the local people in smooth implementation of the subproject; - Land availability for the subproject development; - Likely impacts both negative and positive; - Losses from the proposed subproject development; - Land acquisition issues; - Existing communication, transport, market, facilities, problems, prospects, etc. - Number of houses, community facilities, and social infrastructures likely to be affected/impacted; - People's attitudes and views regarding different losses and other associated impacts likely to be incurred, and consideration of measures to mitigate those impacts; - Expected benefits from the project in the short and long term; - Local people's needs and aspirations; and - Socioeconomic, demographic, poverty, living condition, quality of life aspects of the people under the subproject area.	- Most of the people are not aware of the project. However, when they learn about its development, all of them are pleased. - The participants are interested in the development of the road and are willing to support it whenever required. - The road improvement is highly unlikely to cause population displacement because most of the land along the road belongs to the LGED; - In spite of the losses, most of the participants are interested in the subproject and are willing to donate land for the road development without any compensation. - The people expect new sources of livelihood after the road improvement. - The participants demanded proper construction of the road using good quality materials to ensure longevity of the road. - Most of the participants will support and cooperate with the road development. - Some of the participants requested proper compensation for land and properties lost because of the subproject. - Many of the participants said that the structures used for commercial activities along the road are mostly on the government land and are willing to relocate. However, they also requested the concerned authority to consider their problems and help them restore their livelihood. - The community and religious properties affected, if any, must be compensated or relocated by the project authority to suitable location in consultation with the community people while taking necessary safety measures to preserve them. - The people were concerned about the compensation and requested that all the houses/shops/structures to be displaced get adequate compensation and advance notice before construction. - Proper measures should be taken for resettlement and rehabilitation of the affected persons/families by the project authority to restore livelihood and income lost by the project. - Increased income, employment and quality of life of people of the area through improvement in communication are expected through the road improvement. - Improved road will reduce time and cost of travel, increase mobility and access to bigger market centers for sale and purchase of goods, and will facilitate access to central/district level education, health services and other civic amenities. - People reported that there are no archaeological sites or any protected place in the vicinity of the project area. - Government Departments should work with the Implementing Agency or NGOs during the implementation of RAP. - Government should provide land to the landless people/squatters for their relocation. - The compensation should be based on the current market value, so that the PAPs can regain their lost properties. - The people support the project since they will be employed during the construction. - Requests for increasing facilities and amenities like drinking water or lighting during the construction phase - PAPs requested to employ local people especially those from the PAHs during construction of the project works. - Requests to get small local contractors to work on construction of this road - The people requested precautionary measures for road safety for travelers and pedestrians. - Income generating activities and skill development training for the illiterate women members among the PAPs are needed.

In general, there were strong support and positive responses, especially among the people of the subproject area, towards the proposed subproject development. The subproject will benefit the people of this area in the form of improved communication and road connectivity, enhanced transportation of goods to the market, better access to different community facilities, and smoother traffic movement under all weather conditions. It was perceived that the subproject would help increase the employment and income of people in different ways, therefore helping to alleviate poverty.

This interactive community consultation approach will continue during the implementation of this ARAP through the INGO. For information disclosure to the PAPs, a brochure on resettlement information will be prepared for the subproject, and then its copies will be distributed among the PAPs, providing background information on the subproject, entitlement matrix, and the due process in receiving resettlement benefits. The INGO will be responsible for distributing copies of the brochure among the PAPs, and will place copies at the concerned Union Parishad Office.


1 Meeting with stakeholders


2 Meeting with stakeholders


3 Meeting with stakeholders


4 Interview with a PAP


5 Interview with a PAP


6 Interview with a PAP

Figure 3 Pictures of stakeholders meetings and interviews

5.3 Steps to ensure stakeholders consultation

The LGED will constitute several committees or organizations for the implementation of the ARAP. They include the Joint Verification Team (JVT), PVAT, and Grievance Redress Committee (GRC) PAP representatives will be involved in the GRC to review and resolve disputes concerning compensation and other resettlement benefits.

The INGO will distribute brochures to explain the impact of the subproject, compensation policies for the PAPs including resettlement options and strategies, and the tentative implementation schedule of the subproject. Further steps will be taken 1) to keep the PAPs informed about resettlement and land acquisition plan, compensation policy and payments, and 2) to ensure that the PAPs will be involved in making decisions concerning relocation and implementation of the ARAP.

5.4 Public consultation and information disclosure

The ARAP will be made available to the PAPs and other stakeholders. It shall be disclosed at the

convenient place for PAPs, i.e., the District, Upazila, and Union offices. A summary of the ARAP will be prepared for the distribution to PAPs and other stakeholders. The status of disclosure will be reported to JICA.

6 Relocation and income restoration

6.1 Scope of displacement and relocation

According to the PAP census and socioeconomic survey, implementation of the subproject will require physical displacement of 16 residences and seven businesses and shops. Most of the affected owners of shops and businesses operate their businesses in temporary sheds made of corrugated iron sheet, wood, bamboo, and thatch. A total of 101 people are associated with the 23 PAHs.

