

No.



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
JAMUNA MULTIPURPOSE BRIDGE AUTHORITY (JMBA)

*The Feasibility Study of
Padma Bridge in
The People's Republic of BANGLADESH*

FINAL REPORT

Volume 7

ENVIRONMENTAL AND SOCIAL/RESETTLEMENT STUDIES

MARCH, 2005



NIPPON KOEI CO., LTD.

in association with



CONSTRUCTION PROJECT CONSULTANTS, INC.

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**The Feasibility Study of Padma Bridge
Final Report
(Vol. 4 Topographic Survey and Geotechnical Investigation)**

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Appendix 11 Environmental Studies

Chapter 1 Environmental Considerations for Initial Screening

1.1 INTRODUCTION

1.1.1 Steps of the Environmental Study

The steps of the environmental study implemented for the Padma Bridge Feasibility Study are as follows:

- Environmental assessment of the Padma river eco-system in relation to the initial screening,
- Initial Environmental Examination (IEE) for two preferred sites,
- Environmental Impact Assessment (EIA) for the selected site, and
- Preliminary Environmental Management Plan (EMP) to counteract the negative impacts.

1.1.2 Time Frame of the Environmental Study

The time frame of the various environmental studies within the JICA Feasibility Study is shown in the Figure. 1.1.1. Environmental studies their target and output are shown below. The last 3 steps will be conducted after the Feasibility Study.

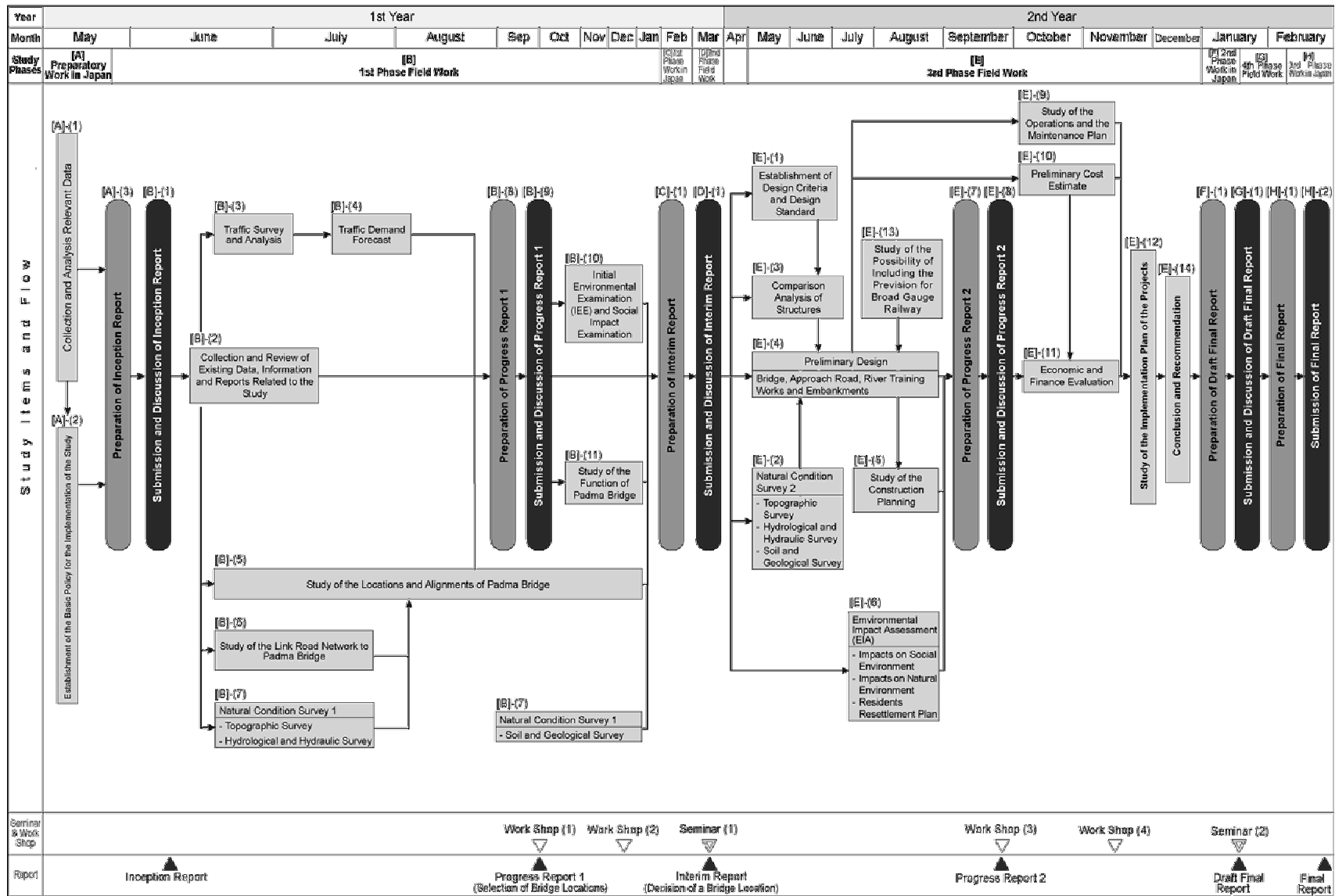


Figure 1.1.1 Study Flow Diagram

Stage	Environmental Activity	Target	Output
Initial Screening (Selection of 2 preferred sites from 4 conceivable sites)	Environmental assessment for initial screening	1. To identify critical issues like ecological park, ethnic minorities, habitat of endangered species, etc. 2. To identify difference in environmental settings among 4 sites 3. To estimate difference in anticipated impacts among 4 sites	1. Compare 4 sites
Final Site selection (selection of final site from 2 preferred sites)	Initial Environmental Examination (IEE) for two preferred sites	1. To identify possible critical impacts 2. To compare 2 sites from environmental aspect	1. Whether the project can go ahead or not 2. Compare 2 sites
Study on selected site	Environmental Impact Assessment (EIA) for the selected site	1. To identify impact 2. To propose possible mitigation measures 3. To prepare a framework of EMP	1. Whether any major change in project component is required or not 2. Whether negative impacts are mitigable or not
Detail design	Environmental Management Plan (EMP)	1. To prepare mitigation plan 2. To prepare EMP implementation plan 3. To estimate EMP implementation cost	1. Fix the mitigation plan 2. Fix the implementation schedule and institutional arrangement 3. Fix the monitoring plan 4. Estimate the cost
Construction	Implementation of EMP	1. Implement mitigation measures 2. Monitor parameters 3. Revise EMP, if required	1. Mitigation measures implemented. 2. Monitoring data available
Post construction	Monitoring	1. Continue monitoring 2. Take steps if required	1. Environmental friendly sustainability

1.1.3 Approaches to the Environmental Studies

Environmental impacts due to the construction of the bridge can be classified into two major groups, natural and socioeconomic. Some of these impacts are positive and some are negative. There are two conventional ways of impact assessment. One is to identify the activities and try to find out their impacts. The other is to identify different environmental issues and try to find out which activity would influence each issue and to what extent. In this Study, both approaches are used.

In this Study, mainly Bangladesh guideline and JICA guideline are followed. However, other guidelines are also consulted.

1.2 ENVIRONMENTAL LAWS AND GUIDELINES

1.2.1 Environmental laws of Bangladesh

There are a number of environmental laws and regulations in Bangladesh. These include:

- Environmental Pollution Control Ordinance (1977)
- Environmental Policy (1992)
- Environmental Conservation Act (1995)
- Environmental Conservation Rules (1997).

In these regulations, there are Environmental Quality Standards (EQS), emission standards, and EIA requirements.

(a) Environmental Pollution Control Ordinance – 1977

Formal concern at the national level for the state of the environment in Bangladesh can be traced back to 1972 as importance of environmental conservation is stated in the Constitution of Bangladesh. The first step was the passage of the Water Pollution Control Act in 1973. In order to expand the scope of environmental management and to strengthen the powers for achieving it, the Government issued the Environmental Pollution Control Ordinance in 1977. The Ordinance provided for the establishment of an Environmental Pollution Control Board, which was charged with formulating policies and proposing measures for their implementation. However, no such Board has been formed till to date. An Implementation Cell was entrusted with the actual implementation of the policy measures of the Board, which started working in 1977. In 1982 the Cell has been re-structured and renamed as the Department of Environment (DOE).

(b) Environmental Policy – 1992

The objectives of Environmental Policy are:

- To maintain ecological balance and overall development through protection and improvement of the environment,
- To protect the country against natural disasters,
- To identify and regulate activities which pollute and degrade the environment,
- To ensure environmentally sound development in all sectors,
- To ensure sustainable, long term and environmentally sound use of all natural resources, and
- To actively remain associate with all international environmental initiatives to the maximum possible extent.

Policies towards realization of the overall objectives of this Environmental Policy are described in 15 sectors. One of these is transport and communication. The sector policy states,

- Ensure that road, rail, air and inland water transport systems do not pollute the environment or degrade the resources. Conduct EIA before undertaking related projects.
- Ensure that vehicles and people using roads, rails, air and inland waterways do not pollute the environment and take steps to protect health of the workers running these transports.
- Control activities in inland ports and dockyards which cause pollution of water and the local environment.

Based on the Policy, an Environmental Action Plan was also prepared in 1992. The Plan identified specific tasks to achieve the objectives of the Policy for each sector and assigns the responsibilities to specific agencies.

(c) Bangladesh Environment Conservation Act - 1995 (including Amendment 2000)

This Act was established to promote environmental conservation, to develop environmental quality standards, and to abate and control environmental pollution. DOE under the Ministry of Environment and Forest is the Regulatory Body responsible for enforcing the ECA.

The Environment Conservation Act is currently the main legislative document relating to

environmental protection in Bangladesh. The Act repealed the earlier Environment Pollution Control Ordinance of 1977. The main objectives of the Environment Conservation Act are conservation and improvement of the environment, and control and mitigation of environmental pollution.

The main strategies of the Act are:

- Declaration of ecologically critical areas and restriction of operations and processes which can be conducted or cannot be initiated in ecologically critical areas
- Regulation in respect of vehicles emitting smoke harmful to the environment
- Prevention of damage to eco-system
- Establishment of procedures for environmental clearance
- Regulation of industrial activities and other development activities, and issuance of discharge permits
- Promulgation of standards for ambient quality of air, water, noise and soil for different areas for different purposes
- Promulgation of standard limits for discharging and emitting wastes
- Formulation and declaration of environmental guidelines

Amendment 2000 to the act actually stiffens penalties for non-compliance with the Act.

(d) Environment Conservation Rules - 1997

While not a direct Act of Parliament, these are the first set of Rules promulgated under the Environment Conservation Act - 1995. Rules are hardly approved by the Parliament. However, according to Section 20 of the Environment Conservation Act, the Government is empowered to formulate Rules for the purposes mentioned in Section 20, by a Gazette notification. The Rule making power is mainly exercised to avoid the pretty long procedure of law making and keep pace with changed circumstances avoiding such procedure.

DOE under the Ministry of Environment and Forest is the Regulatory Body responsible for enforcing the ECR. Among other things, these Rules establish:

- The National Environmental Quality Standards for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust, etc.
- Requirement for and procedures to obtain environmental clearance.
- Requirement for Initial Environmental Examination (IEE) / Environmental Impact Assessment (EIA) according to various categories of industrial and other development interventions (i.e., Green, Amber A, Amber B and Red categories).

For the purpose of granting environmental clearance certificate, industrial units and projects has been divided into four categories depending upon environmental impact and location. These are defined as Green, Orange A, Orange B and Red, where Green denotes the lowest anticipated impacts and Red denotes the highest anticipated impacts. Road construction / reconstruction / extension (regional, national, & international) and Bridge construction / reconstruction / extension (length 100 meters or over) are classified as category Red. Accordingly, Padma bridge construction is under category Red.

According to the Rules, any project/development intervention of the red category must obtain environmental clearance in two steps:

- To obtain site clearance based on an application along with necessary papers, including the IEE, which will contain the scope of work of the proposed EIA, and Relocation plan, if any.

- Obtain environmental clearance by submitting the application along with necessary papers, and after obtaining final approval of the EIA report.

The Department of Environment is allowed up to 60 days to issue the site clearance from the date of receiving the application, 60 days to approve the EIA, and 30 more days to issue the environmental clearance, provided all necessary requirements have been met.

This may be a lengthy process if DOE uses the full extent of the time limits. However, the Rules provide the Director General a discretionary authority to grant environmental clearance to an applicant, exempting the requirement of site clearance, provided the DG considers it appropriate.

1.2.2 Guidelines to be followed

(a) Bangladesh Guideline

According to the Environmental Conservation Act (1995) and Environmental Conservation Rules (1997), a three tier approach is to be followed, namely, screening, IEE and EIA. The screening is based on several criteria such as type of project, its size and location. As per ECR, 1997, there are four categories, Green, Orange A, Orange B, and Red. All projects in Orange B and Red categories have to conduct IEE. The detailed EIA study should be focused on addressing issues which remained unresolved in the IEE.

The following format is recommended for IEE:

- Introduction
- Project description
- Description of existing background environment around the project site
- Potential significant impact (both during construction and operational phases)
- Mitigation and abatement measures
- Residual impacts (if any)
- Monitoring program
- Summary and conclusions

The structure of EIA report is:

- Environmental base map
- Describe features of land use, physical resources, biological resources, economic development, socioeconomic status, quality of life and environmentally sensitive area
- Environmental impacts and mitigation (Major findings of IEE, Detailed examination of unresolved issues, Evaluation of impacts)
- Environmental Management Plan (Technical aspects, Management organization, Environmental monitoring program)
- Summary and conclusions

(b) JICA Guideline

Japan International Cooperation Agency (JICA), the agency conducting this Feasibility Study has an environmental guideline (Environmental Guidelines for Infrastructure Projects, September, 1992). The guidelines consist of 13 sectors. The present project has relation with a number of sectors, namely, Roads (sector 3), Railways (4), River and erosion control (5), Regional development (10) and Transportation development (12). According to this guideline, there is specific format for the site description, screening, and scoping. There are sector specific comprehensive matrixes, checklist scoping matrix and evaluation form. All

matrix and checklist covers social environment, natural environment and pollution.

JICA revised this guideline in order to meet the changed global scenario and published the new “Guidelines for Environmental and Social Considerations” in April 2004. Some of the major focuses of the new guideline are information disclosure, consultation with local stakeholders and compliance with the guideline.

In principle, the recipient governments disclose information about environmental and social considerations of projects. JICA itself discloses important information at the main stages of the project. The information to be disclosed also includes that of the project itself. Regarding the methods of information disclosure, the following ways can be adopted:

- meeting with local stakeholders
- website
- reports for public reading
- leaflet in local language.

In this new JICA guideline, all projects were divided into 3 categories and Padma bridge project can be placed in category A, requiring rigorous evaluation.

(c) JBIC Guideline

Japan Bank for International Cooperation (JBIC) has an environmental guideline for its appraisal of a project (JBIC Guidelines for Confirmation of Environmental and Social Considerations, April, 2002). As a potential donor for the implementation of this Project, that guideline will be consulted. There are 4 categories of projects under this guideline. Road, railway and bridges are included in category A. For category A, borrowers must have to submit EIA report. In addition to the checklist for road, railway and bridges provided in this guideline, it is also mandatory to complete official procedure of the host country, when assessment procedure already exist in the host country.

The environmental items in this guideline for a bridge project are as follows:

- EIA and environmental permits
- Explanation to the public
- Air quality
- Water quality
- Noise and vibration
- Protected area
- Ecosystem
- Hydrology
- Topography and geology
- Resettlement
- Living and livelihood
- Heritage
- Landscape
- Ethnic minorities and indigenous people
- Impacts during construction
- Monitoring

(d) Other Guidelines

Guidelines of other donor agencies are also consulted considering potential funding for the implementation of the project. For example, guidelines of ADB and WB are reviewed.

In this Study, mainly Bangladesh guideline and JICA guideline are followed. However, other guidelines are consulted.

(e) **Environmental Quality Standards (EQS)**

The DOE has prepared a comprehensive EQS, not only applicable to water quality and industrial effluents, but to a wide range of parameters related to pollution emission and the receiving environment. These EQS and, whenever relevant international EQS will be applied for the present study. The EQS values, relevant to Padma Bridge project are presented in relevant sections and can be found in Vol X: Supporting Studies.

The Padma Bridge Project will follow standards relevant to:

- Process standards (raised due to human activities)
- Emission standards (to reduce environmental stress)
- Emission and zoning standards (to maintain environmental quality)

The setting of standards can follow two approaches, source-oriented approach and the impact-oriented approach. The standards in the source-oriented approach attempt to prevent and reduce environmental burdening/stresses, while in the impact-oriented approach the standards are aimed to prevent or reduce the impacts. In this Study both approaches is used, depending on the activity.

1.3 RECONNAISSANCE SURVEY

In the beginning of the Study, four possible river crossing locations were conceived from the technical ground. Districts and Upazilas involved with these four sites are shown in the following table along with the area and population of the concerned Upazilas.

Site	River Bank	District	Upazila	Area (Sq. Km)	Population
Paturia –Goalundo	Left	Manikganj	Shibaloy	199.07	143,842
	Right	Rajbari	Goalundo	149.03	91,675
Dohar – Charbhadrasan	Left	Dhaka	Dohar	161.49	175,842
	Right	Faridpur	Charbhadrasan	141.59	69,876
Mawa – Janjira	Left	Munshiganj	Lauhaganj	130.12	153,433
	Right	Shariatpur	Janjira	239.53	157,316
Chandpur – Bhedarganj	Left	Chandpur	Chandpur Sadar	?	396,872
	Right	Shariatpur	Bhedarganj	267.28	207,258

Source: Bangladesh Population Census 1991 – Community Series

The Study Team members in charge of Environmental Issues made extensive field investigations in all four sites and adjacent areas. In addition, all relevant secondary data was analyzed. Based on these analyses, initial assessments on environmental issues are presented in this chapter. Initial environmental assessment for four alternative sites and Padma River eco-system was conducted between May and July, 2003 and was presented in the Progress Report (1) in September, 2003.

Padma is a braided river. Its width varies from 5 to 15 km. The general topography of the area in the vicinity of Padma River is flat. The soil of the Project area mainly consists of recent Holocene alluvial deposits. The materials are mostly sediments transported by the river. The Project area is located in sub-tropical monsoon fed region. Most of the vegetation are of secondary forest and cultivated crops. A significant number of people live in the Project influence area. The main economic activities are agriculture, fisheries, small trading and day labor. There are many chars within the river and some of them are habited. Overall

landscape features along the Padma River watershed are monotonous.

The environmentally influence zone of the proposed Padma Bridge is set approximately 10,000 sq km. The strip is about 100 km long along the Padma River. The starting point of the strip is the confluence of the Jamuna River and upper Padma near Aricha ghat and continues to the downstream confluence with Meghna River at the Chandpur near Haimchar. The width of the influence strip is 100 km, perpendicularly 50 km from the center of the Padma River to both riverbanks. The influence zone is shown in the Figure 1.3.1. This influence zone covers 16 districts partially or fully. These districts are Manikganj, Dhaka, Munshiganj, Chandpur, Tangail, Gazipur, Narshindi, Narayanganj, Comilla, Shariatpur, Madaripur, Faridpur, Rajbari, Magura, Narail, and Gopalganj.

Members of the Study Team made field reconnaissance of the influence zone a number of times to anticipate environmental scenario of the area. The survey concentrated on the proposed four crossing sites of bridge. Information on land use pattern, such as, land type, trees and vegetation, cropping pattern, settlement pattern, mosques/temple, institutions, cultural values, including flooding occurrence, riverbanks stability and its tributaries, associated channels, etc. within the study area are collected during the field observation.

The Padma River originates from the southern slopes of Himalayas with the name as Ganges and after crossing from India to Bangladesh, it is known as Upper Padma River. About 200 km downstream from Indian boarder, it joined with Jamuna River. From this confluence river changes its direction and joins with Meghna River at Chandpur. This 120 km stretch is named as Padma River. Generally the Padma River has high current and velocity during monsoon season and becomes very ferocious and wild. Riverbank's erosion and accretion are taking place on Padma River watershed as a common phenomenon. From the main stream of river, a number of tributaries, channels and canals are developed. Arial khan is one of the biggest distributaries on the right bank of the Padma River at Shibchar thana in Madaripur District.

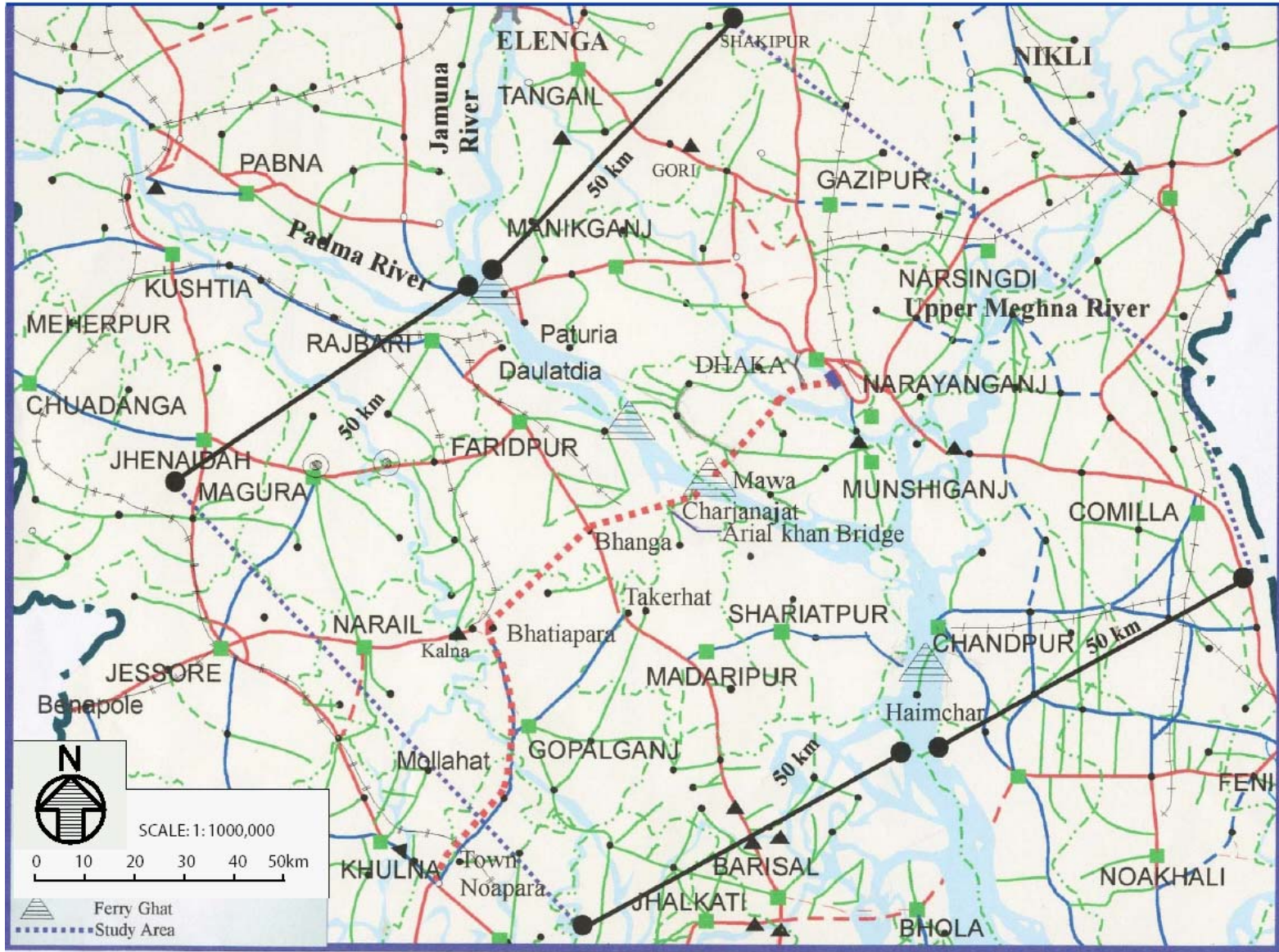


Figure 1.3.1 Environmentally Influence Zone of the Proposed Padma Bridge

A number of chars have developed along the main stream of the Padma River. Settlement and secondary vegetation have started to develop in many of the aged chars such as Char Daulatdia, Char Bhadrasan, Shibchar, Char Janajat, etc. Seasonal flooding is a common phenomenon in the char lands and floodplains adjacent to the banks of the Padma River. Tidal influence of the Padma River varies from upstream to downstream of the mainstream. Tidal flow in the upstream is comparatively lower than downstream. Field investigation indicated that tidal influence is 3-6 inches at Goalando and Charbadrasan. At Bhedarganj and Ibrahimpur, tidal flow difference is about 2-3 feet. Maximum tidal difference of about 4-6 feet was noticed at Chandpur ferryghat site.

Vegetation along both the banks is mainly of agricultural crops and homestead vegetation, which includes fruit tree, timber, bamboo bush and dhoincha bush. Field investigation indicated that afforestation or/community plantation is partly started by the Department of Forest and some NGOs in Janjira Upazila. Major cropping pattern in the char area are paddy, nut, potatoes, jute, chilly, onion, sugarcane etc. Paddy cultivation is mainly IRRI rice and boro rice. Huge amount of onion and chilly are cultivated at the char lands and floodplain lands in Janjira. Jute and sugarcane are mainly grown in Bhedarganj and Chnadpur sites. In addition to these, rabi crops such as green vegetables, pulse, mustard, etc. are also grown in the floodplain lands along the Padma watershed.

Economic condition of the people of the left bank side is more prosperous than the right bank of the Padma River. During the field visit it was noticed that Chandpur site is rich compare to other sites of the proposed bridge locations. Maximum houses corrugated iron sheet as roof and walls. The people of Bhedarganj site and Chrabhadrasan site in Shariatpur and Faridpur districts respectively are poor and a large majority of houses are thatched/hut.

Four crossing sites for the Padma Bridge are proposed at the narrow width sections of the main stream of the Padma River within the study area. A detail description of the landscape pattern of the four proposed crossing sites of the Padma Bridge is given below based on the field reconnaissance.

i) Site 1: Paturia-Gualando

This is a narrow river section located downstream of the Jamuna–Ganges confluence to connect Paturia ferry port on National highway N7-at left bank in Manikganj district with Goalando ferry port on National highway N5 at the right bank in Rajbari district.

Paturia landing site:

The proposed landing site is situated about 2 km downstream from the Paturia ferry crossing in villages named Dorikandi and Noakandi, at Arua union under Shibalaya Upazila in Manikganj district. Proposed landing site is marked about 1 and half km away from main river stream. Dorikhandi khal is located near the river and Ichamati River is located at about 0.5 km east side and connected with the main Padma stream at about 15 km downstream. Low lying inundated agricultural floodplain lands observed along the main river. Major cropping pattern is paddy (IRRI rice), nut, potatoes and vegetable. Farming is main occupation of the people in this area. An old mosque is located at a close distance from the marked pillar of the proposed Site. A number of homesteads are developed within the village. A few Hindu families are living in this village and two temples are observed. There is no high school or college. Only one primary school is located about 1 km away from the proposed site. Sanitary toilet was not found in any homestead within the village. Some tubewell waters are identified as Arsenic contaminated. Dense vegetation, homestead trees (fruit and timber), bamboo bush, date fruit are grown within the area. During 1988 and 1998 flood all villages was inundated under about 0.75 m water. The flood duration was about 3.0 months. Except rural kacha road, no other road is present in this area. It was informed that

huge number of migratory birds come to this place and there is a Natural Resources Management Project in this area operated by International Conservation Union (IUCN).

Gualando landing site:

The proposed landing site is located at Hasenmollapara village and Uttar Daulatdia village, Char Dauladia union in Gualando Upazila under Rajbari district. This site is about 3 km away from Gualando ferry crossing. During field visit the Padma River is found about 2 and half km away from this village. One large wetland (beel) is located in between this village and Padma River bank char. The main river stream is behind this char. This char land is cultivable. Major crops are IRRI rice, Aman rice, nut and vegetables. There is no primary school, high school, college, mosque and other religious institution within area. One primary school is located far away at Gualando growth center. Agriculture is main occupation of the people in this area. Some people are involved in rickshaw pulling and small business such as grocery shops, stationery shops and restaurants at the Gualando ferry ghat. Sanitary toilet is not found in any homestead within the village. Five percent of the tubewell water is identified as Arsenic contamination. The area was flooded during 1988 and 1998 flood, the earthen road near this location (village approach road) was inundated about 1.5 m and flood duration was about 2.0 months. Usually the area flooded every year during monsoon and inundated about 0.5 m. About 12 km long BWDB embankment is located 4 km away from the proposed site at Gualundo.

ii) Site 2: Dohar-Char Bhadrasan

This proposed site for the Padma Bridge is located at the narrow section of the Padma River strip downstream of Site 1. No national highway or regional road network is developed at both sides of this proposed landing site.

Dohar landing site

Landing site is proposed at Srikrishnapur village, Mahmudpur union under Dohar Upazila in Dhaka district. A new ferry facility to cross the Padma is under construction at this site by RHD named, Kartikpur ferry ghat. By the side of the Padma river, a char is developed named Jhaow la-kanda char. In between this char and Kartickpurghat, at Srikrishnapur village one canal is located. There a few number of shops at new ghat. Agriculture is the main occupation of the people here. Some people are involved in fishing and other businesses. It was informed that water from many shallow tubewells of this area is identified as arsenic contaminated. Sanitation facilities are also not found in good condition. Although agriculture is the main occupation of the people but economic condition of these people is good, because some members of most families are working overseas. Adjacent to this landing site Narisha bazar area was flooded during 1988 and 1998 flood and the road was inundated about 0.3 m. The flood duration was about 1.0 month. Existing road was constructed as BWDB embankment. About 1.0 km upstream Sadarbepari khal and 1.5 km downstream Mokshedpur khal passes from this location. No riverbank erosion occurred here from several years.

Char Bhadrasan landing site

The proposed landing site is located at Gopalpurghat, Kalasi dangi village, Charbhadrasan union in Charbhadrasan Upazila under Faridpur district. Presently the Padma River is stable and no erosion occurred after 1990. Before that, this area was eroded by the Padma river flow and a number of villages were totally eroded. Tidal influence at this site is about 3 inches between high and low tides. This area was flooded during 1988 and 1998 flood and flood water comes near the road top. The flood duration was about 20 days. Flood control embankment was located at 0.7 km apart from the riverbank and totally damaged during 88

flood. There are primary school, high school and college in the Upazila head quarters, located about one and half km away from Gopalpurghat. Main occupation of this area is fishing and agriculture. Local peoples are poor and destitute due to riverbank erosion. A few settlements are grown up here and all houses are hut type. Water from 5-10% tubewells are identified as Arsenic contaminated. All households along the riverbanks have open toilets. During field visit a number of fishermen are found preparing fishing net. Different type of nets are used by the fishermen such current net (prohibited under the law), dong net, moi net for catching Hilsha, Pangas and miscellaneous fishes.

iii) Site 3: Mawa-Janjira

The proposed site is located at narrow section of the Padma River close to Mawa ferry ghat to connect National highway N8 on both banks.

Mawa landing site

This proposed landing site is located at Chanderbari village and Wari village under Kumarbhog union close to Shimulia bazar under Louhaganj Upazila in Munshiganj district. This is about 2 km downward from the existing Mawa ferry ghat. People of this Kumarbhog union are comparatively prosperous than other sites. Overall all households have sanitary toilet but 90% tubewell water are found Arsenic contaminated. There are primary school and high school. Field investigation also indicated that mosques and madrasas are present. Adjacent to the proposed landing site a large char is developed along the Padma River within Louhaganj, Dheutia and Kumarbhog unions. Presently this area is inundated but during dry season approximate 20-25 family used to live on the char land temporarily. Economic condition of this people is not good. Paddy, potatoes and nut are major crops in the char land. Upstream of this location Srinagar bazar area was flooded during 1988 and 1998 flood and existing road was inundated up to about 1.0 m. The flood duration was about 1.5 month. A khal/canal passes near the bazar area and join with the Padma River about 6 km downstream. The major crops are Irri rice, Aman rice and vegetables.

Janjira landing site

This proposed landing site is located at Majhirkandi village, Piyenpara mauza, Purbo Naodouba union, Janjira Upazila under Shariatpur district. Along the riverbanks the villages are eroding each year by the Padma bank erosion. Tidal influence in this area is about 6 inches between high and low tides. Local people are poor and destitute people due to riverbank erosion. A few settlements are grown up here. Field investigation indicated that a few households have sanitation toilets and about 30-40% tubewells are identified as arsenic Contaminated. Major crops are chilly, tomato, paddy and nut. Bangladesh Forest Department and some NGOs are started afforestation program/community forestation along the riverbanks. During 1988 and 1998 flood, all homesteads and lands were inundated about 1.0m. The flood duration was about 1.0 month.

iv) Site 4: Chandpur-Bhedarganj

This site is located at the narrow river section at downstream of the Meghna- Padma junction at Chandpur to connect R140 at left bank and R860 at right bank.

Chandpur landing site

This proposed landing site is located at Horina ferryghat, Gobinda village, Thanachar union under Chandpur Upazila in Chandpur district. The confluence point of Padma and Meghna is about 7.0 km upstream from this location. More than 30 shops including some restaurants are located at the ferryghat. Major occupation of the people of this area is agriculture and

businesses. Paddy, onion, potatoes, etc. are cultivated on the very low-lying lands in this area. Many fishermen communities are living in the villages along the riverbank. The site was flooded during 1988 and 1998 flood and the homesteads near the riverbank were inundated about 1.0m. The flood duration was about 2 weeks. Economic condition of the people of this area is found rich compare to other sites of the proposed bridge location. Maximum houses are of tin roof and tin walls together with dense homestead vegetation. There are primary school and high school in Gobinda village. Water from 80% of the tubewells was identified as Arsenic contaminated. Most of the toilets are sanitary and a few are open. Truck terminals are located near this ghat. Huge siltation is occurring at the riverbed and one dredger is digging the riverbed regularly to maintain navigation of the river. Field investigation indicated that during dry season river becomes almost dried up and sometimes only one ferry can move depending on the high tidal flow. Tidal influence at this site is about 6-7 ft between high and low tides. Tributary from the Meghna River named Dakatia River passes from here to the Chandpur district. Harina khal is connected with this river and goes toward east. Approximately 9 km long flood protection embankment is located at 2 km east from riverbank to Dakatia riverbank. Most of this embankment is damaged due to riverbank erosion. One char named Horinachar is developed about 500 m away from the proposed site. Mostly dhoincha vegetation and partly paddy are grown here.

Bhedarganj landing site:

The proposed landing site is located at Norshingapur village, Char Sensas union in Bhedarganj Upazila under Shariatpur district. The existing ferry ghat is located at Bala bazaar river. Bala bazaar river is connected to Padma and the ferry ghat is about 200 m inside. During the day five to six up and down ferry services are available here. After this river a char named Berachakichar is located in main Maghna River. There are 4-5 charlands developed within the Maghna river stream. Among them Mirzapur char and Harina village are cultivable. The area was flooded during 1988 and 1998 flood and inundated about 0.3 m on road top. Bara chaki khal is connected to the Padma river at about 1.0 km upstream and the Padma and the Meghna river confluence is about 8 km upstream from here. High current and wave velocity are found in the river stream. Boulders were placed at some places to protect the bank from erosion. One BIWTA Launch terminal is under construction at about 1 km away from the Norshingapurghat in Ibrahimpur Upazila under Chandpur district. IRRI rice, jute, chilly are the major crops in this area. Agriculture is main occupation of the people over here. Some people are also involved in fishing and other business.

1.4 INITIAL EVALUATION OF FOUR ALTERNATIVES

Bangladesh is a densely populated country and the natural terrestrial ecosystem is mostly lost by the exploitation of this huge population. Therefore, the impacts related to the construction and operation of the bridge primarily affect the conditions and livelihood of the people in the direct vicinity. The bridge will also certainly affect natural environment, especially river morphology and drainage condition. The aquatic fauna may be affected to some extent, mainly during the construction phase. Other impacts due to the proposed bridge will be associated with the construction works. This implies that they are generally of limited spatial extent and of limited duration.

For all the four locations, the areas that may be affected are rural in character. Generally, on the left bank, more commercial activities are found. People are having various economic activities, namely, agriculture, day labor, small trade and fisheries, agriculture being the dominant. It was found that in Chandpur and Goalundo sites, non-farm activities are significant. It is apparent that the economic activities are highest in site-4 followed by site -1.

According to the pre FS (JMBA, 2000), there is neither any ecologically sensitive area, nor any archeologically or culturally important sites.

The project might cause backwater effects during flood conditions, combined with increased scour at and near the bridge crossing and increased sedimentation further downstream. These impacts require further analysis along with cross drainage of the floodplain.

The impact on the terrestrial ecosystem will remain limited to the removal of the current vegetation, mostly agricultural crops, trees, and homestead vegetation, from the project area. Agricultural product and practice must be investigated. During the construction, residential and migratory birds that use char land as feeding and breeding ground, may temporarily driven away. A wildlife baseline survey is required to assess the impact.

To assess the impact on the aquatic ecosystem due to dredging and dredge spoil disposal; and the behavior of riverine fish affected by the pilling works requires further investigation. Fishing practice and catches should be investigated.

The anticipated environmental impact during the construction phase are,

- Noise pollution
- Air pollution
- Surface and ground water pollution
- Hindrance of river transport
- Problem in road transport
- Occupational health and safety
- Social disruption
- Waste disposal, and
- Operation of work site and labor camp.

From the above basic analysis on the anticipated impact, it appears that no site has relative advantage or disadvantage over others as the general environmental setting is very similar in all 4 cases. However, due to the nature of the anticipated impacts, it is expected that environmental impact would be more for longer approach road and greater river training activities. As explained in the technical assessment, site 1 and 3 would require less approach road and also these two sites indicates more stable river sections requiring less river training works. Therefore, it can be estimated that environmental impact would be less for site 1 and site 3.

Chapter 2 Initial Environmental Examinations (IEE)

2.1 INTRODUCTION

The Initial Environmental Examinations (IEE) was conducted for two preferred sites during August to December, 2003 and the results are given in this Chapter.

The main objective of the IEE study is to identify the significant environmental impacts for the two bridge sites of the project by following the requirements of the environmental guidelines prepared by JICA, JBIC, GoB and other donor agencies, and to assess the scope of the EIA for the proposed project. Another major objective is make comparison between two sites from environmental point as an input for the technical team to assist in the final site selection.

2.2 SCOPE, APPROACH & METHODOLOGY

2.2.1 Scope of IEE

The scope of works of IEE includes:

- Project description from environmental aspect
- Data collection and analysis to describe the natural environment, social environment and environmental pollution;
- Screening to identify significant environmental impacts;
- Identification of possible mitigation measures;
- Prepare the scope of EIA for the project

2.2.2 Approach of the Study

The IEE is conducted through a tailor made project specific templates. Project specific IEE/EIA templates have been prepared comprising a number of steps and the steps are presented in Figure 2.2.1. Selection of environmental parameters for the IEE and EIA of the Padma bridge construction along with their selection rational, impact sources, frequency of occurrence, and nature of impacts were made and given in Table 2.2.1 based on various guidelines. In total, 40 environmental parameters are identified and these are classified into natural environment, ecological parameters, environmental pollution and social environment. The weightage values of the environmental parameters are decided in the context of Padma bridge construction and their importance to the national development and environmental conservation. The rationalities of putting the weightage values for different environmental parameters are presented in Table 2.2.2. In the process of selecting the weightage, the values proposed in “Guidelines on Environmental Issues Related to Physical Planning” prepared by LGED and “Preliminary Activities related to Project Environmental Assessment” prepared by REB with WB assistance were consulted. It may be mentioned here that values proposed in LGED guideline was prepared based upon extensive exercise of a number of national environmental experts. A project specific guideline for mitigation measures / supporting strategies is given in Table 2.2.3, which provides a basis for the mitigation measures and/or strategy for each identified screening parameters.

For the screening purpose, three templates are prepared. The first template allows analysis of all screening parameters based on the background information, field investigation, consultation with local stakeholders and worldwide experiences with similar project. This provides the in-depth focus of type of impact (direct, indirect or both), temporal extent (during or after construction or both), spatial extent (local or widespread), mitigability (fully

or partial), and monitoring possibility (fully or partially). Once the analysis of the impacts is clear, the second template is used for identifying the positive and negative impacts of the project with impact rating. This template can identify the key issues, namely the parameters having negative impacts. The purpose of identification of the key issues is to focus on those environmental parameters that need careful attention for ensuring sustainable environment friendly development of the country in the long run. The possible mitigation measures for the key issues can be formulated based on the guideline provided in the Table 2.2.3. The third template is for assessing the overall benefit from implementation of the mitigation measures. This is a Leopold Graded Matrix where the graded values are obtained for both without mitigation case and mitigation case. It may be mentioned here that such grading matrix is usually not a part of IEE, rather done in EIA stage. For this project, to facilitate the final site selection, such grading matrix is used based on very preliminary ideas of mitigation measures as indicated in Table 2.2.3.