6.2 Relocation of housing and establishment

The households, and shop and business owners or operators affected by the subproject will be provided with compensation and other entitlements including restoration and rehabilitation assistance. The entitlements will be provided as per the entitlement matrix. The LGED, with assistance of the Design, Supervision, and Monitoring (DSM) consultants, i.e., the Rehabilitation and Resettlement Specialist (RRS) and the Regional Rehabilitation and Resettlement Experts (RRREs), and the INGO, will provide the PAPs with entitlements, and may assist them to minimize the adverse impacts.

Several options can be considered for the resettlement, i.e., shifting the affected structures onto the remaining unaffected portion of the land, or shifting them to new plots. Whether the PAPs will need the LGED's assistance in relocation should also be confirmed. This will be confirmed and agreed with the PAPs in a series of consultation meetings and interview sessions.

6.3 PAPs' preference for relocation

During the census survey, the relocation choices of the PAPs were surveyed. Most PAHs prefer the self relocation on the residual land to continue their present livelihood. 17.4% have opted for self relocation onto new land they intend to purchase, and three households (13.0%) sought project assistance. Details are given in Table 24.

Table 24 Relocation choice of PAHs

Relocation choice of APs	Number of PAHs	%
Self relocation through purchasing new land	4	17.4
Self relocation on residual land	16	69.6
Project assisted resettlement	3	13.0
Total	23	100.0

Source: Socioeconomic census & survey August, 2012

6.4 Income and livelihood restoration strategy

Mitigation of loss of assets and livelihood is the main focus of the ARAP. In addition to the compensation, additional support will be provided to the livelihood restoration of PAHs, as identified in the census and socioeconomic survey (Table 25). Some PAHs will be relocated and will lose their residences or income from their business operation. Adequate compensation and other entitlements will be awarded to these PAHs before relocation. In addition, vulnerable PAHs will receive additional support, and get preference for employment in civil works under the subproject.

Table 25 Preferred income restoration assistance by the PAPs

Type of Assistance Sought	Number of PAHs	%
Employment in construction works	6	26.1
Loan/credit for income generating activities	14	60.9
Vocational training	2	8.7
Others (free input for production or at low cost)	1	4.3
Total	23	100.0

Source: Socioeconomic census & survey August, 2012

In compliance with the ARAP, the LGED will provide income restoration assistance, in addition to compensation. This will be provided as part of the gender and livelihood component of the NRRDLGIP. Other initiatives will also be considered, including the other ongoing government programs such as the LGED's rural road maintenance including the labor contracting society scheme, or NGO's programs including micro credit, vocational training, and other income generating activities.

Under the ARAP, the income restoration assistance will be provided especially for the vulnerable PAHs. The eligible members of such PAHs will get training on income generation programs such as small business, sewing and tailoring, handicrafts, poultry rearing, cow fattening and others. The LGED, with assistance of the RRRE and the INGO, will conduct a needs assessment survey among the vulnerable PAHs. Based on their needs, training programs for the particular groups will be selected. Special attention will be given to women headed households or vulnerable households having no adult male members to shoulder household responsibility, or vulnerable households losing more than 10% of their income sources due to the subproject development.

6.4.1 Approaches to income generation

A detailed plan for the income generation program will be designed by the INGO under the guidance of the PMO and the DSM consultants. The needs for skill development, capital support and marketing facilities will also be part of the income restoration program.

The short-term objectives of the income restoration program are to restore income of the PAPs during the periods immediately before and after the subproject implementation. The measures as per the ARAP include the following:

- Replacement of acquired property with market price at replacement cost;
- Employment in civil construction works;
- Employment on a priority basis in construction, transportation and maintenance of civic amenities; and
- Employment in the resettlement program to be implemented by the INGO.

In addition to the income restoration assistance support mentioned above, the INGO may undertake income generation activities for the restoration of income of the PAPs in the long run, depending on their needs. Such support will be provided as follows:

- Identification of target groups;
- Identification of involuntary resettlement activities;
- Training needs assessment;
- Identification of trainers or training agencies;
- Provision of training; and
- Participatory monitoring of the PAPs engaged in new vocations.

For the additional support, the INGO will specifically undertake the assessment of the needs and skill base of vulnerable PAPs aged between 15 and 60. Based on the assessment, the INGO will prepare a list of eligible members of vulnerable PAHs with their profile, and send the list to the RRS of the DSM consultants to arrange training programs for them. The short-term livelihood and income regeneration assistance under the ARAP and long-term income generation program under the livelihood restoration program may be organized as shown in Table 26.

Table 26 Livelihood restoration options

Eligible PAPs	Income Restoration Options
1. Members of poor PAHs earning maximum BDT 60,000 per year to be relocated due to the subproject	1-1. Short-term: Compensation for land and structure, shifting allowance, reconstruction assistance, and priority in employment in construction 1-2. Long-term: Needs and capacity identification, human development and skill training on income generation activities
2. Members of poor female-headed PAHs having no adult male members to shoulder household responsibility	2-1. Short-term: In addition to support described as 1.1, additional subsistence allowance 2-2. Long-term: Same as 1.2 above
3. Members of poor PAHs losing more than 10% of their income sources	3-1. Short-term: Compensation for lost assets, payment of other resettlement benefits, and employment in construction 3-2. Long-term: Same as 1.2 above

The INGOs responsible for the implementation of the income restoration program will work under the guidance of the PMO, the RRS, and the RRRE. The budget for the program is estimated as BDT 0.56 million.

6.4.2 Employment in construction

The PAHs will get preference in employment associated with the subproject construction works. The PAPs will be able to participate in or form a labor contracting society (LCS) with the help of the INGO, and may be deployed by the contractor in any suitable work. The employment opportunities in the semi-skilled and unskilled category shall be offered to the PAPs in preference to others. A clause is to be incorporated in the contract requiring contractors to provide the PAPs with the employment in the construction works.

6.5 Common property resources

According to the census and socioeconomic survey, no common property resources such as mosque, school, and other religious or cultural properties have been found to be affected by the subproject.

6.6 Social issues and development needs

According to the census and socioeconomic survey, 47.8% of PAHs belong to the low income group. In addition, four PAHs out of 23 are squatting on government-owned land, without land titles. Their social and economic status is, therefore, considered instable, and careful attention should be given to them in the resettlement and land acquisition process. In particular, five vulnerable PAHs will need special assistance to the income restoration. The INGO will prepare both the short-term and long-term income restoration assistance depending on the PAP's needs.

7 Grievance redress mechanism

7.1 General

The LGED shall establish a Grievance Redress Mechanism (GRM) to receive PAPs' grievances about the implementation of the ARAP. The GRM is intended to seek resolution of the grievances promptly without resorting to expensive and time-consuming legal procedures. This will enable PAPs to resolve any problems associated with the subprojects in a short time. However, it should be noted that the GRM shall not impede access of PAPs to the existing judicial or administrative remedies. PAPs shall be informed that they have a right to raise grievances against adverse impacts under the GRM.

7.2 Grievance Redress Committee

Under the GRM, a GRC shall be established for each or group of subproject that requires land acquisition and resettlement. The GRC receives all the grievances related to land acquisition and resettlement impacts such as right of ownership, entitlement to compensation and other assistance, and any other issues raised by the PAPs. The GRC for the subproject shall comprise the following members:

- Birampur Upazila Engineer, LGED - Convener
- INGO - Member Secretary
- Chairman of Mukundapur Union Parishad (UP), or designated UP member - Member
- Female UP member of Mukundapur Union - Member
- One representative from PAPs - Member

7.3 Procedure

Grievances of PAPs will first be brought to the RRRE or INGO. If any grievance is lodged only in verbal form, the RRRE or INGO shall write it down at no cost. Grievances not redressed by the RRRE and INGO shall be brought to the GRC. The GRC will meet every month, and determine the responses to individual grievances within 15 days upon the date of receipt.

If PAPs are not satisfied with the decision of the GRC, they can attend the next meeting to appeal for the reconsideration of the GRC decision. Grievances not redressed by the GRC will be sent to and addressed by the Inter-ministerial Steering Committee (ISC). If they are related to land acquisition, the Deputy Commissioner (DC) of Dinajpur District will address them. Further grievances will be referred by the PAPs to the appropriate courts of law. All grievances received shall be recorded, and the record shall include contact details of the complainant, the date of receipt of grievance, nature of grievance, agreed corrective actions and the date when the actions were effected, and final outcome. All expenses incurred in arranging grievance negotiations and meetings of GRC as well as logistics required, shall be arranged by the LGED.

Table 27 Procedures for grievance redress

	Concerning Land	Concerning structures and other assets
Step 1	PAP lodges a grievance to RRRE/INGO, who resolves it within 15 days upon receipt.	
	If no resolution is reached, then…	
Step 2	PAP lodges the grievance to GRC for resolution within 15 days. PAP can appeal in the next GRC if not satisfied with the decision of GRC.	
	If no resolution is reached, then…	
Step 3	PMO, PIU and/or GRC assists the PAP in lodging the grievance to ISC or DC. DC appoints an arbitrator under Section 27 of the ARIPO.	PMO, PIU, and /or GRC guide the PAP in lodging the grievance to the District Court.
Step 4	Arbitrator hears the grievances and renders decision within 30 days upon appointment. If the PAP is not satisfied with the decision of arbitrator, DC forms an Arbitration Appellate Tribunal.	The District Court will assess the merit of grievance and schedule the hearing. The decision of the District Court is final and binding.
Step 5	Arbitration Appellate Tribunal hears and assesses the merit of grievance. The decision is final and binding.	Not applicable.