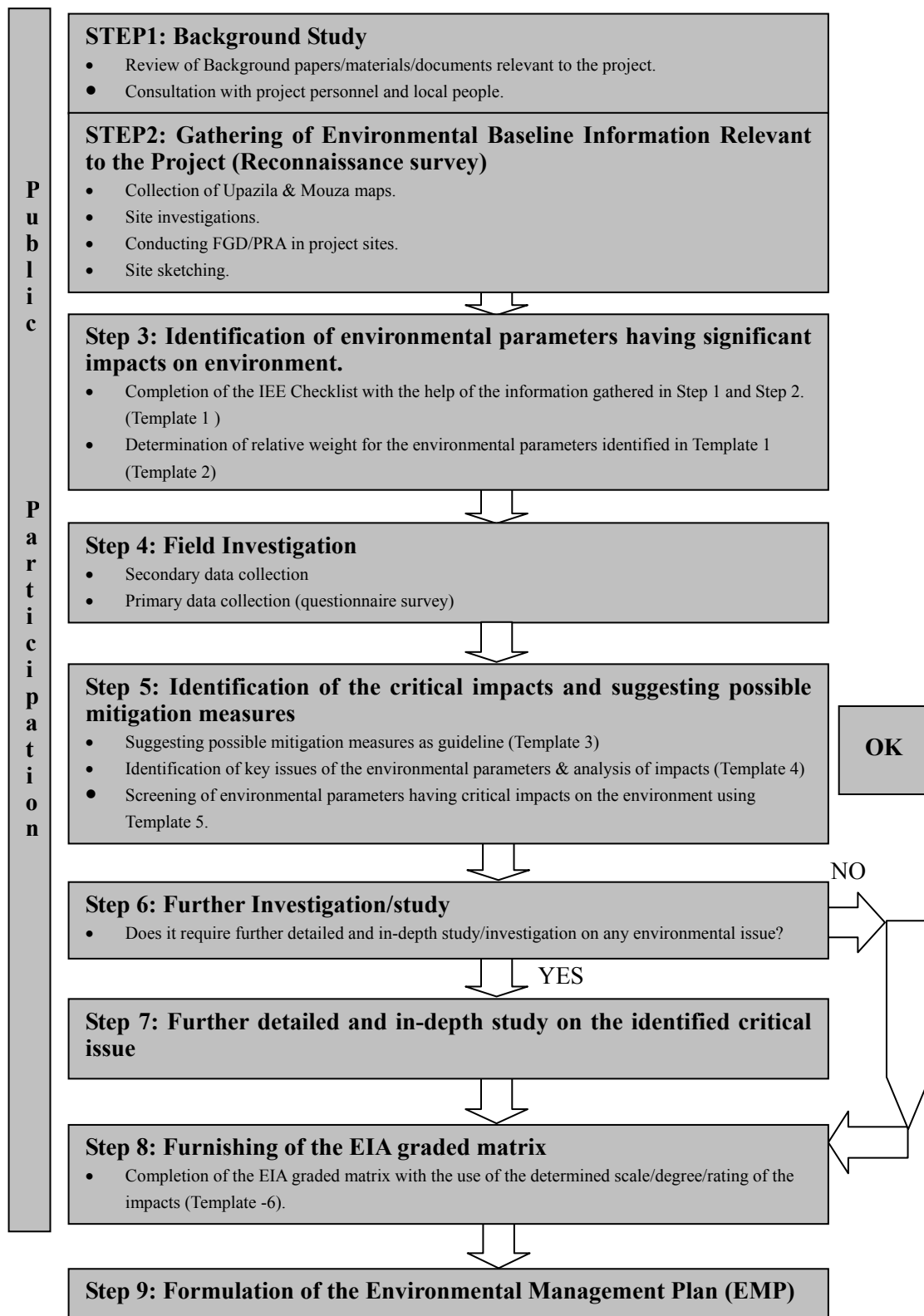


Figure 2.2.1 Procedural Steps in the Environmental Study of the project

Table 2.2.1 Identification of Environmental Parameters, Selection Rational, Impact Source and Nature of impact

Environmental Parameters	Rational for Selection	Sources of Impact and their Occurrence	Nature of Impact
NATURAL ENVIRONMENT			
1. Topography	Due to implementation of the project, topography of the project site might change.	Construction of approach roads, guide bunds and other infrastructures.	Negative
2. Soil Erosion and Siltation	Construction of approach roads may require earth filling. If this earth is supplied from surrounding area then soil erosion may happen which results in decrease of agricultural production. In addition, construction of bridge components i.e., pile, RTW may lead to increase in velocity of river water that could enhance soil erosion. Moreover, for the same consequences siltation could take place.	Construction of approach roads, RTW and other infrastructures.	Negative
3. Hydrology/ Flooding	If the bridge is constructed without the consideration of regional hydrology/flooding level, annual or abnormal flooding may cause damage in the surrounding areas.	Construction of bridge without river flooding consideration.	Negative
4. Drainage Congestion	Construction of approach roads and other infrastructures may disrupt natural cross drainage.	Construction of approach roads and other infrastructures.	Negative
5. Landscape	Improper excavations of borrow pits for the construction of approach roads and other infrastructures may degrade the existing landscape.	Construction of approach roads and other infrastructures.	Negative
6. Meteorology	Large scale deforestation may cause climate change, i.e., variation in temperature and rainfall may occur.	Through decrease of homestead trees and loss of vegetation/ plantation.	Negative
7. Land Subsidence	If implementation of the project causes huge abstraction of groundwater then land subsidence may happen.	Over extraction of groundwater	Negative
8. Flood Control	Threat of flood may be reduced due to implementation of the project.	After construction of the River Training Works (RTW).	Positive
ECOLOGICAL PARAMETERS			
9. Fisheries	Impact on migration and spawning of fish. During construction, pile driving may affect on migration of fish. Fish may also migrate laterally into adjacent floodplains for spawning during flood season. Moreover, disposal of waste into river during construction may be harmful for fish. Filling up wetlands may extinct fish culture.	Construction of substructure of the bridge and land acquisition.	Negative
10. Wildlife	Negative impact may occur due to loss of natural habitat from construction of approach roads and infrastructures for operation and maintenance.	Construction of approach roads and other facilities destroying natural forest area.	Negative
11. Vegetation/ Agricultural Loss	Negative impact may occur if agricultural land is used for construction of approach roads and infrastructures for operation and maintenance.	Construction of approach roads and other facilities using agricultural land.	Negative
12. Tree Plantation	Positive impact for tree plantation in the surrounding areas of bridge site.	Tree plantation program in the project area after construction.	Positive
13. Plant Cutting	In order to implement project components, trees have to be cut. The cutting of trees would demolish the greenery and as well as threaten the climate of the ambient environment.	During construction	Negative
14. Wet Lands	Generally, if there are wetlands in the project sites, those should be considered carefully because implementation of the project might threaten nature of wetlands and the types of plant and animal living in the wetlands.	During Construction	Negative

Environmental Parameters	Rational for Selection	Sources of Impact and their Occurrence	Nature of Impact
15. Water Bodies Loss	In the project sites, small water bodies like pond, khal, beal etc, where local people practice fish cultivation, may be filled up.	Water bodies acquisition	Negative
16. Forest	Forests may be cleared for the project works.	Forest area acquisition	Negative
17. Endangered Species	If there are endangered species in the project site they may be threaten which will lead to their extinction.	Clearing of natural habitat	Negative
18. Environmentally Protected and sensitive areas	Environmentally protection and sensitive areas may be affected by the implementation of the project.	During construction	Negative
ENVIRONMENTAL POLLUTION			
19. Air Pollution	Air pollution may occur through the use of vehicles and equipments, cleaning of materials, coating of construction materials, dust from stone/brick crushing etc.	Construction equipments/material during construction of the bridge.	Negative
20. Surface & Ground Water Pollution	Accidental spillage of toxic chemicals such as fuel, lubricants, and solvents may pollute water.	During construction	Negative
21. Noise and Vibration	During construction period noise pollution will be generated by the use of vehicles, pile driving operation, stone crushing, generators etc.	During construction	Negative
22. Soil Contamination	Accidental spillage of gasoline, chemicals, liquid waste, disposal of dredged spoils etc may pollute soil quality.	During construction.	Negative
23. Waste Disposal	Accidental spillage of toxic chemicals such as fuel, lubricants, and solvents may pollute water and soil.	During construction.	Negative
SOCIAL ENVIRONMENT			
24. Homestead Loss	In order to acquire land, force displacement of people in the project area will happen. This will lead an enormous disruption of social life in the local population.	Construction of approach roads, RTW, bridge landing area and other infrastructures	Negative
25. Income Loss	Agricultural land acquisition, loss of fisheries, loss of business activities and loss of employment	Land acquisition	Negative
26. Historical and Cultural Loss	Construction of approach roads, RTW and other facilities may damage mosque, graveyards etc. The influx of non-local labors may also result social disruption.	Construction of approach roads and other infrastructures	Negative
27. Navigation and Water Transport	Normal navigation in the river Padma may be hindered.	During and after construction of bridge.	Negative
28. Health and Safety	Health risk is related to handling of construction equipments, various chemical materials during construction phase.	Construction phase of the bridge.	Negative
29. Employment	Employment opportunities will be created during construction and operation-maintenance period.	Through various service opportunities after construction.	Positive
30. Women Empowerment	Due to construction of the bridge, home based poultry firm, dairy firm, rice husking machine etc will be established in the rural areas where women will find job.	After construction of the bridge.	Positive
31. Land Acquisition	Land acquisition will impact on local income and social order.	Due to construction of approach roads, RTW and other facilities.	Negative
32. Health & Nutrition	If the project contribute to income generation, living standards, public health, education, etc then health & nutrition situation will significantly enhanced.	Trough indirect impacts after construction of the project.	Positive
33. Infrastructures Development	The project may contribute to infrastructures development, i.e., school, college, universities, mosque etc.	After construction of the project.	Positive
34. Industries	Implementation of the project will augment the establishment of industries in the adjacent areas.	After construction of the project.	Positive

Environmental Parameters	Rational for Selection	Sources of Impact and their Occurrence	Nature of Impact
35. Split of Communities	In order to maintain proper alignment of the project, communities may be split which will affect on ancestral homes and community living.	Due to construction of approach roads..	Negative
36. Road Transport	Road transport will be improved.	After construction of the project.	Positive
37. Road Accidents	Road accidents may be increased.	After construction of the project.	Negative
38. Water Rights	Water wrights may be hampered.	Due to construction of the project.	Negative
39. Ethnic Minorities and Indigenous People	Ethnic minorities and Indigenous people could be affected.	During construction of the project.	Negative
40. Land Use	With the implementation of the project, the rural areas may get urbanization gradually in the long run and this could introduce secondary impact which might change the existing land use.	Overall construction of the project.	Positive

Table 2.2.2 Rationalities of the relative importance of environmental parameters based on national development and environmental conservation

Environmental Parameters	Relative Weightage	Rational
NATURAL ENVIRONMENT		
1. Topography	2	Impacts from the changes in topography are low from implementation of approach road, guide-banks and other infrastructures in the project site.
2. Soil Erosion and Siltation	6	Soil erosion and siltation is very important for Bangladesh being agricultural based and densely populated country.
3. Hydrology/ Flooding	10	Regional hydrology and flooding is the dominating natural process that governs the floodplain activities including agriculture, fisheries, erosion and siltation. It is required to keep regional hydrology and flooding characteristics undisturbed as much as possible.
4. Drainage Congestion	7	Drainage congestion from infrastructure works puts a high costs on the natural resources and agriculture in terms of crop damage and subsequently socio-economic conditions of the poor.
5. Landscape	2	Bridge projects result relatively low change in landscape.
6. Meteorology	2	Bridge projects result relatively low change in meteorology.
7. Land Subsidence	5	Impacts caused by land subsidence are largely non recoverable, but bridge projects result relatively low change in land subsidence.
8. Flood Control	4	Threat of flood may be reduced due to the project, but extent will be low.
ECOLOGICAL PARAMETERS		
9. Fisheries	8	A drastic reduction in open water fisheries production in the country indicates the high importance for its conservation. Fisheries provide high nutrients to the people indicating the requirement of conservation of this resources as well as production of the cultured fisheries.
10. Wildlife	4	In general Bangladesh does not have wildlife resources except the Sundarban, which is a reserved forest and development work strictly prohibited there.
11. Vegetation/ Agricultural Loss	8	Bangladesh is an agrarian country. Its extensive vegetation is the prime source of food. Any development work destroying the vegetation draws significant environmental importance.
12. Tree Plantation	6	Extensive plantation of homestead and roadside trees in the rural areas of the country provides good importance on environmental issue.
13. Plant Cutting	6	Cutting of plants would demolish the greenery and as well as threaten the climate of the ambient environment.
14. Wet Lands	3	Majority of the country is the floodplain of major rivers putting a moderate significance to the wetlands, except the designated wetlands like hoar, baor, and beels.
15. Water Bodies Loss	7	Water bodies like ponds not only provide an income source but also an element of bio-diversity.
16. Forest	8	A drastic reduction in the natural forest indicates a relatively high importance for its conservation.
17. Endangered Species	10	If there are endangered species in the project site they may be threaten which will lead to the extinction.
18. Environmentally Protected and Sensitive Areas.	10	Environmentally protected and sensitive areas require highest importance.
ENVIRONMENTAL POLLUTION		
19. Air Pollution	5	Severe air pollution may lead to health hazard.
20. Surface & ground Water Pollution	7	Water is a source of not only drinking purpose but also irrigation and other uses.
21. Noise and Vibration	3	Severe noise and vibration pollution may lead to health hazard.
22. Soil Contamination	5	Severe soil pollution may lead to loss of fertility
23. Waste disposal	3	Accidental spillage of toxic chemicals can have high consequences but its occurrence frequency is low.
SOCIAL ENVIRONMENT		
24. Homestead Loss	10	This will lead an enormous disruption of social life in the local population.
25. Income loss	8	The present income practice of the local population in the vicinity of the construction site will be disrupted permanently.

Environmental Parameters	Relative Weightage	Rational
26. Historical and Cultural Loss	8	Construction of approach roads, RTW and other facilities following proposed ROW may damage mosque, graveyards etc. However, this loss is compensate-able. The influx of non-local labors may also result social disruption.
27. Navigation and Water Transport	3	Water transport is important in riverine Bangladesh.
28. Health and Safety	5	Health risk is related to handling of construction equipments, chemical materials only during construction phase.
29. Employment	7	With a high unemployment rate in the country, development activities need special focus on employment opportunities.
30. Women Empowerment	7	Women in general believed to be vulnerable group in Bangladesh putting a relative high weightage for their empowerment.
31. Land Acquisition	8	Land acquisition triggers out agricultural impact thereby lead to income loss.
32. Health & Nutrition	4	People of good health can contribute to the national development.
33. Infrastructures Development	5	Infrastructure development will provide education, health and other social benefits.
34. Industries	5	Industries will provide income generation and may lead to increased export earning.
35. Split of Communities	6	Communities may be split which will affect on ancestral homes and community living.
36. Road Transport	7	Road transport is a key to overall development.
37. Road Accident	5	Road accidents may cause live and property loss..
38. Water Rights	2	Bridge projects result relatively low change in water rights.
39. Ethnic Minorities and Indigenous People	10	Impact on ethnic minorities and indigenous people could result into serious social disorder.
40. Land Use	3	With the implementation of the project, the rural areas will be urbanized gradually in the long run.

Note: The weightage values of the environmental parameters are decided in the context of Padma bridge construction and their importance to the national development and environmental conservation. In the process of selecting the weightage, the values proposed in “Guidelines on Environmental Issues Related to Physical Planning” prepared by LGED and “Preliminary Activities related to Project Environmental Assessment” prepared by REB with WB assistance were consulted. It may be mentioned here that values proposed in LGED guideline was prepared based upon extensive exercise of a number of national environmental experts.

Table 2.2.3 Potential impacts and their possible mitigation measures /supporting strategy

Environmental Key Issues	Potential Impacts	Mitigation Measures/ Supporting Strategy
NATURAL ENVIRONMENT		
1. Topography	<ul style="list-style-type: none"> Construction of approach roads, RTW, related infrastructures might change the topography. 	<ul style="list-style-type: none"> Proper design should be employed.
2. Soil Erosion and Siltation	<ul style="list-style-type: none"> Impact on the agricultural top soil. Increase the turbidity of adjacent water bodies affecting the yield of the water bodies. Bank erosion Siltation 	<ul style="list-style-type: none"> Prompt grass plantation. Perform the construction work in the dry season, if possible. Ensure adequate compaction and slope protection work. Avoid, earth cutting from surrounding areas. Careful hydrological planning
3. Hydrology /Flooding	<ul style="list-style-type: none"> Affect on local crop production if flooded by rain or flood water. Flooding pattern might change Regional hydrology might change 	<ul style="list-style-type: none"> Hydrology/Flooding should consider very carefully.
4. Drainage Congestion	<ul style="list-style-type: none"> Affect the agricultural production. Low-lying land becomes mosquito breeding ground spreads water born diseases. Increase of flooding 	<ul style="list-style-type: none"> Avoid filling up of low-lying lands. Perform the land raising with adequate provision of drainage and uninterrupted rainwater/ floodwater drainage from the surrounding areas. Provide alternative drainage
5. Landscape	<ul style="list-style-type: none"> Improper excavation of borrows pits and construction of other components of the project i.e., approach roads and RTW etc will degrade the existing landscape. 	<ul style="list-style-type: none"> Excavation of borrow pits should be done according to the proper design.
6. Meteorology	<p>Large scale deforestation may cause:</p> <ul style="list-style-type: none"> Climate change Variation in temperature and Change in Rainfall 	<ul style="list-style-type: none"> Avoid cutting of vegetation. Increase tree plantation
7. Land Subsidence	<ul style="list-style-type: none"> If implementation of the project causes huge abstraction of groundwater then land subsidence may happen. 	<ul style="list-style-type: none"> Conjunctive use of both ground water and surface water.
8. Flood Control	<ul style="list-style-type: none"> Flood will be reduced. 	<ul style="list-style-type: none"> Implantation of the RTW according to the design. Proper operation and maintenance after construction should be ensured.
ECOLOGICAL PARAMETERS		
9. Fisheries	<ul style="list-style-type: none"> Threat on breeding. Reduction in open water fisheries. Loss of ponds and wetlands 	<ul style="list-style-type: none"> Compensation for the affected fish ponds should be served to the owners. Avoid negative impacts through introduce of aquaculture in borrow pits. Proper construction supervision and monitoring. Prevent discharge of pollutants. Avoid valuable wetlands from earth filling.
10. Wildlife	<ul style="list-style-type: none"> Force the wild animals to move into other places. Loss of wildlife habitat Loss of food chain 	<ul style="list-style-type: none"> Avoid wild life habitat.
11. Vegetation/ Agricultural Loss	<ul style="list-style-type: none"> Acquiring of agricultural land will impact on vegetation. Dust produced by vehicle movements and construction will settle on plants and crops which will contribute to their demise. 	<ul style="list-style-type: none"> Avoid agricultural land loss Prompt afforestation program.
12. Tree Plantation	<ul style="list-style-type: none"> Positive impact for tree plantation in the surrounding areas of bridge site. 	<ul style="list-style-type: none"> Prompt tree plantation

Environmental Key Issues	Potential Impacts	Mitigation Measures/ Supporting Strategy
13. Plant Cutting	<ul style="list-style-type: none"> Clearing trees. 	<ul style="list-style-type: none"> Compensate the loss by extensive plantation around the bridge site.
14. Wet Lands	<ul style="list-style-type: none"> Threaten nature of wetlands Types of plant Animal communities. 	<ul style="list-style-type: none"> Avoid wetlands.
15. Water Bodies Loss	<ul style="list-style-type: none"> Negative impact on fish cultivation. Decrease in natural water retention 	<ul style="list-style-type: none"> Avoid water bodies Provide compensation.
16. Forest	<ul style="list-style-type: none"> Deforestation Loss of bio-diversity 	<ul style="list-style-type: none"> Avoid forests.
17. Endangered Species	<ul style="list-style-type: none"> Endangered species in the project site may be threatened. 	<ul style="list-style-type: none"> Avoid habitat of endangered species.
18. Environmentally Protected and Sensitive Areas.	<ul style="list-style-type: none"> Environmentally protected and sensitive areas may be affected. 	<ul style="list-style-type: none"> Avoid environmentally protection and sensitive areas.
ENVIRONMENTAL POLLUTION		
19. Air Pollution	Air pollution may occur through: <ul style="list-style-type: none"> Use of vehicles and equipments. Cleaning of materials Coating of construction materials. Dust from stone/brick crushing etc. 	<ul style="list-style-type: none"> Ensure proper construction management plan
20. Surface & Ground Water Pollution	<ul style="list-style-type: none"> Impact on water quality may affect from accidental spillage of toxic chemicals such as fuel, lubricants, solvents, etc. 	<ul style="list-style-type: none"> Ensure proper construction management plan
21. Noise and Vibration	<ul style="list-style-type: none"> Noise pollution may be generated by the use of vehicles, pile driving operation, stone crushing, generators, etc. 	<ul style="list-style-type: none"> Enforce noise emission standards. Steam hammers may be used for pile driving.
22. Soil Contamination	<ul style="list-style-type: none"> Damage the soil texture and quality. Affect the agricultural yielding of the soil. 	<ul style="list-style-type: none"> Prevent the discharge of the construction spoil. Develop suitable waste management plan including collection and proper disposal of waste.
23. Waste Disposal	<ul style="list-style-type: none"> Accidental spillage of toxic chemicals such as fuel, lubricants, solvents may pollute water and soil. 	<ul style="list-style-type: none"> Ensure proper waste management plan
SOCIAL ENVIRONMENT		
24. Homestead Loss	<ul style="list-style-type: none"> Force displacement of people in the project area will happen. Enormous disruption of social life in the local population. 	<ul style="list-style-type: none"> Proper RAP should be followed.
25. Income Loss	<ul style="list-style-type: none"> Agricultural land loss. Fisheries loss. Business loss Employment loss 	<ul style="list-style-type: none"> Avoid loss as much as possible. Provide compensation.
26. Historical and Cultural Loss	<ul style="list-style-type: none"> Might damage mosque, graveyards. Influx of non-local labors may also result social disruption. 	<ul style="list-style-type: none"> Avoid loss as much as possible. Provide compensation Use of local labor as much as possible
27. Navigation and Water Transport	<ul style="list-style-type: none"> Normal navigation in the river padma may be hindered. 	<ul style="list-style-type: none"> Ensure proper management plan.
28. Health and Safety	<ul style="list-style-type: none"> Impact on human health may come from handling of construction equipments, chemical materials during construction phase. 	<ul style="list-style-type: none"> Proper measures for safety, security and accidents should be considered.
29. Employment	<ul style="list-style-type: none"> Provide direct employment opportunities during implementation and O & M. Indirect employments from the industries, agriculture and relevant commercial and service sectors. 	<ul style="list-style-type: none"> Ensure the employment for the poor with priority. Positive impact could be enhanced creating more job opportunities.
30. Women Empowerment	<ul style="list-style-type: none"> Increase of women's income Better female education and health 	<ul style="list-style-type: none"> Positive impact could be enhanced by supporting programs

Environmental Key Issues	Potential Impacts	Mitigation Measures/ Supporting Strategy
31. Land Acquisition	<ul style="list-style-type: none"> Impact on people's income. Social order 	<ul style="list-style-type: none"> Ensure RAP in construction phase.
32. Health & Nutrition	<ul style="list-style-type: none"> Income, living standards, public health, education, and health awareness will be increased. 	<ul style="list-style-type: none"> Awareness on public health should be taken.
33. Infrastructures Development	<ul style="list-style-type: none"> The project may contribute to the construction of infrastructures i.e., school, college, universities, mosque etc. 	<ul style="list-style-type: none"> Positive impact can be increased by proper planning.
34. Industries	<ul style="list-style-type: none"> Implementation of the project will augment the establishment of industries in the adjacent areas. 	<ul style="list-style-type: none"> Appropriate strategy should be adopted to increase investment.
35. Split of Communities	<ul style="list-style-type: none"> Communities may be split which will affect on ancestral homes and community living. 	<ul style="list-style-type: none"> Avoid splitting of community.
36. Road Transport	<ul style="list-style-type: none"> Road transport will be improved. 	<ul style="list-style-type: none"> Positive impact can be increased by proper planning.
37. Road Accident	<ul style="list-style-type: none"> Road accidents may be increased. 	<ul style="list-style-type: none"> Ensure proper traffic rule.
38. Water Rights	<ul style="list-style-type: none"> Water wrights may be hampered. 	<ul style="list-style-type: none"> Ensure proper planning.
39. Ethnic Minorities and Indigenous People	<ul style="list-style-type: none"> Ethnic minorities and Indigenous people could be affected. 	<ul style="list-style-type: none"> Minimize such impact
40. Land use	<ul style="list-style-type: none"> Gradual urbanization might change the existing land use as there are possibilities of establishment of commercial and industrial infrastructures. 	<ul style="list-style-type: none"> Formulation of land use plan at the policy level of the government.

Note: This is a preliminary guideline. Mitigation measures are proposed in EIA stage.

2.2.3 Methodology

(a) Secondary Data Collection

Secondary data have been collected mainly for the following environmental items:

- Meteorology;
- Topography and Geology;
- Hydrology;
- Flora and Fauna;
- Land use;
- Socio-economic and Settlement;
- Environmental Pollution; and
- Historical and Cultural Heritage.

Secondary data is collected based on the relevant published and unpublished literatures. Meetings and discussions were held with concerned officials of the relevant organizations such as DoE, BMD, FD, DoF, BWDB, IUCN, LGED & RHD etc. to collect information

(b) Primary Data Collection

An environmental reconnaissance survey was carried out by the JICA Study Team members during August 2003 to identify the significant environmental impacts and specific nature of data to be collected. Another field investigation was carried out during 01-18 November, 2003 through observation, interview and discussion with local leaders of Union Council, Gram Sarker and Project Affected Persons (PAPs) on the following environmental parameters:

- River Erosion and Siltation;
- Landscape;
- Agriculture;
- Forest and Vegetation;
- Fisheries;
- Wildlife;
- Water and Air Pollutions; and
- Historical and Cultural Heritage

A structured questionnaire survey was also conducted with 200 samples, 100 from each side and 50 from each bank of the each side.

(c) Data Processing and Analysis

First, all the data collected from secondary sources and field, were checked and edited. The data were then processed and analyzed. Finally, specifically developed templates were applied for screening and impact assessment.

2.3 PROJECT DESCRIPTION (SITES AND ACTIVITIES)

2.3.1 Bridge Sites

Actual layout of the bridge was not finalized at this stage. However, for the purpose of this IEE study, a tentative layout is assumed based on the most recent findings from the relevant members of the Study Team who are in charge of river training, bridge and highway planning.

(a) Paturia Goalundo Site

The assumed bridge layout at Paturia-Goalundo site is located in Manikgonj and Rajbari Districts. The bridge end at Paturia is located at about 2 km d/s of the Paturia Ferry Ghat at Darikandi village in Sibalay Upazila, Manikgonj District whereas the bridge end at Goalundo is located at about 2.5 km d/s of the Daulatdia Ferry Ghat at Hasan Mollah village in Goalundo Upazila, Rajbari District (Figure 2.3.1). The proposed bridge end at Paturia and Goalundo Sites are marked at about 1.0 km and 2.0 km far away from the present river bank (Nov, 2003). The total length of the proposed approach road on the left bank (Paturia) is about 9 km and on the right bank (Goalundo) is about 5.5 km. The right of ways (ROWs) from the centerline of the approach road is tentatively assumed as 60 m. It is assumed that River Training Works (guide bunds) will be provided at both banks of the river. The total area of the River Training Works (RTW) and other associate working areas (bridge end facilities, construction yards, worker camps, toll plaza, dredged spoil area etc) at each site of Paturia and Goalundo is assumed as approximately 6 km² (along the river bank is 3 km and towards the country side is 2 km).

(b) Mawa Janjira Site

The proposed Mawa-Janjira bridge site is located in Munshigonj and Shariatpur Districts. The bridge end at Mawa is located at about 2 km d/s of the present Mawa Ferry Ghat at Wari village in Lauhajang Upazila, Munshigonj District whereas the bridge end at Janjira is located at about 10 km d/s of the present Kathalbari Ferry Ghat at Mazirkandi village in Janjira Upazila, Shariatpur District (Figure 2.3.2). The proposed bridge end at Mawa Site is marked at about 150 m far away from the present river bank whereas the bridge end at Janjira site is marked just on the present river bank (as on 13 November 2003). The total length of the proposed approach road on the left bank at Mawa Site is about 7 km and on the right bank is about 13 km at Janjira Site. The right of way (ROW) from the centerline of the approach road is assumed as 60 m. The total area of the RTW and other associate working areas (bridge end facilities, construction yards, worker camps, toll plaza, dredged spoil area etc) at each site of Mawa and Janjira is assumed as approximately 6 km² (along the river bank is 3 km and towards the country side is 2 km).

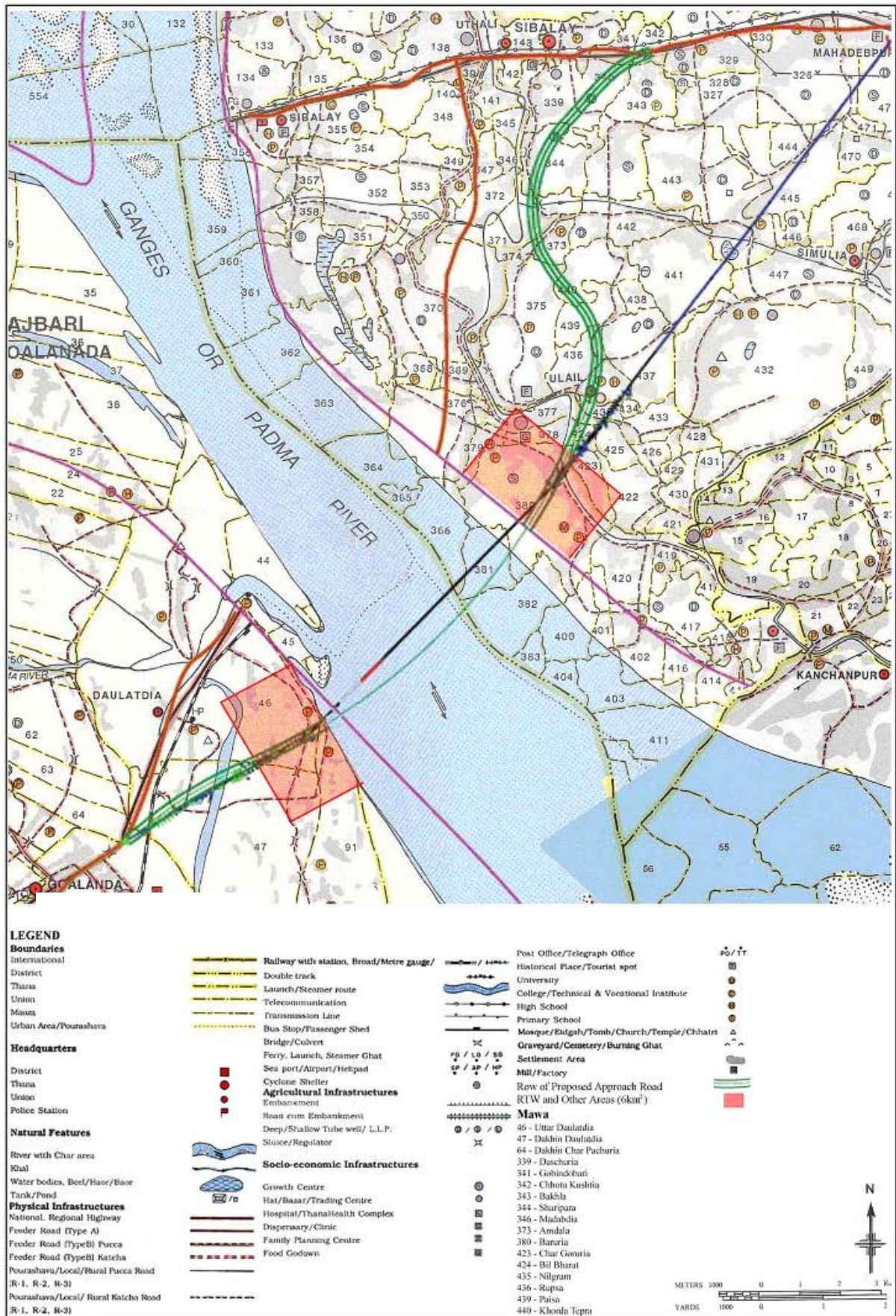


Figure 2.3.1 Paturia – Goalundo Site

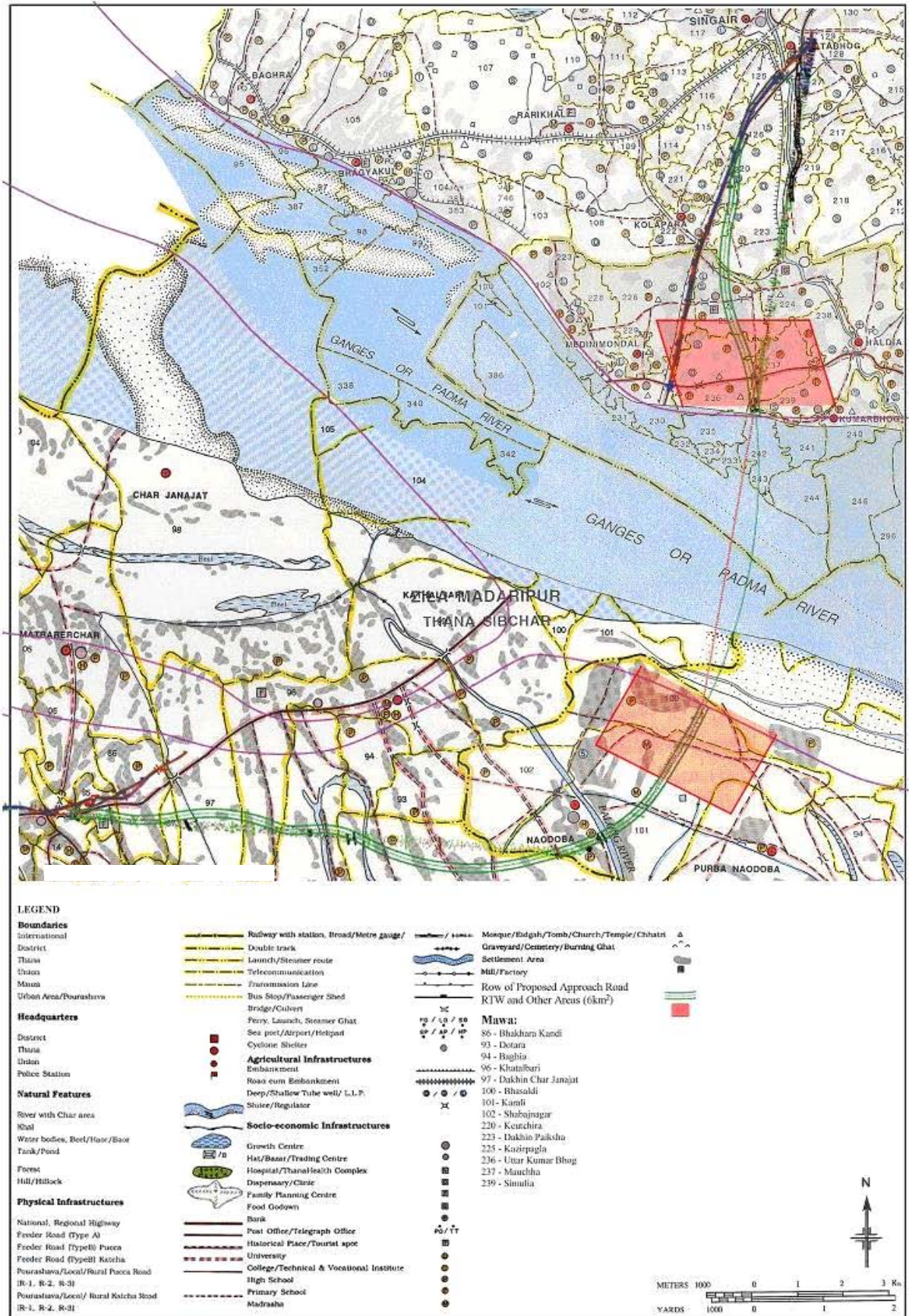


Figure 2.3.2 Mawa – Janjira Site

2.3.2 Environmental Impact Study Area

Since the environmental impact of a major project is not necessarily confined to the project vicinity area, the overall environmental impact study area of the Padma Bridge Project is considered to cover the entire Padma River and its tributaries associated channels. The impact study area is considered as a 100 km strip with the Padma River at Centre. The starting point of the strip is the confluence of the Jamuna and Ganges Rivers near at Aricha and continues up to the downstream (d/s) of Chandpur District near Haimchar Upazila (Figure 1.3.1, Chap 1 of APP – 11). The area of the strip is approx. 10000 km². The strip covers fully or partly the following 16 districts. The proposed two bridge sites including RTW and bridge connecting approaches are located in the districts of Manikgonj, Rajbari, Munshigonj, Shariatpur and Madaripur.

Districts under the Environmental Impact Study Area

Divisions	Districts within the Impact Study Area	
	Fully	Partially
Chittagong	Chandpur	Comilla
Dhaka	Dhaka, Narayangonj, Munshigonj, Manikgonj, Faridpur, Madaripur, Shariatpur and Rajbari	Narsinghdi, Gazipur, Tangail and Gopalganj
Khulna	-	Magura and Narail

2.3.3 Project Activities

The construction of the Padma Bridge is to include the following major project activities.

- Land Acquisition;
- Main Bridge & viaducts;
- River Training Works;
- Bridge Connecting Approach Roads;
- Other associated works

(a) Land Acquisition

Prior to the start of the construction, land acquisition including infrastructure acquisition will be done according to GoB laws and regulations. This will involve significant resettlement.

(b) Main Bridge

The main bridge is planned to be a multi-span structure. The bridge will have a pile foundation. The piling will be done from a barge. The main possible activities involved in the bridge construction are briefly described below.

Pile Driving Works: If the foundation of the piers will be installed by driving long tubular steel piles, it has to be done by using a hammer mounted on a barge. This will create noise and vibration.

Dredging and Disposal of Spoils: To provide safe passage to barges carrying the cranes, piling machines and construction material, local dredging may be needed from Chandpur on the Lower Meghna along the Padma River up to the proposed bridge sites. It might be avoided if the movement takes place during high water time. Also additional dredging along the bridge axis to provide access for the piling equipment and barges transporting the bridge elements will have to take place, especially where the bridge will cross char land. Material dredged close to the river bank may be used for as hydraulic fill for the construction of the

bridge ends.

Fabrication & Installation of Bridge Elements: The superstructure of the bridge is likely to be pre-fabricated. Fabrication of the elements is likely to take place at one side of the river. The bridge elements will be transported as segments along the bridge itself and put in place with an erection gantry.

(c) River Training and other Associated Works

River Training Works (RTW) will be necessary to save the bridge from river bank erosion. The RTW and other associated works will involve:

Dredging: Prior to the construction of the works, extensive dredging will take place. A huge amount of material (sand) will be generated. This material can be used for the filling of river training, approach roads, and other associated working areas.

Disposal of Dredge Spoils: Most of the dredged material will be disposed off on land, to be used later in the RTW and other works. Hydraulic fill method will be used for the disposal of the dredge spoil at the designated sites.

Stockpiling of dredge spoils: Dredges spoil in excess of the amount directly needed for filling of RTW and other associated areas, can be stockpiled at designated locations.

Construction of RTW: The RTW will be constructed along the both river banks. The crest of the RTW will be raised above the design flood level, while the toe at the river side will be excavated to falling apron level. To prevent erosion of the slopes and protect the river banks geo-textiles and rock material will be used for the construction. The construction will require the supply (import) of considerable quantities of rock material, to be transported by different modes of transport (mainly water and land) over large distances.

(d) Bridge Connecting Approach Roads

Some of the major possible activities involved are:

Earth Movement: To construct new flood free approach roads, the existing ground level has to be raised. The new approach roads would require to be raised in accordance with RHD-criteria, corresponding to 0.5 m about the 100 HFL. The spoil from the different dredging operations, in excess of what is used for the construction of river training and other works, may be used for the approach roads. The material stockpiled on the river training and other working areas can be transported in relatively dry condition to the approach roads.

Excavation and Refilling of Borrow Pits: Instead of using dredge spoil for the construction of the road embankments, it is possible to excavate soil from borrow pits along the approach roads. The borrow pits can be refilled (fully or partially) with excess dredge spoil from the river training and other areas, if available, or left open to be used as fish ponds.

Pavement of Roads: After completion of earthwork, bituminous pavement of road (sub-base, base, grouting and carpeting) will be done.

(e) Other Associated Works

Storage of Materials and Equipment: Equipment, materials and consumables (including fuel and chemicals) will be stored at designated storage area.

Solid Waste: A construction project like the size of the Padma Bridge Project will generate, temporarily, a considerable amount of solid wastes (construction related wastes, waste from offices and housing facilities etc.).

Construction Camps: Construction camps (office and worker camps, construction yards etc) will be constructed in a designated area.

2.4 NATURAL ENVIRONMENT

The natural environment comprises of physico-chemical and ecological aspects of the existing environment. Physico-chemical characteristics include the meteorology (climate), topography, geology, soil, seismic characteristics, and hydrology. The ecological resources of the project area comprise of forest, vegetation, fisheries and wildlife.

2.4.1 Meteorology

Bangladesh has a subtropical and tropical climate. The meteorological conditions of the study area vary within a relatively narrow range. Variations of temperatures, humidity, annual rainfall, and wind (speed and direction) during 1983-2002 periods are collected by different meteorological stations from the Bangladesh Meteorological Department (BMD). Six meteorological stations are available within the study area of 16-Districts and these stations are located at Dhaka, Faridpur, Madaripur, Comilla, Chandpur and Tangail. Climatic variations are on temperature, rainfall, humidity and wind speed of these six meteorological stations are presented below.

(a) Temperature

Bangladesh has a tropical monsoon climate with three main seasons: 'monsoon or wet season' from mid-June to mid-October; 'cold season' from mid-October to the end of February; and 'hot season' from March to the mid of June. The annual mean temperature were varied from 25.1 (Tangail, 1997) to 26.8°C (Dhaka, 1987, 1988, 1997) within the 1983 to 2002 period. The highest maximum and lowest minimum temperature near the Paturia-Goadundo site were recorded as 40.7°C (April, 1998) and 8.6°C (December, 1991) respectively. The highest maximum and lowest minimum temperature near the Mawa-Janjira site were recorded as 39.6°C (March, 1999) and 10°C (December, 1981) respectively.

(b) Humidity

Generally 80-85 percent humidity in the hot season is common and the humidity remains high year round, producing thick fogs in winter in the study area of the project. The highest annual average humidity 86% in 1998 (Comilla) and lowest 74% (Dhaka) during 2000-2003 were found within from 1983 to 2002 period. The annual average highest and lowest humidity are 78% (1998) and 74% (2000) near the Mawa-Janjira site. Whereas near the Paturia-Goalundo site, these are 82% (1990) and 78% (1983).

(c) Rainfall

About 15% of the annual rainfall occurs in the pre-monsoon season. About 80% occur in the wet season and only 5% during the winter months. Annual total rainfall varied between 1169 (Dhaka, 1994) and 3772 mm (Chandpur, 1984) within the period from 1983 to 2002. The annual total maximum and minimum rainfall were recorded as 3028 mm (1984) and 1169 mm (1994) near the Mawa-Janjira site whereas near the Paturia-Goalundo site, these were recorded as 2544 mm (1994) and 1344 mm (1984) respectively.

(d) Wind

The wind direction during the rainy season varies from SE-SW towards NW-NW with a general south to north movement while in the dry season the direction varies from NW-NE to SE-SW with a general North to South movement. Extreme meteorological events such as cyclone, tornado and surge normally strike Bangladesh in two seasons from mid October to mid December and April to May. Bangladesh is affected on average 16 times per decade by cyclones, which form in the Bay of Bengal during the wet season. The monsoon season also brings intense cyclones, primarily to the marine coastal areas along the Bay of Bengal. While these cyclones, with winds exceeding 100km/hr and devastating storm tides, affect large expanses of the coastal area, none of the district under the project impact study area are in that zone of influence. The maximum and minimum wind speed near the Mawa-Janjira site are 28 knots (May, 1985) and 1.5 knots (October, 1999) whereas near the Paturia-Goalundo site these values are 60 knots (June, 1998) and 4 knots (April, 1983).

2.4.2 Topography and Geology**(a) Topography**

Bangladesh is a mostly low-lying delta formed at confluence of three major rivers. About 90 percent of country is comprised of relatively flat alluvial plains. The land gradient is approximately 1 m per 20 km. The 16-Districts under study area lie in the northwest and north-central parts of the country. Generalized physico-graphic Map of Bangladesh (Figure 2.4.1) shows that the study area falls under the active Ganges, Brahmaputra-Jamuna flood plain and small portion of the Maghna flood plain. The contour map of Bangladesh shows that the ground elevations of the study area vary from 3 to 8 (Figure 2.4.2). The overall topographies of the two bridge sites are almost flat. The whole of the proposed approaches will run through relatively flat land that lies at an altitude between 2 and 8 m.

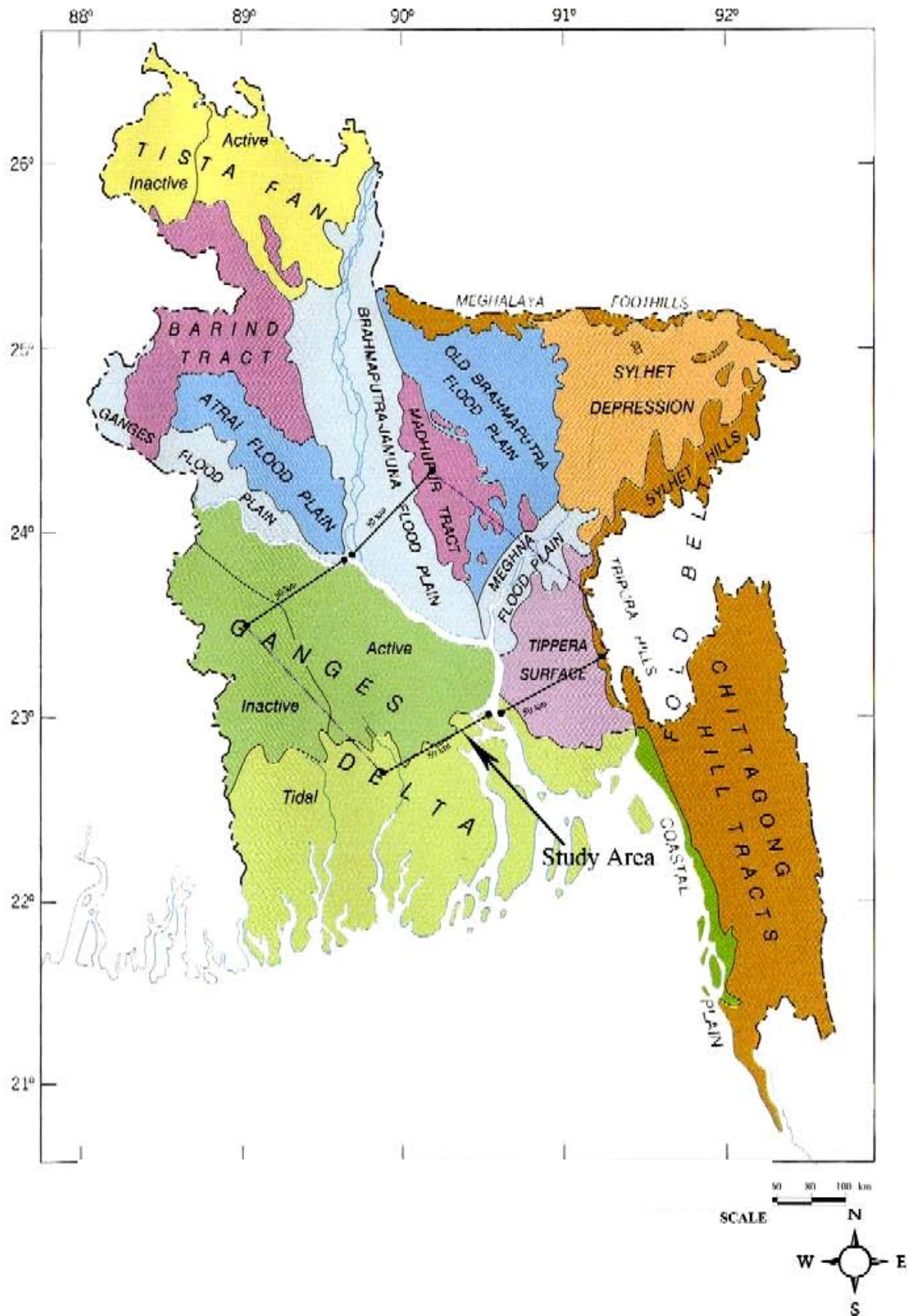


Figure 2.4.1 Generalized Physiographic Map of Bangladesh

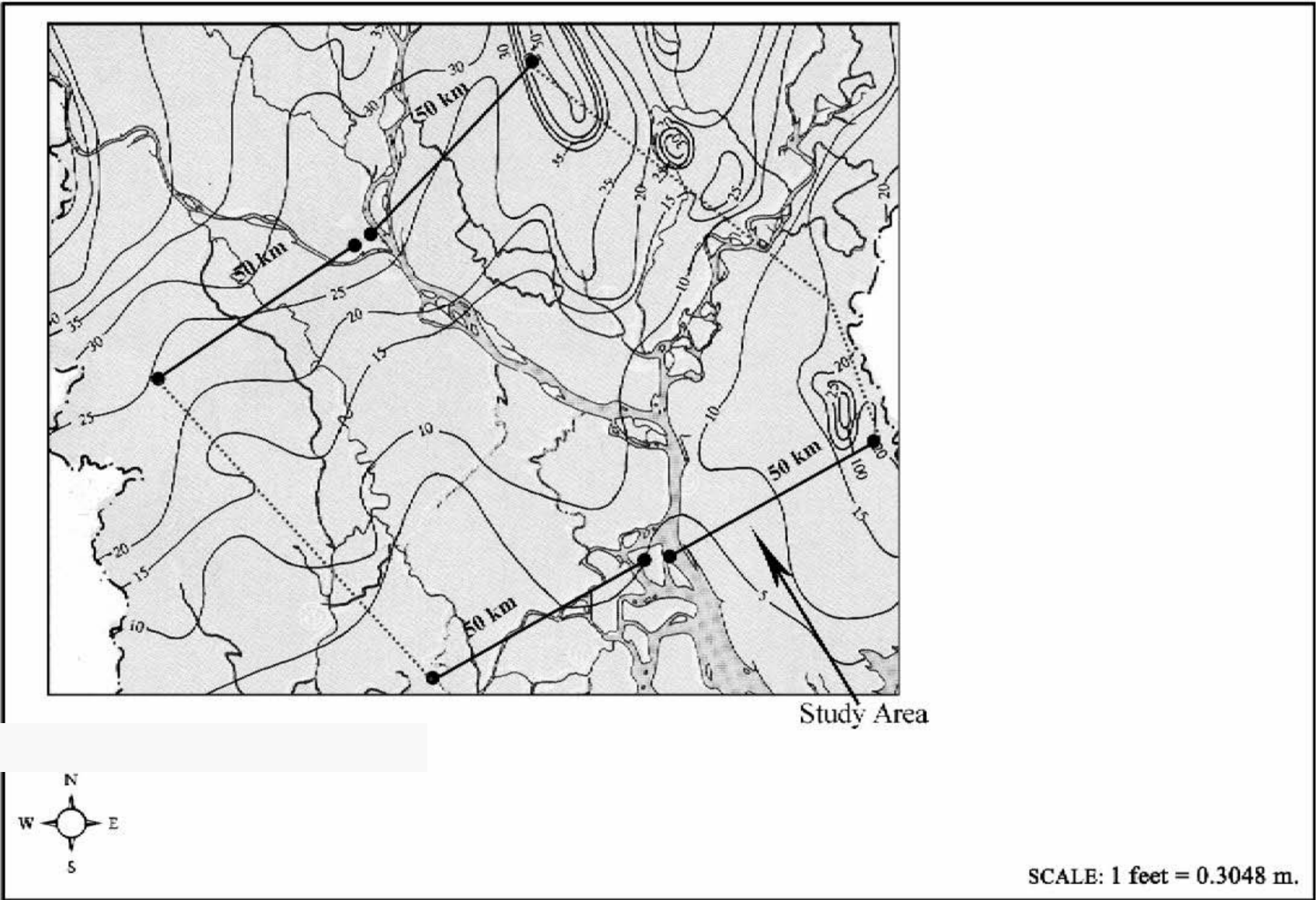


Figure 2.4.2 Study Area Contours

(b) Geology and Soil

Nearly 85 percent of Bangladesh is underlain by deltaic and alluvial deposits. The project area consists of recent Holocene alluvial deposits and predominantly consisting of fine sand, silts and clay. The site is on deep Cenozoic deposits which overlie Precambrian basement rock. The Ganges River deposits are characterized by the presence of non calcareous minerals (calcite and dolomite), while the Jamuna River sediments are rich in mica and biotite (alluvia of other rivers are less micaceous). The geological features of the 16 districts under impact study area according to Geological map of Bangladesh are given in Figure 2.4.3. The vast majority of the study area has the highly fertile soil type. From the agricultural point of view top layer of soils contains loamy, firm and neutral in reaction with medium organic contents. Middle and bottom layer contains sandy loam and slight alkaline in reaction with low organic contents. The soil of Paturia-Goalundo site mainly consists of sandy SILT (Paturia) and silty SAND (Goalundo) whereas the soil of Mawa-Janjira site consists of clayey sandy SILT (Mawa) and sandy SILT (Janjira).