Note: ARIPO: Acquisition and Requisition of Immovable Property Ordinance 1982; DC: Deputy Commissioner; GRC: Grievance Redress Committee; INGO: Implementing Non-Government Organization; ISC: Inter-ministerial Steering Committee; PIU: Project Implementing Unit; PMO: Project Management Office; PAP: Project-affected Persons; RRRE: Regional Rehabilitation and Resettlement Expert

8 Monitoring and reporting

8.1 Monitoring system

Under the NRRDLGIP, a monitoring system needs to be established to ensure the effective and efficient implementation of land acquisition and resettlement. More specifically, the objectives of the monitoring are to: 1) check if compensation, restoration and rehabilitation assistance, and other entitlements are sufficiently provided; 2) see if the standards of living of PAPs are restored or improved; 3) ascertain whether land acquisition and resettlement are implemented as per the schedule; and 4) identify problems and resolve them.

The two-tier monitoring mechanism will be established for this sample subproject in Dinajpur District. The first tier of the monitoring mechanism is at the field level. The Executive Engineer (XEN) of the LGED Dinajpur District Office is responsible for the field-level monitoring. Field-level data and information will be collected by them, and the RRRE and INGOs will help them to collect necessary data and information.

The second tier of the monitoring mechanism will be established at the PMO at the LGED headquarters. The PMO, under the assistance of the RRS at the PMO, will be in charge of overall monitoring and will check the compliance of field-level activities with this RPF and other relevant laws and guidelines. The PMO is also responsible for the reporting to JICA on the progress of land acquisition and involuntary resettlement.

In addition, an external independent monitoring will be conducted to see the social impacts of the subprojects, in particular whether entitlements are timely and sufficiently provided. This external monitoring will contribute to increase in the objectiveness and transparency of the monitoring and evaluation. For this purpose, an independent external monitoring agency (EMA) with experience in

resettlement and rehabilitation and restoration assistance will be engaged.

8.2 Monitoring at the LGED District Offices and Pourashavas

The LGED Dinajpur District Office will monitor the implementation status of land acquisition and resettlement activities. The RRRE and INGOs will help them with the monitoring.

The INGO, with guidance from the RRRE, will collect information on the progress of the ARAP. The progress of each activity listed in the ARAP will be checked by interviews and consultations with PAPs, sample on-site investigations, and other appropriate means. The collected information will be consolidated in a quarterly progress report by the LGED District Offices, and then the report will be submitted to the PMO. The report will contain the following: 1) accomplishments to-date; 2) objectives attained and not attained during the period of subprojects; 3) problems and challenges regarding land acquisition and resettlement; and 4) proposed countermeasures for the next quarter. Such information shall be described in a quantitative way as much as possible. The monitoring report will be integrated by the PMO into the progress reports of the NRRDLGIP to be submitted to JICA.

The indicators to be covered by the monitoring activities at the LGED Dinajpur District Office are listed in Table 28.

8.3 Monitoring by the PMO

The PMO is responsible for the overall monitoring on the progress of land acquisition and involuntary resettlement activities. It will verify the monitoring activities by the LGED Dinajpur District Office.

The PMO will basically check compliance with the ARAP and other relevant laws and guidelines. In particular, the PMO will assess: 1) subproject compensation and entitlement policies; 2) adequacy of organizational mechanism for implementing the ARAP; 3) restoration and rehabilitation assistance to PAPs; 4) complaints and grievances; and 5) provisions for adequate budgetary support by the LGED for implementing the ARAP. In the context of 3) above, the RRS at the PMO will assess whether PAPs have been received sufficient compensation and other entitlements, and whether they have reestablished their structures and livelihoods. The restoration of their income up to the pre-project levels will be focused in particular. The RRS will also appraise the accounting documents that record the payments of compensation to PAPs by the LGED.

Table 28 Monitoring indicators

Monitoring Issues	Monitoring Indicators
Budget and timeframe	- Have all land acquisition and resettlement staff been appointed and mobilized for field and office work on schedule? - Have capacity building and training activities been completed on schedule? - Are resettlement implementation activities being achieved against the agreed implementation plan? - Are funds for land acquisition and resettlement being allocated to the executing agency on time? - Have funds been disbursed according to the ARAP? - Has the land been made encumbrance free and handed over to the contractor in time for subproject implementation?
Delivery of PAP entitlements	- Have all PAPs received entitlements according to numbers and categories of loss set out in the entitlement matrix? - How many affected households have relocated and built their new structure at a new location? - Are activities related to income and livelihood restoration being implemented as planned? - Have affected businesses received entitlements? - Have the squatters and encroachers displaced due to the subproject been compensated? - Have the community structures (e.g., mosque, community organization) been compensated for and rebuilt at a new site? - Have all processes been documented?
Consultations, grievances, and special issues	- Have resettlement information brochures/leaflets been prepared and distributed? - Have consultations taken place as scheduled, including meetings, groups, and community activities? - Have any PAPs used the grievance redress procedures? - What grievances were raised? - What were the outcomes? - Have conflicts been resolved? - Have grievances and resolutions been documented? - Have any cases been taken to court?
Benefit monitoring	- What changes have occurred in patterns of occupation compared to the pre-project situation? - What changes have occurred in income and expenditure patterns compared to pre-project situation? - Have PAPs income kept pace with these changes? - What changes have occurred for vulnerable groups?

Source: Modified and adapted from ADB (2005). *Resettlement Planning Document: Second Rural Infrastructure Improvement Project.*

8.4 External Monitoring

The external monitoring, which will be conducted by the EMA, will focus on social impacts of the subproject on the PAPs, and status of entitlement provision to the PAPs. The EMA will be recruited from an independent consultant, academic research institution, or NGO which has enough experience in monitoring on land acquisition and involuntary resettlement.

The proposed timing of the external monitoring is the post-subproject phase, since the expected scale of land acquisition and resettlement is considered small. Such monitoring should be conducted six months after the completion of land acquisition or resettlement.

Through consultations with the PAPs and on-site investigations, the EMA will assess the socioeconomic conditions of the PAPs, and aftermath impacts. Perceptions of the PAPs on their received entitlements are also confirmed. Baseline information on PAPs' income and livelihood level will be properly referred in the post-subproject monitoring. Based on the monitoring, lessons learned from the land acquisition and resettlement activities will be derived, and they will provide important

feedback for future subprojects involving land acquisition and resettlement.

The RRS and the PMO shall provide necessary assistance, including the provision of field data and information and arrangement of field surveys, to the EMA.

8.5 Reporting Requirements

The Project Director (PD) will periodically prepare and send status reports to JICA on ARAP implementation by incorporating them in the Quarterly Project Progress Reports. A sample monitoring report format is given in the draft RPF. All relevant documents listed below shall be submitted, together with the Reports, by the PMO to JICA.

- A draft ARAP approved by the LGED before the subproject appraisal
- The final ARAP approved by the LGED after the PAP census has been completed
- An updated ARAP if updated during the subproject implementation phase
- Monitoring reports on land acquisition and resettlement

The RRS at the PMO will assist the PD in periodic reviews and supervision during the implementation stage. The RRS will assess the quarterly progress reports, which will be submitted by the LGED Dinajpur District Office through the LGED Dinajpur Regional office, and check the progress of all activities related to land acquisition and resettlement. The RRS will report the assessment results to the PD, and recommend necessary actions as appropriate.

The EMA is responsible for the post-subproject monitoring, and will elaborate a monitoring report. The report shall be submitted to both the PMO and JICA directly.

9 Institutional arrangements and implementation mechanism

9.1 Entities responsible for resettlement and land acquisition

For effective and efficient implementation of the ARAP, it is critical to institute a firm implementation arrangement. The LGED Dinajpur District Office is primarily responsible for the implementation of activities related to land acquisition and involuntary resettlement for the subproject in Birampur Upazila, Dinajpur District. It needs to take necessary actions, including constituting various organizations and mobilizing INGOs.

Relevant entities in relation to the preparation, implementation, and monitoring of the ARAP are presented below.

(1) LGED

The LGED is primarily responsible for overall activities related to involuntary resettlement and land acquisition. The PMO established in the LGED headquarters needs to perform primary responsibilities for activities related to involuntary resettlement and land acquisition. It will recruit the DSM consultant team, especially the Rehabilitation and Resettlement Specialists. INGOs will be also recruited for the implementation of activities on the ground, especially household surveys and consultations with PAPs. The DSM consultant will assist the PMO in overseeing the activities of INGOs.

The PMO will have supervisory roles, whilst the XEN of Dinajpur District will be responsible for the actual implementation of resettlement and land acquisition activities. The PMO will recruit a RRS at the PMO, and three RRRE who will assist the Dinajpur District XEN in preparing and implementing

the ARAPs.

The Dinajpur District XEN, with assistance of the RRS, RRRE, and INGOs, will implement the necessary actions. They will include disclosure of subproject information, detailed surveys on PAPs and other stakeholders, and consultation with PAPs, preparation and implementation of ARAPs. The monitoring reports on the progress of resettlement and land acquisition activities need to be elaborated by the Dinajpur District XENs, and be submitted to the LGED Dinajpur Region offices, which will subsequently submit it to the PMO. The reports will then be submitted to JICA for its approval.

The Upazila Engineers (UE) of Birampur Upazila will also support the Dinajpur District XEN, the RRREs and INGOs in conducting detailed surveys and providing other field-level assistance.