(c) Seismology

In the northern part of Bangladesh, Shillong plateau (Massif) consisting of Archaen proterozoic basement complex is separated from the Sylhet plain by the E-W trending Dauki fault. Tectonic map of Bangladesh indicates (Figure 2.4.4) that most of the impact study area lie under the Faridpur Trough. Due to its location in an active tectonic region, Bangladesh has experienced large earthquakes and among these the great Assam earthquake in 1897 had a magnitude of 8.7 in Richter scale. According to seismic zoning map of Bangladesh (BWDB), the Padma River is located on the boundary of Zone-1 and Zone-2 (Zone 1 is the lowest while zone 3 is the highest active seismic zone in Bangladesh) (Figure 2.4.5).

2.4.3 Hydrology

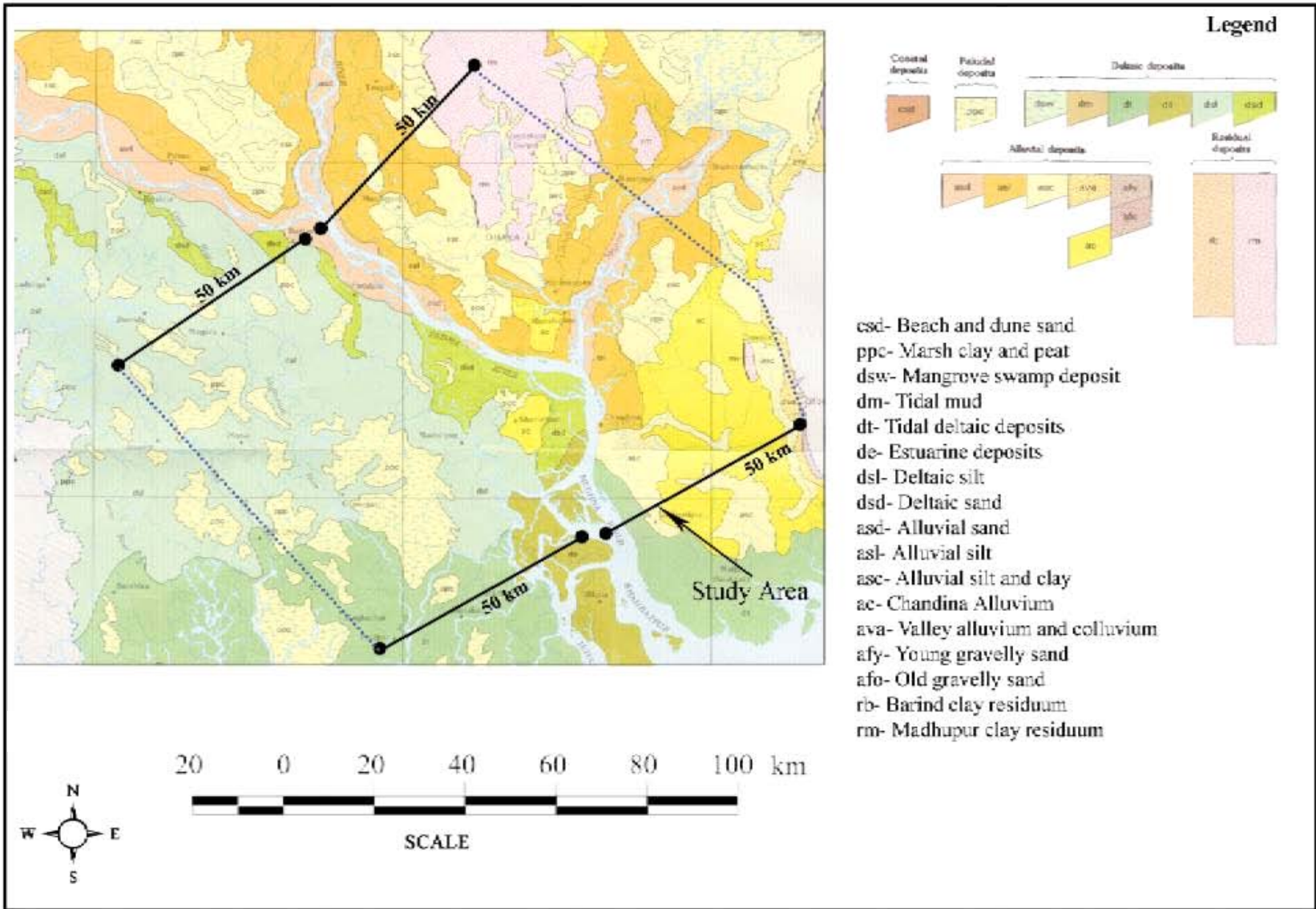
(a) River System

Bangladesh is a riverine and flood prone country and vulnerable to yearly flooding during the monsoon season. The major river systems in Bangladesh are the Jamuna, Padma and Meghna and their vast networks of tributaries and distributaries. In normal flood-years, 18% of the land is inundated, while in severe years nearly 40% is flooded. About 70% area of Bangladesh was affected by the 1988 and 1998 floods. The river system of Bangladesh usually carries an average of approx. 1,400 million tons of sediment every year. The average water level slope of the Padma is about 5 cm/km. The river network within the impact study area is given in Figure 2.4.6.

Major tributaries of the Padma River flowing in the impact study area are Bangshi, Dhaleswari, Kaliganga, Ichamati, Turag, Buriganga, Banar, Balu and Lakhya whereas the major distributaries of the Padma River in this area are Arial Khan, Kumar, Chandana, Arakandikha, and Madhumati. The specific project sites influenced directly by the rivers are Padma, Ganges, and Jamuna, and partially by Ichamati, and Arial Khan.

Ichamati River: The Ichamati is the branch of Kaliganga River and passes through Manikganj and Dhaka districts. This river is very small and runs almost parallel to the proposed approach road at Paturia bridge site in Sibalaya Upazila, Manikganj.

Figure 2.4.3 Geological Features within the Study Area



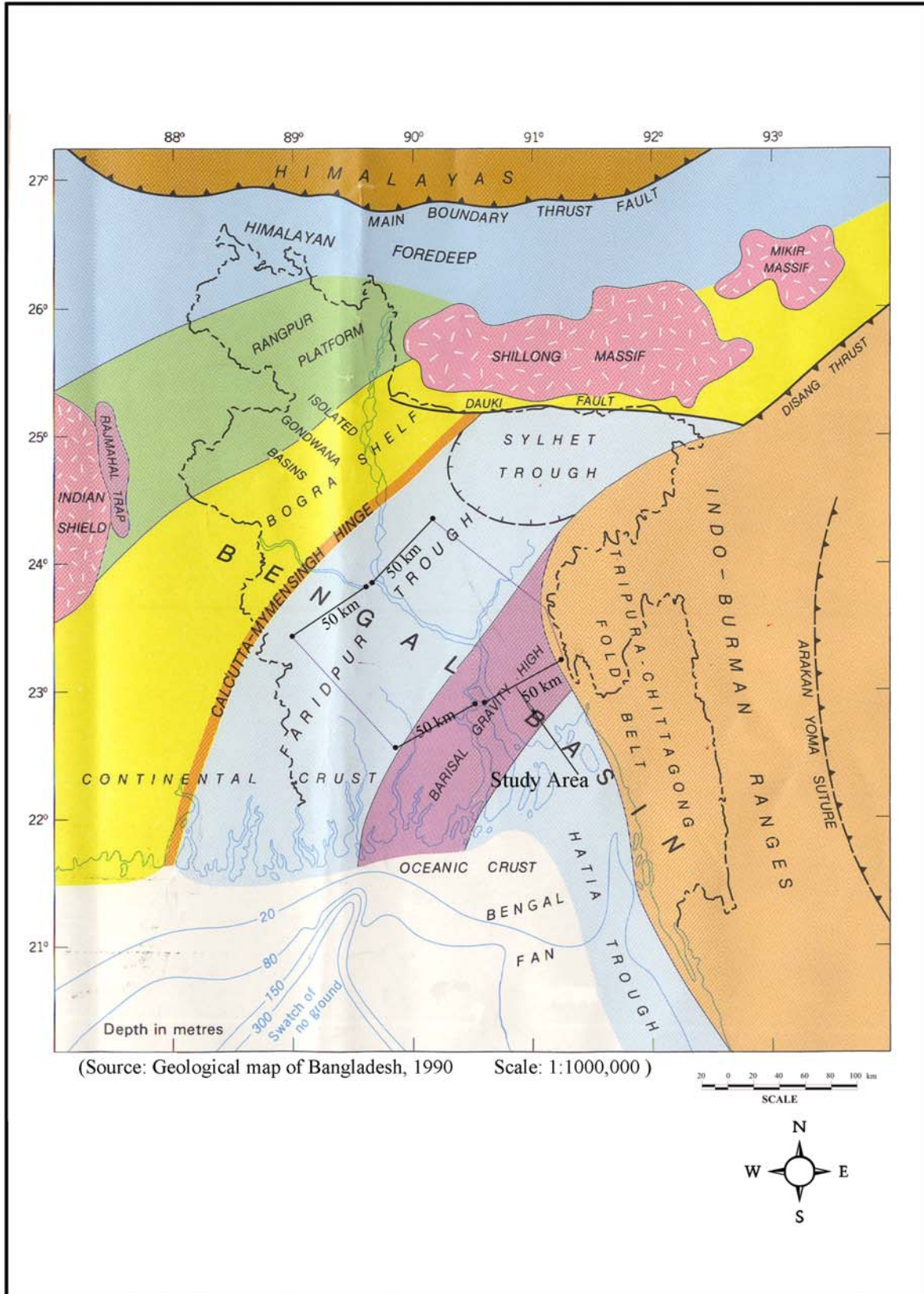


Figure 2.4.4 Generalized Tectonic Map of Bangladesh and Adjoining Areas (Project Study Area)

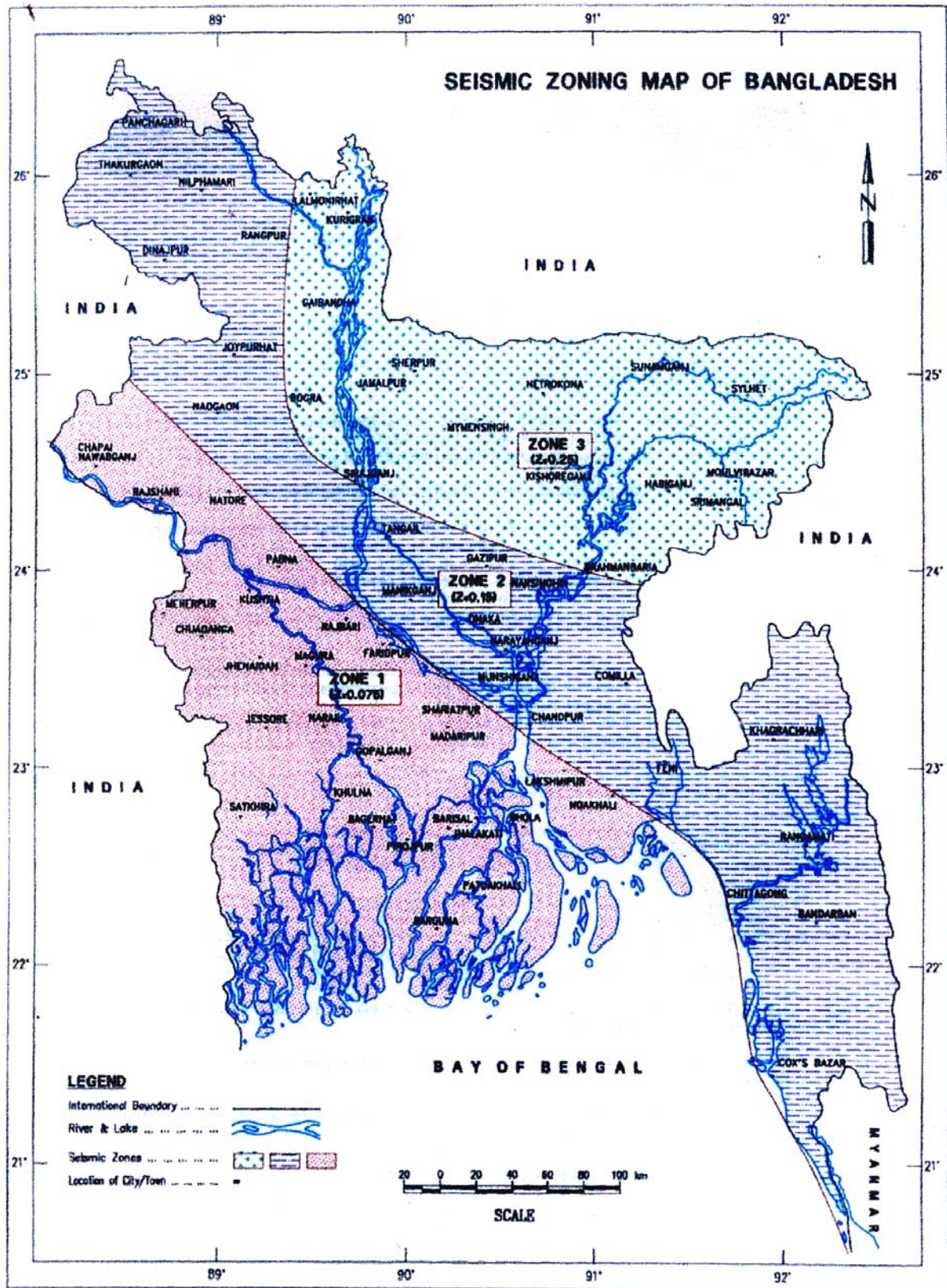


Figure 2.4.5 Seismic Zoning Map of Bangladesh

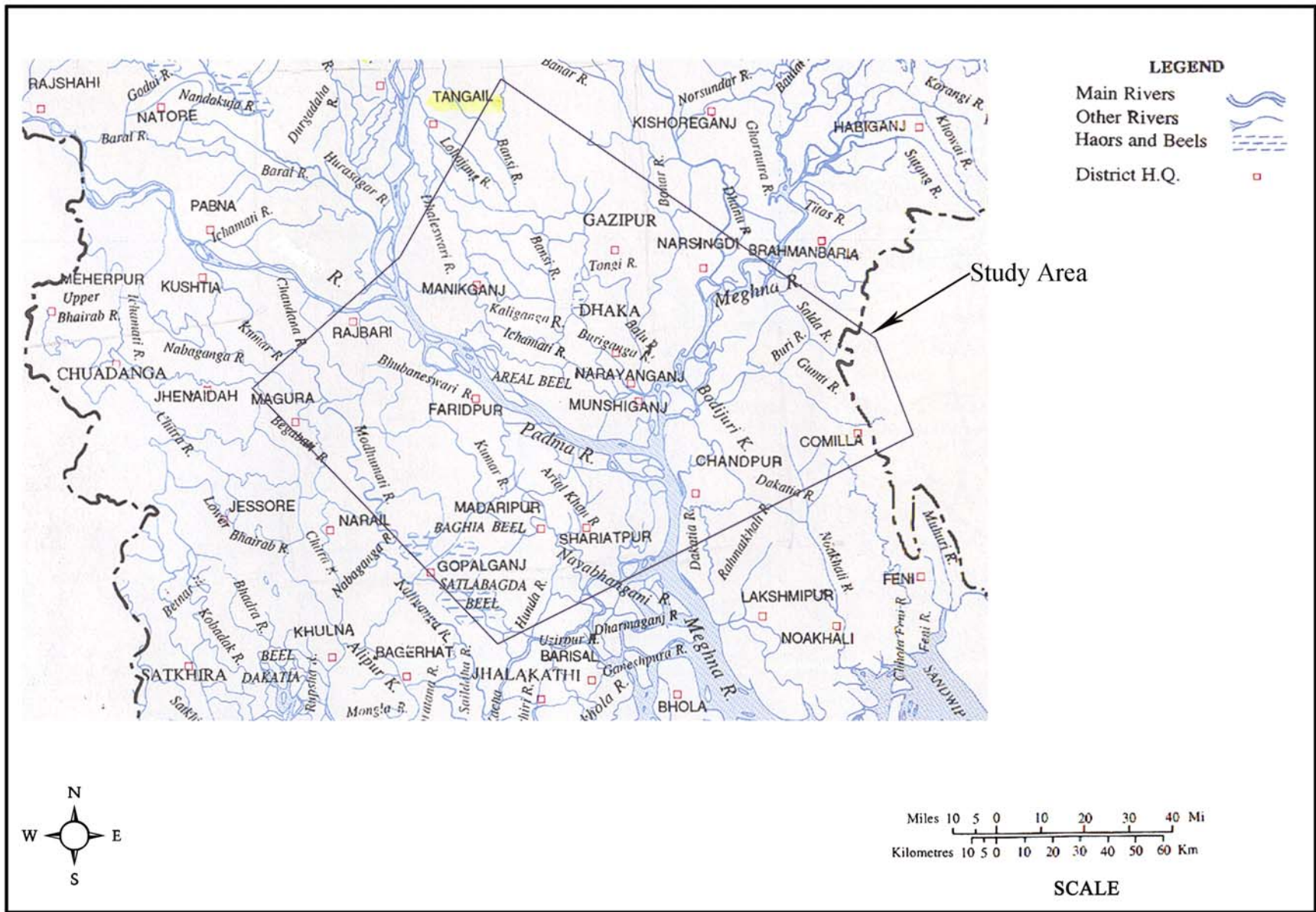


Figure 2.4.6 River Network within the Study Area

Arial Khan River: The Arial Khan is the major right bank distributaries of the Padma River and is originated at about 15 km u/s from Charjanajat Ferry ghat at Chowdhury Char. It is a meandering and severely eroding river. The flow of Arial Khan is seasonally tidal and strongly influenced by the Padma. The Arial Khan River flows through Faridpur, Madaripur, Barisal districts and falls into the Meghna. Observed max water level during 1987 and 1988 were 6.25 and 6.80 m PWD respectively at Chowdhury Char. The recorded peak flow of the river was 4880 m³/sec in 1988. The river is very important for supply of fresh water for agriculture and fish in the d/s of the catchment.

Naodoba River: It is the branch of Padma River which originates from the Padma at the village Naodoba under upazila Janjira and passes through District Sheriatpur. It is very small (about 80m wide and 5m deep) and stable river.

(b) Flooding

Floods in Bangladesh are caused by: (1) normal flood due to upstream water, (2) flash flood in hilly areas, (3) heavy rainfall within the boundaries of Bangladesh, and (4) coastal storm surge. The areas of the Padma Bridge Project suffer from flood of type (1) and (3). The recorded maximum flow of the Padma at Mawa (60 km d/s of confluence at Goalundo) is 115,700 m³/s and at Baruria transit (about 5 km d/s of confluence at Goalundo) is 141,900 m³/s during 1998 flood. The maximum water level at Mawa and Goalundo transit are 6.34 m PWD and 10.21 m PWD, respectively. The width of the river at Mawa and Paturia are 4.9 km and 4.8 km during January 2003. The river width was ranged from 2 to 4.92 km at Mawa and 2.44 to 5 km at Goalundo during past 30 years (1973-2003).

(c) Drainage interference due to Project

The possible drainage interferences due to the Bridge approach road are as follows:

- At Paturia site, about 17 km long proposed approach road runs mainly on the floodplain of the Padma river. It crosses a Khal at Village Amdala and runs almost parallel to the Ichamati River (Figure 2.3.1).
- At Goalundo site, about 7 km long proposed road mainly crosses the dead river of Padma and passes through the floodplain of the Padma River (Figure 2.3.1).
- At Mawa site, about 8 km proposed road runs over the floodplain of Padma River and crosses a Khal at Village Dogachi (Figure 2.3.2)
- At Janjira site, the 21 km long proposed road passes through the floodplain of Padma and crosses the Azra River at Mouza Karali (Figure 2.3.2)

(d) Groundwater

Ground water is widely used for drinking as well as for irrigation purposes in the 16 study districts. The Hand Tubewells in the rural areas and pipe water in the urban areas are used for drinking purpose. The Shallow and Deep Tube wells are used for irrigation. The ground level goes down in dry and winter period (December to May) due to use of large quantities of ground water for irrigation and household requirement. The height of ground water level from ground elevation varies from 1.3m (Munshigonj) to 15.2m (Tangail). The ground water level is located closed to the ground elevation at Paturia and Mawa sites as these sites are located just on and close to the river bank of the Padma. Groundwater table data were collected from BWDB for 20 years periods (1982-2002). Ground water table below measuring point varies from 0.05m (27 July, 1998) to 7.95m (29 March, 1999) at Paturia site and 0.05m (5 September, 1988) to 7.85m (21 January, 1985) at Goalundo site. Ground water table varies from 0.13m (31 August, 1998) to 8.23m (27 April, 1992) at Mawa site and 0.07m (5 September, 1998) to 5.61m (15 April, 2002) at Janjira site.

2.4.4 Landscape

A detail landscape survey is conducted along the river banks for a 400m strip on both banks. The general landscape along the Padma River stream from the Jamuna-Ganges to downstream confluence at Maghna River is mostly floodplain. Dominant landscape types are agricultural land and char land. In addition some housings, homestead trees, orchard, commercial structures, rural roads, schools, religious institutions (such as mosque, temple, etc) and water bodies are also present along the Padma river stream within 400 m distance from the river banks at both sides.

Agriculture lands: Agricultural areas tend to cover large areas and usually comprise monoculture (e.g. rice paddy). Fertile triple cropped agriculture lands are observed in some sections in the right bank of the Padma river within Faridpur sadar, CharBhadrasan and Janjiira upazilas. Majority of the agricultural lands of the plain lands are double cropped lands. Paddy, nut (badam), jute, sugarcane and pulse are main crops under these areas. On the left bank in addition to paddy, chilies, potatoes and vegetables etc. are also grown in the plain lands and char lands within survey areas.

Char land: Along riverbanks many chars are developed during last few decades. Settlement and vegetation are not started in many chars due to new deposition. Agriculture is started only on aged char but these lands are mostly one-cropped lands and during monsoon season these lands goes under the floodwater.

Settlement areas: Some settlement is also found along the riverbanks within 400-meter width, which are surrounded by trees and vegetation. The settlement pattern seems to be clustered but the clusters are apart from each other. These settlements mostly comprise with growth centers (hat/bazer), ghat (river port for launch and boats) and homesteads.

Water bodies: A number of rivers, canals, ditches and ponds are observed within the study area. Two-branch river from the Padma River named Arial khan River and Azra River are present near the Shibchar and Janjira upazila respectively. Names of the canals on both banks are listed.

Cultural and Historical heritage: A number of educational and cultural institutions such as school, mosque, temple and graveyard are found within the 400m strip from the river banks. A number of mosques (64), temple (7) and one cultural sensitive structure (named, Darbar Sharif) are found in right side bank of the survey areas. Similarly, mosques (81), temple (18), graveyard (9) and other cultural sensitive structure (5) are located in the left bank side. A number of schools (59) and madrasas (23) are also found in the settlement area of both river banks under the surveyed area.

2.5 ECOLOGICAL ENVIRONMENT

2.5.1 Flora and Fauna

(a) Forest and Vegetation

Depletion of natural forest has greatly exceeded the replenishment rate in Bangladesh and it is estimated that less than 10% of country remains under forest; a reduction of 50% over the past 20 years. Half of the remaining forest is in the Eastern Hills, a quarter in the Sundarbans and rest scattered in small pockets throughout the country mainly in Gazipur (Bhawal National Park, 50,000 ha) and Tangail (Modhupur Forest, 25,000 ha) (Divisional Forest Office). In addition, there are road side plantations. Apart from forests and road side plantations, there are lots of other vegetations exists in the impact study area. The homestead forest consists of all different kinds of fruits, timber and fuel species. Trees

likely to be affected by two project sites are as follows:

Location	Paturia-Goalundo Sites		Mawa-Janjira Site	
	Paturia	Goalundo	Mawa	Janjira
RoWs of approach road	22,400	2,000	14,050	8,000
RoWs RTW and others (6 km ²)	138,600	21,000	165,950	11,000
Total	161,000	23,000	180,000	19,000

Source: This Study Field Survey, November 2003

(b) Fisheries

A variety of Wetlands are existing in the impact study area that include rivers, canals, beels, ponds, borrow pits and flood plains. The rivers and canals provide capture fishes whereas beels, ponds, floodplain etc. provide the culture fishes. Within the study area, Comilla district has highest area (10,249 ha) of ponds as well as catch (35,066 ton). Highest total catch from all sorts of inland water is 52,339 ton fishes obtained from Comilla district within the study area (Fisheries statistical yearbook of Bangladesh, 2000-01). By sources, comparatively more catches were from flood plain and pond. The fish catch from the river source was in third position. Looking into the shrimp farm area and its catch, Narail district was found to be the best performer having an area of around 250 ha with an annual catch of around 110 ton. Annual Fish catch in the lower Padma in Faridpur district is 1484 ton. There are one river (Ichamati) and many fish ponds are located at Paturia-Goalundo and Mawa-Janjira Sites. The quantity of the ponds at Paturia-Goalundo site is more than the Mawa-Janjira Site.

Fish Ponds likely to be Affected by RoW of Approach Road and RTW (6 km²)

Location	Paturia-Goalundo Sites		Mawa-Janjira Sites	
	Paturia	Goalundo	Mawa	Janjira
RoWs of approach road	167850 m ² (100 nos)	9650 m ² (5 nos)	40774 m ² (13 nos)	78426 m ² (21 nos)
Rows of RTW and others (6 km ²)	201605 m ² (73 nos)	33417 m ² (61 nos)	147700 m ² (58 nos)	27100 m ² (13 nos)
Total	369455 m ² (173 nos)	43067 m ² (66nos)	188474 m ² (71 nos)	105526 m ² (34 nos)

Source: This Study Field Survey, November, 2003

(c) Wildlife

Wildlife habitats in the 16 districts of the impact study area are limited except Gazipur and Tangail districts. The protected areas of Bhawal and Modhupur national park are the habitats of some wildlife such as deer, wood cat, various birds including migrated birds from Russia, monkey, fox, snakes etc. Review of different types of available documents from different sources including IUCN red lists were made and based on that a complete list of all the wildlife that exists within the impact Study Areas are made. The list is sub-divided by mammals, aquatic mammals, reptiles, aquatic reptiles, amphibians, birds, and aquatic birds. Information on Bengali, English, and Scientific names, typical habitats, food behavior and the abundance status of all the listed wildlife are compiled. Among the wildlife listed, Shazaru, Bon Rui, Jalpairong Turtle, Bhubon Cheel, and Shamuk Khor were listed as endangered species. The species that were listed as threatened includes – Mach Biral, Chitra Katchop, Sona Gui, Sabuz Katchop, Sona Bang, Showkoon, Guduni, Lal Ghughu, Shahi Bulbul and Shada Cheel. However, in the vicinity of the project sites, no exclusive habitat for endangered or threatened specie is reported. Some wildlife such as snake, frog, dog, fox, mongoose, cat, mouse, dolphin and some species of birds (including migratory birds during winter) are available in the two project sites.

2.5.2 Environmentally Protected and Sensitive Areas

Two environmentally protected areas namely Bhawal National Park and Modhupur National Reserve forest are located within the 16 impact study districts (Figure 2.5.1). Several environmental sensitive areas, mainly beels (permanent water bodies) are located within the 16 impact study districts but not within the areas of RoWs of approaches and RTW (6 km²) of the Paturia-Goalundo and Mawa-Janjira Sites.

Bhawal National Park: It is located in Gazipur district approximately 38 km north of Dhaka district. The area is primarily re-growth sal forest. The park was established in 1974 and encompasses an area of 5,022 ha. The area has been notified as a protected area in 1982 under the International Union for Conservation of Nature (IUCN's) protected area Category 5.

Madhupur Forest Reserve: It is located in Tangail District at a distance of more than 50 km from Paturia site. This reserve is described as degraded sal (hardwood trees) and mixed forest but also an extremely important habitat for a variety of owls including the rare brown wood owl and a number of raptors.

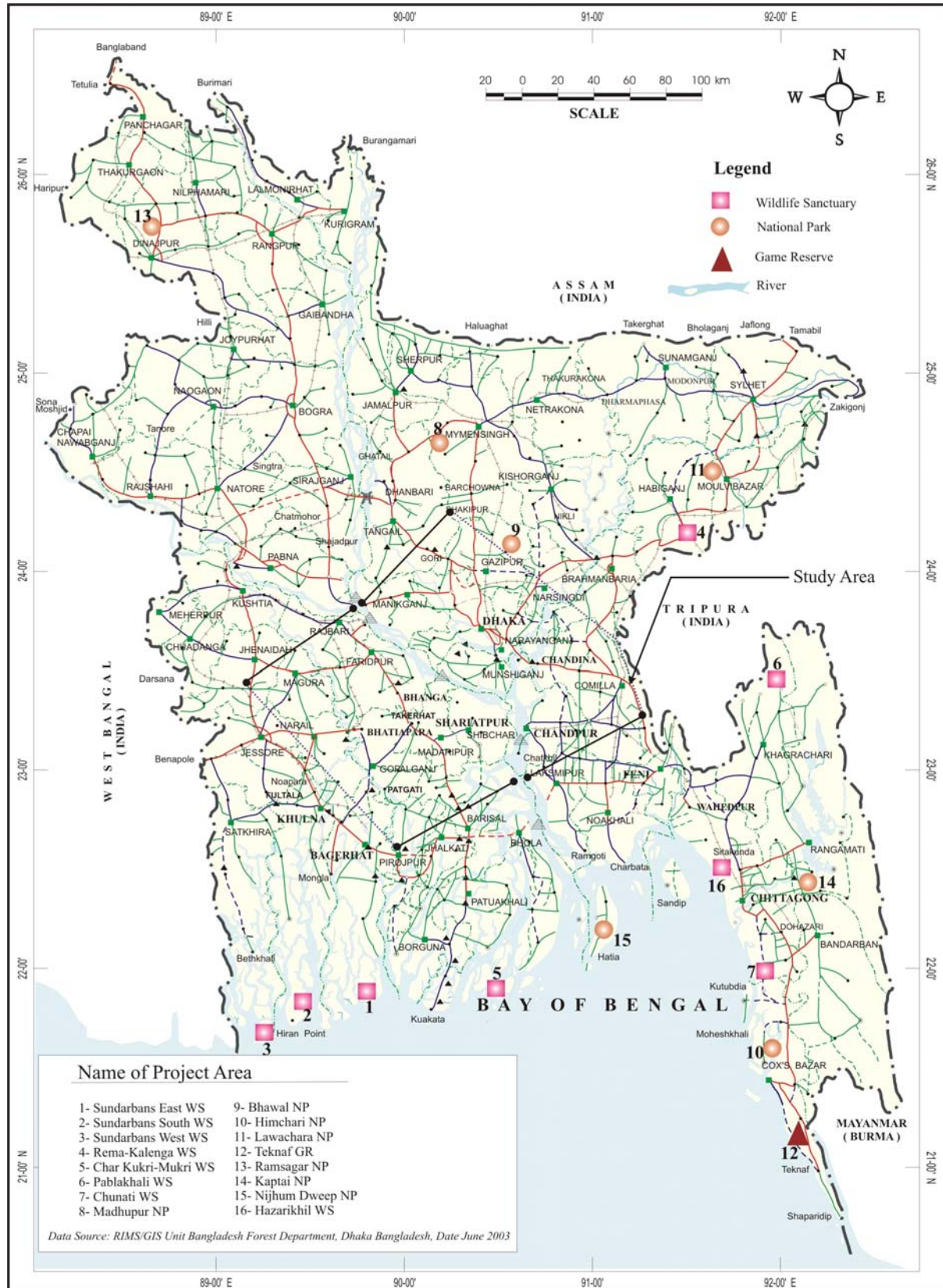


Figure 2.5.1 Environmental Protected Area within the Study Area

2.6 ENVIRONMENTAL POLLUTION

2.6.1 Water Pollution

Surface water in the study area is mainly used for bathing, washing, irrigation etc. At present, sufficient information on surface water quality is not available. The surface water is contaminated mainly due to disposal of industrial waste and other waste. The water quality in the Arial Khan River was tested by the SRNDP is given below.

SI No.	Parameter	Unit	Ferry ghat at Mawa Side	Ferry Ghat at Bhanga Side
1.	Temperature	°C	30	30
2.	pH		6.8	6.9
3.	EC	µs/cm	190	189
4.	Cl (mg/l)	mg/l	4.5	4.5
5.	TSS mg/l	mg/l	168	168
6.	TDS	mg/l	133	132
7.	Suspended Solid	mg/l	35	36
8.	Faucal coliform	mg/l	128	130
9.	Dissolved Oxygen	mg/l	6.2	7.0
10.	BoD	mg/l	1.1	1.8
11.	CoD	mg/l	34	34
12.	Calcium	mg/l	13.6	13.6
13.	Nitrate	mg/l	1.3	1.2
14.	Oil and Grease	mg/l	10	8
15.	Iron	mg/l	0.8	0.82

(Source: SRNDP, 1999)

Ground water is mainly used for drinking and irrigation purposes in the study area. Ground water abstraction is mainly from the shallow aquifers, but the recent discovery of natural arsenic in these aquifers is a serious problem. Some of the most serious arsenic affected parts of the country lie along the Padma River (Manikgonj, Munshigonj, Chandpur, Shariatpur, Faridpur and Rajbari Districts). According to test results of BWDB (3 October, 2000), ground water at Goalundo ghat contains iron (1.5 mg/l), manganese (0.1 mg/l), pH (7.2) and magnesium (17 mg/l). The ground water at Lauhajong (16 March, 2000) contains pH (7.8), iron (9.2 mg/l), manganese (0.43 mg/l) and magnesium (33 mg/l).

2.6.2 Other Pollutions

The main air quality problems in the study area occur from localized pollution (cooking, brick field, vehicle emission, etc). The main noise problems in the area occur from hydraulic horn of the buses and trucks moving on the highways. The main soil contamination problems in the area occur from dumping of solid and liquid wastes as well as accidental spillage of chemicals and fuel from the trucks, buses. Disposal of dredged materials (sand) on char lands is also the cause of soil contamination especially at Goalundo site.

2.7 SOCIAL ENVIRONMENTAL

2.7.1 Socioeconomic condition

(a) Population and occupational pattern

The upazila-wise demographic characteristic of the project sites is presented in the following Table.

Proposed Project Site	District	Upazila	Total Population			Area ha	Total House-holds	Literacy Rate % (7+ over)
			Male	Female	Total			
Paturia	Manikganj	Shibalaya	75404	68438	143842	20117	26334	29.1
Goalundo	Rajbari	Gualando	47760	43915	91675	14908	15694	20.3
Mawa	Munshiganj	Lohajang	76822	76611	153433	13017	26570	37.1
		Sreenagar	102643	103154	205797	20307	36344	39.1
Janjira	Shariatpur	Janjira	80443	76873	157316	23964	28716	18.2
	Madaripur	Shibchar	157502	148580	306082	32202	58085	26.9

(Source: Bangladesh Population Census, 1991, Community series, 1996)

The occupational pattern of population 10 years and over by the main activities of the six upazilas at the both sites is in given the following Table. Majority of people are involved in household works followed by agriculture, and business.

District	Manikganj	Rajbari	Munshiganj	Munshiganj	Shariatpur	Madaripur
Upazilla	Shibalaya	Goalundo	Lohajang	Sreenagar	Zanjira	Shibchar
Population (10+)	100380	59548	103734	140680	99160	193705
Not Working	18.97	18.18	30.03	24.61	17.92	14.85
Household work	37.47	37.09	34.33	37.39	39.36	40.08
Agriculture	23.13	23.66	15.81	17.47	31.97	29.37
Industry	0.77	0.45	0.50	0.94	0.24	0.58
Water, Electric & Gas	0.04	0.03	0.05	0.06	0.03	0.04
Construction	0.50	0.66	0.79	0.95	0.30	0.37
Transport communication	2.08	1.71	0.97	0.54	0.31	0.49
Business	7.30	7.65	9.47	8.42	3.35	4.78
Services	0.50	1.83	1.53	0.71	0.29	0.59
Other	8.59	7.66	5.36	7.59	5.63	7.80

(Source: Bangladesh Population Census, 1991, Community series, 1996)

(b) Social Structures

The ethnic minorities are reported in the population census of 1991 to comprise slightly over one percent of the country's population and are geographically concentrated in other locations outside the Study Area. The social impact survey under this Study did not find tribal people living within the survey area and also did not identify any households or individuals belonging to the refugee population such as Bihari Muslims and Myanmar refugees. It was also found that women in the area had limited income-generating activities. Typically, poor women engage in the drying of paddy on the roadsides, employed by the rice mills, apart from working in the fields for growing rice.

According to the social survey of this Study, the affected population and households within proposed ROW in Mawa Site is higher than Paturia site. However, more people in Paturia site opted for self relocation in case they have to relocate. More details can be found in Chapter 10.

(c) Economic Characteristics

The economic status of the respondents of the questionnaire survey indicates about 1% rich (monthly family income in excess of Tk. 15000), 9% mid income level (monthly family income between Tk. 7500-15000), 67% low income level (monthly family income between Tk. 3000-75000) and 23% poor (monthly family income below Tk. 3000) in Paturia. In Gaolando site, about 1%, 3%, 75% and 21% fall within the rich, mid income, low income and poor categories respectively. In Mawa the economic condition of the people are better. The economic status survey indicates 3% are rich, 11%, 55% and 31% are fall under the categories of mid, low and the poor income groups respectively. The project site in Janjira is

more rural than other three sites. The general economic condition is poor. 1%, 9%, 58% and 32% are fall under rich, medium income, low income and poor groups.

The rich and mid income group own majority of the lands. The majority of the population is sharecroppers, other major economic activities include, cattle rearing, household poultry rearing, transport workers (bus/truck drivers and helpers), and trading in market places/growth centers and ferryghats. No manufacturing industrial base is found at the two proposed project sites. NGOs are active throughout the project study area.

(d) Charland

Along the Padma River and inside the main stream of the Padma River, many chars developed. Generally, it is reported that landless people living on the aged char lands to be about 25-30%, many of them are settlers from other neighboring upazila and districts who are affected by the river erosion. These people are generally poor and are always in the move for a safer place to live due to annual floods and bank erosion.

(e) Land Acquisition and Resettlement

The construction of Padma Bridge will result land acquisition and resettlement issues. In addition, there will be disruption in social coherence, family ties, emotional attachment, social networks and social services. There are two types of affected population. Directly affected and indirectly affected. Directly affected are those whose lands, households and other assets are affected due to land acquisition. Indirectly affected who are not affected by land acquisition but generally had interest in livelihoods. They include sharecroppers, farm labors, employees and workers in shops and other commercial establishments, artisans, craftsmen, construction workers, transport operators and owners. Details on these are given in Appendix 12.

2.7.2 Social Infrastructures

(a) Transport Facilities

The communication network is more developed in the area of the Goalundo-Paturia corridor due to Goalundo (Daulatdia) having been, the main route of access (N5 & N7) to the central Bangladesh traditionally. Non-motorized traffic (NMT) is the dominant transport mode in the both project sites. Rickshaws are the dominant mode of transport for most of the population in the hinterlands, as well as within the villages, growth centers under the project sites. It is also a major source of employment. Presently, the Dhaka- Khulna- Mongla highway (N8) via Mawa ferry is being constructed under ADB assistance. Khulna-Mongla highway part of N8 has been constructed under ADB assistance in late 1980s. The condition of the road is good. The construction of Rupsa Bridge under JBIC assistance will further improve regional transport. The Padma River now has four river crossing ferry systems: (i) Bheramara- Paksey; (ii) Aricha (Paturia)- Daulatdia; (iii) Mawa- Char Janajat; and (iv) Shariatpur- Chandpur. In the vicinity of the project site, railway system is not well established. A broad gauge railway link exists up to Daulatdia while broad gauge railway track up to Atrashī exists in the other side but trains currently operate up to Faridpur.

(b) Water Supply, Sanitation and Electricity

About 96 percent of the population in Bangladesh had access to potable water within 150 meters of their dwellings via tubewells, deep tubewells, taps or ring wells. The effective coverage of safe water dropped to approximately 80 percent due to arsenic contamination. Arsenic level in ground water sources within the impact study area is reported as high as 250 ppm against Bangladesh Standard of 10 ppm. Sources of drinking water, access to toilet

facilities and electricity according to the statistical data as of 1996 census are provided in the following Table.

Upazila	House-holds	Source of Drinking Water					Toilet Facilities			Electricity Facilities
		Tape	Tube well	Well	Pond	River	Sanitary	Other	No	
Shibalaya	57839	79	24246	1303	123	88	2740	21955	1144	573
Gualando	15387	3	15014	237	31	102	599	14028	760	724
Lohajang	26348	36	22651	114	2741	806	1885	22647	1816	2684
Sreenagar	35747	70	33589	101	1668	319	2594	30304	2849	3969
Janjira	28353	14	27313	106	315	605	896	26358	1099	339
Shibchar	57375	20	54946	340	1045	1024	2211	50856	4308	660

Source: Population Census, Community Series, 1996 Bangladesh Bureau of Statistics

According to questionnaire survey, the source of drinking water and sanitation facilities within the specific project site are as follows.

Project Sites	Affected Villages	Drinking Water Source (%)			Toilet Facilities (%)		
		Hand Tube well	Deep Tube well	Others	Katcha	Sanitary	Open space
Paturia- Goalundo Site							
Paturia	15	92	0	8	40	40	20
Goalundo	6	94	0	6	78	10	12
Mawa Janjira Site							
Mawa	10	98	2	0	35	65	0
Janjira	33	98	0	2	64	34	2

(Source: This Study, December 2003)

(c) Public Health

Each upazila within the impact study area has an Upazila Health Complex (UHC), Rural Health Sub-Center, Union Health and Family Centers. These facilities are intended to provide health services delivery systems, including the primary health care services, to the doorstep of the rural people. UHC has a bed capacity of 50-200 beds. The socio-economic survey indicated health facilities under the study area is as follows.

Project Sites	Total No. of Affected Villages	Hospital/ Clinic (%)	Physician Availability (%)	Health care services from NGO's (%)
Paturia- Goalundo Site				
Paturia	15	92	80	64
Goalundo	6	96	96	70
Mawa Janjira Site				
Mawa	10	84	76	50
Janjira	33	70	72	58

(Source: This Study, December 2003)

Both the proposed project sites are mostly rural area and infectious and parasitic diseases generally arise from malnutrition, as well as from lack of hygiene and poor living conditions. Under the present Study, epidemic diseases such as diarrhea suffered during last three months were identified. About 6% people of Paturia- Goalundo site and about 26% people of Mawa- Janjira site were found suffered by Diarrhea. Presently, the longer-term effects of arsenic poisoning is also a major public health challenge.

(d) Historical and Cultural Heritage

No listed archaeological or historical resources are found within the potential impact area of

the Project Site. Other cultural resources (mosque, temple, educational institution, Grave yard etc.) within survey area are indicated in the following Table.

Upazila	Mosque	Temple	School/ College	Madrasa	Grave yard	Fiery yard	Archeological Structure	Community Centre
Paturia-Goalundo Site								
Paturia	4	4	0	1	0	0	0	0
Goalundo	3	0	1	1	2	1	0	0
Total	7	4	1	2	2	1	0	0
Mawa-Janjira Site								
Mawa	16	2	9	3	5	1	0	3
Janjira	10	0	4	4	5	0	0	0
Total	26	2	13	7	10	1	0	3

(Source: This Study, December 2003)

2.7.3 Water Rights

At present, no water rights have been established by the GoB. As per discussions with WARPO, it is learnt that water right is under preparation in line with the 1997 water policy. The 1997 water policy of Bangladesh says that, the Government of Bangladesh reserves the right to allocate water to ensure equitable distribution, efficient development and use and to address poverty. Ownership of water does not vest in an individual but in the state. The Policy also states that in general, the priority for allocating water during critical periods in the water shortage zones will be in the following order, domestic and municipal uses, non-consumptive uses (e.g., navigation, fisheries and wildlife), sustenance of the river regime and other consumptive and non-consumptive uses (such as irrigation, industry, environment, salinity management and recreation).

2.8 SCREENING

2.8.1 Screening Process

Screening is carried out by custom made project specific templates as explained in Section 2.2.2. The first template provides the basis of the impact analysis, while the second template helps in determining the impact rating. The second template gives the identification of key issues. A key issue is the issue, which requires detailed and in-depth further investigation and main focus in the project activities. A preliminary idea on the mitigation measures for the key issues can be obtained from the Table 2.2.3. The tailor made third template is a Leopold graded matrix to be used for EIA. An attempt is made to complete this matrix to get the comparison between two sites. This also gives an indication of impact reduction due to mitigation measures to be employed.

2.8.2 Impact Analysis

The first template of impact analysis is used for both the sites. These are given in Table 2.8.1 for Paturia Goalundo site and Table 2.8.2 for Mawa Janjira site. In this template, impact type is divided into direct, indirect and cumulative; temporal extent is analyzed as impact during construction and impact after construction; spatial extent is characterized as local impact and widespread impact; mitigability is alienated as fully mitigate-able and partially mitigate-able; and finally monitoring possibility is distinguished as fully monitor-able and partially monitor-able. Comparing the two tables, it can be inferred that impact characteristics for both the sites are completely same.

Table 2.8.1 Analysis of Environmental Impact Parameters for the construction of Padma Bridge at Paturia Goalondo Site

ENVIRONMENTAL PARAMETERS	Type of Impact			Temporal Extent		Spatial Extent		Mitigability		Monitoring Possibility	
	Direct	Indirect	Cumulative	During Construction	After Construction	Widespread	Local	Fully	Partially	Fully	Partially
NATURAL ENVIRONMENT											
1. Topography	√			√	√		√		√	√	
2. Soil Erosion and Siltation	√	√	√	√	√	√	√		√		√
3. Hydrology/Flooding	√	√	√	√	√	√	√		√		√
4. Drainage Congestion	√			√	√		√	√		√	
5. Landscape	√			√	√		√		√	√	
6. Meteorology	-	-	-	-	-	-	-	-	-	-	-
7. Land Subsidence	-	-	-	-	-	-	-	-	-	-	-
8. Flood Control		√			√		√	-	-	√	
ECOLOGICAL PARAMETERS											
9. Fisheries	√			√	√		√		√		√
10. Wildlife	√			√			√		√		√
11. Vegetation/ Agricultural Loss	√	√		√	√		√		√	√	
12. Tree Plantation		√			√		√	-	-	√	
13. Plant Cutting	√			√			√		√	√	
14. Wet Lands	-	-	-	-	-	-	-	-	-	-	-
15. Water Bodies Loss	√			√			√		√	√	
16. Forest	-	-	-	-	-	-	-	-	-	-	-
17. Endangered Species	-	-	-	-	-	-	-	-	-	-	-
18. Environmentally Protected and Sensitive Areas.	-	-	-	-	-	-	-	-	-	-	-
ENVIRONMENTAL POLLUTION											
19. Air Pollution	√	√		√	√		√		√	√	
20. Surface & Ground Water Pollution	√			√			√	√		√	
21. Noise and Vibration	√			√			√	√		√	
22. Soil Contamination		√		√			√	√		√	
23. Waste Disposal			√	√			√		√	√	
SOCIAL ENVIRONMENT											
24. Homestead Loss	√	√	√	√			√		√	√	
25. Income Loss		√	√	√	√		√		√	√	
26. Historical and Cultural Loss	√			√			√		√	√	
27. Navigation and Water Transport	√			√	√		√		√	√	
28. Health and Safety	√			√			√	√		√	
29. Employment	√	√	√	√	√	√	√	-	-	√	
30. Women Empowerment		√	√	√	√	√	√	-	-	√	
31. Land Acquisition	√	√	√	√	√		√		√	√	
32. Health & Nutrition		√		√			√	-	-	√	
33. Infrastructures Development		√		√	√	√	√	-	-	√	
34. Industries		√		√	√	√	√	-	-	√	
35. Split of Communities	√			√	√		√		√	√	
36. Road Transport	√			√	√	√		-	-	√	
37. Road Accident	√			√	√		√		√	√	
38. Water Rights	-	-	-	-	-	-	-	-	-	-	-
39. Ethnic Minorities and Indigenous People	-	-	-	-	-	-	-	-	-	-	-
40. Land Use	√	√		√			√		√	√	

Table 2.8.2 Analysis of Environmental Impact Parameters for the construction of Padma Bridge at Mawa Janjira Site

ENVIRONMENTAL PARAMETERS	Type of Impact			Temporal Extent		Spatial Extent		Mitigability		Monitoring Possibility	
	Direct	Indirect	Cumulative	During Construction	After Construction	Widespread	Local	Fully	Partially	Fully	Partially
NATURAL ENVIRONMENT											
1. Topography	√			√	√		√		√	√	
2. Soil Erosion and Siltation	√	√	√	√	√	√	√		√		√
3. Hydrology/Flooding	√	√	√	√	√	√	√		√		√
4. Drainage Congestion	√			√	√		√	√		√	
5. Landscape	√			√	√		√		√	√	
6. Meteorology	-	-	-	-	-	-	-	-	-	-	-
7. Land Subsidence	-	-	-	-	-	-	-	-	-	-	-
8. Flood Control		√			√		√	-	-	√	
ECOLOGICAL PARAMETERS											
9. Fisheries	√			√	√		√		√		√
10. Wildlife	√			√			√		√		√
11. Vegetation/ Agricultural Loss	√	√		√	√		√		√	√	
12. Tree Plantation		√			√		√	-	-	√	
13. Plant Cutting	√			√			√		√	√	
14. Wet Lands	-	-	-	-	-	-	-	-	-	-	-
15. Water Bodies Loss	√			√			√		√	√	
16. Forest	-	-	-	-	-	-	-	-	-	-	-
17. Endangered Species	-	-	-	-	-	-	-	-	-	-	-
18. Environmentally Protected and Sensitive Areas.	-	-	-	-	-	-	-	-	-	-	-
ENVIRONMENTAL POLLUTION											
19. Air Pollution	√	√		√	√		√		√	√	
20. Surface & Ground Water Pollution	√			√			√	√		√	
21. Noise and Vibration	√			√			√	√		√	
22. Soil Contamination		√		√			√	√		√	
23. Waste Disposal			√	√			√		√	√	
SOCIAL ENVIRONMENT											
24. Homestead Loss	√	√	√	√			√		√	√	
25. Income Loss		√	√	√	√		√		√	√	
26. Historical and Cultural Loss	√			√			√		√	√	
27. Navigation and Water Transport	√			√	√		√		√	√	
28. Health and Safety	√			√			√	√		√	
29. Employment	√	√	√	√	√	√	√	-	-	√	
30. Women Empowerment		√	√	√	√	√	√	-	-	√	
31. Land Acquisition	√	√	√	√	√		√		√	√	
32. Health & Nutrition		√		√			√	-	-	√	
33. Infrastructures Development		√		√	√	√	√	-	-	√	
34. Industries		√		√	√	√	√	-	-	√	
35. Split of Communities	√			√	√		√		√	√	
36. Road Transport	√			√	√	√		-	-	√	
37. Road Accident	√			√	√		√		√	√	
38. Water Rights	-	-	-	-	-	-	-	-	-	-	-
39. Ethnic Minorities and Indigenous People	-	-	-	-	-	-	-	-	-	-	-
40. Land Use	√	√		√			√		√	√	

2.8.3 Impact Rating

The second template of impact rating is also applied for both the sites. These are given in **Table 2.8.3** for Paturia Goalundo site and **Table 2.8.4** for Mawa Janjira site. In this template, Impact is principally divided into 3 categories, namely, positive, negative and no impact. Positive and negative impacts are further classified into severe, moderate and low impacts with impact ratings vary between 1 and 3.

From the two tables, it can be noted that most of the impacts are similar for the two sites. There are 8 positive impacts, 8 no impacts and 24 negative impacts. The adverse impacts identified are as follows:

- Topography
- Soil Erosion and Siltation
- Hydrology/ Flooding
- Drainage Congestion
- Landscape
- Fisheries
- Wildlife
- Vegetation /Agricultural Loss
- Plant Cutting
- Water Bodies Loss
- Air Pollution
- Surface & Ground Water Pollution
- Noise and Vibration
- Soil Contamination
- Waste Disposal
- Homestead Loss
- Income Loss
- Historical and Cultural Loss
- Navigation and Water Transport
- Health and Safety
- Land Acquisition
- Split of Communities
- Road Accident, and
- Land Use.

Table 2.8.3 Environmental Impact Rating for the construction of Padma Bridge at Paturia Goalundo site

ENVIRONMENTAL PARAMETERS	ENVIRONMENTAL IMPACT RATINGS						
	Positive Impact			No Impact	Adverse Impact		
	Severe (+3)	Moderate (+2)	Low (+1)		Severe (-3)	Moderate (-2)	Low (-1)
NATURAL ENVIRONMENT							
1. Topography							√
2. Soil Erosion and Siltation					√		
3. Hydrology/ Flooding					√		
4. Drainage Congestion						√	
5. Landscape							√
6. Meteorology				√			
7. Land Subsidence				√			
8. Flood Control		√					
ECOLOGICAL PARAMETERS							
9. Fisheries					√		
10. Wildlife							√
11. Vegetation /Agricultural Loss					√		
12. Tree Plantation		√					
13. Plant Cutting						√	
14. Wet Lands				√			
15. Water Bodies Loss					√		
16. Forest				√			
17. Endangered Species				√			
18. Environmentally Protected and Sensitive Areas.				√			
ENVIRONMENTAL POLLUTION							
19. Air Pollution						√	
20. Surface & Ground Water Pollution							√
21. Noise and Vibration						√	
22. Soil Contamination							√
23. Waste Disposal							√
SOCIAL ENVIRONMENT							
24. Homestead Loss						√	
25. Income Loss						√	
26. Historical and Cultural Loss							√
27. Navigation and Water Transport							√
28. Health and Safety							√
29. Employment		√					
30. Women Empowerment		√					
31. Land Acquisition					√		
32. Health & Nutrition		√					
33. Infrastructures Development		√					
34. Industries			√				
35. Split of Communities						√	
36. Road Transport	√						
37. Road Accident						√	
38. Water Rights				√			
39. Ethnic Minorities and Indigenous People				√			
40. Land Use							√

Table 2.8.4 Environmental Impact Rating for the construction of Padma Bridge at Mawa Janjira site

ENVIRONMENTAL PARAMETERS	ENVIRONMENTAL IMPACT RATINGS						
	Positive Impact			No Impact	Adverse Impact		
	Severe (+3)	Moderate (+2)	Low (+1)		Severe (-3)	Moderate (-2)	Low (-1)
NATURAL ENVIRONMENT							
1. Topography							√
2. Soil Erosion and Siltation						√	
3. Hydrology/ Flooding					√		
4. Drainage Congestion						√	
5. Landscape							√
6. Meteorology				√			
7. Land Subsidence				√			
8. Flood Control		√					
ECOLOGICAL PARAMETERS							
9. Fisheries						√	
10. Wildlife							√
11. Vegetation /Agricultural Loss					√		
12. Tree Plantation		√					
13. Plant Cutting						√	
14. Wet Lands				√			
15. Water Bodies Loss						√	
16. Forest				√			
17. Endangered Species				√			
18. Environmentally Protected and Sensitive Areas.				√			
ENVIRONMENTAL POLLUTION							
19. Air Pollution						√	
20. Surface & Ground Water Pollution							√
21. Noise and Vibration						√	
22. Soil Contamination							√
23. Waste Disposal							√
SOCIAL ENVIRONMENT							
24. Homestead Loss					√		
25. Income Loss					√		
26. Historical and Cultural Loss							√
27. Navigation and Water Transport							√
28. Health and Safety							√
29. Employment		√					
30. Women Empowerment		√					
31. Land Acquisition					√		
32. Health & Nutrition		√					
33. Infrastructures Development		√					
34. Industries			√				
35. Split of Communities					√		
36. Road Transport	√						
37. Road Accident						√	
38. Water Rights				√			
39. Ethnic Minorities and Indigenous People				√			
40. Land Use							√

2.8.4 Grading Matrix

The third template developed in this Study is a Leopold Graded Matrix. This template gives the impact graded values for both the site for two cases, with mitigation measures and without mitigation measures. The grading matrix is given in Table 2.8.5. It is to be noted that usually this step is not part of IEE, rather part of EIA. However, this is carried out just to compare the two sites and to assist the process of final site selection. Also, it is to be noted that this grading is subjective in nature; environmental professionals usually do not look at the absolute value, rather the range of change. The weightage of each parameter are obtained from Table 2.2.2 and impact degree is taken from the Table 2.8.3 and 2.8.4. Impact rating after mitigation is judged considering the mitigation measures in line with guidelines proposed in Table 2.2.3. It is to be noted that impact rating after mitigation is preliminary in nature and will be investigated in detail in EIA stage.

2.8.5 Comparison between Two Sites

From the environmental screening, it can be concluded that impact types and their degrees are very similar for the two sites. However, the following slight differences are observed:

- Erosion and siltation might pose greater threat at PG site.
- Impact on fisheries is expected to be more at PG site.
- Water bodies loss will be more at PG site.
- Homestead loss will be more at MJ site.
- Income loss is expected to be more at MJ site.
- Split of communities might be more at MJ site.

Hence, it can be said that there is no relative advantage of one site over other in terms of environmental impact.

Table 2.8.5 Leopold Graded EIA Impact Matrix for the Construction of Padma Bridge for Total Environmental Benefits Estimation from EMP Implementation

Environmental Parameters	Relative weightage	Without Mitigation Measures				With Mitigation Measures			
		Paturia-Goalundo		Mawa-Janjira		Paturia- Goalundo		Mawa-Janjira	
		Degree	Graded value	Degree	Graded value	Degree	Graded value	Degree	Graded value
(i)	(ii)	(iii)= (i)x(ii)	(iv)	(v) = (i)x(iv)	(vi)	(vii) = (i)x(vi)	(viii)	(ix) = (i)x(viii)	
NATURAL ENVIRONMENT									
1. Topography	2	-1	-2	-1	-2	0	0	0	0
2. Soil Erosion and Siltation	6	-3	-18	-2	-12	-1	-6	-1	-6
3. Hydrology/ Flooding	10	-3	-30	-3	-30	-1	-10	-1	-10
4. Drainage Congestion	7	-2	-14	-2	-14	-1	-7	-1	-7
5. Landscape	2	-1	-2	-1	-2	0	0	0	0
6. Meteorology	2	0	0	0	0	0	0	0	0
7. Land Subsidence	5	0	0	0	0	0	0	0	0
8. Flood Control	4	+2	8	+2	8	2	8	2	8
ECOLOGICAL PARAMETERS									
9. Fisheries	8	-3	-24	-2	-16	-1	-8	-1	-8
10. Wildlife	4	-1	-4	-1	-4	0	0	0	0
11. Vegetation/ Agricultural Loss	8	-3	-24	-3	-24	-1	-8	-1	-8
12. Tree Plantation	6	+2	12	+2	12	2	12	2	12
13. Plant Cutting	6	-2	-12	-2	-12	-1	-6	-1	-6
14. Wet Lands	3	0	0	0	0	0	0	0	0
15. Water Bodies Loss	7	-3	-21	-2	-14	-1	-7	-1	-7
16. Forest	8	0	0	0	0	0	0	0	0
17. Endangered Species	10	0	0	0	0	0	0	0	0
18. Environmentally Protected and Sensitive Areas	10	0	0	0	0	0	0	0	0
ENVIRONMENTAL POLLUTION									
19. Air Pollution	5	-2	-10	-2	-10	-1	-5	-1	-5
20. Surface & Ground Water Pollution	7	-1	-7	-1	-7	0	0	0	0
21. Noise and Vibration	3	-2	-6	-2	-6	-1	-3	-1	-3
22. Soil Contamination	5	-1	-5	-1	-5	0	0	0	0
23. Waste Disposal	3	-1	-3	-1	-3	0	0	0	0
SOCIAL ENVIRONMENT									
24. Homestead Loss	10	-2	-20	-3	-30	-1	-10	-1	-10
25. Income Loss	8	-2	-16	-3	-24	-1	-8	-1	-8
26. Historical and Cultural Loss	8	-1	-8	-1	-8	0	0	0	0
27. Navigation and Water Transport	3	-1	-3	-1	-3	0	0	0	0
28. Health and Safety	5	-1	-5	-1	-5	0	0	0	0
29. Employment	7	+2	14	+2	14	2	14	2	14
30. Women Empowerment	7	+2	14	+2	14	2	14	2	14
31. Land Acquisition	8	-3	-24	-3	-24	-1	-8	-1	-8
32. Health & Nutrition	4	+2	8	+2	8	2	8	2	8
33. Infrastructures Development	5	+2	10	+2	10	2	10	2	10
34. Industries	5	+1	5	+1	5	1	5	1	5
35. Split of Communities	6	-2	-12	-3	-18	-1	-6	-1	-6
36. Road Transport	7	+3	21	+3	21	3	21	3	21
37. Road Accident	5	-2	-10	-2	-10	-1	-5	-1	-5
38. Water Rights	2	0	0	0	0	0	0	0	0
39. Ethnic Minorities and Indigenous People	10	0	0	0	0	0	0	0	0
40. Land Use	3	-1	-3	-1	-3	0	0	0	0
Total Graded Value			-191		-194		-5		-5

Chapter 3 Environmental Impact Assessment (EIA)

3.1 INTRODUCTION

The Environmental Impact Assessment (EIA) is executed from June to December, 2004 for the selected site (Mawa – Janjira) and results are presented in this Chapter. This also includes a preliminary EMP.

The main objective of the EIA study is to identify the significant environmental impacts for the bridge site along with mitigation measures by following the requirements of the guidelines of EIA prepared by JICA, JBIC, GoB and other donor agencies, and to prepare a preliminary EMP for the project.

3.2 SCOPE & APPROACH

3.2.1 Scope of EIA

The scope of the EIA study is based upon the requirements of the environmental guidelines of JICA, JBIC and GoB. The scope of works include:

- Review of all relevant environmental reports including monitoring of Jamuna, Paksey & Bhairab Bridges;
- Project description from environmental aspect
- Supplementary secondary & primary data collection;
- Data analysis to describe the natural environment, social environment and environmental pollution, especially for the negative impacts identified in the IEE;
- Environmental quality survey on air, noise, water (surface & ground) & riverbed material;
- Input from SIA study;
- Input from mathematical modeling study;
- Conducting questionnaires survey;
- Meeting with stakeholders (FGD & PRA);
- Analysis of environmental impacts
- Identification of mitigation measures;
- Preparation of Preliminary EMP to reduce or eliminate significant environmental impacts; and
- Preparation of approx. environmental cost.
-

3.2.2 Approach of EIA

Study approach can be summarized as follows:

- The Project component is described from environmental aspect,
- Review of EIA of the large bridges constructed in Bangladesh is done together with the comparison of present situation with the anticipation made in the EIA,
- Detail methodology is set up.
- Environmental base line is described from both primary and secondary data,
- Impact is assessed,
- Mitigation measure is proposed,
- Impact evaluation is made considering the mitigation measures,
- Preliminary EMP is proposed with approximate cost estimates
- Recommendations is made for further studies required.

3.3 EIA STUDY AREA AND PROJECT COMPONENT

The Environmental Impact Assessment (EIA) is carried out for the selected Mawa – Janjira site of the Padma Bridge. The impact area covers section of the Padma River and its tributaries, associated channels and drains; and land area in the vicinity of the approach road. The Work Area is in the districts of Munshiganj, Shariatpur and Madaripur.

3.3.1 Proposed Main Bridge Site

The proposed 5.58 km long (including viaducts) Padma Bridge site is located on the Dhaka-Khulna/Mongla National Highway over the Padma River. The bridge end at Mawa is located at the stable left bank of the Padma at about 1 km d/s of the present Mawa Ferry Ghat at village: Parchim Kumarbhog in Upazila: Lauhajang, District: Munshigonj whereas the bridge end at Janjira is located at the unstable right bank of the Padma at about 8 km d/s of the present Kathalbari Ferry Ghat (Shariatpur Ferry ghat) at village: Munsur Mollah Kandi under Naodoba Union in Upazila: Janjira, District: Shariatpur. The proposed bridge abutment at Mawa Site is marked at Village-Parchim Kumarbhog at about 50 m far away from the riverbank whereas the bridge end at Janjira site is marked at village Munsur Mollah Kandi at about 50m far way from the river bank (as on 04 June 2004).

3.3.2 Bridge Connecting Approach Road

The total length of the proposed bridge connecting approach road on the left bank at Mawa Site is 0.273 km and on the right bank at Janjira Site is about 12 km. The right of way (RoW) investigated for the environmental study is 50 m from the centerline of the approach road (100 m strip). However, land use is investigated for 150 m strip. The proposed bridge connecting approach road at Mawa Site starts from the intersection of the existing Dhaka-Mawa National Highway at meeting point of Dhaka-Mawa & Lauhajang-Mawa Ferryghat roads in Upazila: Lauhajang, District: Munshigonj and ends at bridge abutment.

The bridge connecting approach road at Janjira site commences from bridge abutment and ends at the Mawa-Bhanga National Highway at Village: Char Ragunathpur under Union: Mathbarer Char, UZ: Sibchar. The approach road at Mawa and Janjira sites runs mainly through agricultural lands, homesteads, several water bodies, cultural institutes etc., through the unions of Madinimondal (Lauhaganj UZ), Madbarchar, Kathalbari, & Kutubpur (Sibchir UZ), and Naodoba (Janjira UZ). These areas are usually inundated during monsoon. During 2004 flood these areas were submersed at about 2m water depth.

The proposed Service Area is located just at the landing site of the proposed bridge at village: Munsur Mollah Kandi under Naodoba Union in Janjira Upazila. The RoW of the service area is approx. (1.00 x 1.00) km for direct project activities and passes through the agricultural lands, homestead, water bodies, cultural institutes etc in the Union of Naodoba (Janjira UZ). However, for the land use investigation, 2.5 X 2.5 km area was considered. The RoW of Toll Gate Area is (200x400)m and is located at Village: Kutubpur under Kutubpur Union, Upazila: Sibchar. The proposed road alignment bisects the Service and Toll Gate Areas.

3.3.3 River Training Works Area

The length of the river training works are 6 km for Mawa site and 10 km for Janjira side. The actual RoW varies at various section and it's width is maximum 60 m at Mawa side and maximum 100m at Janjira side. It is to be noted that some portion of RoW is within the river during the field investigation (October – November, 2004). For the EIA study, however, RoW is considered as 60 m and 100 m from the bank line at the survey time for Mawa and Janjira side, respectively. As a result, it is recommended that review should be

done as part of EMP preparation. For the purpose of land use review, for both side, 300 m strip is considered from the bank line at the time of survey.

The RTW area at Mawa runs mainly through densely populated residential areas and tree plantation area whereas, the RoW of RTW at Janjira crosses mainly several channels, agricultural lands & houses along the right bank of the Padma River (Fig-2.1). The unions directly affected by the RTW works are Kumer Bhog and Medinimondal under Lauhaganj UZ and Rarikhal and Bhaggyakul under Sreenager UZ on the Mawa side. On the Janjira side, the affected unions are Madbarchar, and Kathalbari under Sibchar UZ and Noadoba and Purbo Noadoba under Janjira UZ.

3.3.4 Project Activities

The construction of the proposed Padma Bridge is to include the following major project activities:

- Land Acquisition including Infrastructure;
- Main Bridge & Viaducts;
- River Training Works (RTW);
- Bridge Connecting Approach Roads;
- Service Area; and
- Toll Gate Area.

Details of each activity and its possible environmental impact are given in Chap 2 of the APP 11.

3.4 ENVIRONMENTAL INVESTIGATION OF SIMILAR PROJECTS

A number of large bridge projects already implemented in Bangladesh. In all cases, EIA were conducted. However, there is no systematic study for environmental monitoring at the operational stage. To compare between the impacts anticipated in EIA stage and present condition, JICA Study Team made an environmental investigation of the following bridges:

- Padma Bridge pre-feasibility study
- Jamuna Bridge
- Paksey Bridge
- Bhairab Bridge, and
- Rupsa Bridge

3.4.1 Review of Padma Bridge pre-feasibility

Under the 3rd amendment to the contract between JMBA and the consultant for Jamuna Bridge Project, the pre-feasibility for Padma Bridge was conducted in 1999. An Initial Environmental Examination (IEE) was included in that Pre-FS. However, the IEE was limited to the Mawa site only.

Potential impacts and their severity were identified in the Pre FS are shown below:

Severe:	Soil quality Social disruption Occupational health hazards and safety Other health hazard Employment
Moderate:	Ground water quality Quantitative aspects of surface and ground water

Atmosphere
 Nutritional status
 Disruption of agricultural practice
 Hindrance to navigation
 Hindrance to road traffic
 Terrestrial environment

Insignificant: Surface water quality
 Aesthetics and landscape
 Archaeologically or culturally important sites
 Aquatic environment

Not Clear: Erosion, siltation and bank stability

3.4.2 Environmental experiences of Jamuna Bridge

(a) Environmental Studies and Anticipated Impacts

Jamuna Bridge is the longest bridge of Bangladesh with a length of 4.8 km. This rail-cum-road bridge was constructed during 1994 – 1998 and opened to traffic on 22 June 1998. It is located on the Dhaka – Dinajpur National Highway in Tangail and Sirajgonj Districts. The total cost was 40,000 million Taka and jointly funded by WB, ADB and JBIC.

An EIA was conducted during the ‘Phase II Feasibility Study and Detailed Design’ in 1989. After that a number of studies were conducted, like,

- Dhaleswari Mitigation Plan (1992)
- Land Use Master Plan (1992)
- Fisheries Impact and Mitigation Study (1992)
- Wildlife Survey (1990-92)
- Bridge End Planning Integration Study (1992)

Based on these studies, JMBA prepared Fisheries Action Plan and Wildlife Action Plan in 1993. Finally, Environmental Management Action Plan (EMAP) was prepared in 1995.

No major environmental effects were expected during the construction period (about 3.5 years), except the following normal construction hazards.

- Temporary disruption of drainage (drainage congestion due to diversion at bridge/culvert site, stock piling of earth at non designated area etc)
- Interruption of agricultural practice due to temporary occupation of land (40 ha). Agricultural production losses were estimated at Tk. 2.8 million
- Some disturbance of wildlife (such as migratory birds, dolphin, dogs, fox etc)
- Pollution of water, soil and other potential contaminants.

In addition, the followings were the expected impacts:

- Impact on soil, water bodies etc. from dredged spoil (about 30 mill. m³ dredged materials) due to disposal of spoil on outside of designated area.
- It was unlikely that dredged material from the Jamuna river was contaminated by toxic chemicals or heavy metal, because no heavy industries exists as yet upstream of the bridge site. It was nevertheless recommended to analyze the fill material prior to reclaiming the housing and residential areas.
- Maximum backwater effects during average floods were less than 10 cm and during

- standard high water almost negligible.
- Closure of the northern intake channel of the Dhaleswari river by the construction of the left approach embankment was expected to have a significant hydrological impact on the upper Dhaleswari basin (700 km²). The EIA Study asked for further studies on the impact of closure of Dhaleswari River.
 - Potential irrigation development both from ground and surface water was expected to be reduced by the changing flood regime.
 - Drainage and runoff from the floodplain land upstream of the bridge were expected to be severely disrupted as a result of the construction of the road embankments across the floodplain. The area affected is some 4,000 ha.
 - Navigation on the upper Dhaleswari river was expected to be disrupted by the closure of the channel.
 - Closure of the Dhaleswari river and the resulting flood reduction was expected to have a significant impact on fish resources in the impact area i.e,
 - Disruption of longitudinal fish migration
 - Reduction of spawn fry fish collection in the Dhaleswari-Kaliganga system, this loss of spawn represents 30 ton of fish or some Tk. 1.75 million per year
 - Flood reduction causes a loss of fish grounds of about 1,500 ha which represents of loss of fish of about 300 ton/year or an economic loss of Tk. 10 million.
 - Socio-economic impacts:
 - Total agricultural land loss = 1150 ha
 - Annual loss of agricultural revenue = 9.94 million
 - Total affected household = 1376 nos

In the Fisheries Mitigation Action Plan, it was found that due to the closure of the northern intake of Dhaleswari River, a number of small rivers and lowland will be affected. This would lead to significant loss of fish production. The Mitigation plan included low land (beel) stocking and pond aquaculture.

In the Wildlife Action Plan, specific mitigation programs were proposed for the anticipated negative impacts. These included, monitoring of wildlife, selection of protected site for Spotbill Duck, public awareness building and tree plantation for the protection of wildlife.

In the Dhaleswari Mitigation Plan, it was found that there would be reduction of agricultural productivity, negative impact on wildlife, loss in fisheries and economic loss of local people. An embankment was proposed as a mitigation measure to limit over bank flow and consequent erosion-cause land loss.

In the EMAP, the major environmental issues identified were:

- Disruption of navigation
- Disruption of road transport and traffic
- Dredging and disposal of dredged spoils
- Impact of approach roads and bridge end facilities
- Disruption of surface drainage
- Disruption of Irrigation
- Deterioration of surface water quality
- Air pollution
- Noise pollution
- Disposal of construction materials and wastes
- Disruption of agricultural practices
- Disturbance of wildlife
- Destruction of plant and vegetation
- Health and sanitation hazards

- Social disruption
- Temporary job opportunities
- Accidents and construction hazards

The mitigation measures included;

- Promotion of changes in cropping pattern
- Fisheries mitigation plan
- Wildlife protection plan
- Boat navigation
- Plantation and social afforestation
- Monitoring and management of water resources
- Environmental planning of bridge ends and settlement sites

The estimated cost for the implementation of EMAP was 240 million taka. However, during implementation, EMAP was substantially revised with regard to opening of a new channel at the south end of the bridge, which helped to maintain the natural condition of the inner basin. As a result, very limited action was required.

(b) Present Experience

Under the present JICA Study, a team visited the Jamuna Bridge site to monitor the implementation of the environmental activities during operation stage of the project. The team had discussion meeting with the Grameen Mothsa Foundation (GMF) at their office at Elenga and local people at Serajgonj who are involved with the environmental activities. It is noted that GMF is the implementing agency for the environmental activities.

The information on the following Important Environmental Component (IECs) of the Jamuna Bridge were gathered during site visit:

- **Tree Plantation:** Planted 188,450 nos of trees (such as sisso, shegun and mehogini) on the roadside slopes and within the Bridge End Facility (BEF) areas. However, some of the sisso trees are found to be died.
- **Fisheries**
 - Culture Fisheries have increased due to excavated 60 ponds (Area = 19ha) in the borrow pit areas of Jamuna bridge connecting approach roads.

Table 3.4.1 Fish Production in Borrow-pit Ponds of Jamuna Bridge Connecting Road

Year	Production (MT)	Value (Tk)
1999	5.5	127892
2000	31.6	713738
2001	34.5	829273
2002	51.0	1275000
2003	53.0	1325000

- Capture Fisheries have reduced due to reduction of river areas at west side of the Jamuna River and siltation at u/s and d/s of the bridge. Siltation occurs due to low flow velocity
- **Wildlife:** Quantity of dolphin has reduced due to decreases of river fish. River fish decreases due to siltation at u/s and d/s of the bridge.
- **Riverbank Erosion and Siltation:** No erosion occurs within the following limits due to construction of guide bunds
 - At u/s approximate 6km

- At d/s approximate 10km
- **Agriculture:** Price of agricultural products has increased in northwest part of Bangladesh due to good and easy communication through the bridge.
- **Job Opportunities**
 - 21 personnel from GMF
 - 832 local people for fish culture
- **Drainage Congestion:** No drainage congestion occurs due to construction of adequate bridges/culverts on the approach road
- **Closure of Dhaleswari River:** A new channel has naturally formed at d/s of the old Dhaleswari River due to close of old Dheleswari and as a result, some impacts like properties loss (mainly agricultural land and vegetation) have been occurred
- **Road Accident:** Road accident has increased after construction of the bridge. Before construction of bridge accident was approx. 15 nos/year and as a result about 20 persons were killed and 30 injured. But after construction it is about 20 nos/year and as a result, about 30 persons are killed and 50 persons injured.

Table 3.4.2 Comparison of Expected Impacts and Actual Impacts due to Implementation of the Project

Sl No	IEC	Expected Impacts	Actual Impacts
1.	Tree Plantation	About 70000 trees felled	Enhanced tree plantation and 188450 trees on roadside slopes and BEF areas have planted
2.	Agriculture	40 ha temporary and 1150 ha permanently lost	1150 ha permanently lost.
3.	Fisheries	300 MT due to flood reduction	53 MT in borrow pit ponds during 2003
4.	River Erosion	Severe river erosion especially at west side	No erosion within 6km (u/s) and 10km at d/s of the bridge
5.	Drainage Congestion	Temporary congestion during construction	No drainage congestion due to adequate bridge/culvert in road and naturally excavation of new channel at d/s
6.	Regional Hydrology	Backwater effect 10 cm	No backwater effect reported
7.	Job Opportunities	2000 workers/day worked during construction	Job opportunities increased during construction but decreased after construction. Presently 853 persons work with GMF for the project. However, indirect job increase happened.
8.	Closure of Dhaleswari channel	Impact on 700 km ² at u/s due to close of Dhaleswari	New channel originated at d/s, so no major impact
9.	Road Accident	Less accidents due to better road	Accidents increase mainly due to violation of BRTA rules and regulations
10.	Wildlife	Disturbance mainly during construction	Disturbance decreased after construction

Priority of IEC: Sl No. 4, 2, 1, 5, 8, 6, 7, 9, 10

3.4.3 Environmental experiences of Paksey Bridge

(a) Environmental Studies and Anticipated Impacts

This JBIC financed bridge is located on the Pabna – Kustia National highway over the Ganges river. It was constructed during 2001 to 2004 and opened to traffic on 18 May, 2004. The cost of this 1.8 km bridge is 11,000 million taka.

An Environmental Impact Assessment was prepared in November, 1996. The Report stated that the project had no major negative impacts during its construction period of 3 years. It was also found that the project was environmentally sound and sustainable after the construction. However, positive impacts were found to be more significant than negative impacts. Overall impacts are as follows:

Negative Impacts

- Land loss (total = 120 ha permanently and 52 ha temporarily).
- Agricultural production loss (production loss = Tk. 5.5 million/year)
- Tree cutting (41 gardens, 20 bamboo bushes and 436 trees)
- Estimated resettlement cost = Tk. 85.3 mill.
- Road accident (expected to be increased)
- Air, noise and water pollutions mainly due to construction activities
- Disturbance of wildlife (birds & dolphin)
- Disruption of drainage and irrigation
- Disruption of navigation/boat communication

Positive Impacts

- Better and easy communication specially between Kusthia and Pabna districts
- Commercial and industrial facilities were expected to be developed at both sides of the bridge due to better communication through the bridge
- Employment opportunities were expected to be increased specially during construction
- Landscape at both sides of the bridge was expected to be improved by replanting of various types of trees
- Plantation of 18838 trees on roadside slopes and BEF areas
- Increase of river water fisheries
- Reduction of erosion / siltation of river banks
- Improved land use and landscape
- Increased recreational facilities

An Environmental Management and Monitoring Plan (EMMP) was prepared to overcome the negative impacts anticipated.

(b) Present Experience

Under the present JICA Study, a team visited the Paksey Bridge site to monitor the implementation of the environmental activities during operation stage of the project. The team had discussion meeting with the project officials and local people at Bheramara and Ishurdi, who are involved with the environmental activities.

The information on the following IECs of the Paksey Bridge were gathered during site visit:

- **Tree Plantation**
 - Tree plantation is on going. By this time about 7,800 nos of trees planted on roadside slopes (such as sisso, akasmoni, gammer, neem, epil-epil, rain tree and jackfruit) and within the BEF areas at eastside. About 9,000 nos of trees planted at west side of the bridge (such as jackfruit, akasmoni, gammer, neem, rain tree, epil-epil) under Social Forestation Program (SFP).
- **Traffic Congestion:** It has reduced due to construction of bridge.
- **Riverbank Erosion and Siltation:** No erosion occurs within the limits of the bank revetment at u/s and d/s.
- **Fisheries:** Fish production slightly increases due to withdrawal of ferry operation.
- **Wildlife:** Quantity of dolphin increase slightly due to withdrawal of ferry.
- **Agriculture:** Price of agricultural products (about 10%) have increased in this area due to good and easy communication through the bridge.
- **Road Accident:** Only 3 accidents occurred after opening of bridge on 18 May, 2004 but previously road accidents occurred at rate of 10 persons/year, especially due to ferry

operation.

Table 3.4.3 Comparison of Expected Impacts and Actual Impacts due to Implementation of Project

Sl No	IEC	Expected Impacts	Actual Impacts
1.	Tree Plantation	Affected 436 trees, 41 gardens & 20 bamboo bushes	Planted 16800 trees. Tree plantation is on going.
2.	Land Loss	Affected 20 ha permanently and 52 ha temporary	Decrease of land and physiological stress
3.	Agriculture	Production loss = Tk. 5.5 mill/year	Decrease of agricultural production due to agriculture land loss
4.	Fisheries	Reduction of fish production	Fish production slightly increases due to withdrawn of ferry
5.	River Erosion	Riverbank erosion was expected without RTW	No erosion due to RTW
6.	Drainage Congestion	Drainage congestion was anticipated if no bridge/culvert provides in approaches.	No drainage congestion due to provide of adequate bridge/culvert in road
7.	Job Opportunities	Job opportunities were expected to increase during construction	It was increased during construction but has decreased after construction
8.	Navigation/Water Transport	Disrupted due to ply of vessels and barges during construction	No disruption after construction.
9.	Road Accident	Less road accident	Accident increased slightly

Priority of IEC: Sl No. 5, 2, 3, 1, 4, 7, 8, 9.

3.4.4 Environmental experiences of Bhairab Bridge

(a) Environmental Studies and Anticipated Impacts

This DFID financed bridge is located on the Dhaka – Sylhet National highway over the Upper Megna river, connecting Bhairab with Ashuganj. It was constructed during 1999 to 2002 and opened to traffic on 10 September, 2002. The cost of this 1.2 km bridge is 6,500 million taka.

An Environmental Impact Assessment was prepared in October, 1996. No major adverse impact was found and all the minor negative impacts were local in nature and for short duration. All the positive impacts including employment opportunities and increased commerce and industry would offset the negative impacts. The expected negative and positive environmental impacts due to implementation of the project are as follows:

Negative Impacts

- Deterioration of water (ground and surface) quality due to disposal of dredged spoil (sand) on non-designated areas, accidental spillage of chemicals, fuel and paints, unhygienic toilet facilities etc.
- Air pollution due to heavy dust, generated from earth works, stone crushing plant etc.
- Noise and vibration due to driving of pile by hammer.
- Traffic congestion mainly at ferryghat due to movement of construction vehicles.
- Tree cutting (only 136 nos of small, medium and large trees).
- Health and safety (health hazards mainly due to works such as pile driving, damping of stone and sand bags into river from boat, works with chemical materials, etc).

Positive Impacts

- Improved communication facilities through the bridge.
- Commercial and industrial activities were expected to be increased.
- Job opportunities specially during construction period of the project.

(b) Present Experience

Under the present JICA Study, a team visited the Bhairab Bridge site to monitor the implementation of the environmental activities during operation stage of the project. The team had discussion meeting with the project officials and local people at Bhairab and Ashuganj, who are involved with the environmental activities.

The information on the following IECs of the Paksey Bridge were gathered during site visit:

- **Noise Pollution**
 - Noise pollution reduced at the Bhairab High school location due to installation of CC Noise Barrier on shoulder of road.
- **Tree Plantation**
 - 1500 nos of trees (such as sisso, shilkoroi, shegun, mango, jackfruit and mehogini) planted on the roadside and within the BEF area at Bhairab side.
 - Planted 1400 trees at Ashuganj side.
- **Traffic Congestion:** Traffic congestion has reduced due to construction of the bridge.
- **River Erosion:** River erosion has not occurred due to bank revetment works.

Table 3.4.4 Comparison of Expected Impacts and Actual Impacts due to Implementation of Project

SI No	IEC	Expected Impacts	Actual Impacts
1.	Tree Plantation	Cutting of 136 trees	Tree plantation has increased. 2900 trees planted
2.	Traffic Congestion	Increasing of traffic congestion specially at ferryghats at Ashuganj & Bhariab	Traffic congestion was increased during construction but has decreased after construction
3.	Noise and Vibration	Increasing of noise and vibration due to construction activities & ferry operation specially pile driving	Noise pollution has reduced due to good counter measure specially at school due to noise barrier
4.	Water Quality	Deterioration of water quality specially surface water due to project activities	Water quality specially surface water was deteriorated during construction but improved after construction

Priority of IEC: SI No. 3, 2, 1 and 4.

3.4.5 Environmental Experiences of Rupsa Bridge

This is an on-going project funded by JBIC. JICA conducted the feasibility study for the project together with the EIA in February, 2000. Major negative impacts identified were, agricultural land loss, crop loss, plantation loss, and some social disturbance. However, positive impacts of better transportation and job opportunities are significant. A detail monitoring program was proposed.

3.4.6 Summary and Conclusions

Review of environmental condition after the completion of construction is very limited in Bangladesh. Investigation by the JICA Study Team gives an opportunity to review the environmental situation first hand. Major conclusion can be drawn that at every case, actual impact is much less than expected. This is because of the natural, topographic, hydraulic and biologic setting of the bridges. It is also found that very normal impact from a bridge project like increased flooding in u/s and erosion at d/s seen in other parts of the world are not observed in major Bangladeshi bridges. This is because of the scale of the river and flood plane. As a result, it can be expected that the actual environmental impact for Padma Bridge construction would be less than the environmental impact to be found in this EIA following classical approach.

On the other hand, in all major bridges, social impact was found to be critical. JICA Study Team is giving due importance to this issue.

3.5 METHODOLOGY

3.5.1 General

The specific job of EIA study is to identify the potential environmental parameters to be affected by the project, assessing the impact of the project on them, and then recommending mitigation measures for negative impacts and enhancing the positive impacts where cost is reasonable and possible.

This section contains details methodology adopted to carry out the EIA. EIA methodologies are considered to be organised tactic which seek to identify, predict and evaluate environmental impact of development projects.

The Work comprises data collection for natural environment and socio-economic context for the Work Area, questionnaire survey, baseline quality assessment for air, water, dredge material and noise, data analysis, analysis of environmental elements affected significantly based on the results of IEE previously executed, and carrying out EIA for the proposed bridge site based on various guidelines. A preliminary Environmental Management Plan (EMP) is to be prepared based on the EIA findings to mitigate negative environmental impacts and to enhance positive impacts of the project.

The present environmental study is carried out in conformity with the requirements of the environmental guidance of JICA, the 1995 Environmental Protection Act of DoE and 1997 Environmental Conservation Rules of DoE, as well as environmental guidance of other agencies such as ADB, WB etc.

Scoping and bounding of the EIA is carried out first based on the result of the IEE conducted in earlier phase of this Feasibility Study.

Information disclosure and public participation were given continuous focus throughout the Study period in conformity with new JICA environmental guideline.

3.5.2 Baseline Data Collection

(1) Secondary Data

The secondary data were collected on the followings from various organizations.

Table 3.5.1 Collection of Secondary Data

SI No	Type of Data	Source of Data
• Natural Environment		
1.	General topography of the project area	UZ, SoB and BCL
2.	Regional hydrology and flood pattern	BWDB, IWM, BCL and JICA Study Team
3.	Present river erosion and siltation pattern	BWDB, IWM, BCL and JICA Study Team
4.	Drainage condition	BWDB, IWM, BCL and JICA Study Team
• Ecological Environment		
1.	Water bodies	IWM, UZ and JICA Study Team
2.	Fisheries situation	DoF, UZ, BCL and IUCN
3.	Vegetation / agricultural situation	DEA UZ, IUCN and BCL
4.	Wildlife	IUCN, DF and BCL
• Environmental Pollutions		
1.	Air	UZ and BCL
2.	Noise and Vibration	UZ and BCL
3.	Water pollution data in the vicinity	BCL
• Social Environment		
1.	Land use pattern	UZ and BCL
2.	Historical and cultural area	UZ and BCL
3.	Navigation and water transport	BIWTA, BIWTC, UZ and BCL
4.	Health and sanitation information	UZ and BCL
5.	Road accident data	BRTA, UZ and BCL

Source: Visit to various organizations during August-September, 2004

(2) Primary Data Collection

Some of the primary data was obtained from separate sectoral studies carried out within this JICA FS. For the rest, questionnaire survey, Focus Group Discussion (FGD) and field reconnaissance were carried out.

Under the supervision of JICA Study Team members, two field survey groups were organized and after initial field investigation, a structured questionnaire was prepared. Then field surveys were conducted for primary data collection by those two environmental survey groups during September, 2004. Each survey team consists of four well-experienced and highly qualified personnel. Prior to moving to the site, two days training course was organized for the survey team under the supervision of JICA Study Team members. In addition, riverbank line survey was carried out by GPS in October, 2004. Senior professional experts including JICA Study Team members visited the field from time to time and monitored the data collection program by the field survey teams. Discussions with the local inhabitants especially the PAPs were a vital activity during field investigations.

The primary data were collected on the followings.

(a) Natural Environment

- River erosion and siltation (from JICA FS hydrological model test)
- Regional hydrology and flood pattern (from JICA FS hydrological model test)
- Drainage condition (from JICA FS hydrological model test)
- Landscape (by direct investigation, within the ROW)

(b) Ecological Environment

- Water bodies loss within ROW (field observation/inventory)

- Fisheries (questionnaire survey and focus group discussion FGD)
- Vegetation/agricultural loss (questionnaire survey and FGD)
- Plant cutting within ROW (field observation/inventory)
- Wildlife (questionnaire survey and FGD)

(c) Environmental Pollutions

- Air, noise, dredge material and water pollution data in the project area (environmental quality survey)
- Waste disposal (questionnaire survey and FGD)

(d) Social Environment

- Land acquisition, homestead loss, income loss and split of communities (from JICA FS SIA and Resettlement Study)
- Historical and cultural loss within ROW (field observation/inventory)
- Navigation and water transport (questionnaire survey and FGD)
- Health and safety (questionnaire survey and FGD)
- Road accident (questionnaire survey and FGD)
- Land use within ROW (field observation/inventory)

(3) Environmental Quality Survey

Principal features of the environmental quality survey is summarized below.

Table 3.5.2 Principal Features of Data Collection Activities

Components	Parameters	Site of Sample Collection	Date of Sample Collection
Air Quality	Pb, CO, SO _x , NO _x , and SPM	2 points at Mawa and 4 points at Janjira, along the proposed alignment	During 8 to 9 and 22 to 26 Sept 2004 at Mawa and Janjira respectively.
Noise	Average and peak of 10 minute continuous	2 points at Mawa and 4 points at Janjira, along the proposed alignment	During 8 to 9 and 22 to 26 Sept 2004 at Mawa and Janjira respectively.
Surface water quality	BOD, COD, pH, TDS, DO, SS and Grease & Oil	3 points at Mawa and 5 points at Janjira (Note 1)	9 September 2004 at Mawa and 25 Sep 2004 at Janjira
Ground water quality	pH, Mn, Fe, As, Fe, NH ₃ -N ₂ and Chloride as Chlorine	2 points at Mawa and 2 points at Janjira, along the proposed alignment	9 September 2004 at Mawa and 25 Sep 2004 at Janjira
River bed material	Zn, Cu, Hg and Mn	1 point at Mawa and 1 point at Janjira	9 and 18 Sept 2004 at Mawa and Janjira

Note 1: 3 points at Mawa end (one from Padma river, one from pond, and one from the flood plain) and 5 points at Janjira end (one from Padma river, one from pond, two from channel crossed, and one from the flood plain)

The environmental quality survey was carried out by the Chemical Engineering Department of Bangladesh University of Engineering & Technology (BUET).

3.5.3 Conducting EIA

(1) Data Processing and Analysis

First, all the data collected from secondary sources and field are checked and edited. The data then processed and analyzed in the most appropriate manner in consultation with environmental guidelines and under the supervision of JICA Study Team member. Finally, specifically developed tools are applied for impact assessment.

(2) Impact Assessment

Three types of conceptual models are useful in EIA to define the relationship of environmental components to one another and to the project, and to serve as a basis for describing and, in some cases, for predicting and assessing impacts. These are,

- Matrices
- Networks
- Seasonal models

Networks and matrices are often interchangeable because the elements of the matrix frequently represent links in the network. In this study, because of highly visual nature of impacts in matrices, the matrix method for impact assessment is selected for EIA.

Matrices are useful two dimensional models for relating two sets of items represented by rows and columns in the matrix. A common use in EIA is to relate project activities to environmental components. A cross-impact matrix illustrates the project activities (rows) that have an effect on the column listed Important Environmental Components (IECs). The elements of the matrix represent the individual relationships between each project activity and each IECs.

The main value of a matrix lies in its use in communicating complex information in a simplified and easily assimilated form. Items displayed in a matrix can easily be compared and contrasted. Matrices can also be utilized quantitatively by computing means and ranges of rows and columns to provide summarized information.

(3) Impact Prediction

Impacts can be predicted on the basis of the following:

- Modeling
- Correlation with specific key variables
- Trend analysis
- Comparison and projection

All four methods can be employed to various extents in order to predict the impacts on various parameters. In this study, comparison and projection method was extensively used to predict impact as it is often possible to obtain some estimate of future conditions for a specific area under a specific set of interventions by making comparisons to areas that have already been subjected to similar interventions and where results have been observed and adequately documented. This method is probably most commonly in use since most practitioners tend to evaluate conditions based on their experience of previous projects.

In last ten years, a number of large bridges, namely Jamuna, Paksey and Bhairab have been constructed. The predicted and actual impacts of these bridges were studied to predict impacts of Padma bridge where ever appropriate. Therefore selection of comparison and projection method was especially relevant.

Modeling results from Institute of Water Modeling (IWM) were used to predict impacts on regional hydrology, flood pattern, river erosion, siltation, and drainage congestion.

(4) **Impact Rating**

Impacts were evaluated on the basis of:

- Magnitude
 - Type of impact (direct, indirect, cumulative)
- Immediacy
 - Temporal extent (during construction, after construction)
 - Spatial extent (local, widespread)
- Sustainability and Reversibility
 - Mitigability (fully, partially)
 - Monitoring possibility (fully, partially)

Cumulative impacts were carefully evaluated. This is especially important because now there are two large bridges (Paksey at Ishurdi-Bheramara over Ganges River and Jamuna at Kalihati-Serajgonj over Jamuna River) at upstream of the proposed Padma bridge at Mawa-Janjira Site over Padma River.

A 21-point scale has been suggested for Flood Action Plan Project, for example (1 to 10 for beneficial impacts, 0 for no impact, -1 to -10 for negative impacts). Such a scale was adopted in this study.

3.6 SCOPING AND BOUNDING

3.6.1 Scoping

A scoping process was used to identify various Important Environmental Components (IECs). IECs are components that, by virtue of their importance to ecosystem functioning, production of food and/or maintenance of livelihoods and quality of life, are considered essential and worthy of sustaining at existing or enhanced levels under the proposed project regime.