(2) DSM Consultants

The DSM Consultants will be recruited by the PMO to provide assistance to the PMO. They include a RRS at the PMO, and three RRREs at the regional level. The RRREs will be based in the Supervision and Monitoring Office (SMO), and will be in charge of land acquisition and resettlement issues. The RRREs shall support the PMO to ensure that all subprojects comply with the requirements of the JICA Guidelines in terms of involuntary resettlement and land acquisition. They are responsible for regular reviewing and updating of the RPF, assisting the LGED Dinajpur District Office in the preparation and implementation of the ARAPs, and monitoring on activities related to involuntary resettlement and land acquisition.

(3) Implementing Non-Government Organization

The INGOs with guidance and supervision of the RRS and RRRE will engage in the preparation and implementation of the ARAPs. The INGOs will work at the level of grassroots as a catalyst to interact with PAPs. They should have enough capacity to identify problems or complaints at the grassroots level, and assess the needs of PAPs for the restoration of income and livelihoods.

The main role of the INGOs is to assist the LGED at the field level in accordance with the guidance from the RRREs. The INGOs will assist the LGED in: 1) disclosure of subproject information; 2) public consultation meetings; 3) socioeconomic surveys on PAPs including those on the inventory of losses and replacement cost; 4) consultation with PAPs and other stakeholders; 5) processing the collected data for the preparation of ARAPs; 6) implementation of ARAPs including payment of compensation and entitlements, and restoration and rehabilitation assistance; and 7) monitoring on the implementation of the ARAPs. The sample questionnaires to be used in the surveys are presented in the RPF.

(4) Deputy Commissioners

The office of DC, Dinajpur District, will be responsible for land acquisition, in particular the assessment of affected assets under the ARIPO. It will appoint representatives as member of the JVT and PVAT for quantifying losses and determining valuation of affected properties. The LGED, RRS, RRREs and INGOs shall liaise with concerned DC offices to take necessary procedures.

(5) Relevant organizations for implementation of ARAP

The LGED shall constitute several committees or organizations for the implementation of the ARAP. They include the JVT, PVAT, and GRC.

a) Joint Verification Team

A Joint Verification Team (JVT) will be formed. The major responsibility of the JVT is to review the field data collected by the INGO together with the DCs' assessment on the loss of physical assets. The JVT will scrutinize the list of PAPs and affected assets, and verify and finalize the list through conducting joint verification activities. The entitlements of PAPs will be determined by using the assessment result of the JVT as one of the important determinants. The JVT will be a three-member body as shown below:

- Dinajpur District XEN: Convener
- Representative of DC office, Dinajpur District: Member
- INGO: Member Secretary

b) Property Valuation Advisory Team

A Property Valuation Advisory Team (PVAT) will be formed. The PVAT will determine the market price and replacement cost of lands or other affected properties. Based on the assessment of the PVAT, the compensation amount will be finalized. The PVAT will be comprised as follows:

- Dinajpur District XEN: Convener
- Representative of DC office, Dinajpur District: Member
- INGO: Member Secretary

c) Grievance Redress Committee

The Grievance Redress Committee (GRC) will be formed. Representatives of PAPs will be involved in the GRC to review and resolve disputes related to compensation and other resettlement entitlements. Details of the GRC are presented in Section 7.2.

9.2. Roles and responsibilities of relevant entities

Details on activities and responsibilities of the relevant entities described above related to the ARAP activities are presented in Table 29.

Table 29 Institutional roles and responsibilities

	Activity	Implementing/ Responsible entity
1.	**Detailed design phase**	
	Recruitment of RRS and RRREs	PMO
	Recruitment and mobilization of INGO	PMO, RRS
	Information disclosure on details of subprojects	D-XEN, RRS, RRRE, INGO
	Preliminary screening of land acquisition and resettlement	D-XEN, UE, RRRE, INGO
	Consultation with potential PAPs and local stakeholders	D-XEN, UE, RRRE, INGO
2.	**ARAP preparation phase**	
	PAP census and socioeconomic survey	D-XEN, UE, RRRE, INGO
	Preparation of inventory of losses	D-XEN, UE, RRRE, INGO
	Market price survey	D-XEN, UE, RRRE, INGO
	Consultation with PAPs and other stakeholders	D-XEN, UE, RRRE, INGO
	Preparation of draft ARAP	D-XEN, RRS, RRRE
	Disclosure of final entitlement packages and of draft ARAP	D-XEN, RRS, RRRE, INGO
	Finalization of ARAP and its submission to JICA	PMO, D-XEN, RRS, RRRE
3.	**ARAP implementation phase**	
	Budget allocation and approval	PMO, RRS
	Disbursement of funds	PMO
	Payment of compensation to PAPs for land and other properties	D-XEN, RRS, RRRE, INGO
	Commencement of restoration and rehabilitation assistance	D-XEN, RRRE, INGO
	Advance notice to PAPs on schedule of clearing of land and resettlement	D-XEN, RRRE, DC, INGO
	Clearance of lands, and resettlement	DC, D-XEN, RRRE, INGO
	Monitoring of implementation status of ARAP	D-XEN, RRS, RRRE, INGO, EMA
	Overall monitoring of progress of land acquisition and resettlement activities	PMO, RRS
	Resolution of grievances of PAPs	GRC, RRS, RRRE, INGO
	Preparation of quarterly monitoring report	D-XEN, RRS, RRRE
	Submission of monitoring report to JICA	PMO

Legend: ARAP: Abbreviated Resettlement Action Plan; DC: Deputy Commissioner of Dinajpur District; D-XEN: Dinajpur District Executive Engineer; EMA: External Monitoring Agency; GRC: Grievance Redress Committee; INGO: Implementing Non-Government Organization; PAP: Project affected person; PIU: Project Implementing Unit; PMO: Project Management Office; RRS: Rehabilitation and Resettlement Specialist; UE: Upazila Engineer

9.3 Implementation schedule

The standard implementation schedule of an ARAP is presented in Table 30. It is expected to take about nine months to complete the ARAP preparation and implementation, except for the external monitoring. At the detail design stage, the implementation schedule, with concrete dates, for the subproject should be prepared.

Table 30 Implementation schedule of Abbreviated Resettlement Action Plan

No	Land Acquisition and Resettlement Activities	Start Date	Complet-ion Date	Duration (days)
1	Hiring, mobilization and deployment of INGO	1st of Month 1	30th of Month 1	30
2	Information campaign on a subproject and possible resettlement	1st of Month 2	30th of Month 8	240
3	Consultation and focus group discussion	1st of Month 2	30th of Month 8	240
4	Organization of an internal monitoring team	1st of Month 1	15th of Month 1	15
5	Formation of GRC and other committees and teams	15th of Month 2	30th of Month 2	15
6	Preliminary screening survey based on detailed design of subproject	1st of Month 2	7th of Month 2	7
7	Implementation of a census survey, socioeconomic survey, and other surveys	15th of Month 2	15th of Month 3	30
8	Identification of entitled PAPs	15th of Month 2	15th of Month 3	30
9	Data processing, fixation of property value, and determination of individual entitlements	1st of Month 3	30th of Month 3	30
10	Agreement of entitlements with PAPs, and preparation of land acquisition documents, and an ARAP if necessary.	1st of Month 3	30th of Month 3	30
11	Preparation and submission of land acquisition and/or resettlement budget	15th of Month 3	15th of Month 4	30
12	Approval of land acquisition and/or resettlement budget by the LGED	15th of Month 4	30th of Month 4	15
13	Release of funds for compensation, and payment of compensation to PAPs, and provision of restoration and rehabilitation assistance	1st of Month 5	30th of Month 8	120
14	Documentation and resolution of grievances from PAPs	1st of Month 2	30th of Month 8	240
15	Consultation with PAPs on schedule of clearing lands, or relocation if necessary	1st of Month 5	30th of Month 5	30
16	Clearing of lands, or relocation if necessary	15th of Month 5	30th of Month 5	105
17	Training and income generation programs if necessary	1st of Month 5	30th of Month 8	120
18	Elaboration and submission of the completion report by INGO to the PMO	1st of Month 9	15th of Month 9	15
19	Award of civil work contract to subproject contractor, and the mobilization of the contractor	15th of Month 9	-	-
20	Post-resettlement and acquisition monitoring on the impacts of subprojects, and adequacy of the compensation and other entitlements	180 days after the 30th of Month 8		

Source: Survey team

10 Costs and budget

In the Preparatory Survey phase, it is not practical to accurately estimate land acquisition and resettlement costs for the subproject because a detailed design of the proposed UZR has not yet been determined. A provisional budget estimates for this ARAP, therefore, has been prepared based on the survey results. Provisional quantities of land, structures, and trees to be affected are indicated in the budget.

The budget includes: 1) compensation for land, structure, and trees, and relocation, and livelihood and income restoration and improvement; 2) administrative costs; 3) ARAP implementation cost 4) All training costs for the PAPs including capacity building of LGED personnel; 5) monitoring cost; and 6) contingencies. This budget shall be updated by PMO under the assistance of the DSM consultants at the implementation stage. The total estimated budget for resettlement is BDT 6.5 million as shown in Table 31.

During the implementation stage, the INGO will assist the DSM consultants and the LGED prepare the resettlement budgets for the subproject, covering all eligible losses and entitlements confirmed through the joint verification and determination of the replacement price of properties by the PVAT. This budget will be approved by the LGED through appropriate authorities and made available for placement with the resettlement account of the LGED- PMU as per requisition from the PD.