Selection and prioritization of IECs were done using four avenues.

- General literature review
- Review of IEE of Padma Bridge
- Review of EIA of Jamuna, Paksey and Bahirab Bridges
- FGD/PRA

First 3 items are used to select potential environmental parameters of the project, while FGD/PRA is carried out to validate the IECs and rank the potential environmental parameters in order of importance.

The infrastructure development in Bangladesh is closely related to a considerable number of environmental parameters or components of the environment, which may be grouped under three mutually interacting major components:

- Natural
- Ecological
- Ambient and
- Social

Various parameters may be affected to different degrees depending on various phases of the project e.g. pre-construction activities, construction activities, and operation and maintenance activities. By identifying those environmental elements significantly affected, assessment is done by means of generally acknowledged practices in Bangladesh, such as

checklist, flow chart, and impact matrix. Other qualitative methods adopted by multilateral agencies are also consulted.

3.6.2 Bounding

The spatial boundary of the project influence area was selected on the basis of the following:

- Land that will be occupied by permanent structures
- Land that will be acquired for temporary use or occupation during construction
- Land in the vicinity of project works, where changes in land use are expected as a result of project implementation (settlements, industries, etc)
- Land where water management, agricultural and fishing practices will change as a direct result of the bridge project (e.g., backwater effect, disrupted drainage, navigation etc)
- Land where ecological changes (flora, fauna, soil, water, air) will occur as a result of the infrastructural works

Temporal boundaries refer to the timing and duration of the proposed phases. In this study, two phases were considered; construction phase and operation phase of the bridge. Construction periods are usually relatively brief but induce certain types of impacts of high intensity, e.g., deteriorating water quality or labor influxes. Operational periods are usually longer than construction and induce impacts of longer duration.

3.7 INFORMATION DISCLOSURE AND PUBLIC PARTICIPATION

Disclosure of project information including anticipated impacts and public participation like stakeholders meetings were conducted continuously in this Study in conformity with new JICA guideline.

Public consultation and participation in EIA aim to achieve the following objectives:

- To enhance the sustainability of projects by ensuring that interventions are relevant to the people of the area.
- To learn from the various social groups living in a project area how they perceive the existing situation, recent trends, existing problems, and potential solutions; this includes collecting local knowledge, information, and ideas about the technical implications and impacts of project design;
- To identify the Important Environmental Components (IEC) for the environmental assessment;
- To get degree and ranking of IECs as foreseen by the stakeholders;
- To determine potential social, economic, and cultural impacts not always foreseen in survey based socio-economic studies;
- To provide local communities and socio-economic interest groups with the foundation for a role in post-feasibility project interventions; this means participation in project planning and a role in project implementation, operation, and maintenance.

Ideally, when properly associated with project interventions, “empowered” local groups help stabilize project impacts, provide social channels through which benefits can be provided and mitigation can be managed, and ultimately, result in more sustainable projects.

In this study a number of Focus Group Discussion (FGD) and Participatory Rapid Appraisal (PRA) have been conducted with the Project Affected Population (PAP). The main objectives were to:

- adequately inform the PAPs about the various project components;

- assure the PAPs that a thorough EIA is underway;
- identify and prioritize various IECs based on local knowledge; and
- identify enhancement and mitigatory measures.

The list of FGD/PRA conducted is provided in Table 3.7.1 below. A total of 344 participants took part in the FGD/PRA. The participants included 104 farmers (30%), 98 businessmen (29%) and others 142 (41%). Men and women constitution were 291 (84%) and 53 (16%) respectively. In all consultation meetings, officials and members of the NGOs working locally were included. These NGOs are working in various sectors like income generation, micro credit, education, health and family planning, and small scale rural infrastructure development. Detail proceedings of each FGD/PRA can be found in Volume X: Supporting Studies.

Table 3.7.1 List of FGD/PRA conducted in Project Sites

Date	Location	Participants
28 September, 2004	Vill: Matborerchar, UZ: Sibchar, Dist: Madaripur	75
04 September, 2004	Vill: Sikerkandi, UZ: Sibchar, Dist: Madaripur	51
07 October, 2004	Vill: Kandipara, UZ: Lauhaganj, Dist: Munshigonj	46
08 October, 2004	Vill: Diara Naoboba, UZ: Janjira, Dist: Shariatpur	30
09 October, 2004	Vill: Medinimondol, UZ: Lauhaganj, Dist: Munshigonj	52
08 October, 2004	Vill: J. Mathbarkandi, UZ: Janjira, Dist: Shariatpur	42
09 October, 2004	Vill: South Medinimondal, UZ: Lauhajang, Dist: Munshigonj	48

In order to learn from the experiences of PAPs in other large bridge sites, separate discussion sessions were carried out in those sites as shown in Table 3.7.2 below.

Table 3.7.2 List of Discussion Sessions in other Large Bridge Sites

Date	Site	Number of Participants
12 & 16 September, 2004	Jamuna Bridge on Jamuna River	7
16 October, 2004	Paksey Bridge on Ganges River	5
16 October, 2004	Bhairab Bridge on Meghna River	6

3.8 ENVIRONMENTAL BASELINE

Extensive investigation was made and compiled in the IEE stage to establish an environmental baseline, and can be found in Chapter 2 of APP – 11. In this Chapter, only the additional information is provided.

3.8.1 Natural Environment

(1) Meteorology

Major information is given in Chap 2 of APP – 11. Two meteorological stations are located close to the project site. The Dhaka station is located close to the Mawa site whereas Madaripur is located close to the Janjira site. Climatic variations are on temperature, rainfall, humidity and wind speed of the two meteorological stations are presented below:

Temperature: Monthly mean maximum temperature of 31.2 0C (June 1998), and 30.6°C (June 1998) were observed at Dhaka, and Madaripur stations respectively within the 1983 to 2002 period. Monthly mean minimum temperature 17.70C (January 1998) and 17.70C (January 1989) were reported at Dhaka and Madaripur stations respectively for the same observation period. The highest maximum and lowest minimum temperature were recorded as 39.7 0C (October 10, 2000, Madaripur) and 6.5 0C (January 3, 1995, Dhaka) respectively.

Humidity: Monthly average maximum humidity of 90% (June, July, 2001, Madaripur) and minimum of 55% (March, 1984, Madaripur) was observed within 1983 to 2002 period.

Rainfall: The annual total maximum and minimum rainfall were recorded as 3028 mm (Dhaka, 1984) and 1169 mm (Dhaka, 1992) for the project area.

Wind: The maximum and minimum wind speeds in the project area are 31 knots (July, 1994, Dhaka) and 1.5 knots (October, 1999, Dhaka).

(2) Topography and Geology

Topography: Major information is given in Chap 2 of APP – 11. According to topo-survey carried out by JICA study team in June 2004 it is observed that the ground elevation at Mawa site varies from 6 mPWD (on riverbank) to 4.50 mPWD (at country side) which indicates that the project area is sloping from riverbank towards country side. The main features within the project area are: ponds, roads, brickfields, small roadside shops, ferryghat and densely homestead including tree plantation. The project area at Janjira is almost flat agriculture lands with some homesteads and homestead plantation. According to topo-survey, ground elevation is sloping from south to north and varies from 6 mPWD to 5 mPWD. The elevation of river bed at the proposed bridge crossing location ranges from 0.00mPWD (at mid of the river) to –10.50mPWD (close to left riverbank). The riverbed slope of the Padma is about 0.00005. The left bank is relatively stable than the right bank.

Geology and Soil: Major information is given in Chap 2 of APP – 11. The project area is a flood prone area and almost uniformly covered mainly by silty SAND at Janjira site and by clayey SILT at Mawa site. From agricultural point of view, soil at project site is fertile and suitable for agricultural crop production and tree plantation.

Seismology: Major information is given in Chap 2 of APP – 11.

(3) Hydrology

River System: Major information is given in Chap 2 of APP – 11.

Flooding: Major information is given in Chap 2 of APP – 11. At the project site, the extent of inundation during 1998 flood is given in Table 3.8.1.

Table 3.8.1 Percentage of Open Water Flood in the Project area by Upazila during 1998 Flood

District	Thana	Area (ha)	Percent of Area Flooded		
			26-Aug	10-Sep	17-Sep
Munshiganj	Srinagar	20,299	67%	67%	60%
	Lohajang	13,012	62%	66%	60%
Madaripur	Sibchar	32,189	63%	66%	52%
Shariatpur	Janjira	23,954	81%	77%	70%

Source: Mapping of the 1998 Floods, EGIS Technical Note 14, 1999

Drainage Interference: Major information is given in Chap 2 of APP – 11. There are several water bodies located within the project. Among them, the following water bodies originate from the 10km long right riverbank of Padma within RoW and then cross the proposed 12km long approach road.

- Naodoba River at ch 8+053
- Shikderkandi Khal at ch 11+948
- Kutubpur Khal at ch 12+463

- Borokanopur Khal at ch 13+268
- Low Lying Area at ch 13+678
- Mollah Kandi Khal at ch 15+428

Drainage congestion at Janjira site will occur by the proposed approach road running on the flood plain on the right bank and RTW along the right bank if no adequate drainage structures are provided in the embankments. No channel crosses the 0.273km approach road and 6km RTW at left riverbank at Mawa site. So, major drainage congestion will not occur at Mawa site.

Groundwater: Major information is given in Chap 2 of APP – 11.

(4) Landscape

A detail landscape survey is conducted along the river banks for a 400m strip on both banks for the entire Padma River (100km) and description can be found in Chap 2 of APP – 11.

The landscape at Mawa site is dominated by dense commercial and residential areas. Commercial activities are mainly concentrated around the existing ferryghat. Principal land cover and landscape elements are residential and commercial houses, dense homestead and roadside tree plantation, fishponds and beautiful mosques. Linear development along the riverbank and ferryghat is a prominent feature with both attractive (various types of dense trees and beautiful two storied tin shed houses) and detractive (brickfields, rice mill, saw mill and fish market) characteristics. The areas through which the proposed bridge and its associated structures pass are flat land and flooded during monsoon.

The landscape at Janjira site is dominated by large areas of agricultural lands. This area is flooded every year during monsoon. Scattered and unplanned homesteads along with dense homestead plantation and water bodies are common. Linear development along the Kawrakandi (Charjanajat) and Kathalbari (Shariatpur) ferryghat is a prominent feature with both attractive (various matured trees) and detractive (rice mills and small shops) characteristics. Linear planting along the road is also one of the main landscape elements in this area.

3.8.2 Ecological Environment

(1) Flora and Fauna

Major information is given in Chap 2 of APP – 11.

Agriculture and Vegetation: The major agriculture crops in Lauhajang and Sreenagar are paddy (Aman, Aus and Boro), jute, wheat, pulses, potato, betel nut, betel leaf, chilli, as well as vegetations namely donicha, vegetables, etc. But only Paddy, Pulses (Maskolai) and donicha are produced in the project area at Mawa site. The major crops of Janjira side are paddy (Aman and Aus), jute, sugarcane, pulses, chilli, onion, garlic, as well as vegetations such as donicha, vegetables etc. The floating aquatics vegetations namely Kachuri pana (*Eichhornia crassipes*), Shapla (*Nymphaea nouchali*), Kalmi (*Ipomoea aquatica*) etc. are also found in water bodies of the project area at Janjira site. More detail information on cropping season, cropping diversity, cropping pattern and cropping intensity of the project area can be found in Vol X: Supporting Studies. Also, in the supporting study, cropped area by crop type for various project components was surveyed along with unit crop production and unit crop value. It is estimated that total crop loss 2396 MT, of which paddy loss is 635 MT (27%). In terms of money, the total loss is around 45 million Taka.

Forest and Tree Plantation: There is no designated forest in the project area. However,

homestead and roadside plantations are plenty in the project area. The homestead forest consists of different kinds of fruits, timber and fuel species. The project areas lie under the four upazilas and roadside plantation lengths are Lauhajang (70km), Sibchar (110km), Janjira (60km) and Sreenagar (65km). Roadside plantation figures provided covers all the roads of the upazilas owned and looked after by the RHD and LGED. Plant species found in the homestead and roadside plantation in the project area can be found in Volume X: Supporting Studies.

Tree Cutting: Census on trees within RoW of the project was carried out during September-October, 2004 which is presented in Volume X: Supporting Studies. It is understood that total 327,868 trees of various sizes and species are going to be affected. Out of which 63,105 are banana and 149,054 bamboo plantation. In that census, all types of trees to be affected are identified (more than 100 species) and classified in large, medium, small and sapling.

Water Bodies and Fisheries: A field survey on water bodies and fish production was carried out and found that no big water bodies are located in the project area. Table 3.8.2 shows various types of water bodies found in the Project ROW, with their numbers, area, and production rate. All local major fishes are cultivated in these ponds and ditches. The fish species in the project areas identified during survey are presented in Volume X: Supporting Studies. Few years ago, the Padma River was very famous for Hilsha fish. Beside Hilsha, there are other varieties, like cat fish, prawn shads, pangas etc. were also found in plenty, but their availability is now became less, like other parts of the country. The open water fishery in the river, khals and floodplain has declined very sharply. It is believed due to: (a) construction of extensive road embankment without adequate drainages structures that disrupt the movement of fish, (b) use of chemical fertilizers, pesticides, herbicides increases the pollution level in the water bodies which are responsible to damage the fish eggs, (c) use of current net for catching jhatka and (d) an increase in population has caused unusual and explained abstract of natural resources and has a sharp pressure on fish resources.

Table 3.8.2 Water Bodies and Fish Culture Within RoW

Project Component	Pond			Ditch			Khal		River	
	No	Area (ha)	Prod. Rate/ha (MT)	No	Area (ha)	Prod. Rate/ha (MT)	No	Prod. Rate/ha (MT)	No	Prod. Rate/ha (MT)
• Mawa Site										
RTW	16	1.16	2	1	0.06	1.0	4	0.75	-	-
Approach Road	2	0.12	2	-	-	-	-	-	-	-
Sub-Total	18	1.28	-	1	0.06	-	-	-	-	-
• Janjira Site										
RTW	-	-	-	3	0.05	0.75	4	0.75	1	0.75
Approach Road	21	2.55	1.5	47	1.56	0.75	4	0.75	2	0.75
Service Area	14	0.189	1.5	15	0.67	0.75	-	-	-	-
Toll Gate	5	0.156	1.5	8	0.32	0.75	-	-	-	-
Sub-Total	40	2.895	-	73	2.603	-	-	-	3	-

Source: Field Survey, September-October, 2004

Wildlife: Major relevant information is provided in Chap 2 of APP – 11. The study area falls into the Bio-ecological Zones No-11 as defined by IUCN. Wildlife habitats in the three districts of the project area are limited. Some wildlife such as snake, frog, dog, fox, mongoose, cat, mouse, crocodile, dolphin and some species of birds (including migratory birds during winter) are available in the project area. There is no exclusive habitat for any endangered species in the vicinity of the Project area. However, The Padma river is a secondary habitat to two critically endangered species, namely Ganges river Dolphin (*Plantanista Gangetica*) and Gangetic Gharial (*Garialis Gangeticus*). Their main habitat is

the Ganges River upstream of confluence of the Ganges and Jamuna rivers at Paturia and seldom found at the project site Mawa – Janjira.

(2) Environmentally Protected and Sensitive Area

No environmentally protected and sensitive areas are located within the RoW of the project. Other relevant information is provided in Chap 2 of APP – 11.

3.8.3 Environmental Pollution

(1) Surface Water

Surface water resources in the four project affected UZs mainly consist of river, canal, pond and beel. Surface water in the project area is principally used for external use like bathing, washing and irrigation and in some limited cases, for drinking purpose. The water quality of the Arial Khan River (branch of Padma at u/s) was tested in the SRNDP project and is given in Chap 2 of APP – 11. The most notable aspect of that result is the relatively high concentration of oil and grease in the water. This is likely due to the nearby presence of the ferries and other riverine traffic.

Under the Environmental Quality Survey (EQS) of this Study conducted in September, 2004, surface water samples were collected from two locations within RoW of approach road at Mawa site on 09 September, 2004 and five locations with RoW of approach road at Janjira site on 18 & 25 September, 2004 by the Chemical Engineering Department of BUET and tested in their laboratory to establish the base value of surface water. The Test results are given in Table-3.8.3. Details of test are given in Vol X: Supporting Studies. It can be said in general that water quality of the samples is acceptable.

Table 3.8.3 Analysis of Surface Water Quality

Measuring Parameters	Unit	Surface Water Analysis								DoE Standard Value (Irrigation)
		River Water				Pond Water		Flood Plain Water		
		M-4	J-3	J-7	J-9	M-6	J-6	M-8	J-4	
		(Padma River Mawa side)	(1 st River Channel, Janjira)	(4 th River Channel, near Monsur Molla Kandi)	(Fakir Kandi, Padma river, Janjira side)	(Anu Sheik South Medini Mondal)	(Naodoba, Jamadarbari Bus Stand)	(Beside Mawa-Dhaka Highway Road)	(Shikderhandi, Kutubpur)	
PH		6.82	7.36	6.96	7.58	7.36	7.45	6.64	7.22	6.5-8.5
BOD	mg/l	3.90	2.30	3.60	1.00	11.80	7.40	2.70	7.60	10 or less
COD	mg/l	111.00	91.00	67.00	129.00	39.00	19.00	26.00	48.00	-
TDS	mg/l	63.00	95.00	102.00	92.00	139.00	141.00	113.00	142.00	-
DO	mg/l	6.40	9.50	5.40	7.00	6.00	5.60	6.80	5.30	5 or above
SS	mg/l	598.17	468.11	319.34	321.23	61.21	33.69	8.61	150.87	-
Grease and Oil	gm/l	0.159	0.787	0.207	0.303	0.122	0.249	0.262	0.310	-

Source: Eqs, September, 2004

(2) Ground Water

Groundwater is the main source of drinking water in the four project affected UZs and also used for cooking, washing, bathing and irrigation purposes. The ground water samples were collected from two locations at Mawa and three locations at Janjira on 9 and 25 September, 2004 and tested by BUET to identify the present ground water quality. Test parameters are selected as general practice of EIA in Bangladesh, where fecal coliform and ammonia are tested to understand if the groundwater is contaminated with human and animal waste or not. Sampling points and test parameters were kept minimum because this is a bridge project, where there is less direct interaction with groundwater and also because main

purpose of present tests is to determine how much focus should be given on groundwater during EMP stage. Test results are shown in Table-3.8.4 and details of test are given in Vol X: Supporting Studies. In all cases, it was found that though fecal coliform is not present, the concentration of ammonia is higher than the WHO standard of 1.5 mg/l. This indicates possibility of sanitary contamination and any future plan to develop groundwater as drinking water source requires extensive sampling and analysis. Though the area is generally affected by naturally occurring arsenic (“Arsenic Contamination of Groundwater in Bangladesh”, British Geological Survey), the four samples are not contaminated with arsenic. Concentrations of iron and manganese are above the DOE drinking water standard, which is common in Bangladesh in naturally occurring arsenic area. Other relevant information is given in Chap 2 of APP – 11.

Table 3.8.4 Analysis of Ground Water Quality

Measuring Parameters	Unit	M-5 (Abdur Rahim South Medini Mondal)	M-7 (Nantu Hotel, near Mawa Chowrasta)	J-2 (Bakarkandi, Pachchar)	J-6 (Naodoba, Jamadar Bari Bus Stand)	DoE Standard for potable water
PH		6.83	6.98	6.45	6.45	6.5 – 8.5
Mn	mg/l	0.20	0.50	3.00	1.45	0.1
Fe	mg/l	14.68	19.74	3.71	3.11	0.3
As	mg/l	0.01	0.00	0.00	0.00	0.05
Chloride as Chlorine	mg/l	52.00	113.00	15.76	20.30	150 – 600
Fecal Coli form	mg/l	0.0	0.0	0.0	0.0	-
NH ₃ -N ₂	mg/l	9.30	12.40	4.21	3.00	-

Source: Eqs, September, 2004

(3) Air Quality

The main air quality problems in the project area occur from localized pollution like, dust, vehicles emission, brickfields, industries, etc. Air quality measurements include CO, SO_x, NO_x, Pb and SPM and were carried out at 2 locations at Mawa site (once on holiday and once on working day) during 8 & 9 September, 2004 and at 6 locations at Janjira site during 22 to 26 September, 2004. Measurement results are shown in Table-3.8.5 and details of test are given in Vol X: Supporting Studies. From the result, it is seen that SO_x concentration is high at Mawa junction and Pachchar Bazar. The probable reason is the existence of brick fields in the vicinity. Concentration of NO_x is higher than the standard at only one case (Mawa junction). CO is below the standard at all sampling points. SPM is higher than standard at Pachchar and Kutubpur. Highest lead concentration among the sampling sites was found at Mawa junction. Air quality is poor at Mawa junction due to vehicle emission including emission from ferry and other river transport as well as brick fields.

Table 3.8.5 Air Quality Test Results

SO ₂							
Locations							
Date	M-1 Mawa River Bank	M-2 Mawa Chowrasta	J-1 Bakor Kandi (Pachchar)	J-4 Shikder Kandi (Kutubpur)	J-5 Naodoba (Jamadar Bari Bus-stand)	J-8 Monsur Molla Kandi (Diara-Naodoba)	Standards
Concentration (ppm)/(Measuring time)							
9.9.04 (Week day)	0.013 (2:00 pm)	0.05 (5:00 pm)					DOE Standard for Commercial and Mixed Area 0.039 ppm (100 µg/m ³)
10.9.04 (Week-end day)	0.025 (2:20 pm)	0.065 (12:10 pm)					
23.9.04 (Week day)			0.05 (10:00 am)			0.03 (5:00 pm)	WHO Standard 125 µg/m ³
24.9.04 (Week-end day)			0.045 (1:30 pm)		0.03 (11:30 am)		
25.9.04 (Week day)				0.04 (10:50 am)	0.045 (1:40 pm)		

Source: Eqs, September, 2004

NO _x (NO + NO ₂)							
Locations							
Date	M-1 Mawa River Bank	M-2 Mawa Chowrasta	J-1 Bakor Kandi (Pachchar)	J-4 Shikder Kandi (Kutubpur)	J-5 Naodoba (Jamadar Bari Bus-stand)	J-8 Monsur Molla Kandi (Diara-Naodoba)	Standards
Concentration (ppm)/(Measuring Time)							
9.9.04 (Week day)	Less than 0.01 (12:50 pm)	0.01 (5:20 pm)					DOE Standard for Commercial and Mixed Area 0.066 ppm (100 µg/m ³)
10.9.04 (Week-end day)	Less than 0.01 (2:40 pm)	Less than 0.01 (11:38 am)					
23.9.04 (Week day)			Less than 0.01 (12:20 pm)			Less than 0.01 (5:20 pm)	WHO Standard 150 µg/m ³
24.9.04 (Week-end day)			Less than 0.01 (4:20 pm)		Less than 0.01 (12:10 pm)		
25.9.04 (Week day)				Less than 0.01 (11:10 am)	Less than 0.01 (4:10 pm)		

Note: Detection limit was 0.01 ppm

Source: Eqs, September, 2004

Carbon Monoxide (CO)

Locations							
Date	M-1 Mawa River Bank	M-2 Mawa Chowrasta	J-1 Bakor Kandi (Pachchar)	J-4 Shikder Kandi (Kutubpur)	J-5 Naodoba (Jamadar Bari Bus-stand)	J-8 Monsur Molla Kandi (Diara-Na odoba)	Standards
Concentration (ppm)/(Measuring Time)							
9.9.04 (Week day)	2.25 (1:30 pm)	3:00 (5:40 pm)					DOE Standard for Commercial and Mixed Area 4.48 ppm (5000 $\mu\text{g}/\text{m}^3$) WHO Standard 30,000 $\mu\text{g}/\text{m}^3$
10.9.04 (Week-end day)	1.8 (1:40 pm)	2:50 (12:30 pm)					
23.9.04 (Week day)			1.8 (11:15 am)			1.0 (5:40 pm)	
24.9.04 (Week-end day)			1.25 (5:00 pm)		1.3 (11:40 am)		
25.9.04 (Week day)				1.0 (11:30 am)	1.20 (4:30 pm)		

Source: Eqs, September, 2004

SPM (Suspended Particulate Matter)

Locations							
Date	M-1 Mawa River Bank	M-2 Mawa Chowrasta	J-1 Bakor Kandi (Pachchar)	J-4 Shikder Kandi (Kutubpur)	J-5 Naodoba (Jamadar Bari Bus-stand)	J-8 Monsur Molla Kandi (Diara-Na odoba)	Standards
Concentration ($\mu\text{g}/\text{m}^3$)/(Measuring Time)							
9.9.04 (Week day)	104.00	451.34					DOE Standard for Commercial and Mixed Area 400.00 $\mu\text{g}/\text{m}^3$ WHO Standard No guideline
10.9.04 (Week-end day)	152.18	320.36					
23.9.04 (Week day)			385.24			231.78	
24.9.04 (Week-end day)			557.49		381.19		
25.9.04 (Week day)				658.85	395.42		

Source: Eqs, September, 2004

Lead

Locations							
Date	M-1 Mawa River Bank	M-2 Mawa Chowrasta	J-1 Bakor Kandi (Pachchar)	J-4 Shikder Kandi (Kutubpur)	J-5 Naodoba (Jamadar Bari Bus-stand)	J-8 Monsur Molla Kandi (Diara-Naodoba)	Standards
Concentration ($\mu\text{g}/\text{SCM}$)							
9.9.04 (Week day)	0.45	1.95					No standard set for Bangladesh WHO Standard 1.0 $\mu\text{g}/\text{m}^3$
10.9.04 (Week-end day)	0.51	2.75					
23.9.04 (Week day)			1.06			0.27	
24.9.04 (Week-end day)			0.46		0.40		
25.9.04 (Week day)				1.81	0.52		

Source: Eqs, September, 2004

(4) Noise and Vibration

The noise problem in the project area is minor except the ferry terminal and occurs from

hydraulic horn and from the movement of buses, auto-rickshaws and trucks on the roads. Noise pollution also occurs due to plying of engine boat in the river and khals especially at Janjira site. Vibration occurs slightly at Mawa, Charjanajath (Kawrakandi) and Kathabari ferryghats during loading and unloading of heavy vehicles such as trucks, buses etc. Noise levels were measured at locations where air quality measurements were made at Mawa and Janjira site. Measurement of noise levels are shown in Table-3.8.6 and details of test are given in Vol X: Supporting Studies. The only place where noise level crossed the limit is the Mawa junction.

Table 3.8.6 Measurement of Noise

Date	M-1 Mawa River Bank	M-2 Mawa Chowrasta	J-1 Bakor Kandi (Pachchar)	J-4 Shikder Kandi (Kutubpur)	J-5 Naodoba (Jamadar Bari Bus-stand)	J-8 Monsur Molla Kandi (Diara-Naodob a)	DOE Standard for Commercial and Mixed Area
Intensity (decibel)/(Measuring Time)							
9.9.04 (Week day)	60 (5:00 pm)	70 (4:20 pm)					60
10.9.04 (Week-end day)	52 (1:45 pm)	70 (1:10 pm)					
23.9.04 (Week day)			50 (9:20 am)			54 (5:20 pm)	
24.9.04 (Week-end day)			52 (4:00 pm)		50 (11:00 am)		
25.9.04 (Week day)				51 (10:30 am)	46 (3:30 pm)		

Source: Eqs, September, 2004

(5) Dredge Material

For the RTW, a large amount of river bed soil has to be dredged and possibly will be used for road, toll plaza and service area construction. Thus, river bed samples were collected from river bed of Padma at Mawa and Janjira site on 09 and 18 September, 2004 and tested by BUET to identify the presence of heavy metals. Samples were collected at a depth of 1 m and at locations 30 m from bank line at Mawa and 40 m from bankline at Janjira side. Test results are shown in Table-3.8.7 and details of test are given in Vol X: Supporting Studies. Anticipating minor pollution level because there is no major industries nearby as well as the river's high flow velocity and large flow quantity, test parameters were kept minimum since the purpose is to establish a base level. Arsenic is not tested as the area is within the naturally occurring arsenic area. As the only possible use of such dredge material is filling the proposed road or service area, chances of subsequent surface water, ground water or air pollution is less as the top and side of the fill will be sealed.

There is no DOE standard for dredge material. According to the Netherlands standard, the "Action" concentrations for Zn, Cu and Hg are 720, 190 and 10 mg/kg. Also, according to the Canada standard, the allowable limit for soil in case of residence and park are (where indirect human contact is possible, and in the present case, human contact is not possible), 200 and 6.6 mg/kg for Zn and Hg. Present test result shows concentrations below those standards. However, since the test parameters and sampling points are limited, more extensive sampling and analysis (also from different depth) is required in EMP if the dredge material is to be used for road, toll plaza and service area construction. If it is found in the EMP that the dredge materials are highly polluted, it should not be used as fill for road or service area. Instead, it can be used in the concrete mixing.

Table 3.8.7 River Dredged Materials Analysis

Measuring Parameters	Unit	Concentration Present	
		Mawa Riverside (M3) Moisture content 27.37%	Jajira Riverside (J9) Moisture content 65.35%
Zn	mg/kg wet river bed material	93.99	76.78
Cu	mg/kg wet river bed material	39.24	132.86
Hg	mg/kg wet river bed material	4.00	6.00
Mn	mg/kg wet river bed material	201.00	275.84

Note: No Standard set for Bangladesh.

Source: Eqs, September, 2004

3.8.4 Social Environment

(1) Socioeconomic Condition

Population and Economic Pattern: Major relevant information is provided in Chap 2 of APP – 11. From the SIA and Resettlement Study under this JICA FS, it is reported that total Project Affected Persons (PAP) are 19,021, out of which 8,308 are in Mawa and 10,713 in Janjira. Total number of household required to be relocated is 3,150 (1,343 in Mawa and 1,807 in Janjira).

Social Structures: The Social Impact Survey under this Study did not find any tribal or ethnic minorities living within the project area. Also, no households are identified belonging to the refugee population such as Bihari and Myanmar refugee. It was also found that women in the project area had limited income-generating activities. Other relevant information is provided in Chap 2 of APP – 11.

Economic Characteristics: Business is the primary profession for the PAPs at Mawa site (16.38%) followed by service (6.15%), whereas agriculture is the primary profession for the PAPs at Janjira site (19.04%) followed by business (13.68%). Majority of the PAP household income comes within the bracket of annual income of 45,001 to 60,000 taka (25.02%) followed by income group of 30,000 to 45,000 taka (23.87%). Total income loss of PAPs is approx. Tk. 210 million. More detail can be found in SIA and Resettlement related sections of this Report.

Charland: According to the mathematical model study under this JICA FS, the increase of water level upstream and downstream of the bridge is expected to be limited mainly due to the fact that the river width is not constrained. As a result, no nearby char will be inundated due to the bridge construction. In case of Jamuna bridge, as the river width was reduced to around half of the original width, water level at the bridge site was increased significantly and its impact was wide spread as far as 12 km to upstream and 8 km to downstream of the bridge site. As a result, a number of chars were inundated.

Inside the main stream of the Padma River many char lands are developed. At the u/s of the proposed bridge site, a big char land is located. There are about 18 villages are located on the char land. The area and population of the char land are 60km² and 45000 as reported by local inhabitant. The people in the char land are poor and living on agriculture and fishing. The age of char is about 12 years and according to model study, this char may be totally eroded even without bridge after few years. Other relevant information is provided in Chap 2 of APP – 11.

Land Acquisition: It is estimated from the SIA and Resettlement Survey that the project requires about 616 ha of land. The actual project land acquisition is super imposed on the land use survey conducted to identify landuse type of land acquisition. After the

superimposition, the actual land requirement comes as 318 ha, which must be verified in the field in detail RAP study. Major landuse type is agricultural (232 ha) followed by housing/settlement area (65 ha). It may be mentioned that total land acquisition for Jamuna Bridge project was 3,000 ha. Land acquisition by landuse type (for the super imposed actual requirement) is given in the following Table 3.8.8.

Table 3.8.8 Total Area of Land to be Acquired

Project site	Agricultural (ha)	Housing/ Settlement (ha)	Commercial (ha)	Fallow (ha)	Orchard/ Plantation (ha)	Water body (ha)	Cultural Res. (ha)	Total (ha)
• MAWA SITE								
RTW	5.340	32.170	1.720	2.190	0.240	0.980	0.280	42.920
Approach Road	0.100	0.220	0.800	0.860	0.000	0.450	0.090	2.520
Sub-Total	5.440	32.390	2.520	3.050	0.240	1.430	0.370	45.440
• JANJIRA SITE								
RTW	45.300	12.200	0.040	3.000	0.620	0.500	0.730	62.390
Approach Road	87.900	8.770	0.000	2.360	0.030	2.960	0.410	102.430
Service Area	88.800	9.500	0.000	0.280	0.000	0.859	0.125	99.564
Toll Gate	4.420	2.400	0.000	0.120	0.000	0.460	0.044	7.444
Sub-Total	226.420	32.870	0.040	5.760	0.650	4.779	1.309	271.828
Total	231.860	65.260	2.560	8.810	0.890	6.209	1.679	317.268

Note: River, khal, road etc are not included in the estimate.

Source: Field Survey, September-October, 2004

Resettlement: SIA and resettlement report estimated that though total project affected households is 5,000; and only 3,150 households will require resettlement. It may be mentioned here that total households required to relocate were 4,000 in case of Jamuna Bridge.

(2) Social Infrastructures

Road Transport: The road system on both side of the river is dominated by National Highway (NH8). This is connected by a ferry crossing between Mawa and Kawrakandi. Presently, the Dhaka-Khulna Highway (NH8) via Mawa Ferry called SRNDP (southwest road network development project) is being constructed under ADB assistance. The opening of the road will reduce the distance by 100 km between Dhaka and Mongla. Khulna-Mongla highway part of NH8 has been constructed under ADB assistance in late 1980s. The condition of the road is good. Several development projects are ongoing in Khulna-Mongla area. Notable of whom is the construction of Rupsa Bridge under JBIC assistance. NH8 is also the route for Benapole, the largest land port of the country. The proposed approach road at Janjira crosses several roads including one Regional Highway, two Feeder Roads (Type-B), 10 local roads under LGED, and some minor trails in the plain on the right bank of the Padma River. Since the approach road will overpass all these crossing roads with grade separation, local communication will not be disturbed and there will less impact of split of communities. Most of the internal roadways within the project areas, particularly the feeder roads, are characterized by roadside settlement and development patterns. Non-Motorized Traffic (NMT) is the dominant transport mode in the project area.

Navigation/Water Transport:

Various vessels, launches and boats are plying on the Padma and only country boats and trawlers are playing on Naodoba River (Table-3.8.9). The Mawa and Janjira sites of the

project are connected by ferries. These ferries carry passengers, trucks, buses and goods in between Mawa and Charjanajath (Kawarakandi) and Mawa and Kathalbari ferryghat. In addition, about 40 speedboats and 50 country boats carry passengers from Mawa to Charjanajath and Kathalbari ghats. About 200 boatmen involve with boat services.

Table 3.8.9 Water Transport

Sl No	Type of the Vassal	Quantity No	Day/ Month/ Year	Between	
• PADMA RIVER					
1.	Cargo Vessel	10	Day	Dhaka	Khulna
2.	Fishing Trawler	150	Day	Dhaka	Madaripur
3.	Oil Tanker	8	Day	Dhaka	Chittagong
4.	Launch	180	Day	Mawa	Madaripur
5.	Boat with Engine	30	Day	Dhaka	Kawarakandi
6.	Boat with Engine (carrying sand)	25	Day	Janjira	Dhaka
7.	Boat with Engine (carrying cow)	15	Day	Sibchar	Dhaka
8.	Shallow fishing Trawler	100	Day	Mawa	Kawarakandi
9.	Indian Vassal	3	Month	India	Dhaka
10.	Bangladesh Railway Ship	8	Year	Dhaka	Bhahadura + Teesta ghat
11.	Ferry	72	Day	Mawa	Kawarakandi / Kathalbari
12.	Sea Boat	150	Day	Mawa	Kawarakandi
• NAODOBA RIVER					
1.	Boat with Engine	250	Day	Naodoba	Kazirhat
2.	Trawler with Shallow Engine	50	Day	Naodoba	Kazirhat

Source: Field Survey, September-October, 2004

Water Supply, Sanitation and Electricity:

Electricity facility in Sreenagar and Lauhaganj UZs is average and in Janjira and Sibchar UZs is poor. The main source of water supply in the project area is groundwater. However, approximated 20% HTW at Mawa & 30% at Janjira sites are contaminated by arsenic as reported by local people. About 97% people within RoW at Mawa site use tubewells for drinking purpose. But less people at Janjira site (about 80%) use hand tubewell for drinking water (Table-3.8.10). Rest use river, ring well and pond water. About 30% people at Mawa site within RoW use sanitary toilet and rest 70% use katcha (open) toilet. These numbers for Janjira site are 20% and 80% (Table 3.8.11). Other relevant information is provided in Chap 2 of APP – 11.

Table 3.8.10 Affected Drinking Water Facilities within RoW

Project Site	Mawa Site						Janjira Site						Total	
	Munshiganj				Total		Madaripur		Shariatpur		Total			
Upazilas	Lauhajang		Sreenagar				No.	%	No.	%			No.	%
Sources of Drinking Water	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Tubewell	1421	98.27	124	96.00	1545	98.09	696	58.49	834	98.58	1530	74.78	3075	84.92
Well	4	0.28	0	0.00	4	0.28	11	0.92	4	0.47	15	1.39	19	1.67
Other Sources of Water	21	1.45	5	4.03	26	1.65	488	41.01	13	1.54	501	24.48	527	14.55
Total	1446		129		1575		1195		851		2046		3621	

Source: Field investigation, November, 2004

Table 3.8.11 Affected Sanitary Facilities within RoW

Project Site	Mawa Site						Janjira Site						Total	
	Munshiganj				Total		Madaripur		Shariatpur		Total			
	Lauhajang		Sreenagar				Sibchar		Janjira					
Type of Sanitation	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Katcha Latrine	256	18.18	10	8.06	266	17.36	395	43.59	682	8.22	1077	62.07	1343	41.10
Slab Latrine	943	66.97	83	16.93	1026	66.97	460	50.77	137	16.52	597	35.41	1623	49.67
Pucca Latrine	209	14.84	31	25.00	240	15.66	51	5.60	10	1.20	61	3.51	301	9.21
Total	1408		124		1532		906		829		1735		3267	

Source: Field investigation, November, 2004

Public Health: Relevant information is provided in Chap 2 of APP – 11.

Historical and Cultural Heritage: No listed archaeological or historical resources are found within the potential project impact area. Cultural (community) resources present within RoW are given below (Table-3.8.12).

Table 3.8.12 Cultural / community Resources within RoW of the Project

Project Site	School		Madrasha		Mosque		Eidghah		Graveyard		Hindus Burning Yard	
	No	Area (ha)	No	Area (ha)	No	Area (ha)	No	Area (ha)	No	Area (ha)	No	Area (ha)
• MAWA SITE												
RTW	1	0.080	1	0.040	3	0.040	0	0.000	0	0.000	0	0.000
Approach Road	0	0.000	0	0.000	2	0.030	0	0.000	0	0.000	0	0.000
Sub-Total	1	0.080	1	0.040	5	0.070	0	0.000	0	0.000	0	0.000
• JANJIRA SITE												
RTW	1	0.030	0	0.000	6	0.049	0	0.000	2	0.360	0	0.000
Approach Road	1	0.105	0	0.000	2	0.014	1	0.158	13	0.039	0	0.000
Service Area	0	0.000	0	0.000	5	0.081	0	0.000	1	0.044	0	0.000
Toll Gate	0	0.000	0	0.000	1	0.015	0	0.000	0	0.000	1	0.044
Sub-Total	2	0.135	0	0.000	14	0.159	1	0.158	16	0.443	1	0.044
Total	3	0.215	1	0.040	19	0.229	1	0.158	16	0.443	1	0.044

Source: Field Survey, September-October, 2004

(3) Landuse Pattern

In general, the project area at Mawa & Janjira consists of alluvial fertile land. Major area of the project is occupied by agricultural lands especially at Janjira site and rest is homesteads, commercial, water bodies, cultural institutes etc. The area is densely populated (especially Mawa site) and scattered unplanned settlement/homesteads are very common. The landuse survey was carried out for 300m strip along the RTW and 150 strip along the approach road and also 2.5 km x 2.5 km area for service area at Janjira site to understand the landuse pattern of the directly and indirectly project affected areas (Table-3.8.13). The RoW of the directly affected area of the project was superimposed on the landuse map to estimate the direct affected area where land acquisition is envisaged. Based on the landuse survey, the landuse pattern is estimated as below:

Table 3.8.13 Landuse Pattern in the Project Areas

Landuse Type	Mawa Site	Janjira Site
Agricultural	12 %	83 %
Housing/Settlement	71 %	12 %
Commercials	6 %	0.1 %
Fallow	7 %	2 %
Orchard/Plantation	0.4 %	0.3 %
Water bodies	3 %	2 %
Cultural and Community Property	0.6 %	0.6 %
Total	100 %	100 %

Source: Field Survey, September-October, 2004

From the above table, it is evident that at Mawa site, homestead/settlement (71%) is dominate whereas at the Janjira site, agricultural land (83%) is dominate. Brief description of landuse pattern is given below. The detail information on the landuse pattern and landuse map is given in the Vol X: Supporting Studies.

Mawa Site:

Bridge Connecting Approach Road: About 0.273km short approach road (for landuse 150m wide strip was surveyed) at Mawa site starts just on the extended line of the national highway (NH8) and passes through the village. Commercial activities such as big fish market, roadside shops are the main activities within RoW of the approach.

RTW: About 6km long RTW (for landuse 300m from the riverbank was surveyed) along the riverbank at Mawa site runs mainly through the densely unplanned scattered settlements/homestead. The riverbank within RTW area is stable. The local inhabitants are generally businessmen. Overall their economical status is good showing a good quality of life. Trees plantation & ponds are common with each homestead. Sanitation (about 70% pucca & 30% kucha toilet) and drinking water (about 80% arsenic free HTW & rest arsenic contaminated HTW) conditions at Mawa site are better then Janjira site. The ferry ghat at Mawa, school, mosques, eidgah, family graveyards, roads, local govt. offices are also located in the survey area.

Janjira Site:

Bridge Connecting Approach Road, Service Area and Toll Gate: About 12km long proposed approach road (for landuse 150m wide strip was surveyed) at Janjira site bisects the Service Area (2.5km x 2.5km surveyed) and Toll Gate (200mx400m surveyed). Agro-based economy prevails in the project area. Major portion of the survey area is mainly occupied by fertile agricultural lands where 3 cropped and 2 cropped lands are common. Settlements within the survey area are not as dense as Mawa and surrounded by trees and vegetation. In addition, there are growth center (hat/bazar), boat ghat, and water bodies (such as rivers, khals, ditches and ponds) Local communication in the survey area is poor.

RTW: The 10km long proposed RTW (for landuse 300m from the riverbank was surveyed) along the right riverbank passes mainly through the agricultural lands. This riverbank erodes every year due to high flow velocity and sandy soil. Most of the area surveyed is used for agricultural purpose and 3 and 2 cropped lands are present in the survey area. Major people in the area are farmer and their economic status is very poor. A few settlements/homesteads are located along the riverbank. Sanitation and drinking water facilities are poor. About 30% toilets are pucca and rest 65% are kutcha. A number of cultural institutes such as school, mosque, eidgah, family graveyard etc are located within the survey area. Two ferry ghats (Kawarakandi and Kathalbari) and several boat ghats are functioning within RoW of RTW. The road communication in the survey area is very poor.

(4) Water Rights

At present, no water rights have been established by the GOB. Other relevant information is provided in Chap 2 of APP – 11.

3.9 IMPACT ASSESSMENT AND MITIGATION

3.9.1 Identification of IECs

Selection of Important Environmental Component (IEC) for the EIA is primarily based on the IEE study. The EIA Reports of Jamuna, Bhairab and Paksey Bridges were also consulted in the selection process. Finally, the selection of IECs was validated during FGD/PRA in the study area. Out of the 40 parameters initially selected, IEE study identified 8 positive impacts, 8 no impacts and 24 negative impacts (Chap 2 of APP – 11). In EIA study, 28 parameters are selected as IECs based on results from IEE and output of public consultation. The selected IECs and the rationale behind their selection are provided in Table 3.9.1. Based on the previous sections, impact assessment along with mitigation measures for these 28 IECs has been prepared and is given the following sections.

Table 3.9.1 List of Selected IECs

SI No	IECs	Rationale for Selection
NATURAL ENVIRONMENT		
1	Regional hydrology and flood pattern	If the bridge is constructed without consideration of regional hydrology/flooding level, then annual and abnormal flood may cause damage in the surrounding area.
2	Drainage congestion	The approach road may have negative impact on local drainage pattern especially since the proposed site is located in a floodplain.
3	River erosion and siltation	The change in hydrological regime due to the bridge may induce change in the river morphology, thereby increase erosion and siltation.
4	Landscape	Improper excavations of borrow pits for the construction of approach roads and other infrastructures may degrade the existing topography and landscape.
ECOLOGICAL ENVIRONMENT		
5	Agriculture	Scope for crop diversification will increase with the opening of the bridge
6	Tree plantation/cutting	In order to implement project components, trees have to be cut. On the other hand, opportunity for tree plantation arises due to project.
7	Water Bodies and Fisheries	After construction increased velocity may affect longitudinal fish migration. Approach road in the floodplain may hinder lateral migration. Disposal of waste into river during construction may be harmful for the fish. During construction, pile driving may affect fish migration. Some fish pond will be acquired.
8	Wildlife	Construction activities may create disturbance for aquatic and terrestrial wildlife.
SOCIAL ENVIRONMENT		
9	Land acquisition	Land acquisition will impact on local income and may create social disorder
10	Homestead/Settlement	In order to acquire land, forced displacement of people in the project area will happen. This will lead to an enormous disruption of social life in the local population.
11	Income loss	Agricultural land acquisition, loss of fisheries, loss of business activities and loss of employment will result in loss of income.
12	Agriculture production	The approach road on the right bank will pass mainly through agricultural land
13	Cultural resources loss	Construction of facilities may damage mosque, educational institute, graveyards etc.
14	Navigation/water transport	Normal navigation in Padma river may be hampered during and after construction of bridge
15	Health and safety	The construction workers may be exposed to health risk from drinking water quality especially arsenic, handling of construction equipments, chemical materials
16	Employment opportunities	Employment opportunities will be created during construction and operation-maintenance period.
17	Women empowerment	Due to construction of the bridge, home based poultry farm, dairy farm, rice husking machine etc. will be established in the rural areas where women will find job. Access to health and education will also increase.
18	Social Infrastructure	The project may contribute to infrastructure development, i.e. educational institute, market, mosques, tourism facilities, etc.
19	Industry	Implementation of the project will create scope for establishment of industries in the adjacent areas
20	Split of communities	In order to maintain proper alignment of the project, communities may be split which will have affect on ancestral homes and community living
21	Road transport	Improvement of road transport is the principal objective of the project.
22	Road accident	Road accidents may be increased during construction and operation.
23	Landuse	Land use will gradually change from pre-dominantly rural setting to an urban setting due to gradual increase in commercial and industrial activities
ENVIRONMENTAL POLLUTION		
24	Surface and ground water quality	Accidental spillage of chemicals such as fuel, lubricants and solvents may pollute water. Waste disposal from construction site may pollute local environment.
25	Air pollution	Air pollution may occur due to the use of vehicles and equipments, cleaning of materials, coating of construction materials, dust from stone/brick crushing
26	Noise and vibration	During construction period, noise pollution will be generated by the use of vehicles, pile driving operation, stone crushing, power generators etc.
27	Soil contamination	Accidental spillage of chemicals such as fuel, lubricants and solvents may pollute soil.
28	Pollution due to waste	During construction huge quantities of construction and general waste will be generated

3.9.2 Natural Environment

(1) Regional hydrology and Flood Pattern

Impact:

During Construction: Most of the river training related works will be carried out during dry season. Other construction will also cause minor impact on flooding.

After Construction: The confinement effect of the bridge may increase flood level of the river. Such higher water level along with the impact of the approach road may disrupt the regional hydrology for the study area, which is located in a deeply flooded region.

JICA Study Team conducted a separate Hydraulic Modelling with IWM and simulated 'without project' and 'with project' conditions for the design floods of 25 and 100 years return periods. Simulated highest water levels and maximum discharges at Mawa and Arial Khan Bridge are listed in Table-3.9.2. In general, differences in water levels between 'without project' and 'with project' conditions are approximately 0.1 m. The confinement effect is not significant, as RTW will not confine the normal flow of the river. Therefore only confinement effect is due to the piers of the bridge, the total width of which is 1% of the river width.

Table 3.9.2 Simulated Water Levels and Discharges

Highest Water Level				
Return Period	Mawa (m, PWD)		Arial Khan Bridge (m, PWD)	
	Without Project	With Project	Without Project	With Project
25-year	6.93	7.02	7.10	7.23
100-year	7.49	7.55	7.76	7.78

Maximum Discharge				
Return Period	Mawa (m ³ /sec)		Arial Khan Bridge (m ³ /sec)	
	Without Project	With Project	Without Project	With Project
25-year	117,000	118,000	3,700	3,300
100-year	134,900	134,800	3,900	3,900

Source: JICA Hydraulic Modeling Study

The maximum flooding depth in the flood plains around the proposed bridge site were estimated by the highest water level distributions superimposed on DEM for each return period. The relative comparison of maximum flooding extent by depth between 'without project' and 'with project' conditions is shown in Table-3.9.3. In general, the maximum flooding extent becomes slightly larger in the 'with project' condition. Details of the Hydraulic Modeling Study can be in other sections of this report (Main Report, Sec 4.3.3 Mathematical Modeling).

Table 3.9.3 Comparison of Maximum Flooding Extent by Depth

Without Project					
Return Period	Accumulated Flooding Extent by Depth (km ²)				
	Over 2.0m	Over 1.5m	Over 1.0m	Over 0.5m	Over 0.0m
25-year	888	1,074	1,162	1,188	1,196
100-year	1,087	1,163	1,190	1,197	1,197

With Project					
Return Period	Accumulated Flooding Extent by Depth (km ²)				
	Over 2.0m	Over 1.5m	Over 1.0m	Over 0.5m	Over 0.0m
25-year	932	1,094	1,168	1,190	1,196
100-year	1,088	1,163	1,190	1,197	1,197

Source: JICA Hydraulic Modeling Study

It is seen from the above analyses that the bridge will not have any significant impact on the regional hydrology and flood pattern in the vicinity of the bridge site. This is mainly due to the fact that the constriction effect of the proposed bridge on the river is minimal.

Mitigation:

During Construction: Careful construction planning is required not to disturb the natural flooding pattern.

After Construction: Adequate waterway opening is already provided as bridge/culvert on approach road in the preliminary design. However, it is recommended to conduct both mathematical and physical modelling to confirm the hydrologic and flood impact during the detail design stage.

(2) Drainage Congestion

Impact:

During Construction: Some localized drainage problem can happen due to unplanned construction activities.

After Construction: Some impacts on drainage may be anticipated by the proposed approach road embankment with a length of 12 km running on the flood plain on the right bank. The approach road will cross two rivers, four khals and one low-lying area. JICA Hydraulic Modeling Study simulated the impact of the approach road on flooding by considering five major openings. The impacts on flooding were assessed by simulations in terms of changes in flooding duration and water level. Table-3.9.4 shows the changes in flooding duration at the selected locations upstream and down stream sides of the proposed approach road on the right bank. Flooding duration only changed the impact a little between 'without project' and 'with project' conditions.

Table 3.9.4 Flooding Duration near Proposed Approach Road (Right Bank)

Return Period	Flooding Duration by Days			
	Without project		With project	
	Location-A Upstream of Approach Road (DEM 5.65 mPWD)	Location-B Downstream of Approach Road (DEM 5.25 mPWD)	Location-A Upstream of Approach Road (DEM 5.65 mPWD)	Location-B Downstream of Approach Road (DEM 5.25 mPWD)
25-year	41	72	39	72
100-year	67	78	68	78

Source: JICA Hydraulic Modeling Study

Water levels of local channels crossing the proposed approach road embankment on the

right bank were also assessed as shown in Table-3.9.5. At the proposed major crossings, the highest water levels become slightly higher for the 'with project' condition. Details of the Hydraulic Modeling Study can be in other sections of this report (Main Report, Sec 4.3.3 Mathematical Modeling).

Table 3.9.5 Water Level of Local Channel at Crossing of Proposed Approach Road on Right Bank

Without Project

Return Period	No.1	No.2	No.3	No.4	No.5
25-year	6.93	7.06	7.26	7.28	7.39
100-year	7.49	7.64	7.83	7.85	7.95

With Project

Return Period	No.1	No.2	No.3	No.4	No.5
25-year	7.01	7.1	7.33	7.34	7.47
100-year	7.55	7.66	7.87	7.88	8.01

Source: JICA Hydraulic Modeling Study

The above data show that there will be only some minor drainage congestion in the right bank due to the approach road.

Mitigation:

During Construction: Proper construction planning can eliminate local drainage congestion.

After Construction: Adequate waterway opening of the bridges/culverts are already provided in the preliminary design on the approach road at appropriate locations to minimize the scope of drainage congestion. However, it is recommended to conduct both mathematical and physical modelling to confirm the drainage congestion impact in the flood plain during the detail design stage.

(3) River Erosion and Siltation

Impact:

During Construction: Most of the river training related works will be carried out during dry season. Other construction will also cause minor impact on natural river erosion and siltation.

After Construction: Both left and right bank of Padma River are prone to erosion to various degrees. In order to protect the bridge from erosion, RTW of about 6km at Mawa and 10km at Janjira site are planned. JICA Hydraulic Modeling Study simulated the lowest river bed level for different design flood between 'without project' and 'with project' conditions. Comparison of the simulated results between 'without project' and 'with project' conditions indicate that no significant difference is visible for the main water course in view of macro-basis morphological developments. Details of the Hydraulic Modeling Study can be in other sections of this report (Main Report, Sec 4.3.3 Mathematical Modeling).

Mitigation:

During Construction: Careful construction planning is required not to disturb the natural condition.

After Construction: It is seen that the scour, erosion and siltation is not significant. However, it is recommended to conduct both mathematical and physical modelling to confirm the river erosion and siltation impact during the detail design stage.

On the other hand, the RTW will protect the project site area from river erosion. This will have major beneficial impact on local population. In order to enhance the benefits of RTW, it is suggested to include provision of fish landings and ghats in the design of RTW. This will ensure the access of the local population to the river water, which they use for variety of purposes. Such provision was included in the design of Sariakandi hard point.

(4) Landscape

Impact:

During Construction: The construction activities will considerably degrade the local topography and landscape. Improper excavations of borrow pits for the construction of approach roads and other infrastructures may degrade the existing topography and landscape.

After Construction: Without monitoring, there is a chance that undesired structures will be erected at undesired locations. The project when completed will attract settlements near the bridge and along the connecting roads. A part of these will be industrial establishments and commercial facilities. Without proper control, unplanned establishment will deteriorate the pleasant landscape. There is also a possibility of growth of squatter settlements on those acquired lands that may become surplus and which have no specific use once the construction is over.

Mitigation:

During Construction: Regulatory measures should be undertaken to prevent uncontrolled land use adjacent to the approach roads and bridge. Input of a landscaping expert is required during construction and post construction stage.

After Construction: With proper landscape planning, the bridge site can be developed into attractive tourist spots. The maintenance staff at the bridge-site shall be properly equipped to maintain the planned landscape.

3.9.3 Ecological Environment

(1) Agriculture

Impact:

During Construction: The project has potential negative impact on agriculture. The approach road, especially on the right bank (Janjira) passes mainly through agricultural land. Paddy including Aman and Aus, is the main crop in the project area. Other important crops are rabi crops such as onion, groundnut, pulses and garlic. As stated in Section 3.8.2, total crop loss is 2,396 MT. As shown in Section 3.8.4, in the Mawa side, out of the total land lost, 12% is agricultural, on the other hand, in the Janjira side, 83% of the lost land is agricultural. Total agricultural land lost is 231 ha.

After Construction: There is no major ecology related agricultural impact after construction.

Mitigation:

During Construction: This is permanent ecological loss. Steps should be taken to convert the fallow lands in the vicinity into agricultural land.

After Construction: No impact is anticipated.

(2) Tree Cutting and Plantation

Impact:

During Construction: The trees that will need to be cut for construction of the project are of homestead and road plantation variety. Census on trees within RoW of the project was carried out during September-October, 2004 which is presented in Volume X: Supporting Studies. It is understood that total 327,868 trees of various sizes and species are going to be affected. Out of which, about 107,689 large, 75,150 medium, 75,171 small and rest are saplings.

After Construction: There is no major impact on tree cutting and plantation after construction.

Mitigation:

During Construction: In order to compensate for the loss of trees, the project provides opportunities for new plantation. A buffer strip of 20 meter width for RTW has been planned for tree plantation. There will be opportunities for plantation on the roadside slopes of the approach roads and in the service area. Total estimated area for tree plantation is about 300ha. It is recommended to plant fruit (40%), wood (50%) and fuel trees (10%). Estimated number of trees to be planted is 238,692 based on suitable spacing. Provision for more space for tree plantation can be considered but should not be in expense of fertile agricultural land.

In the Jamuna, Bhairab and Paksey Bridge sites, a number of tree species were planted. Survival rate of some of the species, for example, Shishu is not satisfactory. Before selection of tree species for plantation in the Padma bridge site, it is recommended that the performance of plantation be studied in the other three major bridge sites. It is noted that Eucalyptus (*Eucalyptus Camaldulensis*) trees have been banned by GoB for road side plantation. Tree plantation should be carried preferably through engagement of NGO and destitute women. Some of the suitable species for local condition is provided in Table-3.9.6.

Table 3.9.6 Suitable Tree Species for the Project

Sl No	Fruit Trees	Wood Trees	Fuel Trees
1.	Jackfruit (<i>Artocarpus Heterophyllus Lamk</i>)	Raintree (<i>Albizia Spp</i>)	Jarul (<i>Lagerstroemia Speciosa</i>)
2.	Mango (<i>Mangifera Indica</i>)	Mehogini (<i>Swietenia Mahagoni</i>)	Debdaru (<i>Polyalthia Longifolia</i>)
3.	Jam (<i>Syzygium Cumini Skiel</i>)	Shilkoroi (<i>Abzia Procera</i>)	Kadam (<i>Anthocephalus chinensis</i>)
4.		Shegun (<i>Tectona Grandis</i>)	-
5.	-	Akasmoni (<i>Acacia Auricoliformis</i>)	-
6.	-	Neem (<i>Azadirachta Indica</i>)	-

Source: Field Survey, September-October, 2004 and UZ office.

After Construction: No impact is anticipated.

(3) Water Bodies and Fisheries

Impact:

During Construction: Construction on and by the river might create some disturbance to fish. However, this impact is minimal and reversible.

After Construction: The pattern of migration of riverine fishes is controlled by the seasonal flooding following monsoon rains. Fish movement and migration longitudinally, upstream or downstream, occurs at various times of the year. Any barrier to the normal movement will affect the life and reproductive cycles. It has been observed that Hilsa (Tetraodontidae Hilsa) is a major species in the study area. Hilsa is the national fish and has a very special place in the Bangladesh diet. Hilsa of Padma is additionally famous for its taste. So any impact on Hilsa needs to be carefully scrutinized. This is especially true because there will be two large bridges in place on the Padma-Ganges river (Paksey and Mawa) and the cumulative impact on Hilsa may be significant.

JICA Hydraulic Modeling Study simulated the river flow velocity for different design flood between 'without project' and 'with project' conditions. Comparison of the simulated results between 'without project' and 'with project' conditions indicate the increase in velocity due to the project is only marginal. So it can be said that Hilsa and other fishes which seasonally migrate up and down the Padma river, are not expected to be affected by the project.

Fish which migrate laterally onto floodplain may be impacted by the approach road on the left bank. The floodplain is an important fisheries ground. The natural khals especially the Naodoba khal maintain connectivity between Padma river and inland water bodies.

It was learnt through a FGD in Paksey bridge site that fish resources were once declining in the Ganges river due to oil pollution from the ferry operation. After the stoppage of ferry services, fish catch has improved. Therefore, it can be expected that stoppage of ferry service between Mawa-Janjira after the opening of the bridge will be beneficial for fisheries. In the Jamuna Bridge Monitoring Report, no significant impact of the bridge on fisheries has been noted. However, it is to be noted that construction activities, especially the pile driving, will hamper fish migration, which is unavoidable but temporary in nature.

In case of culture fish production there will be some loss. The estimated loss of water bodies (58 ponds and 74 ditches) is 4.18ha (pond) and 2.66ha (ditch) as shown in Table-3.8.2. The types of fish that are cultivated in the water bodies are telapia, carp, pangas, migrigal, rui, aire, boal, pabda, katla, tengra, chala, koi etc. The total losses of fish production within affected ponds and ditches are 2.62 MT/year and 8.92 MT/year valued at Tk. 235,800 and 739,380/year at Mawa and Janjira sites, respectively.

Mitigation:

During Construction: No disposal of waste products from construction site to the river during construction should be ensured.

After Construction: The loss of fish production can be compensated by strengthening extension effect in the nearby villages (especially new borrow pit ponds). In case of Jamuna Bridge, the borrow pits were designed for fish culture. Though it is inferred that there will be no adverse impact on Hilsa migration, considering its national interest, an independent study on Hilsa migration can be recommended. Adequate opening on five channels and on low depression at Janjira side are recommended to mitigate the impact of lateral fish migration.

(4) Wildlife

Impact: Wildlife habitats in the project area are very limited. This is due to the natural environment in this area being already under stress from human habitation, agriculture, grazing, navigation and other human activities. There is no important habitat of migratory birds near the study area. There is no exclusive habitat of endangered species in the vicinity

of the project area. However, The Padma river is a secondary habitat to two critically endangered species, namely Ganges river Dolphin (*Plantanista Gangetica*) and Gangetic Gharial (*Garialis Gangeticus*). Their main habitat is the Ganges River upstream of confluence of the Ganges and Jamuna rivers at Paturia and seldom found at the project site Mawa – Janjira.

During Construction: The impact on the wildlife will be mainly during the construction activities arising from noise, vibration and human activities.

After Construction: After the construction, as there will be insignificant constricting effect, therefore no impact on wildlife is anticipated. After construction, wildlife living situation will actually improve with closing of the Ferry Ghat which will stop oil pollution as has been observed in case of Paksey Bridge.

Mitigation:

During Construction: The piling activities and the noise level will need to be managed so that these activities result least disruption to the wildlife. Though it is anticipated that impact of the project on wildlife is very minimal, an independent study can be recommended.

After Construction: No negative impact is expected.

3.9.4 Environment Pollution

(1) Surface and Ground Water Quality

Impact: Table 3.8.3 and 3.8.4 give an indication of the surface and ground water quality. It indicates that the surface water quality is acceptable. However, for the groundwater, it was found that though fecal coliform is not present, the concentration of ammonia is higher than the WHO standard of 1.5 mg/l. This indicates possibility of sanitary contamination and any future plan to develop groundwater as drinking water source requires extensive sampling and analysis. Concentrations of iron and manganese are above the DOE drinking water standard, which is common in Bangladesh in naturally occurring arsenic area.

During Construction: The quality of surface and ground water may be reduced by the discharge of liquid or solid wastes, sewage, dredged materials or by accidental spillage of fuels and chemicals during the construction. Groundwater pollution by liquid wastes can have serious effects on the quality of drinking water.

After Construction: Post construction rapid urbanization will put serious stress on water quality.

Mitigation:

During Construction: Handling and storage of the potential contaminants has to be organized under strict condition to avoid water pollution during construction of the bridge.

After Construction: Planned future development can ascertain water quality maintenance.

(2) Air Pollution

Impact: Air quality test conducted shows that SOX concentration is high at Mawa junction and Pachchar Bazar. The probable reason is the existence of brick fields in the vicinity.

During Construction: In and around the construction site, it is expected that air pollution will occur through the use of vehicles and machinery, the asphalt and aggregate plants, and burning of bituminous and other materials. Dust generated by construction vehicle movement, crushing and handling of aggregates, and earth works will also be sources of localized air pollution. Traffic using the road following construction may deteriorate air quality.

After Construction: It is rather difficult to predict the future air quality after the opening of the bridge. This is because the future ambient air quality not only depends on the future vehicle emission, but also on the air pollution caused by future nearby traffic and surrounding industries. In addition, development of engine technology and change in government emission standard are also highly uncertain. As the ambient air quality also depends on flow velocity and direction, temperature and humidity, a complex, expensive and time consuming dynamic three dimensional mathematical model is required for future air quality prediction. However, total pollution load from the future vehicle operation is provided below.

To estimate future air pollution load from the future vehicle operation, the following emission factors are considered.

Emission Factors for different vehicle types

Unit: gm/km

Category	CO	NOX	SO2	SPM
Light Vehicles	25.0	1.0	0.05	0.27
Diesel Trucks and Buses	12.7	21.0	1.5	3.0

Sources:

1. Light Vehicle: from VAPIS-Dhaka Model, World Bank SE Asia Unit, April, 1998
2. Diesel Trucks and Buses: from Faiz: Air Pollution from Motor Vehicles, World Bank, 1996

Based on the projected traffic assignment on Padma Bridge in 2025 (Chapter 3 of Main Report), the future air pollution is shown below.

Future Air Pollution from Traffic Movement in 2025

Unit: kg/km/day

Category	Traffic volume in 2025	CO	NOX	SO2	SPM
Light Vehicles	7,340	183.50	7.34	0.37	1.98
Diesel Trucks and Buses	34,210	434.47	718.41	51.32	102.63
Total	41,550	617.97	725.75	51.69	104.61

Mitigation:

During Construction: In order to keep the pollution level within acceptable limit, construction related emissions should be regulated. Regular water spray on dry surfaces to reduce dust generation must be practiced. Air quality should be monitored regularly after opening of the bridge.

After Construction: During the operation period, if the air quality deteriorates, a number of mitigation measures can be conceived. One idea is the modal shift, that is, diverting more passenger and goods to less polluting mode like railway. Other ideas include, to impose more strict vehicle emission standard (as adopted in California, USA); to restrict number of vehicles (as adopted in Singapore); or to enforce time slot (for example, trucks should operate in night time as adopted in India).

(3) Noise and Vibration

Impact:

During Construction: Due to construction activities, the noise and vibration levels are likely to be increased in the project area. Sources of noise include pile driving, rock crushing, dredging, electricity generation and transportation. As seen in Table-3.8.6, the ambient noise level already exceeds the DoE standards of 60 dB for some sampling points. Sources of existing noise pollution are passing vehicles using hydraulic horns, ferries and speed boat.

After Construction: To predict the future noise level after opening of the bridge, an existing noise profile must be prepared during detail design stage. The cumulative noise of existing profile and the maximum expected noise from the future traffic must be compared with the standard and locations should be identified where the cumulative noise exceeds the standard.

The source of noise from a traffic stream can be divided into two components. The first is generated by the engines, exhaust system and transmission, and is the dominant noise source when traffic is not free flowing, particularly from heavy vehicles, which contribute most low frequency noise. Noise levels will vary according to engine speed rather than vehicle speed. The second noise source component is generated from the interaction of tyres with the road surface and is the dominant noise source under free flowing traffic conditions at moderate to high speeds and contributes a significant proportion of high frequency noise. Noise levels will vary dependent on vehicle speed, the road surface and whether the surface is wet or dry.

The noise from a stream of traffic at a reception point at any one instant is an aggregation of noise from each of many vehicles at various distances. Among factors which influence a basic traffic noise level are traffic flow, speed and composition (i.e., percentage of heavy vehicles), road gradient and road surface characteristics. The noise level at a particular reception point will also be affected by other factors among which are distance from the noise source, the nature of intervening surface and the presence of obstructions.

In Bangladesh, additional traffic noise is generated through the persistent use of horns.

An indication of the level of sound generated by traffic is shown below:

Car/light van traveling at 60 kph at 7 meters away	70 dB
Heavy diesel truck traveling at 40 kph at 7 meters away	86 dB

Source: Design Manual for Roads and Bridges, Volume 11-Environmental Assessment, Her Majesty's Stationery Office: UK legislation, 1993.

The index usually adopted to measure traffic noise is LA10,18h, which is the arithmetic mean of noise levels exceeded for 10% of the time in each of the 18 one hour periods between 6 am and midnight. To measure future noise pollution calculated as LA10,18h, complex models are available. For the SRNDP project (Dhaka Khulna Highway), 'Calculation of Road Traffic Noise' (CRTN, HMSO, 1988) was used. Thus, it is recommended to employ CRTN or similar type of model to predict future noise pollution during EMP study. Predictions should be made at distances of 10, 50, and 100 meters from the road edge for 'with project' and without Project' scenarios.

Mitigation:

During Construction: Since the noise pollution already exceeds the standard, therefore strict measures for noise pollution control need to be undertaken during construction activities. Implementation of these measures may be expensive and difficult. The Contractor should be asked for consideration of these aspects and should apply optimum site activities and site layout so as not to exacerbate existing noise levels at sensitive receptor sites (e.g. mosques, schools etc.). The Bhariab Bridge is located in relatively urban area, thus a number of noise pollution measures were taken. For example, a sound barrier was constructed to protect a nearby school from noise pollution. Also, stream hammer method of pile driving was used, instead of hydraulic hammer used in Jamuna Bridge.

After Construction: Detail design stage will identify the sections of the approach road where cumulative noise would cross the standard after the opening the bridge. Sound barriers should be placed on those locations. Continuous monitoring should be carried out in other locations also and whenever a section's noise level crosses the standard, JMBA should place noise barrier at that section.

(4) Soil Contamination**Impact:**

During Construction: Deterioration of soil quality at the construction site is a possibility through accidental spillage of chemicals, bituminous materials, fuel and prolonged storage of such materials. Another potential source of soil contamination is through disposal of solid and liquid wastes.

Huge quantities of sand will be dredged and will be used for the construction of approach roads and other facilities at both sides of the bridge. An analysis of the dredged material has been carried out as reported in Table-3.8.7. The result shows that pollutions are not particularly high as there are no major polluting industries upstream of the bridge site.

After Construction: No major impact on soil contamination is expected after construction.

Mitigation:

During Construction: More detail analysis of dredge material is required during EMP stage if the dredge material is to be used for road and service area construction. Adequate precaution should be taken in order to minimize scope for accidental spillage. Regular monitoring of dredged sand quality is recommended.

After Construction: No major impact is anticipated.

(5) Pollution due to Waste**Impact:**

During Construction: During construction huge quantities of construction waste (such as dredged spoil, construction materials etc) and general waste will be generated and as a result, soil, air, water and project worker will be affected if no waste management plan is formulated.

After Construction: No major impact on waste pollution is expected after construction.

Mitigation:

During Construction: A waste management plan should be prepared and followed.

After Construction: No major impact is anticipated.

3.9.5 Social Environment**(1) Land Acquisition****Impact:**

During Construction: Land acquisition has been kept to a minimum. Total area to be acquired stands at 616ha as the SIA study. Most of the land to be acquired is in the right bank and mainly under agricultural practice. Details of land acquisition have given in the SIA and Resettlement Report APP – 12.

After Construction: No major impact on land acquisition is expected after construction.

Mitigation:

During Construction: Land Acquisition plan will have to be prepared for proper compensating of land loss and rehabilitation of the PAPs according to GoB rules and regulations as well as other relevant guidelines.

After Construction: No major impact is anticipated.

(2) Homestead/Resettlement**Impact:**

During Construction: About 3000 households will require resettlement. Traditionally, Bangladeshi people are extremely emotionally attached to their homesteads. So eviction from the homesteads can be traumatic to the affected people. Details of resettlement have given in the SIA and Resettlement Report APP – 12.

After Construction: Even after full compensation for the resettlement, the physiological impact will remain forever. It would be difficult to settle in a new place.

Mitigation:

During Construction: A resettlement action plan (RAP) will be needed for proper rehabilitation of the displaced persons. RAP will be prepared for proper compensating of land loss and rehabilitation of the PAPs according to GoB rules and regulations as well as “good Practice” adopted in Jamuna Bridge and other projects.

After Construction: The RAP should include the rehabilitation plan even after the resettlement.

(3) Income Loss**Impact:**

During Construction: As mentioned in Section 3.8.4, that during construction, there will be a total loss of income of approximately Tk. 210 million. Out of these, agriculture related loss is around Tk. 45 million. In addition, number of fishermen living in the RoW are 97

(21 at Mawa and 76 at Janjira sites), most of them are poor (average income Tk. 40000/year). They will lose their income due to their loss of access to the river for fishing. Further, people associated with Ferry Ghat operation will also lose their income. These include about 200 boat operators, 100 hawkers, 1000 shopkeepers and 200 ferry operators. The total loss of ferry related income is estimated at Tk. 4,200,000/month. More detail can be found in SIA and Resettlement related sections of this Report.

After Construction: If there is no income restoration program, this loss will be repeated even after the construction.

Mitigation:

During Construction: All direct income loss must be adequately compensated within the RAP.

After Construction: Income loss can be mitigated by providing alternative job opportunities for PAPs. The compensation for income loss should be higher to women and poor. Due to nature of their profession, the fishermen should be rehabilitated as near as possible to the riverbank. Fish landing site should be incorporated in the design of the RTW.

(4) Agricultural Production

Impact:

During Construction: The project has potential negative impact on agriculture. The approach road, especially on the right bank (Janjira) passes mainly through agricultural land. Paddy including Aman and Aus, is the main crop in the project area. Other important crops are rabi crops such as onion, groundnut, pulses and garlic. As stated in Section 3.8.2, total crop loss is 2,396 MT with a price tag of around 45 million Taka.

After Construction: Besides paddy, which is the dominant crop, other crops like onion, chilli, sugarcane, jute, wheat, etc. are grown in the study area. After the construction of the bridge, which will improve transportation facilities, it is expected that the cultivation of these cash crops will increase. This will be beneficial for the local economy. The positive impact will be wide spread as seen in the case of Jamuna Bridge.

Mitigation:

During Construction: Proper compensation must be included in the RAP.

After Construction: Any loss in agricultural production due to land loss will be compensated by the expected increase of agricultural production on remaining land. Farmers will be induced into production of more cash crops due to closeness of the study area to Dhaka city. The agricultural production can be further enhanced by constructing market facilities in the vicinity of the study area. Loan and training are also essential.

Market facilities (growth centers) need to be developed near bridge site in order to facilitate the cash crop based economy. In addition, support as a form of loan and training should be provided. It may be mentioned here that income generation program was not adequate in the Jamuna bridge project.

(5) Cultural Resources Loss

Impact:

During Construction: Due to the construction of approach road, no historic establishment will be affected. Some cultural resources including school (3), madrasha (1), mosque (19), eidghah (1), graveyard (16) and Hindu burning yard (1) will be affected as shown in Table 3.8.12. As shown in that table, more establishments will be affected in the Janjira site than in the Mawa site. All establishments can be relocated. More problematic are likely to be graveyard/family graves.

After Construction: No impact is expected regarding cultural resources loss after construction.

Mitigation:

During Construction: Alternative locations and facilities should be provided for the cultural infrastructure such as family grave/graveyard, educational institutes, mosque/temple, burring yard, eidgha etc. However, if the relocation takes place before the establishments are broken down, then this will help to reverse many negative impacts. As much as possible, graves/graveyards will need to be avoided by alternative design, but where this proves impossible then negotiations should be held to provide agreed relocation arrangements. This work should be included as part of the RAP.

After Construction: No impact is expected.

(6) Navigation/Water Transport

Impact: The Padma river is a Class-II navigation route. As mentioned in Table 3.8.9, large numbers of commercial and passenger steamers and barges ply in the Padma through the proposed bridge crossing. The right bank approach road crosses four khals and 2 small rivers. Among these khals and rivers, Noadoba river is navigationally important. The left bank short approach road does not cross any active channel.

During Construction: During construction, considerable quantities of construction materials and equipment will have to be brought by river barges and may disrupt the regular riverine traffic. In addition, piling works, dredging and other construction activities will involve disruption to the navigational channel.

After Construction: Adequate navigational clearance has been kept in the design of main bridge and bridge over Noadoba river in consultation with BIWTA. As a result, no interruption is expected.

Mitigation:

During Construction: To avoid navigational problems during construction, adequate navigation lights and markings are to be provided to avoid accident.

After Construction: No impact is expected.

(7) Health and Sanitation

Impact:

During Construction: About 3621 tubewells and 3267 latrines are likely to be affected

(Table-3.8.10 & 3.8.11). People using these facilities will be relocated.

A labor camp/barrack will be constructed with temporary accommodation for about 5000 workers during the peak of construction activities in the contractor's working area. After the project is completed most of the family and bachelor quarters will be used by the O&M personnel and rest of the facilities will be dismantled. Therefore, conditions should be set for the Contractors to consider the above situation. Major health and sanitation concerns are drinking water, drainage and sewerage, solid waste and disease transmission. Lack of proper drainage and sewerage system is likely to cause waterborne diseases. Solid wastes (rubbish, garbage and construction wastes, etc) may pose additional health threat and nuisance. Risk of transmission of communicable disease among the labor force is high.

After Construction: No negative impact is expected on health and sanitation after the construction. On the other hand, due to better access, health and sanitation situation of the area is expected to improve.

Mitigation:

During Construction: Soft loan should be provided to the relocated persons for construction of water supply and sanitation facilities. Adequate facilities should be provided for quality water supply, hygienic toilets etc in the construction camps and in the resettlement area of PAPs to ensure good health.

Drinking Water: Good quality drinking water is of paramount importance for maintaining good health of construction laborers. Drinking water should meet the WHO guideline values (1984) or Bangladesh Standards (DoE, 1997). As public drinking water supply system is not available at the project area, contractors have to provide their own facilities. It is to be remembered that the project area is located in one of the most arsenic prone area. During construction, more tests should be carried out and if needed, arsenic treatment plant should be constructed.

Drainage and Sewerage: Toilets for the construction workers must be fitted with water seals and connected with septic tank. Care should be taken, that the effluent from the septic tank is not discharged into open drains but is treated by subsurface infiltration through absorption trenches or soak pits without contaminating ground water. Septic tanks have to be inspected regularly and de-slugged, if necessary. Wastewater from washing, bathing, kitchen, etc can be treated separately from excreta by infiltration in the sub-soil or direct discharge into the river via sewer pipe.

Solid Wastes: As a mitigation measure, regular collection of the solid wastes and proper disposal is essential.

Transmission of Diseases: Awareness building and education must be carried out regularly. Regular health inspection and vaccination program is also necessary.

After Construction: No negative impact is expected. Local health and sanitation situation will be improved.

(8) Employment Opportunities

Impact:

During Construction: Due to relocation, a number of persons will lose their income as mentioned in Section 3.8.4. Total income loss of PAPs is approx. Tk. 210 million. However, the project will be able to generate considerable employment during construction period.

Total number of employment to be generated during construction is estimated to be about 5000 laborers/day.

After Construction: After construction, a total of approx. 1000 number of employment will be generated for O&M works.

Mitigation:

During Construction: Alternative job opportunities should be arranged specially for the affected persons during the construction of the project. The increased employment opportunities should be utilized to the maximum benefit of the local populace. It is suggested that the priority in employment during construction and operation stage should be given in the following order.

1. PAPs
2. Destitute women
3. Poor people in the project area
4. Local people
5. People from outside the project area

After Construction: Proper income restoration program should be included in RAP for the post construction period. It may be noted that income restoration program for Jamuna bridge was not satisfactory.

(9) Women Empowerment

Impact:

During and After Construction: This project will provide direct and indirect opportunities for women empowerment in the form of increased employment during and after construction, trade prospect, better access to health and education, etc.

Mitigation:

During Construction: During construction, women should be engaged in different types of construction related jobs. This provision must be included in RAP.

After Construction: After the opening of the Bridge, there are opportunities for women to involve into various trades like handicraft, poultry, dairy, etc. With engagement of NGO to facilitate the process especially with loan, training and marketing, it will provide tremendous women empowerment.

(10) Social Infrastructure

Impact:

During Construction: Under the RAP, a number of social infrastructures were constructed in Jamuna Bridge like schools, health centers, community centers, etc. Similar approach can be taken in the present case.

After Construction: After opening of the bridge, due to increased economic activities, it is expected that a number of new social infrastructure including schools, colleges, markets, recreation facilities, religious places, and tourism facilities will be developed in the vicinity of the Bridge.

Mitigation:

During Construction: Construction of various social infrastructures should be included in the RAP for the affected as well as local peoples.

After Construction: A proper infrastructure development plan will enhance the benefits.

(11) Industry**Impact:**

During Construction: No major impact is expected during construction.

After Construction: There is a tremendous potential of industrial development near the bridge site because of many factors, such as, proximity to Dhaka, transportation link with Southwest region including third largest city of Khulna and link with Benapole land port and Mongla seaport.

Mitigation:

During Construction: No major impact is expected.

After Construction: A master plan for industrial development should be prepared urgently to facilitate the development in a sustainable manner.

(12) Split of Communities**Impact:**

During Construction: Approach road may split some of the communities. The psychological impact due to split might be traumatic. In order to reduce the emotional stress, underpasses are included in the design at suitable locations of the approach roads.

After Construction: The split of communities due to relocation can not be avoided.

Mitigation:

During Construction: Underpasses are included in the design to reduce the split of communities.

After Construction: During relocation process, extensive consultations with potentially affected communities need to be taken up, so that their concerns can be addressed as much as possible. In such cases, experience of Jamuna Bridge will be especially relevant.

(13) Road Transport**Impact:**

During Construction: During construction, movement of heavy vehicles will disrupt the local traffic.

After Construction: The Bridge, once operational, will revolutionize the entire road network of the country. The south-west region, Benapole land port and Mongla port will be particularly benefited.

Mitigation:

During Construction: Proper traffic management needs to be put in place in order to minimize the disruption during construction stage.

After Construction: A national road transport master plan can tap best of the benefits from this bridge.

(14) Road Accident**Impact:**

During Construction: Transportation of construction material, equipment and movement of the project personnel by road will increase road traffic during construction phase. As a result, risk of traffic accident will increase.

After Construction: When the bridge opens for vehicle movement, increased speed of vehicles will again increase the risk of traffic accident. Such a trend has been observed in case of Jamuna Bridge.

Mitigation:

During and After Construction: BRTA rules and regulations will need to be strictly followed to minimize the risk of traffic accidents.

(15) Landuse**Impact:**

During Construction: It is not expected that there will be major landuse change during the construction.

After Construction: The economy generated by the construction of the project will increase money supply in the area and will change in land use pattern. The land price will increase, particularly the price of roadside land which will be sought after for industrial, commercial and settlement purposes. Proximity to Dhaka will encourage rapid housing development. Other activities will also develop such as educational institutions, health facilities, recreation centers, tourism facilities, government institutions, etc. All these will provide employment to many people.

The short term significant social impact will be the transfer of the land from small farmers to big holders and land speculators. The land value will rapidly rise and this will be a real threat to small farmers living around the acquired area for being displaced: they will eventually join the ranks of the landless.

There are 7 villages presently existing within 1 km of the road on the east side and 21 villages on the west side. These villages will experience both growth and transformation as a direct result of the opening up of the area to a greater market and opportunities and each will demand connection to the approach road.

The long term effect, unless regulatory measures are taken in time, will be uncontrolled settlement, environmental pollution from industries and innumerable places of access to the road leading to traffic congestion and hazard.

Mitigation:

During Construction: No major impact is expected.

After Construction: It is desirable to institutionalize some form of effective planning for and control on the development growth. While the demand of connections of local growth centers with the bridge approach road will be necessary and cannot be denied, their number and location can be controlled by a careful advance planning.

3.9.6 Prioritization of IECs

An attempt has been made to prioritize IECs. Such prioritization is helpful to formulate detailed EMP. The prioritization has been done on the basis of FGD/PRA's carried out for Padma bridge. The priority of IECs is provided in Table-3.9.7. The major concern for the PAPs is social issues. The other concerns are natural environmental, ecological environment and environmental pollution, in that order.

Table 3.9.7 Priority of IECs

Environmental Category	IECs
Social	<ul style="list-style-type: none"> • Homestead loss • Land acquisition • Split of communities • Employment opportunities
Natural	<ul style="list-style-type: none"> • Erosion • Drainage congestion
Ecological	<ul style="list-style-type: none"> • Tree cutting/plantation • Fisheries
Environmental pollution	<ul style="list-style-type: none"> • Noise and vibration

3.10 IMPACT EVALUATION**3.10.1 Procedure**

In this section, impacts are evaluated on the basis of magnitude, immediacy, and sustainability / reversibility. The focus of each items are as follows:

- Magnitude
 - Type of impact (direct, indirect, cumulative)
- Immediacy
 - Temporal extent (during construction, after construction)
 - Spatial extent (local, widespread)
- Sustainability and Reversibility
 - Mitigability (fully, partially)
 - Monitoring possibility (fully, partially)

A 21-point scale is adopted, for example: 1 to 10 for beneficial impacts, 0 for no impact, -1 to -10 for negative impacts. For the relative weightage, magnitude is given higher value (40%) ahead of immediacy and sustainability/reversibility (30% each) because of its more direct and visual influence. The grading for each IEC is explained in the following sections.

3.10.2 Natural Environment

(1) Regional hydrology and Flood Pattern

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	-1	Little increase in flood level and extent. With sufficient openings in the approach road, effect can be further minimized.
Immediacy (± 3)	-3	-3	Any effect on regional hydrology will occur immediately after the construction of the bridge.
Reversibility/ Sustainability (± 3)	-3	-2	Some effects on regional hydrology can be reversed with appropriate interventions at a later stage
Total	-8	-6	

(2) Drainage Congestion

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	0	Drainage congestion due to approach road on the right bank can be mitigated by providing adequate passages through the approach road.
Immediacy (± 3)	-2	-1	Occurrence of drainage congestion will be gradual in nature
Reversibility/ Sustainability (± 3)	0	0	Any drainage congestion due to approach road is reversible.
Total	-4	-1	

(3) River Erosion and Siltation

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	+2	+2	RTW will arrest erosion of the banks Some scours will develop.
Immediacy (± 3)	+3	+3	Erosion will be arrested immediately Scours will develop gradually.
Reversibility/ Sustainability (± 3)	+2	+3	Erosion protection will be sustainable. However, regular monitoring is needed to rectify any future developments. Small measures like ghats and fish landing sites will make the RTW more sustainable.
Total	+7	+8	

(4) Landscape

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-1	+3	With proper landscaping, the bridge site can be developed into important tourist and urban site
Immediacy (± 3)	-2	+2	Development will contribute whole country
Reversibility/ Sustainability (± 3)	-1	+1	Proper planning will help sustainable development
Total	-4	+6	

3.10.3 Ecological Environment**(1) Fisheries and Water Bodies**

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	-1	Some impact on fisheries especially during construction. Closure of the ferry ghat will be beneficial for the fisheries after construction Lateral migration can be hindered by the approach road. Adequate openings will mitigate the impact
Immediacy (± 3)	-3	-2	Impact on fisheries with construction related activities will be immediate.
Reversibility/ Sustainability (± 3)	-2	-1	Experience with Paksey Bridge shows that impact on fisheries is somewhat reversible.
Total	-7	-4	

(2) Wildlife

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-3	-2	During construction, piling activities and noise will impact wildlife. Closing of ferry operation after the bridge construction will improve the habitat condition.
Immediacy (± 3)	-2	-1	With proper mitigation, effect can be made gradual
Reversibility/ Sustainability (± 3)	-2	-1	Experience with Paksey Bridge and Jamuna Bridge shows that impact on wildlife during construction activities are reversible.
Total	-7	-4	

(3) Agriculture

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	-1	There will be some permanent loss in agriculture. Conversion of fellow land into agricultural land will reduce the impact.
Immediacy (± 3)	-3	-2	The process will be immediate.
Reversibility/ Sustainability (± 3)	-3	-2	The process will be reversible only up to certain level.
Total	-8	-5	

(4) Tree Cutting and Plantation

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-3	+4	New plantation and dust management will be able to recover much of the damage. Plantation with appropriate species will be much more beneficial.
Immediacy (± 3)	-3	-2	Plantation after the construction will makeup the loss gradually
Reversibility/ Sustainability (± 3)	-3	+3	Any loss of trees is irreversible without proper mitigation. Plantation with involvement of NGOs and destitute women will make new plantation highly sustainable.
Total	-9	+5	

3.10.4 Environment Pollution**(1) Surface and Ground Water Quality**

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	0	There are risks of water pollution. With careful and strict procedures in place, risk can be eliminated.
Immediacy (± 3)	-1	0	The impact of the spillages will be gradual and accumulate especially in groundwater.
Reversibility/ Sustainability (± 3)	-1	-1	Impact on groundwater will be difficult to reverse.
Total	-4	-1	

(2) Air Pollution

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-3	-1	Some air pollution due to construction activities can happen. With proper mitigation, pollution level can be kept within acceptable limit Increased future traffic may increase pollution
Immediacy (± 3)	-1	0	Air pollution effects are gradual.
Reversibility/ Sustainability (± 3)	-2	-1	After construction, air pollution will be considerably reduced. Increased future traffic may increase pollution
Total	-6	-1	

(3) Noise and Vibration

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-4	-2	Existing noise pollution level is already high. Construction activities will aggravate the situation. mitigation measures are expensive and sometimes difficult. Sound barrier can reduce noise pollution from future traffic.
Immediacy (± 3)	-3	-1	Impact of noise and vibration is immediate.
Reversibility/ Sustainability (± 3)	-1	-1	After construction, there will be residual noise pollution from construction activities. Noise pollution from ferries and speed boat operation will stop. But increased future traffic may increase pollution.
Total	-8	-4	

(4) Soil Contamination

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	0	Impact of accidental spillages will be medium in nature. With proper measures, it is possible to contain spillages.
Immediacy (± 3)	-2	0	Impact on soil will be rather immediate.
Reversibility/ Sustainability (± 3)	-2	-1	Impact on soil will be almost irreversible.
Total	-6	-1	

(5) Pollution due to Waste

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	0	Water, soil and health will be affected, but proper planning will eliminate the impact
Immediacy (± 3)	-2	0	Impact on health will be immediate
Reversibility/ Sustainability (± 3)	-2	-1	Impact on health, soil and water will be irreversible
Total	-6	-1	

3.10.5 Social Environment**(1) Land Acquisition**

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	-1	Land acquisition has been kept to a minimum Land holders, especially poor and women to be adequately compensated.
Immediacy (± 3)	-3	-3	Impact will happen at once
Reversibility/ Sustainability (± 3)	-3	-3	Land loss is irreversible
Total	-8	-7	

(2) Homestead/Resettlement

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	-1	Person requiring relocation will get proper compensation package with proper RAP
Immediacy (± 3)	-3	-1	Impact on evictees is immediate with proper RAP
Reversibility/ Sustainability (± 3)	-1	-1	Some psychological stress due to loss of homestead will not diminish
Total	-6	-3	

(3) Income Loss

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	0	Income loss is not very high as the bridge passes though an underdeveloped region. Any income loss can be properly compensated.
Immediacy (± 3)	-1	0	Income loss will be covered quickly.
Reversibility/ Sustainability (± 3)	0	0	No impact
Total	-3	0	

(4) Agricultural Production

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-1	+2	Loss of agricultural production is insignificant. Development of proper market facilities will induce additional production in the nearby agricultural lands. Because of the bridge, there will be opportunities for crop diversification for wide area.
Immediacy (± 3)	-2	+1	Land acquired for construction will be immediately taken out of agricultural production. Market facilities after the bridge will develop gradually.
Reversibility/ Sustainability (± 3)	-2	+1	The loss of production in the acquired land is irreversible. The increase in production will be sustainable because of proximity of the Bridge to Dhaka.
Total	-5	+4	

(5) Cultural Resources Loss

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-1	0	There are no important historical sites. Other than some cultural resources. Existing establishments can be relocated.
Immediacy (± 3)	-3	-1	With proper relocation before the construction, the immediate impact can be significantly reduced.
Reversibility/ Sustainability (± 3)	-3	-1	With proper relocation, the impacts can be reversed.
Total	-7	-2	

(6) Navigation/Water Transport

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	-1	During construction, there will be disruption to navigation.
Immediacy (± 3)	-2	-1	The disruption will disappear after construction
Reversibility/ Sustainability (± 3)	0	0	Since the bridge has been provided with adequate navigational clearance, therefore after construction, there will be very little impact.
Total	-4	-2	

(7) Health and Sanitation

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-3	+3	Without proper health facilities, impact may be very high for the construction workers as well as local people. With proper mitigation, health and safety situation can be considerably improved.
Immediacy (± 3)	-1	+1	Health impacts will be gradual.
Reversibility/ Sustainability (± 3)	-1	+1	Many of the health hazards are reversible with proper measures.
Total	-5	+5	

(8) Employment Opportunities

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	+3	+4	Project will generate large number of temporary jobs; Few jobs related to ferry ghat will be lost. To enhance this employment benefits, PAPs, Women and poor people should be engaged.
Immediacy (± 3)	+3	+3	Employment effect will start immediately with construction activities
Reversibility/ Sustainability (± 3)	+1	+2	The employment opportunities will decrease substantially at the end of construction. In O&M activities women and poor should be given preference which will increase sustainability
Total	+7	+9	

(9) Women Empowerment

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	+2	+3	Women should be heavily recruited for construction jobs. NGOs should be engaged to facilitate small business opportunities for women after the opening of the Bridge.
Immediacy (± 3)	+1	+1	The impact is gradual
Reversibility/ Sustainability (± 3)	+1	+2	With proper long term intervention, sustainability will increase.
Total	+4	+6	

(10) Social Infrastructure

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	+2	+3	Potential of infrastructural development will be fully realized with a proper infrastructure development plan.
Immediacy (± 3)	+1	+2	Benefits will come rather quickly
Reversibility/ Sustainability (± 3)	+1	+2	Proper infrastructure development planning will increase sustainability.
Total	+4	+7	

(11) Industry

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	+1	+2	An industrial development plan is needed to harness the benefits of industrialization.
Immediacy (± 3)	+1	+1	Industrial development will be gradual
Reversibility/ Sustainability (± 3)	+1	+2	Proper industrial development plan will increase sustainability.
Total	+3	+5	

(12) Split of Communities

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-1	0	Few communities and community facilities will be split. Proper measures will mitigate much of the impacts.
Immediacy (± 3)	-3	-2	The effect of split is immediate.
Reversibility/ Sustainability (± 3)	-1	0	The impact lessens with time.
Total	-5	-2	

(13) Road Transport

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	+3	+4	There will be some hindrance to traffic flow during construction. But the road transport network of the entire region will get tremendous boost.
Immediacy (± 3)	+3	+3	Impact is immediate
Reversibility/ Sustainability (± 3)	+3	+3	Contribute to national sustainability
Total	+9	+10	

(14) Road Accident

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	-2	-1	There will be increased risk of traffic accident during construction and operation.
Immediacy (± 3)	-1	0	Proper measures can reduce impacts
Reversibility/ Sustainability (± 3)	0	0	No impact
Total	-3	-1	

(15) Landuse

Parameter	Impact value (-10 to +10 scale)		Rationale/Remarks
	Without mitigation	With mitigation	
Magnitude (± 4)	+2	+3	Land values will increase. A land use development plan is needed. To increase the benefits.
Immediacy (± 3)	+1	+1	It has gradual effect
Reversibility/ Sustainability (± 3)	+1	+2	Proper planning can increase sustainability
Total	+4	+6	

3.10.6 Summary of Evaluation

The summary of impact evaluation is presented in Table 3.10.1. The relative weightage values have been taken from the IEE study (Chap 2 of APP – 11). The weightage values of the environmental parameters are decided in the context of Padma bridge construction and their importance to the national development and environmental conservation. In the process of selecting the weightage, the values proposed in “Guidelines on Environmental Issues Related to Physical Planning” prepared by LGED and “Preliminary Activities related to Project Environmental Assessment” prepared by REB with WB assistance were consulted. It may be mentioned here that values proposed in LGED guideline was prepared based upon extensive exercise of a number of national environmental experts. In addition, public consultation was held for prioritization of IECs (as explained in Sec 7.9.6), and that result is also incorporated in the weightage selection.