The LGED will be responsible for the timely allocation of the funds for the implementation of the ARAP. All costs for land acquisition, compensation, relocation and rehabilitation, administrative expenses, monitoring, consultants and INGO, and income and livelihood restoration assistance will be considered an integral component of project costs, and timely disbursement of funds will be required for efficient ARAP implementation. The costs for consultations and the GRM will be covered under the operation cost of the INGO.

Table 31 Resettlement budget for the Rampura Habibpur More-Mongalpur via Ketra GC and Ekoir GC Upazila road subproject

	Category of loss	Unit	Quantity	Rate (BDT)	Amount (BDT)
A. Compensation for land					
A-1	Homestead land	Decimal	7.76	96,250	746,900
A-2	Commercial land	Decimal	1.125	281,142	316,285
B. Compensation for structure					
B-1	Temporary structure	m^2	66.27	7,138	473,035
B-2	Semi-permanent structure	m^2	56.69	20,903	1,184,991
C. Compensation for trees					
C-1	Fruit trees				
C-1-1	Small	Number	4	550	2,200
C-1-2	Medium	Number	4	1,250	5,000
C-1-3	Large	Number	1	2,000	2,000
C-2	Timber-wood trees				
C-2-1	Small	Number	2	550	1,100
C-2-2	Medium	Number	51	1494	76,194
C-2-3	Large	Number	2	1750	3,500
Subtotal (A-C)					**2,811,205**
D. Taxes/Fees @ 10% of the subtotal (A-C)					281,121
E. Other resettlement benefit					
E-1	Structure moving grants @10%/ m^2	m^2			165,803
E-2	Business restoration grant (3 month-net income)		7	15,000	105,000
E-3	Additional grant for vulnerable households	Number	5	5,000	25,000
Subtotal E					**295,803**
F. Rehabilitation cost					
F-1	Income restoration program			Lump sum	505,000
F-2	Training on IGA for vulnerable households			Lump sum	50,000
Subtotal F					**555,000**
G. EA capacity building training				Lump sum	200,000
H. Operation cost for INGO				Lump sum	1,500,000
I. Operation cost for EMA				Lump sum	500,000
Subtotal (A-I)					**6,143,129**
J. Contingency @ 5% of the subtotal (A-I)					307,156
Grand total					**6,450,285**

Note: Price of the land, structure and tree are based on the PAP census, socioeconomic survey, and market price survey.

Attachment 1 List of project affected households with inventory of affected assets

	Name of Household Head	Father's name	Type of Impact					Land holding status	Vulnerability status
			Area of own land affected (decimals)	Number of own structure affected	Use of affected structure	Number of rented households	Number of trees affected		
1	Md. Mukul Hossen	Md. Mustafizur Rahman	0	1	Shop/ business	0	4	Squatting on government land	
2	Md. Anowarul Islam	Md. Sekendar Ali	0	1	Shop/ business	0	0	Squatting on government land	
3	Delowar Hossen	Late Veku Mia	0	1	Shop/ business	0	0	Squatting on government land	
4	Sekendar Ali	Late Faez Uddin	0	1	Shop/ business	0	0	Squatting on government land	
5	Golam Mostafa	Late Ataullah	1.50	1	Residence	0	50		
6	Md. Haque Shaheb	Late Ataullah	0.12	1	Residence	0	1		
7	Md. Ansar Ali	Late Md. Asad Ali	0.12	0	Residence	1	0		
8	Md. Touhidur Rahman	Late Abul Kashem	0.90	1	Shop/ business	0	0		
9	Abdul Hakim	Late Idris Munshi	0.11	1	Residence	0	0		Disabled
10	Abdul Latif	Late Idris Munshi	0.11	1	Shop/ business	0	0		
11	Abdul Motin	Late Idris Munshi	0.15	1	Residence	0	0		
12	Md. Moncher Ali	Late Asad Ali Mondol	0.80	1	Residence	0	0		
13	Md. Hafizur Rahman	Late Kholil Mondol	0.25	1	Residence	0	2		
14	Nasir Uddin	Late Kashemuddin	0.10	0	Shop/business	1	0		
15	Md. Abul Kalam	Md. Zoimuddin	0.12	1	Residence	0	0		
16	Mozammel Mondol	Late Kofil Uddin	0.50	1	Residence	0	0		Below poverty line
17	Mahtab Uddin	Late Hossen Uddin	0.50	1	Residence	0	0		
18	Md. Mokhlesur Rahman	Late Mokbul Hossen	0.25	1	Residence	0	0		Below poverty line
19	Md. Moksedur Rahman	Late Mokbul Hossen	0.50	1	Residence	0	6		Below poverty line
20	Md. Shofikul Islam	Md. Amir Ali Mondol	0.25	1	Residence	0	0		
21	Md. Abdul Latif shah	Late Arief Uddin Shah	0.60	1	Residence	0	0		
22	Md. Korban Ali	Md. Abbdus Samad	0.50	1	Residence	0	1		
23	Md. Rohomot	Late Abdul Karim	1.50	1	Residence	0	0		Below poverty line