The graded values are calculated for ‘without mitigation measures’ and ‘with mitigation measures’. It is to be noted that though the rating method is widely practiced for EIA and accepted all over the world, it is subjective in nature. To eliminate this subjective dimension of the grading, a number of environmental experts do the rating independently and then combine. Also, EIA professionals usually don’t look at the absolute numbers, rather the range of change. In the present case, the rating was done by 3 experts, namely, member of the JICA Study Team, a professor of BUET and leader of the local sub contract team. The range of the graded values shows that implementation of mitigation measures will considerably mitigate or enhance the impacts on IECs.

Table 3.10.1 Summary of Evaluation of Impacts on IECs

Environmental parameters	Relative Weightage	Environmental impact rating		Graded Value	
		Without mitigation	With mitigation	Without mitigation	With mitigation
	(i)	(ii)	(iii)	(iv)=(i)x(ii)	(v)=(i)x(iii)
Natural Environment					
Regional hydrology & flood pattern	10	-8	-6	-80	-60
Drainage congestion	7	-4	-1	-28	-7
River erosion, scour and siltation	2	7	8	14	16
Landscape	2	-4	6	-8	12
Ecological Parameters					
Fisheries and water bodies	8	-7	-4	-56	-32
Wildlife	4	-7	-4	-28	-16
Agriculture	8	-8	-5	-64	-40
Tree plantation/cutting	6	-9	5	-54	30
Environmental Pollution					
Surface and ground water pollution	7	-4	-1	-28	-7
Air pollution	5	-6	-1	-30	-5
Noise and vibration	3	-8	-4	-24	-12
Soil contamination	5	-6	-1	-30	-5
Waste	5	-6	-1	-30	-5
Social Environment					
Land acquisition	8	-8	-7	-64	-56
Homestead loss	10	-6	-3	-60	-30
Income loss	8	-3	0	-24	0
Agriculture production	8	-5	4	-40	32
Cultural loss	8	-7	-2	-56	-16
Navigation	3	-4	-2	-12	-6
Health and safety	5	-5	5	-25	25
Employment opportunities	7	7	9	49	63
Women empowerment	7	4	6	28	42
Infrastructure	5	4	7	20	35
Industry	5	3	5	15	25
Split of communities	6	-5	-2	-30	-12
Road transport	7	9	10	63	70
Road accident	5	-3	-1	-15	-5
Land use	3	4	6	12	18
Total Graded Value				-585	54

3.11 PRELIMINARY ENVIRONMENTAL MANAGEMENT PLAN (EMP)

3.11.1 Scope of JICA Study

Environmental Management Plan (EMP) should be prepared after the proponent JMBA gets environmental clearance from DOE. Procedure for getting environmental clearance is explained in Chap 1 of APP 11. It is a two step process. In the first step the proponent will apply in a prescribed form for site clearance attaching IEE report. After getting DOE's site clearance, the next step is to apply for environmental clearance attaching EIA report. EMP should be prepared after that during the detail design stage. JICA Study is outlining a preliminary EMP in this section as a framework and guidance.

3.11.2 Objectives of EMP

Environmental Management Plan (EMP) is necessary on the grounds that it will manage the environment by off-setting the negative impacts with mitigation measures and enhancing the positive impacts within the allocated fund from the project. Thus, the main objectives of the EMP for the construction of the proposed Padma Bridge are:

- Mitigation measures to reduce or eliminate negative impacts;
- Measures to off-set or compensate irreversible and residual negative impacts;
- Enhancement measures to maximize positive impacts;
- Monitoring requirements;
- Funding requirements;
- Institutional arrangement for the implementation of the EMP; and
- Implementation schedule of the EMP activities.

3.11.3 Environmental Mitigation Measures (EMM)

In the outline of EMM, negative impacts have been identified and assessed qualitatively and quantitatively wherever possible. Mitigation measures to offset or compensate such impacts have been devised and incorporated in preliminary EMP.

Based on Section 3.9, possible mitigation measures presented in tabular form in the following Table-3.11.1 and may be recommended for the major negative impacts. A mitigation measure is said to be successful when it complies with the EQS as set by DOE. In absence of DOE set EQS, WHO standards can be applied in this regard.

Table 3.11.1 Possible Environmental Mitigation Measures (EMM)

Environmental Impacts	Possible Mitigation Measures	Residual Impacts
• PRE-CONSTRUCTION STAGE		
Land acquisition	<ul style="list-style-type: none"> • Prepare LA plan • Land acquisition notice should be served well ahead of time, so that people can get compensation before actual acquisition • Provide adequate compensation • Engage NGOs for implementation of LA plan 	<ul style="list-style-type: none"> • Permanent loss of land and crop production • Psychological stress • Increase of land value
Relocation of homestead/ settlement/ other infrastructure	<ul style="list-style-type: none"> • Prepare RAP • Advance notice for relocation should be served, so that people can get compensation before they have to leave their house. • Provide appropriate compensation based on so-called "Good Practice" and "Replacement Value" • Engage NGOs for implementation of RAP • Monitoring Unit should be established involving three parties (project financier, project proponent, and project affected people) 	<ul style="list-style-type: none"> • Increase in the price of land and building materials in the locality • Psychological stress

Environmental Impacts	Possible Mitigation Measures	Residual Impacts
	<ul style="list-style-type: none"> • Consultation services and credit can be provided to assure better environment and income restoration • Provide alternative employment opportunities to PAPs 	
Relocation of cultural resources	<ul style="list-style-type: none"> • Alternate location/facilities should be provided to continue the earlier activities before destruction of present facilities 	<ul style="list-style-type: none"> • Some social disruption.
Tree cutting	<ul style="list-style-type: none"> • Notice for removal of trees • Provide adequate, quick and fair compensation to owners 	<ul style="list-style-type: none"> • Some ecological impact
• CONSTRUCTION STAGE		
Drainage Congestion	<ul style="list-style-type: none"> • Construct temporary cross drainage in the diversion road 	<ul style="list-style-type: none"> • Minimal Impact
Disruption of Agricultural Activities	<ul style="list-style-type: none"> • Provide adequate compensations to land owners. • Prevent unauthorized earthworks on private properties. • Provide alternative job opportunities. 	<ul style="list-style-type: none"> • Loss of crop production
Destruction of Plants	<ul style="list-style-type: none"> • Provide compensation to owners • Organize tree planting and landscape maintenance team. 	<ul style="list-style-type: none"> • Some ecological impacts
Disturbance of Fisheries	<ul style="list-style-type: none"> • Avoid disruption of surface runoff • Prevent disposal of any waste into the river and ponds 	<ul style="list-style-type: none"> • Some reduction of fish stock
Disturbance of Wildlife	<ul style="list-style-type: none"> • Prevent unplanned invasion outside the project area. • Proper planning for noise and vibration level 	<ul style="list-style-type: none"> • Some ecological impacts
Contamination of surface and ground water	<ul style="list-style-type: none"> • Prevent discharge of organic, inorganic, and toxic materials • Provide retention pond to ensure natural treatment for the wastes before discharging into the receiving water. • Increase retention time of the outflow hydraulic fills to increase sedimentation, thus, reduce sediment load to the Padma river. 	<ul style="list-style-type: none"> • Minimal Impact
Air Pollution	<ul style="list-style-type: none"> • Strictly regulate vehicle emissions to the manufacture's standard • Spray water on dry surfaces regularly to reduce dust generation. • Maintain optimum moisture content during transportation, compaction and handling of soils. 	<ul style="list-style-type: none"> • Possible future impact
Noise and Vibration	<ul style="list-style-type: none"> • Regulate the construction process • Install barrier, if required. 	<ul style="list-style-type: none"> • Minimal Impact
Soil Contamination	<ul style="list-style-type: none"> • Implement strict handling and storage practices to prevent accidental spillage. • Provide proper waste management plan and implement accordingly. 	<ul style="list-style-type: none"> • Minimal Impact
Interruption of Navigation/ Water Transport	<ul style="list-style-type: none"> • Maintain close liaison with the BIWTA • Conduct dredging operations, if required • Provide proper navigational instructions • Place buoys and navigational lights 	<ul style="list-style-type: none"> • Minimal Impact
Interruption of Road Transport	<ul style="list-style-type: none"> • Provide alternative access for road traffics where necessary. • Ensure proper traffic management 	<ul style="list-style-type: none"> • Minimal Impact
Social Disruption/ Community Split	<ul style="list-style-type: none"> • Set up mosques, market, etc. adjacent to the labor camp. • Reduce social tension through public participation programs. • Liaison with the village and labor representatives to resolve social conflicts. 	<ul style="list-style-type: none"> • Psychological stress
Health, Sanitation and Safety	<ul style="list-style-type: none"> • Provide regular health inspection and vaccination among workers and establish clinic in project camps. • Provide hygienic toilets in project camps. • Ensure security of construction area by providing proper fencing, lighting and security force. • Ensure supply of quality water. • Make the workers aware of chemical materials and proper handling methods. • Setup warning signs, signals and provide personnel protective equipment (PPE) for all workers. 	<ul style="list-style-type: none"> • Minimal impact
Job Opportunities	<ul style="list-style-type: none"> • Generate job opportunities for PAPs 	<ul style="list-style-type: none"> • Minimal impacts
• AFTER CONSTRUCTION STAGE		
Regional Hydrology and Flood Pattern	<ul style="list-style-type: none"> • Provide adequate drainage structures as per design 	<ul style="list-style-type: none"> • Minimal impact

Environmental Impacts	Possible Mitigation Measures	Residual Impacts
River Erosion and Siltation	<ul style="list-style-type: none"> To provide adequate river training works according to design. Maintenance works are required after completion of the RTW. 	<ul style="list-style-type: none"> Minimal Impact
Drainage congestion	<ul style="list-style-type: none"> To provide adequate drainage structures on the approach roads. Maintenance works also to be required 	<ul style="list-style-type: none"> Minimal Impact
Water Bodies and Fisheries	<ul style="list-style-type: none"> Rehabilitation of affected fishermen through loan and training Enhance culture fisheries in the nearby water bodies 	<ul style="list-style-type: none"> Reduce fish stock
Tree Plantation	<ul style="list-style-type: none"> Tree plantation at roadside, RTW and resettlement area 	<ul style="list-style-type: none"> Some impact on ecology
Road Accident	<ul style="list-style-type: none"> Road accident can only be controlled by the application of relevant regulations of BRTA 	<ul style="list-style-type: none"> Injury

3.11.4 Environmental Enhancement

Environmental enhancement has been considered where significant gains in production, resources enhancement and management, and environmental protection can be achieved with financial support from the project.

(1) Tree Plantation

Tree plantation is not only required to compensate the negative effects of the plant cutting, but also to improve the environment. Trees take carbon dioxide and discharge oxygen for their photosynthesis, which helps clean the air. In addition, the wood, fruit and fuel value of trees are considerable. Roadside trees intercept the dust on their leaves and keep the ambient air dust free. About 300ha land has been estimated for plantation of 238692 trees considering planting space of 3m from each other. Usually fruit trees will be planted over 40% free space, wood trees over 50% and fuel wood trees over the remaining 10%. Grassing will be provided on the roadside slope to protect slope erosion. Table-3.11.2 presents the approximate estimate for tree plantation.

Table 3.11.2 Approximate Cost Estimate for Tree Plantation

Type	Total area (m ²)		No of trees		Total nos. of Trees	* Cost per plant (Tk)	Total (Tk)
	Mawa side	Janjira side	Mawa side	Janjira side			
Fruit Trees	192750	1005000	20726	77749	98475	300	29542500
Wood Trees	240937	1256250	18409	97189	115598	300	34679400
Fuel Trees	48187	251250	5183	19436	24619	300	92321
Total	481874	2512500	44318	194374	238692		64,314,221

* Cost included seedling, materials, labors, maintenance and contingency during 4 years

(2) Recreation Facility

Under the Environmental Management, recreational facilities can be made through environmental enhancement in the suitable area within the acquired land. As such, it is proposed to make garden within RoW of RTW along the riverbanks and in service area. Seating arrangement along the bank and elsewhere may develop in the garden area. Such recreational facilities will also benefit the local people through creating job opportunities.

(3) Landuse and Landscape Planning

With proper landscape and landuse planning, the site can remain ecologically friendly and environmentally sustainable. Input of a landscape expert is required during construction and post construction stage. The maintenance staff of the bridge should be trained to maintain planned landscape. Social, industrial and commercial infrastructure should be set up with

proper planning to maximize sustainable development.

(4) Income Restoration / Generation Program and Women Empowerment

This is one thing which was not properly planned and practiced in Jamuna Bridge Project. Marketing facilities should be developed to facilitate agro, livestock and fish based economy. In addition, support as a form of loan and training should be provided. Alternative job creation like handicraft, poultry, dairy, etc. in the vicinity is essential to make up the income loss, women empowerment and poverty reduction.

3.11.5 Institutional Arrangement

An institutional arrangement has to be ensured for conducting an effective and meaningful EMP execution including monitoring. The designated institution for overseeing environmental management in Bangladesh is the DoE. Unfortunately, the DoE is a relatively new institution and has been poorly resourced. It thus falls to each of the government line agencies to ensure that their work abides by the environmental laws, rules and procedures, with overall direction given by the DoE. As the project developer, the Jamuna Multi Purpose Bridge Authority (JMBA) has the responsibility to ensure that the EMP has properly implemented. The Environmental and Resettlement Division (ERD) within JMBA will be overall responsible. The ERU will require an intensive orientation training to enhance the skill and efficiency in running the program. The proposed institutional framework for implementing the EMP is to use consultancy services (both international and national) for overall management, design and supervision of the works.

A number of other governmental departments will have linkage with the EMP implementation. Authorization will be needed from RHD and LGED to cut trees in areas under their jurisdiction. For planting trees within the project area, consultations should be done with FD. The DoF is responsible for fisheries whereas DPHE is for quality of water. During construction, stakeholders participation should be maintained.

The construction of the proposed bridge would be carried out by the international and national Contractors. Much of the EMP must be carried out by Contractors and those must be incorporated in the contract document. The role of consultant will include checking on conformity with the relevant clauses in construction contracts and national and international environmental legislation and regulations. Responsibilities of the Contractor in relation to environmental management will have to be elaborated during EMP preparation but must include the followings:

- The Contractor shall take all reasonable steps to protect the environment and avoid damage and nuisance arising because of his operations.
- The Contractor shall be responsible for the costs of cleaning up any environmental pollution resulting from his activities.
- The Contractor shall take adequate preventive measures against water, air, and soil pollution.
- The Contractor shall be careful about excessive groundwater abstraction.
- The Contractor shall, at all times, maintain all sites under his control in a clean and tidy condition and shall provide appropriate and adequate facilities for the temporary storage of all wastes before disposal.
- The Contractor shall be responsible for the safe transportation and disposal of all wastes
- The Contractor shall be responsible for the provision of adequate sanitary facilities for the construction workforce.
- The Contractor shall make every reasonable effort to reduce noise nuisance caused by construction activities.

3.11.6 Environmental Monitoring

As discussed earlier (Section-3.9), most of the negative impacts arise from the construction activities. Monitoring during construction can play a key role to off-set the negative impacts or to keep the negative impacts to a minimum. Environmental Monitoring (EM) in the EMP for Padma Bridge has been designed with the following objectives to:

- Measure the extent of expected or poorly quantified impacts;
- Ensure incorporation of Environmental Mitigation Measure (EMM) during implementation of the proposed project;
- Observe effectiveness of EMM;
- Ensure early detection of unexpected impacts and adoption of appropriate protection measures;
- Provide periodic reviews to observe adherence to Environmental Quality Standards (EQS) and adjust EMM, if required; and
- Detect unacceptable level of impacts and adopt corrective measures.

Environmental monitoring requires a set of indicators that could be conveniently measured, assessed and evaluated periodically to establish trends of impacts. Monitoring of construction related environmental impact should take place throughout the period of implementation of the project. Some of important monitoring are described here.

- Surface water of the downstream of the proposed bridge location will be tested routinely for important water quality parameters to monitor that the construction activities are not deteriorating downstream river water quality.
- Before being used for land reclamation, dredged spoil will be tested for checking concentration level of toxic substances.
- Prior to approving the ground water for drinking, contractor shall submit the test results of the groundwater to the consultant.
- Monitoring of surface water drainage will be done to prevent unusual localized flood.
- Air quality, noise and vibration levels shall be checked routinely to keep the air and noise within EQS level as set by DoE.
- Agricultural lands surrounding the project area will be monitored to check if there is any crop damage by the construction activities.
- Periodic check on workers' health will be carried out by the contractor and to isolate any cases of infectious diseases.
- Road and water transport will be monitored continuously to ensure that those are not disrupted.

3.11.7 Environmental Implementation Schedule

Table 3.11.3 gives the implementation timing and responsible agency for all EMP items.

Table 3.11.3 Summary of EMP

Environmental Items	Possible Mitigation & Enhancement Measures	When to Implement (Project Stage)	Implementation and Monitoring Agency
NATURAL ENVIRONMENT			
Regional Hydrology and Flood Pattern	Design to minimize induced flooding. Provide adequate drainage structure on approach roads	Design Construction	Consultant and contractor
River Erosion and Siltation	Design to consider minimized impact. Detail river study (Physical and mathematical model)	Design Construction	Consultant and contractor
Drainage congestion	Proper design Provide adequate drainage structures	Design Construction	Consultant and Contractor

Environmental Items	Possible Mitigation & Enhancement Measures	When to Implement (Project Stage)	Implementation and Monitoring Agency
ECOLOGICAL ENVIRONMENT			
Removal of trees and plantation	Minimize tree cutting Plantation	Pre-construction Construction Post Construction	JMBA, RHD, FD, LGED, Consultant, Contractor, NGOs and PAPs
Water bodies/ Fisheries	Reduce negative impacts on fish habitats	Design Construction	JMBA, RHD, DOF, Consultant, Contractor, & PAPs
Agriculture	Develop market facilities to encourage diversified crops	Construction Post construction	Consultants and contractor, JMBA
Wildlife	Minimize disturbances to habitat condition	Design Construction	FD, Consultant & Contractor
Landscape	Consider in design	Design	Consultant
SOCIAL ENVIRONMENT			
Land Loss	Proper land acquisition plan (LA) Provide adequate compensation in time to PAPs	Design Pre-construction	JMBA, Deputy Commissioner (DC) Consultant, NGOs & PAPs
Homestead Loss	Proper resettlement action plan (RAP) Provide adequate compensation in time to PAPs	Design Pre-construction	JMBA, Deputy Commissioner (DC) Consultant, NGOs & PAPs
Agricultural and Commercial Loss	Proper RAP Provide adequate compensation.	Design Pre-construction, Construction	JMBA, DC, Consultant, NGOs & PAPs
Water Bodies/ Fisheries Loss	Proper RAP Provide adequate compensation.	Design Pre-construction Construction	JMBA, Consultant, DC, NGOs, PAPs
Split of Communities	Provide underpass in the road embankment	Design Construction	Consultant & Contractor
Historical & Cultural Loss	Try to avoid cultured heritage (graveyards, etc), Reconstruct mosque and others	During Construction	JMBA, Consultant & Contractor,
Road Accident	Follow BRTA rules and regulations	Construction Post construction	JMBA, Consultant & Contractor
Navigation/ Water Transport	Follow BIWTA navigation rules and regulations	Construction	BIWTA, Consultant & Contractor
Employment Opportunities	Target employment opportunities to PAPs specially women	Construction Post construction	JMBA, Consultant, Contractor & Local Authority, NGO
Health and Sanitation	Provide health and sanitation facilities	Construction	Consultant and Contractor
ENVIRONMENTAL POLLUTION			
Air Pollution	Enforce environmental legislation and minimize dust & vehicle emission.	Construction Post Operation	DoE, Consultant & Contractor, JMBA
Surface and ground Water Pollution	Construction management plan	Construction	Consultant, Contractor & DPHE, JMBA
Noise & Vibrations	Enforce noise emission standards	Construction	DoE, Consultant & Contractor, JMBA
Soil Contamination	Enforce environmental legislation	Construction	DoE, Consultant & Contractor, JMBA
Waste (general and construction)	Proper waste management plan	Construction	Consultant and Contractor

3.11.8 EMP Cost Estimate

An indicative cost estimate is made for the preliminary EMP and it is found to be around 3 million US\$. A breakdown is given in Table 3.11.4. It is to be noted that it is very indicative in nature and actual cost should be estimated in the EMP preparation stage.

Table 3.11.4 Approximate EMP cost**Pre-Construction Stage**

Activities/ Items	Unit	Rate (Taka)	Quantity	Amount (Taka)
• Hilsha Migration Study	LS			2,000,000
• Charland Study	LS			3,000,000
• Testing of river bed materials (metal & PAH) to be dredged	LS		3 locations	6,500,000
Total:				11,500,000

Preparation of EMP including Environmental Guidelines

Activities/ Items	Unit	Rate (Taka)	Quantity	Amount (Taka)
• Environmental Specialist	mm	180,000	3	540,000
• Fisheries Expert	mm	160,000	1	160,000
• Wildlife Specialist	mm	160,000	1	160,000
• Forest Expert	mm	160,000	1	160,000
• Data Collection/Analysis	LS	-	-	1,000,000
• Transport	mm	60,000	3	360,000
• Reporting	LS	-	-	100,000
• Furnished Office Space	mm	50000	3	150,000
Total:				2,630,000

Monitoring During Construction Stage

Activities/ Items	Unit	Rate (Taka)	Quantity	Amount (Taka)
• Environmental Specialist	mm	180,000	54	9,720,000
• Testing of Parameters				
- Surface Water (4.5 years)	nos	30,000	18	540,000
- Ground Water (4.5 years)	nos	30,000	18	540,000
- Drinking Water (4.5 years)	nos	30,000	18	540,000
- Air	LS	-	-	2,000,000
- Noise*		-	-	100,000
- Effluent from dredged materials in to the Padma	nos	30,000	12	360,000
• Wildlife monitoring (2 years)	LS	-	-	1,800,000
• Transport	LS	-	-	4,000,000
• Reporting	LS	-	-	1,000,000
• Furnished Office Space	LS	-	-	3,000,000
Total:				23,600,000

* Buying of noise equipment

Plantation and Social Afforestation After Construction Stage

Activities/ Items	Unit	Rate (Taka)	Quantity	Amount (Taka)
• Tree plantation at Mawa site	nos	300	44,400	13,320,000
• Tree plantation at Janjira site	nos	300	194,400	58,320,000
Total:				71,640,000

Others

Activities/ Items	Unit	Rate (Taka)	Quantity	Amount (Taka)
• Fisheries in Resettlement Areas after Construction Stage	LS	-	-	10,000,000
• Dust Control Measure	LS	-	-	10,000,000
• Vibration Monitoring	LS	-	-	5,500,000
• Health and Safety	LS	-	-	40,000,000
• Training and Organisation	LS	-	-	5,000,000
Total:				70,500,000

Grand Total			Tk.	179,870,000
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Note: Monitoring will be a part of Management Consultant so International Consultant is not required.

3.12 CONCLUSIONS AND RECOMMENDATIONS

3.12.1 Conclusions

The key conclusions of the EIA of Padma river bridge project are as follows:

- The impact of the bridge on regional hydrology and flooding pattern will be minimal as the increase in highest water level of the Padma river due to the bridge construction will be approximately 10cm.
- Adequate openings on the right bank approach road is planned to alleviate drainage congestion.
- Erosion and siltation are limited.
- A total of 327,868 trees will need to be cut for the project. This loss may be compensated by planting 238,692 trees.
- A total of 58 ponds (area=4.18ha) and 74 ditches (area=2.66ha) will be affected by the project. Fish production loss will be about 11 MT/year which may be compensated by fish culture in new borrow pit ponds.
- The project does not pass through any ecologically protected and sensitive area.
- There is no exclusive habitat of any endangered species near the Project site. However, Padma river is a secondary habitat of two critically endangered species namely, Gangetic Gharial and Dolphin. Their main habitat is the Ganges river and seldom found in project site.
- Padma river is an important migratory route for Hilsa fish.
- Due to land acquisition of 616ha, about 3,150 housing structures will be affected. LA plan and RAP will be prepared to mitigate all these issues.
- Total income loss is 210 million taka of which agriculture production loss is about Tk. 45 million/ year
- A total of 41 cultural establishments including school, madrasa, mosque, eidgha, graveyard and Hindu burning-ghat will be directly affected.
- With the proposed mitigation measures, overall impact will be limited.
- The indicative EMP cost is US\$ 3 million.

The general conclusions for the environmental issues are discussed below.

(1) Natural Environment

In physical environment category, erosion is a significant IEC. The proposed river protection work will stabilize the erosion of the banks and will be highly beneficial to the local population, who has been suffering from gradual erosion of their land for long. In the river protection work, it is recommended to include provision for openings in the natural khals in the right bank for flood control, drainage and ecological connectivity. Fish landing sites and ghats for household purposes (domestic water collection, bathing, livestock drinking water, livestock bathing etc.) need to be accommodated in the design of river protection works. These measures will increase the benefits of river protection works. Since the Bridge does not propose to constrict the river, therefore the backwater effect and river erosion will be minimal.

(2) Ecological Environment

The Bridge does not pass through any ecologically sensitive area. Therefore no major impact on wildlife, fisheries and vegetation are expected. However, the Bridge crosses the Padma River which is one of the major migratory route of the most important fish species of Bangladesh, namely Hilsa. Since the river is not constricted, long term impact on Hilsa migration is expected to be minimum. The impact on Hilsa can be significant during construction activities. Fortunately, as has been experienced in case of Paksey and Jamuna Bridges, the impacts are somewhat reversible. Padma river is a secondary habitat of two

critically endangered species namely, Gangetic Gharial and Dolphin. Their main habitat is the Ganges river upstream of confluence of the Ganges and Jamuna rivers at Paturia and seldom found at the project site. Still, minimum disturbances during construction activities need to be attempted. With the opening of the Bridge, ferry operation will stop and many pollution associated with ferry operation will cease. This will improve the habitat condition as has been observed in case of Paksey Bridge.

(3) Social Environment

Land acquisition and resettlement are the most significant impact and will bear heavily on the local population. Adequate compensation and relocation measures should be taken through proper LA plan and RAP. The affected population should be given priority in the employment opportunities that the Bridge will generate. Other vulnerable groups of people who need preference in employment are destitute women and poor people.

(4) Environmental Pollution

The significant environmental pollution IEC is noise and vibration. Large noise and vibration pollution will occur in the neighborhood during construction. Appropriate specification of construction equipments based on ambient pollution level should be prepared and followed in order to reduce the level of pollution. Sound barrier should be placed where it is required.

3.12.2 Recommendations

Based on the findings of this study, various studies are recommended.

Within the EMP

Groundwater analysis: The project site is within the naturally occurring Arsenic area. Also, EIA test results indicate possibility of sanitary pollution. Thus, detail investigation is necessary. Test parameters should include pH, EC, hardness, COD, NH₄-N, Nitrate, Nitrite, PO₄-P, Total Coliform, Fecal Coliform, Cl, Fe, As, and Mn.

Surface water analysis: EIA test shows generally good condition of surface water. Still, more analysis is desirable. Test parameters should include pH, EC, Cl, TSS, TDS, Total Coliform, Fecal Coliform, DO, BOD, COD, Ca, T-P, NH₄-N, Nitrate, Nitrite, Fe, As, and oil and grease.

Noise pollution: Limited test results of EIA shows that at some points, noise level exceeds the standard. So, detail noise level profile has to be determined along the route. Test parameters should include peak and average noise for both day and night time.

Air pollution: More sampling is required to evaluate the existing air quality. Test parameters should include Sox, Nox, CO, SPM and Pb.

Dredge material test: Since there is a possibility to use the dredge material excavated for river works for the construction of road, service area and toll plaza, good number of samples from different depth should be analyzed in detail. Test parameters should include Zn, Cu, Hg, Mn, COD, Pb, CN, Cd, Cr, As, Se, and Volatile Solid.

Analysis of future air pollution level: Expected ambient air quality after the opening of the bridge should be estimated by utilizing mathematical modeling.

Analysis of future noise pollution level: Expected ambient noise quality after the opening of

the bridge should be estimated.

From the parallel study

Hydrological investigation: In the detail design stage, physical and mathematical model test will be executed for hydrological investigation. Information on flooding, drainage, erosion and sedimentation should be used in EMP.

Social investigation: In the detail design stage, Land Acquisition Plan and Resettlement Action Plan will be conducted. Information on land acquisition, relocation and other indirect loss should be used in EMP.

Independent Study

Further, some additional studies can be undertaken independently. These are as follows:

Hilsa Migration: As has been mentioned, Padma is an important migration route of Hilsa. The production of Hilsa in the country is in decline due to various reasons. Further decline should be avoided to the extent possible. In near future, there will be two bridges on the Ganges-Padma river, one at Paksey which is already been completed and another is the proposed Padma Bridge. The cumulative impact of these bridges is desirable to be studied. Study on migration pattern of Hilsa can recommend proper mitigation measures.

Landuse and Landscape (Regional Development): A land use plan around the proposed site is needed to maximize the benefits of the Bridge. This will be a regional development planning including land use planning, landscape planning, industrial development, tourism development, urbanization, commercial and residential development. Such a plan should be based on the experiences of the land use development in other large bridge sites, namely Jamuna Bridge, Bhairab Bridge and Paksey Bridge.

Charland Study: There is a large char upstream of the bridge site. Mathematical study of this study estimated that there would be no impact on the char due to the bridge construction. However, inhabitants of the charlands are mainly marginal people and prone to environmental and social impacts. Therefore, an independent study can be undertaken to carefully evaluate the impacts on charland population.

Wildlife survey: There is no exclusive habitat of any endangered species near the project site. However, there will be some impact on wildlife especially during the construction period. An independent study can elaborate such issues.

Appendix 12 Social Impact Assessment and Resettlement Framework

Chapter 1 Project Background

1.1 INTRODUCTION

Bangladesh is a riverine country. It has close to 700 rivers, large and small. The three major rivers – the Padma, Jamuna (Brahmaputra) and Meghna – divide the country into four principal areas such as the North, East, Northwest, and Southwest zones (Figure 1.1.1 – Map of Bangladesh).

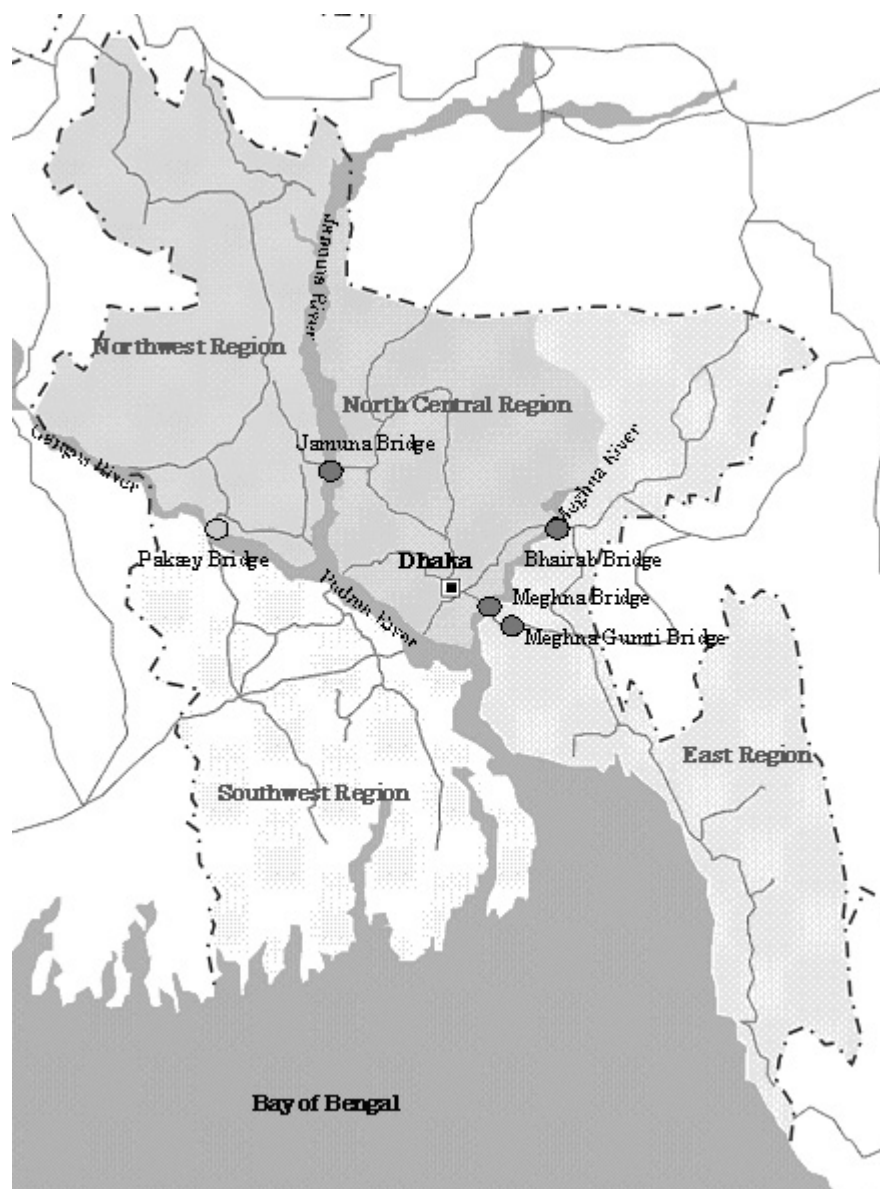


Figure 1.1.1 Map of Bangladesh

To date, five major bridges (e.g., Meghna Bridge, Meghna-Gumti Bridge, Bhairab Bridge, Jamuna Bridge, and Paksey Bridge) have been built that provide good links between the Northwest, North and East zones with the national capital Dhaka. Despite improved road networks, the Southwest zone is still separated by the Padma River and requires time-consuming ferry crossings to major destinations like the second major port Mongla, third largest city Khulna, and the main land port at Benapole. The proposed project to build a multi-purpose bridge (with additional utilities such as rail, gas, power line) over the Padma is thus desirable to physically unite the country and provide rapid and secure connections to promote economic, social and industrial development of the relatively underdeveloped Southwestern zone.

1.2 PRE-FEASIBILITY STUDY

In 1999, the Jamuna Multipurpose Bridge Authority (JMBA) conducted a pre-feasibility study¹ for the construction of the Padma Bridge. The pre-feasibility considered two potential locations or crossing sites, namely, Aricha-Goalundo and Mawa-Charjanajat. The Mawa crossing on the left bank was about 35 km upstream of the confluence between the Padma and the Meghna River. The Aricha-Goalundo site was about 80 km upstream from the Mawa crossing site. The project areas on both banks were largely rural, although non-farm economic activities (e.g., trade/commercial enterprises, shops/self-employment, transport business, etc.) were reported on the left bank ghats (ferry stations) at Mawa and Aricha, and Goalundo on the right bank.² Based on some preliminary technical and social investigations, the pre-feasibility study had recommended Mawa-Charjanajat as the preferred site for the bridge location. The study also observed that the average density on the left bank (2,176 persons/sq. km) of the river was about double (1,286 persons/sq. km) than the right bank.

1.3 FEASIBILITY STUDY

The Japan International Cooperation Agency (JICA) has funded the Feasibility Study for the Padma Bridge. The JICA-Padma Study Team (the Study Team) was mobilized in May 2003 with the purpose to finalize site selection for the bridge project and to prepare a feasibility study of the project. The Draft Final Report (DFR) presents the results of the feasibility study. This report is particularly dedicated to presenting the findings of the social impact assessment conducted during the study period.

1.3.1 Potential Crossing Sites and Screening

Four potential corridors or crossing sites, including the two sites considered during the pre-feasibility study, were studied. The four sites are: (i) Site-1 Paturia/Aricha-Goalundo; (ii) Site-2 Dohar-Charbhadrasan; (iii) Site-3 Mawa-Janjira/Charjanajat; and (iv) Site-4 Chandpur-Bhedarganj (Figure 2 – Four Crossing Locations).

¹ *Padma Bridge Study: Pre-Feasibility Report*. RPT/Nedeco/BCL, October 1999.

² *Padma Bridge Study: Pre-Feasibility Report* (Vol. VI Resettlement Policy and Data). RPT/Nedeco/BCL, October 1999.

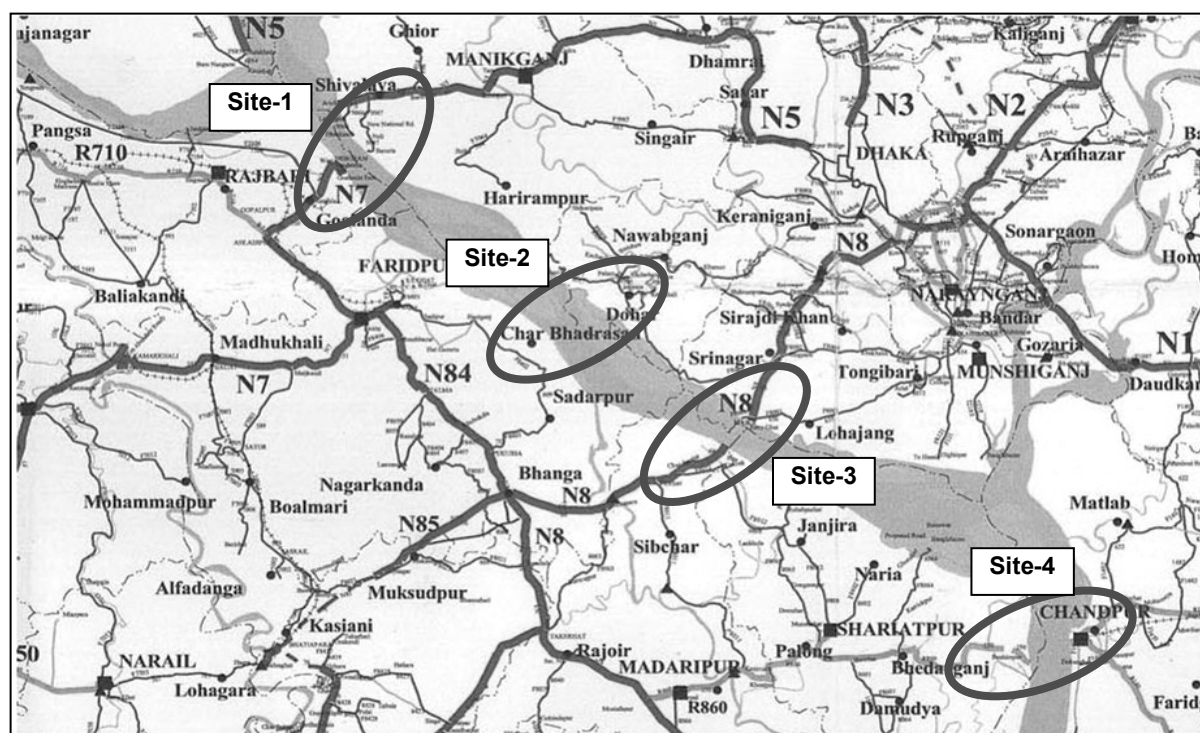


Figure 1.3.1 Four-Crossing Locations

The four crossing sections were subjected to initial screening to select two “preferred” locations through comparative studies of the physical, technical, economic, local infrastructure, and social/environmental aspects. All four crossing sites have very similar geo-social features having mainland on the left bank and char land (newly emerged land from riverbeds) on the right bank, with typical risk and uncertainty associated with the floodplain ecology and development.

The screening showed that the Dohar-Charbhadrsan and Chandpur-Bhedarganj corridors were physically, technically and economically less attractive due to – for example, unstable riverbanks, increased length of the bridge, inadequate/poor road network access to national/regional highways, low traffic volume, unfavorable travel distance to major destinations in the Southwest, higher capital investment and lower rate of return and finally higher land acquisition and population displacement – and thus were eliminated or screened out from any further consideration. In other words, the Study Team selected Site-1 (Paturia-Goalundo) and Site-3 (Mawa-Janjira) for further in-depth study for final site selection.

1.3.2 Bridge Site Selection

The two preferred sites – Paturia-Goalundo and Mawa-Janjira – were further studied from October 2003 to March 2004. The sites were compared taking into consideration the (i) economic feasibility (economic internal rate of return, cost/benefit ratio, net present value); (ii) economic costs (direct investment costs, operation/maintenance); (iii) regional development (increase of gross regional domestic product); (iv) environment, social/resettlement aspects; and (v) poverty reduction and enhancement of regional development in the Southwestern region.

The general socioeconomic characteristics of the two alternative sites are fairly similar. A brief description of the sites is presented below focusing on some key socioeconomic features of the areas.

(i) Mawa-Janjira Site

Mawa is located on the left bank within the administrative domain of Lauhaganj *Upazila* (subdistrict) of Munshiganj district. Lauhaganj is part of the historic Bikrampur Pargana – considered culturally rich and economically advanced in the region. Being on the Padma, Lauhaganj has been an important river port and transportation hub for the southwestern part of the country. In the past years, the area has experienced massive erosion due to shifting of the left bank. The river recently washed the *upazila* headquarters and several villages along the riverbank away.

Presently, settlement patterns along the riverbank are very dense. People here are generally better off, with multiple sources of income from business and trade links with Dhaka and other riverine ports. The density of population is 1,200/sq km. At Mawa site, the potential bridge location was identified about a half kilometer down stream from Mawa ferry *ghat*. The landing site on the left bank in Janjira was located about 3 km down stream from the existing ferry *ghat* in Shariatpur.

The landing area is predominantly rural with a density of 885/sq km. There are no visible island *chars* at the site; however, a cluster of *chars* slightly upstream has fairly old settlements. Some *chars*, according to local information, do appear during low water/winter season. Local peasants, particularly the erosion-displaced families and the poor grow winter vegetable and cash crops like peanuts on the those temporary *chars*. While the left bank still experiences erosion annually, the right bank area is gradually gaining more and more newly deposited *char* lands.

(ii) Paturia-Goalundo Site

Paturia-Goalundo site is located upstream from the Mawa site. Paturia on the left bank belongs to Shibalaya *Upazila* in Manikganj district. Of the total area in Manikganj district (199 sq. km), nearly 45% (89.12 sq. km) are riverine area. At this site, the bridge head on the left bank was identified at Nayakandi under Shibalaya *upazila*. The road network is more developed in Paturia-Goalundo corridor due to Daulatdia/Goalundo having been the main route of access to north and southwest until the opening of the Jamuna Bridge upstream near Bhuapur in Tangail district. The likely landing area of the bridge on the right bank in this corridor was at Hasan Mollar Gram in Char Daulatdia – about 3 km downstream of the present Daulatdia ferry *ghat*.

While Paturia *ghat* is very rural, Daulatdia/Goalundo is an urban municipal area. It is also a historic port and a rail junction. The rate of erosion has slowed down in Goalundo. Indeed, the depth of water is reportedly low and the banks are very stable. The main river has moved off towards the east of the present ferry *ghat* passed what is now known as the *Mora* (dead) Padma. There are several textile mills, hatcheries, and poultry farms. The expanding commercial and industrial activity of this port town will benefit from a fixed link over the Padma River.

At the conclusion of the various physical, technical, hydraulic, transport, and socio-environmental studies, the Study Team decided in favor of Mawa-Janjira over Paturia-Goalundo as the final site for the construction of the proposed bridge. For Mawa-Janjira, the traffic forecast was much higher compared Paturia-Goalundo. Similarly, the rate of return was also in favor of Mawa site. Despite potentially larger social impacts in terms of population displacement at the Mawa-Janjira site, the site was favored due to higher bankline stability, based on a temporal study of riverine system and bankline changes in the floodplain. It was considered that the impact could be minimized through adopting options such as adjustment of technical design and consultation with the affected communities. The Government of Bangladesh (GOB) approved the recommendation of the

Study Team. So, Mawa-Janjira was confirmed as the location for the future bridge construction.

1.4 BRIEF OVERVIEW OF THE SELECTED SITE

The proposed bridge will provide a fixed link over the Padma River and connect the relatively backward southwest with the rest of the country. The southwestern region comprises of the Khulna and Barisal Divisions and greater Faridpur District of Dhaka Division with a total population of 30.19 million (Census 2001), which is one-quarter of the total population of Bangladesh. The area under the influence of the project is 42,579 sq km – about 29 percent of the total area in Bangladesh (147,570 sq km). Therefore, the project is viewed an important infrastructure toward improving the transportation network and regional economic development of the country.

The selected Mawa-Janjira site covers three districts – Mawa on the left bank in Mushiganj district and Janjira on the right bank in Shariatpur and Madaripur districts. The corridor is characterized by deltaic floodplain with associated physical and socio-economic features. For example, riverbank erosion is endemic at both ends of the bridge site. As a result, many homes are destroyed every year, displacing hundreds of families who take refuge as temporary in-migrants in the existing villages on both sides of the riverbanks.³ However, new *chars* are also formed in the floodplain as a natural process of erosion (*sikosti*) and accretion (*payasti*), which are ultimately settled by the displaced families.⁴ Thus, the floodplain inhabitants are accustomed to displacement and localized migration as a form of traditional adjustments to riverine hazards. This is perennial throughout the Brahmaputra-Jamuna and Padma floodplains.⁵ Detailed description of the local ecology and dynamics of natural processes of erosion and accretion is presented in Chapter 2.

1.5 OBJECTIVES OF THE REPORT

The Study Team has prepared this report on the social impact assessment and resettlement framework with assistance from local sub-consultants provided under the JICA-Padma Feasibility Study. It examines the social impacts of the project and addresses the land acquisition and resettlement aspects. The report is based on socio-economic surveys and census of the potentially affected persons (APs) along the project corridors/right-of-way (ROW).

The overall impacts reported here are based on best available estimates derived from the potential impacts of the preliminary design of various infrastructures associated with the construction of the bridge. At this time, the estimated impacts, particularly people to be affected along the bank lines for river training and protection works, is slightly on the higher side as the “bank lines” used during the survey were much closer to the villages due to flood season. When the water level recedes, the number of households/villages to be affected will reduce as the bank lines move away from the present distance of many “affected” villages. The river training and protection works will be built on the bankline at dry season (i.e., PW2 level), thus reducing the overall impact significantly in terms of displacement of households/businesses along the banklines on both sides of the river.

The Jamuna Multipurpose Bridge Authority – the project executing agency (EA) - should use this report as a planning tool, prepare a full inventory of land acquisition and affected

³ C. E. Haque and M.Q. Zaman, “Coping with Riverbank Erosion Hazard and Displacement in Bangladesh,” *Disasters*, Vol. 13(4), 1989.

⁴ M. Q. Zaman, “Social Structure and Process in *Char* Land Settlement in the Brahmaputra-Jamuna Floodplain,” *Man* (N.S.), Vol. 26(4), 1991.

⁵ M. Q. Zaman, “Ethnography of Disasters: Making Sense of Flood and Erosion in Bangladesh,” *Eastern Anthropologist*, Vol. 47(2), April-June 1994.

households/businesses during detailed project design, and prepare a resettlement action plan (RAP) for the project-affected persons. While the principles and the resettlement entitlements have been stipulated in this framework document, the compensation and rehabilitation packages for the affected households and shops, including the indicative budget, will be revised based on further detailed planning.

Chapter 7 provides a list of outstanding planning and implementation tasks to be completed by the EA during detailed design period. The preparation of a RAP will be critical to safeguarding the rights of the affected peoples such as replacement value of their assets, resettlement, livelihood restoration, and additional assistance to marginal and vulnerable groups. The RAP should benefit from the Jamuna Bridge resettlement experience and other “best practices” already established in various infrastructure projects in Bangladesh. The RAP thus prepared should be reviewed further as a condition for project processing by the donor agencies.

1.6 APPROACHES AND METHODOLOGY

Initial social assessments were carried out during the screening and final site selection for the bridge.⁶ Since site selection at Mawa-Janjira, the Study Team and sub-consultants conducted extensive field visits to the project sites. Multiple methods have been used to collect both quantitative and qualitative data from the project areas. For example, the Study Team conducted many (i) information and consultation meetings (ICMs) and (ii) focus group discussions (FGDs) with stakeholders, particularly in likely affected villages/communities. During FGD meetings, the project design details were drawn on the ground to explain the various components and the potential impacts of the bridge, including mitigation measures to be undertaken by the project.

Further, a series of participatory rapid appraisals were held at both ends of the bridge project. The objectives of the PRA sessions were to involve local population in participatory assessment of the adverse project impacts and benefits, including response to the project, nature and types of losses – both individual and common properties, and potential mitigation measures for resettlement and rehabilitation. Additional goals of PRA exercises were to (i) ensure participation of the local people; (ii) create opportunity to play roles and express their views; (iii) analyze household and community level issues to draw early attention for mitigations; (iv) promote “people-centered” resettlement and development strategies; (v) social preparation for relocation, confidence and capacity building for community level resettlement management; and (vi) empowerment of the community with information so that they can use their best judgment in deciding appropriate measures. The various tools used and results of the PRAs are presented in Chapter 4.

A census of all likely affected households/structures was conducted over a period of four months (August-November 2004). Prior to the census, the Study Team and sub-consultants carried out reconnaissance surveys to identify the corridors for approach roads and the area likely to be acquired for the construction of the bridge end facility, construction yard and river training work. A detailed questionnaire was used to collect both household and community-level data with regards to impacts, types of losses, and perception about the project. The census questionnaire also included many demographic, socioeconomic, and gender issues for formulating appropriate mitigation measures, including social development aspects. In addition, key informants like local government officials (i.e., union council chairman/members, head of *gram sarkar*, community leaders etc.) were interviewed to assess the overall impacts of the project ROW, types of losses, and locally

⁶ Results of the initial social assessments are available in *Progress Report 1*- September 2003 (Volume 2 Main Report, Chapter 11) and *Interim Report* – March 2004 (Volume 2 Main Report, Chapter 10), The Feasibility Study of Padma Bridge, Nippon Koei Co. and Construction Project Consultants, Inc.

preferred resettlement options. The objective was to gather a broader overview of project impacts and mitigations, based on local knowledge and practices. The Study Team supervised the census work and participated in many PRAs and FGDs in Mawa and Janjira sites.

1.7 ORGANIZATION OF THE REPORT

The Report consists of seven chapters, including this chapter (Chapter 1) on project background. Chapter 2 provides a general overview of the project area, particularly focusing on the geography/local ecology, socio-economic, land use/tenure systems, health/education, gender, and rural poverty in the southwestern region. The discussion is presented on the basis on available secondary data, supplemented by field observations. Chapter 3 presents the project impacts, based on the census data collected by the Study Team. It identifies the types of losses due to land acquisition for the construction of the bridge and other associated facilities. Disclosure of project impacts, consultation with stakeholders and their responses to the project are presented in Chapter 4. Chapter 5 examines compensation and resettlement policy issues within the context of past experiences in Bangladesh and outlines a project-specific resettlement framework and an entitlement matrix. Chapter 6 deals with institutional, monitoring, and resettlement management issues, including various procedures and practices. Finally, in Chapter 7 a set of outstanding issues are presented that require attention for further project processing as well as compliance of donors' policies and requirements.

Chapter 2 General Overview of the Project Area

2.1 GEOGRAPHY AND LOCAL ECOLOGY

The Southwestern region of Bangladesh covers Barisal and Khulna Divisions and the greater Faridpur and Munshiganj districts of Dhaka Division. The area is situated between 88.6°E and 90.6°E latitudes and 20°N to 22°N longitudes. The total land area of the region is 43,954 sq km, which consist of medium to high and low-lying areas. Topographically the entire area is flat surface several meters above mean sea level gradually sloping from north to south.⁷ The major rivers comprising Ganges/Padma, Dhaleswari, Bhairab, Kumar, Kobadak, Chitra, Nabaganga, Gorai-Modhumati and Arial Khan criss-cross the entire region. Besides, estuarine rivers like Rupsa-Shibsa- Passur in the lower Khulna area and Bishkhali, Tetulia, Baleswar, Kirtonkhola, Kocha and Andharmanik in the lower Barisal area are the other major rivers. Most of the areas of greater Kushtia (Khulna Division), greater Faridpur and Munshiganj (Dhaka Division) lie in the floodplain of Padma-Ganges Rivers and routinely suffer from annual flooding of medium to high intensity.

The proposed bridge corridor area characterizes as lying between the Ganges and Dhaleswari natural levees in the vast low lying areas known as Arial *beel*. These soils are flooded 3-6 meter deep in the monsoon season. River bank erosion and population displacement are annual phenomena are the floodplain area. Thus, people living in the floodplain do not construct permanent houses and are ready to move to safer places in the event of flooding and erosion in the area. However, the displacement caused by riverbank erosion can often be permanent in nature. Indeed, there are thousands of permanently displaced households on both sides of the river. Floodplain inhabitants desperately hope and wait for the eroded lands to reappear as *chars*. The newly formed *chars* are often very fertile, which are immediately put to use for winter crops such as water melon and groundnuts. The newly emerged *chars* are settled only after they become “flood-free” or above normal flood level. The development of settlements in the *chars* are, however, function of local ecology and political patronage by local landlords, who provide shelter and assistance to members of their own kin groups (*gusthi*) and/or non-kin factions (*dal*) coming from different local villages where they had already lost their lands and homestead to the river.⁸ This dynamics of *char* settlement is a traditional response and adjustment to endemic population displacement in the floodplain.

2.2 POPULATION CHARACTERISTICS

2.2.1 Demography

The total area under the influence of the proposed Padma Bridge in the southwest is 43,534 sq. km or about 30% of Bangladesh. Population density in the project area is 686 persons per sq km (compared to 834 persons nationally). The male-female ratio 102.6. The male-female literacy rates of the region are 51.2% and 43.4%, respectively as against national figures of 49.6% and 40.8% (Table 2.2.1).

⁷ Bangladesh Bureau of Statistics, *Statistical Year Book 2001* (Ministry of Planning, Government of Bangladesh).

⁸ M. Q. Zaman, “Social structure and process of *char*land settlement in the Brahmaputra-Jamuna floodplain”, *Man* (NS), Vol. 26(4), December 1991.

Table 2.2.1 Area, Population, Sex Ratio, and Literacy Rates (2001)

Name of Division/Dist.	Area (sq km)	Population (million)			Sex Ratio	Population Density	Literacy Rate		
		Total	Male	Female			Total	Male	Female
Barisal	13,279	8.112	4.070	4.041	100.3	610	54.6	56.7	52.5
Khulna	22,274	14.468	7.386	7.081	103.7	650	46.2	50.5	42.4
Greater Faridpur	6,008	5.985	3.010	2.975	101.2	996	42.0	46.0	41.9
Total South West	41,579	28.565	14.466	14.097	102.6	686	47.8	51.2	43.4
Munshiganj	955	1.289	0.656	0.633	103.6	1350	51.6	54.2	49.1
Bangladesh	147,570	123.151	62.736	60.415	103.8	834	45.3	49.6	40.8

Source: BBS Statistical Year Book, 2001

2.2.2 Rural-Urban Distribution

About 89.75% of the population in the region lives in rural areas, while the urban population accounts for only 10.25% as against national average of 76.9% and 23.1% respectively. Average household sizes of Khulna, Barisal divisions, Greater Faridpur district and Munshiganj district are 4.7, 4.9, 5.0 and 5.1, respectively (Table 2.2.2).

Table 2.2.2 Population Distribution, Households, Urban and Rural (2001)

Division/Dist.	Rural Area				Urban Area			
	Population	Percent	HH	Average HH Size	Population	Percent	HH	Average HH Size
Barisal	7,335,475	90.82	1,493,646	4.9	776,958	9.18	155,400	5.0
Khulna	1,250,370	88.07	2,671,890	4.7	1,965,120	11.90	423,560	4.7
Greater Faridpur	5,411,110	90.35	1,081,180	5.0	569,980	9.65	115,700	5.0
Total South West	13,996,954	89.75	5,247,416	4.9	3,312,058	10.30	694,660	4.9
Bangladesh	94,342,769	76.90	19,437,353	4.8	28,804,477	23.10	5,924,968	4.8

Source: BBS Statistical Year Book, 2001

2.2.3 Religion

The distribution of population by religion is shown in Table 2.2.3. Eighty-three percent are Muslims while the rest belong to various other religious groups (for example, Hindus -16%; Buddhist – 0.04%; Christian – 0.26%; and Others - 0.06%).

Table 2.2.3 Population Distribution in the Region by Religion

Division/District	Religion by Percent				
	Muslim	Hindu	Buddhist	Christian	Others
Barisal	81.2	18.6	0.06	0.12	0.03
Khulna	84.6	15.0	0.02	0.32	0.07
Greater Faridpur	83.9	15.6	0.05	0.32	0.09
Average of Region	83.23	16.4	0.04	0.25	0.08
Bangladesh	88.30	10.5	0.6	0.3	0.05

Source: BBS Statistical Year Book, 2001

2.3 ECONOMIC AND SOCIAL DIMENSIONS

2.3.1 Local Economic Features

The contribution of the region to the national Gross Domestic Product (GDP) had been around 21% since 1995-96. The shares of various sectors are: agriculture – 26%; fisheries – 9%; services – 47%; and industry/manufacturing – 18%. The per capita GDP of the region in 1999-2000 at constant prices (1995-96= Tk.100) had been Taka 11,474 (Table 2.3.1).

Table 2.3.1 Regional Share to GDP at Constant Prices (1995-96=Tk.100)

Division/Dist	Agriculture Sector Million Tk. (%)		Service Sector Million Tk. (%)		Industry Sector Million Tk. (%)		Total Million Tk. (%)	
Barisal	44,543	(38.74%)	53,494	(46.50%)	16,952	(14.76%)	114,989	(100%)
	*15,675	(13.63%)						
Khulna	75,402	(33.0%)	107,524	(47.0%)	45,948	(20.0%)	228,874	(100%)
	*18,118	(7.91%)						
Greater Faridpur	24,198	(33.75%)	34,685	(48.37%)	12,823	(17.88%)	71,706	(100%)
	4,542	(6.33%)						
Total Southwest	144,143	(35.16%)	195,703	(47.29%)	75,723	(17.55%)	415,569	(100%)
	*38,335	(9.29%)						
Bangladesh	504,150	(25.25%)	975,026	(48.83%)	517,361	(25.92%)	1,996,537	(100%)

Contribution of the Region to the national GDP 21%

Source: BBS Statistical Year Book, 2001

Note: Asterisk marked figures are contribution of the fisheries sector. BBS has lumped these quantities with agriculture.

2.3.2 Occupational Background

(1) Agriculture, Cropping Pattern and Intensity

In the project region, people engaged in agriculture amounts to 71.2% (Bangladesh 66.2%). The region generally produces rice of various types such as *aus*, *aman* and *boro*. Wheat, potato, mustard, ground nuts, winter vegetables, and jute as major agricultural crops. Table 2.3.2 provides an index of crop diversity.

Table 2.3.2 Common Cropping Pattern

Type	Seasons		Rabi	Approx. Proportion %
	Kharif I	Kharif II		
1	B. Aus Rice	T. Aman Rice	Boro Rice/Wheat	70
2	Jute/Vegetables	T. Aman Rice	Oilseeds/Pulses/ Spices	20
3	T. Aus Rice	T. Aman Rice	Potato/Vegetables	7
4	Vegetables	Vegetables	Vegetables/Fruits	3

In addition, some sugarcane are cultivated in Kushtia, Jessore and Faridpur districts. Kushtia also produces tobacco also. However there are variation of cropping pattern within the region, Faridpur produces wheat, jute and a variety of species, Barisal grows more rice and Khulna produces vegetables and oilseeds. Besides agriculture, people are engaged in horticulture, cattle and goat rearing and poultry farming.

Table 2.3.3 illustrates the cropping intensity of the region. As evident, incidence of hybrid seed technology is showing an increasing trend in Khulna and Faridpur areas.

Table 2.3.3 Intensity of Cropping, 2000-01

Division/Dist	Total Area	Net Area	Total Cropped Area	Area in '000ha	
				Cropping Intensity (Avg.)	
Barisal	1,330	803	1,299	160.44%	
Khulna	2,245	1,050	1,811	174.54%	
Greater Faridpur	699	456	830	181.81%	
Total of region	4,274	2,309	3,940	172.26%	
Bangladesh	14,846	8,085	14,305	176.94%	

Source: BBS Statistical Year Book, 2001

In the horticulture sector, Jessore district produces date palm and palm *gur* (molasses). Coconuts are produced in the coastal belt of greater Khulna, greater Barisal and Patuakhali

districts, citrus fruits like guava, *amra* and tamarind etc are produced in the greater Barisal district, and betelnuts are produced in Bagerhat district.

(2) Labor Market and employment scenario

The employment/labor market scenario by main activities is presented in Table 2.3.4. It is important to note that the figures date back to 1991 census; up-to-date data from 2001 is still not available.

Table 2.3.4 Employment/Labor Market by Main Activities (%) - 10 years and above

Division/ Dist	Not Working	Looking for job	House- hold work	Agri- Culture	Indus- try	Water, Elect, Gas	Cons- truction	Transport/ Commu- nication	Busi- ness	Servi- ces	Oth-ers
Barisal	21.33	1.46	40.58	19.47	0.47	0.05	0.64	0.60	5.55	0.99	8.87
Khulna	21.17	0.94	37.23	22.56	1.23	0.05	0.56	0.91	5.83	0.77	8.74
Greater Faridpur	20.46	0.91	38.50	26.11	0.56	0.04	0.51	0.67	4.88	0.63	6.72
Total of Region (Average)	21.06	1.08	38.44	22.44	0.88	0.05	0.57	0.77	5.55	0.80	8.35

Source: Population Census 1991 (BBS)

Agriculture is still the predominant employer among other sectors. A growing area of employment for local people, particularly women, has been shrimp farming in Khulna, Satkhira, Bagerhat and Pirojpur districts. Due to the growth of shrimp, poultry and other local commercial activities, there has been noticeable growth in the local transportation business, creating additional jobs. A large number of people commute to towns, cities and the capital with increased and better road network for odd and skilled jobs. The construction industry in Dhaka employs large number of workers from the region. Further, there is migration of workers/labors in the districts within the region. Considerable number of people works as wage earners in foreign countries like Japan, Korea, Italy and Singapore.

(3) Industry

There is an industrial belt between Jessore and Khulna with several dedicated industrial zones in Khulna. A new EPZ area will be established near Mongla Port area – the second largest sea port serving as the gateway for imports and exports to the southwestern and northern regions. The bridge would largely benefit the import/export trade through this port as well as reduce pressure on the Chittagong Port.

2.3.3 Land Tenure System

The land utilization pattern of the region is presented in Table 2.3.5. The figures show that the total cropped area is about 96% of the total area of the region, which clearly indicates the predominance of agriculture in the economy of the region. This is also corroborated by having the share of farm households (66%) on the total households in the region (Table 2.3.6).

Table 2.3.5 Land Utilization Statistics (2000-2001)

Division /Dist	Total Area	Forest	Not Available for Cultivation	Culturable Waste	Current Fallow	Single Cropped	Double Cropped	Tripple Cropped	(in thousand ha)	
									Net Cropped Area	Total Cropped Area
Barisal	1,330	262	226	21	19	388	334	81	803	1,299
Khulna	2,245	601	489	28	78	412	515	123	1,050	1,811
Greater Faridpur	699	-	198	15	28	149	241	66	456	830
Total of Region	4,274	863	913	64	125	949	1,090	270	2,309	3,940
Bangladesh	14,846	2,628	3,412	321	400	2,891	4,167	1,027	8,085	14,306

Source: BBS Statistical Year Book, 2001

Table 2.3.6 Distribution of Farm and Non Farm Households

Division/Dist	Total HH	Non-Farm HH	Farm Holdings			
			Small	Medium	Large	Total
Barisal	1,352,016	325,879	812,650	184,758	28,729	1,026,137
Khulna	2,174,009	655,217	1,170,809	305,058	42,923	1,518,792
Greater Faridpur	989,770	286,386	555,211	134,091	14,082	703,384
Total of Region	17,828,187	6,029,945	9,422,793	2,077,784	297,665	11,798,242

Source: BBS Statistical Year Book, 2001

The land ownership pattern is presented in Table 2.3.7. The table shows that 5.5% of the households do not have own land and live as tenants or on rental arrangements. The agricultural labor households account for 25% of the total households. These households generally derive their livelihood from wage labor and sharecropping. The incidence of such landless households would be higher in the floodplain areas, particularly due to endemic erosion of banklines.

Table 2.3.7 Ownership, Tenancy, and Landlessness

Division/Dist	Owner Holdings	Owner Cum Tenant Holdings	Tenant Holdings	Holdings with no Own land	Holding reporting Cottage Industry	Agri. Labour Households	Total
Barisal	897,239	331,792	122,986	122,986	54,525	469,130	1,998,658
Khulna	1,469,908	537,464	166,637	166,637	57,454	856,025	3,254,125
Greater Faridpur	640,353	269,303	80,113	80,113	23,215	345,318	1,438,417
Total of Region	3,007,500	1,138,559	369,736	369,736	135,144	1,670,473	6,691,200
Bangladesh	11,807,551	4,206,072	1,814,595	1,814,595	464,238	6,401,453	26,508,480

Source: Agricultural Year Book 2001, June 2004

2.3.4 Poverty Ratio: Dimension and Vulnerability

(1) Poverty Ratio and Dimension

In Bangladesh, poverty to a large extent is rooted to deprivation. Nearly 150 million people living in an area of 147 thousand sq km and are contesting for their livelihoods. More than 80 percent of the population live in rural areas where, farming and farm based activities provides employment to more than two thirds of the active labor force. With about \$400 per capita GNP, Bangladesh ranks around 140th among the 180 nations of the world. Of the three popular measures of poverty – per capita GNP, per capita calorie intake and anthropometric – the most poplar and widely used indicator in Bangladesh is the per capita calorie intake. The people who take less than 2,120 kcl per day are designated as living below the poverty line (or living in poverty), and of them whose calorie intake is < 1,850 are said, living in hard core poverty. The Household Expenditure Survey –2000 by BBS has

shown that about 44 percent of the national population was living below the poverty line during 2000. The regional statistics is presented in Table 2.3.8.

Table 2.3.8 Percentage of Population Below Poverty Line

Division/District	Rural	Urban	Total
Barisal	37.6	30.1	37.0
Dhaka (representing Greater Faridpur as District Statistics is unavailable)	47.0	26.8	40.4
Khulna	44.1	35.5	42.8
Bangladesh	47.4	31.3	40.2

Source: BBS Household Expenditure Survey- 2000

An important point with respect to rural-urban poverty is that, the proportion of rural people living in poverty is about 50 percent higher than the urban proportion. Again of the total population of Bangladesh, Barisal, Dhaka and Khulna divisions, over 30% have been placed under the category of living in “hard core” poverty and designated as very poor. The principal causes of poverty (with weight age) are as follows: (i) low income and high expenses (70%); (ii) expenses are high because of large family (20%); (iii) lack of suitable job (10%); (iv) death of earning member (4%); and (v) others (8%).

(2) Vulnerability

The coastal belts including almost the entire Southwestern region are frequently visited by cyclonic storms causing damage to lives, properties and crops. As a result, people become vulnerable to increased poverty. This is particularly true in the floodplain area due to increasing risk of bank erosion hazards, loss of houses/properties, loss of land/sources of income, low income/endemic poverty, unemployment, and migration to *chars*/risk-prone areas. In the project area, erosion and loss of land trigger a process of landlessness and poverty.

The physical “risk” of erosion disaster combined with structural causes – the pattern of resource control, land ownership/distribution, local stratification, employment, income and inequality – make people further vulnerable in the floodplain. Therefore, various types of vulnerability are interconnected and thus require attention to complex interactions of physical, socioeconomic, environmental and ecological processes that determine vulnerability of populations to natural disasters.⁹ For instance, physical vulnerability like exposure to erosion risks and settlement in *chars* is primarily a symptom of economic vulnerability. Lack of adequate land for agricultural production forced many floodplain users in the past to settle in extremely vulnerable low lands and/or pushed them into the most fragile wetlands, making them yet more vulnerable. Economic vulnerability thus shapes social and environmental vulnerability as well. In many villages in Mawa and Janjira areas, nearly 25 percent of households displaced by erosions presently live on land provided by their relatives/patrons. The socioeconomic profiles of the affected people in Chapter 3 will provide compelling illustrations of this point. The mitigation measures for project-induced displacement consider this vulnerability theme for addressing long-term sustainable resettlement management of the affected people.

2.3.5 Gender and Development Issues

Number of female population in the region is about equal to the male population. Sex ratio

⁹ This approach emerged as an alternative to the conventional/technocratic approach, which failed to address the social dimensions of disasters. For a review of the most recent applications of the approach, see M. Q. Zaman, “Vulnerability, Disaster, and Survival in Bangladesh: Three Case Studies”, Anthony Oliver-Smith and Susanna Hoffman (eds.) *The Angry Earth: Disaster in Anthropological Perspective*, London: Routledge, 1999; and Peter Blaikie, et al. (edited), *At Risk: Natural Hazards, People’s Vulnerability, and Disasters*, London: Routledge, 1994.

of this region is 102; this is lower than the national average of 104 (number of male for every 100 female). It is comparatively high (110) in Barisal division than in the others. It indicates that like any other urban areas employment opportunities for women in the municipalities of this region are limited as compared to the male population. This enhanced more male migration to the urban areas as compared to the females.

Like other areas of Bangladesh, percentage of female adult and active population (Age group 15-59) is also higher in this region. However, scope for cash or wage employment is comparatively limited; as a result, most women identified them as involved in household work irrespective of rural or urban areas. Lower percentage of old (60 and above) female population indicates lower expectancy of life for female population than the male. It can be seen as an indication of the status of women of Bangladesh, that they enjoy less access to health facilities as compared to the male population.

In general, literacy rate among the female population is less than the male population. However, in past years this rate is increasing through the government supported scholarship program for female students in school level in the rural areas all over the country. Employment opportunities have not increased except in the garment industries. Again this is mostly limited to large cities. Employment in garment industries in Khulna and shrimp processing industries in the coastal region, mostly in Khulna and Satkhira Districts, are available to village women other than household work.

The Agricultural Census (1996) indicates that only 7 percent of the rural households are female headed in this region. This is double than the national average of 3.5 percent. Among them, farm households (51.3%) are slightly higher represented than the non farm households (48.7%), contrary to 66% and 34% farm and non-farm male-headed households. A majority of these non farm female household heads make their living by working as household maids in the wealthy families and/or self-employed through NGO-assisted micro-credit programs. It is also remarkable that 92 percent of the female headed farm households have small farm holding as compared to 77 percent of male headed farm holdings of similar category. It indicates the vulnerability of the women of this region in respect of owning property or employment opportunity. It is expected that with the improvement of communication facilities through construction of Padma Bridge, employment opportunity for women of this region will be enhanced with overall enhancement of the economic development of this region.

2.4 ECONOMIC AND SOCIAL BENEFITS OF THE PROJECT

The construction of the bridge will bring many economic and social benefits to the people in the Southwestern region. For example, the distance of nearly all major destinations in the southwest from Dhaka will be reduced by 100 km or more. This will have tremendous savings in passenger time, commodity movement time, O&M costs of vehicles, increased life of vehicles, reduced import bill on fuels etc and reduce transport costs of passengers and commodities. Second, with the bridge, capital inflow will increase promoting industrial and commercial activities and increased economic and employment opportunities for the local populations. The people of the region will have better access to healthcare facilities and latest health technologies available at Dhaka. Third, easier communication will help expanding better education and training facilities and skill development will take place ensuring availability of quality manpower/workers. Export of skilled manpower will increase wage earnings. Fourth, river bank protection will reduce bank erosion and check incidences of increased vulnerability and poverty among erosion induced displaced population. Fifth, during Construction activities, local unemployed people will get employment and some increased commercial activity will help income generation of the locals. Finally, the country will be physically integrated through the fixed link resulting in reduced economic disparity and deprivation. There will of course be some negative impacts

like loss of land properties, businesses, and livelihoods of the affected displaced persons. These negative impacts will be largely compensated with adequate resettlement planning, compensation payment and implementation of resettlement plans.

Chapter 3 Project Impacts and Analysis of Census Data

3.1 THE PROJECT

According to the Feasibility Study design, the proposed Padma Bridge Project contains the following features:

- (i) A 5.58 km long 4-lane bridge over the Padma River connecting Mawa (left bank/East side) and Janjira (right bank/West side)
- (ii) About 300m of existing N8 highway at the Mawa intersection to be widened into 4-lane as the starting point of the bridge
- (iii) 6-km of riverbank protection work in Mawa
- (iv) 11-km of 4-lane approach roads from the bridge landing point at Mansur Mollar Kandi (Janjira) up to N8 near Panchchar Bazar (Sibchar)
- (v) The approach road in Janjira site will have a service area for (near the landing site) traveling public and a toll plaza
- (vi) 10.5 km riverbank protection work in Janjira site

A layout of the technical design is in Figure 3.1.1. It shows the river and the two ends of the bridge, the approach road, service area, toll plaza and riverbank protection work in Mawa and Janjira.

3.2 LAND ACQUISITION AND IMPACTS

The project requires acquisition of 616.5 ha of land for the construction of the bridge and associated infrastructures listed above. In addition, 174 ha land will be temporarily required during the construction period for facilities like construction yard. Most of the associated infrastructures are in Janjira site. Table 3.2.1 presents land acquisition by project components and locations. Over 35 percent of the acquired land will be used for river protection work followed by approach road (25%).

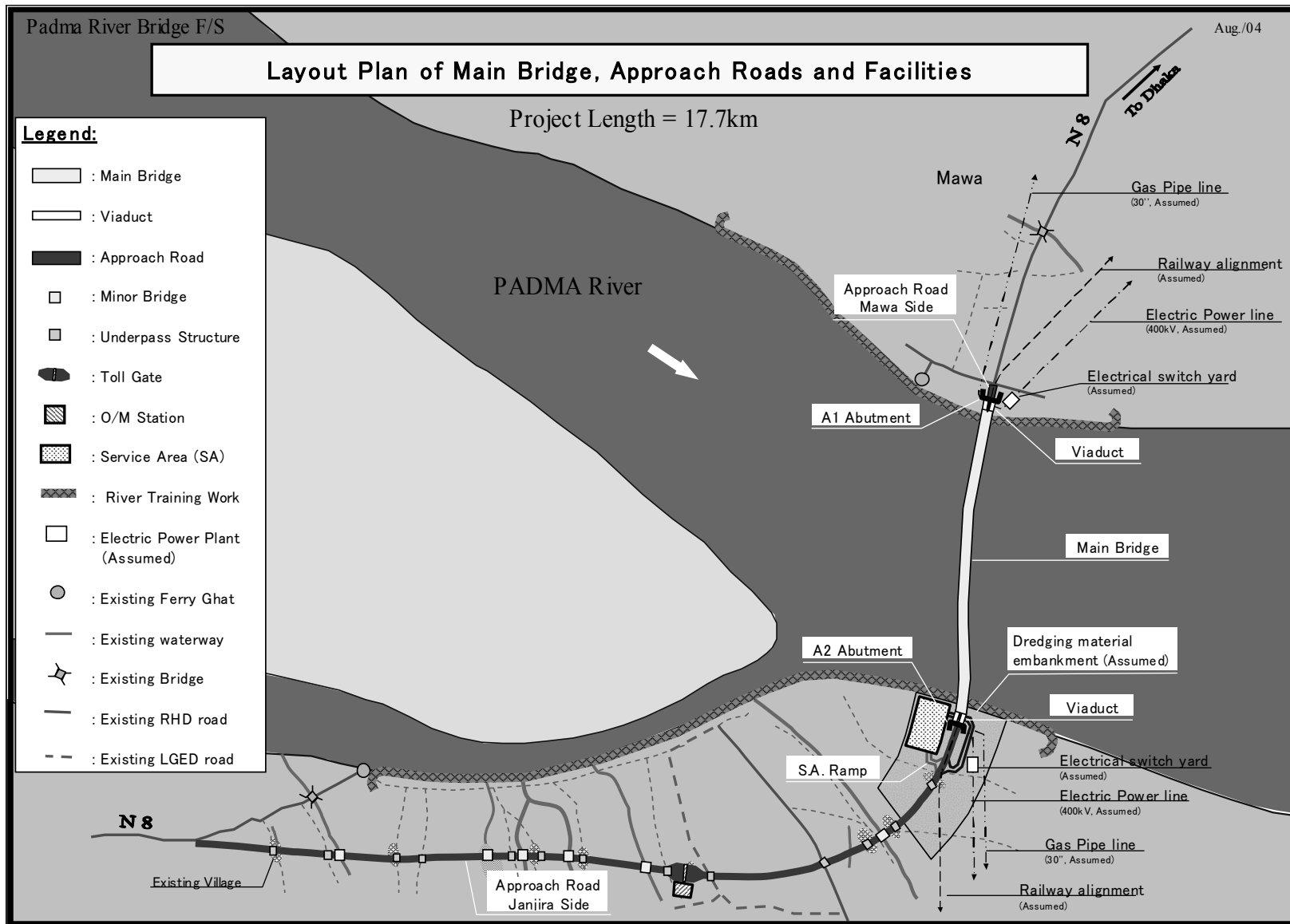


Figure 3.1.1 Layout of the Technical Design

Table 3.2.1 Land Acquisition by Project Components

Location /Area	Land to be Acquired					Land to be Requisitioned		
	Component		Amount of land (ha)	% of Subtotal	% of Total	Component	Amount of Land (ha)	% of Total
	Name	Nature						
East End-Mawa	Approach Road	Widening of existing 300 m road	02.5	4.00	0.41	Construction Purpose	30.0	17.24
	River Protection Works	About 6 kmX100 m river bank protection work	60.0	96.00	9.73			
Sub-Total			62.5	100	10.14			
West End-Janjira	Approach Road	11 km long 4 lane approach road	147.0	26.53	23.84	Construction Purpose	144.0	82.76
	River Protection Works	10.5kmX100m river bank protection work	157.0	28.34	25.47			
	Service Area	1000mX1000m service near the bridge landing point	100.0	18.05	16.22			
	Toll Plaza	250mX200m toll plaza several kms from the bridge landing point	5.0	0.90	0.81			
	Borrow Area	25 ha area will be required on the west side	25.0	4.51	4.06			
	Reclamation Area	120 ha area will be required on the west side	120.0	21.66	19.46			
Sub-Total			554.0	99.99	89.86			
Grand Total			616.5		100		174.0	100

Ninety percent of the acquired land will be from the west end in Janjira site where 11 km long four lane approach road, 10.5 km long/100m wide river protection work, service area and toll plaza will be constructed. Therefore, the impact of land acquisition will be felt more on the Janjira site than Mawa.

As evident from Table 3.2.2, the land-use pattern at the two ends of the bridge is quite contrasting. For example, 62% of the land to be acquired in Mawa involves houses and settlements compared to 15% in Janjira site. Of the proposed acquisition in Janjira, 76% are agricultural land, more specifically *charland*/and or bankline. Mawa is semi-urban and dense in settlement while Janjira is rural and agricultural. As a result, the number of displaced households/businesses per km will be higher than Janjira. The differences in land-use pattern have also other implications such as occupation and livelihood sources of the affected households and business.

Table 3.2.2 Land-use Pattern in Mawa and Janjira

Land-use Type	Mawa End/East Bank	Janjira End/West Bank
Settlements	62.12%	15.30%
Agricultural	14.25%	75.51%
Commercial	8.19%	0.15%
Fallow	3.48%	2.41%
Orchard/Plantation	2.04%	0.67%
Water body/Ponds	4.87%	4.17%
Community Property	1.25%	0.50%
Others	3.80%	1.29%
	100%	100%

3.3 SCOPE OF THE CENSUS SURVEY

The scope of the survey was focus on the ROW/corridor to assess the project impact. The ROW for all infrastructures was followed as per the technical design. However, in the case of the ROW for bank protection work on both sides of the river, the corridor of impact

considered was wider (i.e., 1 km and 1.5km from the bankline to the floodplain in Mawa and Janjira, respectively) than technical specification due to the flood season. The bankline at flood season was much closer to village settlements along the river, which recedes at PWD2 level during the winter season. The technical design considered PWD2 level as the “centre-line” for protection work along the bankline.¹⁰ The objective of the survey was to assess the potential impacts of the bridge project, including an estimate of the scope of population displacement and resettlement needs.

The census was carried out by experienced enumerators (including female enumerators) under the supervision of senior social/resettlement specialists. The enumerators were mobilized in the field in early September and continued through mid-November 2004. The devastating flood slowed down the survey activities at the early stage but eventually peaked up when flood water was slowly receding. The survey activities were conducted through field offices on both the sides of the river. A video filming of the project ROWs was carried out during the census survey to control any fraudulent claims by people moving to the project area for compensation benefits.

3.4 IMPACT OF LA AND DISPLACEMENT

The project area covered 15 *mouzas* of four *upazilas* in three districts of Dhaka Division. The extent of impact varies by locations. Land acquisition by district is yet to be determined. The districts are located on both sides of the river (Table 3.4.1).

Table 3.4.1 Project Area

Area/Location	District	Upazila	Mouza	Land Acquired area (Ha)
East bank-Mawa	Munshuganj	Lauhajang	South Medinimondol, Joshaldia, Kandipara and Kumarbhog (4)	62.5
		Sreenagar	Hatarpara and Manda (2)	
West bank -Janjira	Shariatpur	Janjira	Diara Naodoba, Painpara (2)	554.0
	Madaripur	Shibchar	Baghira, Kesabpur, Kutubpur, Kanthalbari, South Charjanajat, Char Raghunathpur and Bakhorkandi (7)	
Total	3	4	15	616.5 ha

Total number of affected households who would lose homestead land/structure partially or fully by the project is 3150 (Table 3.4.2). The number is obviously higher in Janjira (1807) than Mawa (1343) side of the river. This translates into 21.45 households/ha in Mawa and only 3.26 households/ha in Janjira. The number of affected common property resources (CPRs) is also higher in Mawa than Janjira. A complete database of the census is available separately for future verification and project implementation.¹¹ The database lists every single households/business interviewed by village/location with detailed socioeconomic and demographic information and likely losses of assets, including responses to dislocation and resettlement.

The number of households affected by land acquisition only (without being displaced) is estimated at 5,000; actual number affected will be available only after the Land Acquisition Plan is prepared and notification under section 3 (u/s3) is processed by the concerned Deputy Commissioners (DCs). Furthermore, the study did not investigate the indirect or secondary impact of the project such as the impact on hotel/restaurant businesses at the three ferry *ghats* (Mawa on the left bank and Kathalbari and Charjanajat on the right bank),

¹⁰ This means that the present survey covered more areas and thus included households along the riverbanks, who eventually will be excluded from the inventory of affected households during detailed design and/or joint verification.

¹¹ *Report on Social Analysis and Resettlement Framework, Part 2 – Database* (See Final Report : Vol. X – Supporting Studies)

boat operators and ferry-related small business.¹²

The Study team took efforts to minimize the project impacts through adjustments of the technical design. This should also continue during the detailed design period. However, it is important to note that the overall impact of the bridge project is much lower than the Jamuna Bridge Project.¹³

Table 3.4.2 Project Impact – Displacement and Loss of Assets

Area/Location	Component	Land to be		HHs (Nos)	CBEs (Nos)	CPRs (Nos)	Families losing trees only
		Acquired (ha)	Requisitioned (ha)				
Ease End-Mawa	Approach Road	2.5		11	20	6	0
	River Protection	60.0		1332	131	19	51
Sub Total		62.5	30.0	1343	151	25	51
West End-Janjira	Approach Road	147.0		619	10	10	32
	River Protection Works	157.0		947	114	25	24
	Service Area	100		221	2	5	6
	Toll Plaza	5.0		20	0	0	1
	Borrow Area	25.0		-	-	-	-
	Reclamation Area	120		-	-	-	-
Sub Total		554	144	1807	126	40	63
Grand Total		616.5	174.0	3150	277	65	114

About 1500 households, mostly erosion displaced (nadibashi), live on land owned by others or on rental arrangements will also be affected by the project. Special attention needs to be given to these households, who are vulnerable and already displaced by the natural process of erosion. Table 3.4.3 provides further details regarding their tenurial status and distribution.

Table 3.4.3 Tenurial Status of Erosion Displaced Households

Area	East End-Mawa						West End-Janjira						Grand Total	
	Munshiganj				Sub Total		Shariatpur		Madaripur		Sub Total			
	Lauhajang		Sreenagar		No.	%	No.	%	No.	%	No.	%	No.	%
Status/ownership of the land	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Relative/Father/Brother	119	21.52	16	94.12	135	09.12	247	44.42	124	35.03	371	25.06	506	34.19
RHD	06	01.08	00	00.00	06	0.40	03	00.54	00	00.00	03	0.20	09	0.61
Lease/Agreement	417	75.41	01	05.88	418	28.24	306	55.04	230	64.97	536	36.21	954	64.46
Vested Property	11	01.99	00	00.00	11	0.74	00	00.00	00	00.00	00	0.00	11	0.74
Grand Total	553	100	17	100	570	100	556	100	354	100	910	100	1480	100

Table 3.4.4 shows the use of land received from relative and/or rented by the households by location. Table shows that 95 percent of these lands are used for housing purposes. It is to be mentioned here that migration across the river because of riverbank erosion is very common in this area. Population density along the river bank is also very high for this region. Most of these housings are on rented or leased property. These people will need assistance for relocation and resettlement. For these households, job or business

¹² This will be carried out during the detailed design period.

¹³ The 4.48 km long Jamuna Bridge Project had acquired 3,000 ha of land. In all, 16,000 households were affected, out of which 4,000 required relocation.

opportunities must be considered along with resettlement.

Table 3.4.4 Use of Land Rented and/or from Relatives

Area	East End-Mawa						West End-Janjira						Grand Total	
	Munshiganj				Sub Total		Shariatpur		Madaripur		Sub Total			
	Lauhajang		Sreenagar				No.	%	No.	%			No.	%
Purpose of use of land	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Business	12	2.17	0	0.00	12	0.81	19	3.42	04	1.13	23	1.55	35	2.36
Business Rent	03	0.54	0	0.00	03	0.20	03	0.54	00	0.00	03	0.20	06	0.41
Housing	532	96.20	17	100	549	37.09	523	94.06	348	98.31	871	58.85	1420	95.95
Social Institution	00	0.00	0	0.00	0	0.00	00	0.00	00	0.00	00	0.00	00	0.00
Workshop/ Saw Mill / Farm/ Garage	00	0.00	0	0.00	0	0.00	03	0.54	00	0.00	03	0.20	03	0.20
Others	4	0.72	0	0.00	4	0.27	04	0.72	00	0.00	04	0.27	08	0.54
Grand Total	553	100	17	100	570	100	556	100	354	100	910	100	1480	100

3.5 SOCIO-ECONOMIC PROFILES OF APS

Mawa is a river port and a “gate-way” to the southwest by ferry and other transport modes. It has very good road connection with the capital city Dhaka. It is a semi-urban area. The livelihoods of people are dependent on diverse sources such as trading, fishing, farming, business, and small business and transport services. On the other hand, Janjira – being mostly *char* land – is characterized as rural with agriculture and fishing as the two most important sources of livelihoods. As indicated earlier, people are used to migration and adjustment to displacement by river erosion and displacement.

3.5.1 Demographic Characteristics

The distribution of population is shown in Table 3.5.1. Of the 19,000 people to be affected, 56% are males with a sex ratio (male per 100 female) 111 against national average of 104. It is very high (122) in Lauhajang *upazila* where the ferry ghat is located. Most of the workers of shops at the ferry ghat are male. However sex ratio is also very high on the Janjira side (113). During field study it was observed that because of limited job opportunities and regular shifting nature of the riverbank, male members migrate to the urban areas for their livelihoods. They often desert their families back home and continue living in urban areas. Eventually the family members remain in the locality run by deserted woman and become the most vulnerable segment of population.

Table 3.5.1 Population Distribution in the Affected Areas

Area	District	Upazila	Affected Population by Sex					
			Male		Female		Total	
			No.	%	No.	%	No.	Sex Ratio
East Bank –Mawa	Munshiganj	Lauhajang	3982	51.97	3680	48.03	7662	108
		Sreenagar	355	54.95	291	45.05	646	122
		Sub Total	4337	52.20	3971	47.80	8308	109
West Bank-Janjira	Shariatpur	Janjira	2476	52.82	2212	47.18	4688	112
	Madaripur	Shibchar	3197	63.06	2828	46.94	6024	113
Sub Total			5673	52.95	5040	47.05	10713	113
Grand Total			10010	56.32	9,011	43.68	19,021	111

3.5.2 Female-headed Households

The incidence of female-headed households is quite significant in the project area. This is clearly demonstrated in Table 3.5.2. While national average is about 3 percent, 7.49% of the households are female-headed. This percentage is slightly higher in the Mawa than Janjira. Being already vulnerable, these female-headed household need special attention with regard to their relocation and resettlement.

Table 3.5.2 Incidence of Female-headed Household

Area	District	Upazila	Gender Distribution of the Affected Household Heads					
			Male		Female		Total	
			No.	%	No	%	No	%
East Bank-Mawa	Munshiganj	Lauhajang	1121	91.44	105	08.56	1226	100
		Sreenagar	105	89.74	12	10.26	117	100
Sub Total			1226	91.40	117	8.71	1688	100
West Bank-Janjira	Shariatpur	Janjira	774	95.91	33	4.09	807	100
	Madaripur	Shibchar	914	91.40	86	8.60	1000	100
Sub Total			1688	93.41	119	6.59	1807	100
Grand Total			2914	92.51	236	7.49	3150	100

3.5.3 Distribution of Population by Age Group

About half of the affected population is below 20 years of age. High percentage of infant population among the affected families indicates higher population growth. Table 3.5.3 presents the percentage of population by age group and sex. The average household size is 5.38/household (Table 3.5.4).

Table 3.5.3 Distribution of APs by Age Group

Area	East End-Mawa						West End-Janjira						Grand Total	
	Munshiganj				Sub Total		Shariatpur		Madaripur		Sub Total			
	Lauhajang		Sreenagar											
Age Group	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0-4	9.94	11.35	8.17	10.65	9.80	11.29	13.00	12.53	10.45	11.99	11.56	12.22	10.80	11.82
5-9	11.30	13.58	11.27	11.00	11.30	13.39	15.99	16.60	12.86	13.47	14.24	14.84	12.95	14.20
10-14	12.22	12.49	12.11	12.71	12.22	12.51	13.61	14.07	13.86	14.57	13.77	14.35	13.08	13.54
15-19	10.82	11.00	10.99	07.56	10.84	10.75	09.89	09.23	9.73	07.85	9.81	08.45	10.25	09.46
20-24	8.81	08.47	10.14	08.25	8.92	08.45	07.07	08.86	8.04	08.84	7.61	08.85	8.18	08.68
25-29	9.01	08.36	7.89	08.93	8.92	08.40	8.00	08.59	8.26	07.85	7.62	08.18	8.48	08.28
30-34	7.61	06.24	8.17	08.93	7.66	06.44	6.14	06.38	6.76	06.97	8.15	06.71	6.99	06.59
35-39	6.53	05.97	7.04	6.87	6.57	06.04	5.90	05.02	6.07	06.44	6.49	05.81	6.24	05.91
40-44	5.32	05.48	5.07	07.56	5.30	05.64	4.32	04.30	5.38	05.20	6.00	04.80	5.08	05.17
45-49	4.54	03.77	5.63	03.09	4.63	03.72	4.00	03.35	4.97	04.28	4.54	03.87	4.58	03.81
50-54	4.07	03.61	4.79	05.15	4.13	03.72	2.71	03.62	3.78	03.43	3.31	03.51	3.67	03.61
55-59	2.46	02.04	2.54	02.06	2.47	02.04	2.18	02.26	2.53	02.51	2.38	02.40	2.48	02.24
60-64	2.43	03.10	1.97	1.72	3.40	02.99	2.71	02.44	2.38	02.65	2.52	02.56	2.47	02.75
65+	4.94	04.53	4.23	5.50	4.84	04.60	4.48	02.76	4.48	03.96	4.74	03.43	4.80	03.95

Table 3.5.4 Distribution of APs by Age Group

Area	East End-Mawa			West End-Janjira			Grand Total
	Munshiganj		Sub Total	Shariatpur	Madaripur	Sub Total	
	Lauhajang	Sreenagar					
HH size							
1-2	07.01	06.84	02.97	05.33	09.70	04.43	07.43
3-4	29.04	30.77	12.43	28.62	31.60	17.35	29.81
5-6	39.32	41.03	16.81	35.56	36.70	20.75	37.59
7-8	23.00	13.68	09.46	23.80	17.80	11.74	21.20
9-10	04.57	03.42	01.89	06.82	05.40	04.45	05.37
11-12	02.28	03.42	01.00	03.34	01.30	01.26	02.28
12+	00.65	02.56	00.34	01.24	00.60	00.50	00.86

3.5.4 Distribution of Population by Religion

More than 98 percent of the populations are Muslim (Table 3.5.5). Presence of so many mosques in the acquired area is an indication of higher percentage of Muslim population in the project area. Only about two percent population is Hindu and less than one percent from Christian religion. There are no indigenous or *adibhasis* in the project area.

Table 3.5.5 Distribution of Households by Religion

Area	District	Upazila	Affected Households Sex					
			Islam		Hindu		Christian	
			No.	%	No	%	No	%
East End-Mawa	Munshiganj	Lauhajang	1177	96.00	45	3.67	4	0.33
		Sreenagar	117	100	0	0	0	0
		Sub Total	1294	96.35	45	3.35	4	0.30
West End-Janjira	Shariatpur	Janjira	807	100	0	0	0	0
		Madaripur	991	99.1	9	.09	0	0
		Sub Total	1798	99.50	09	0.50	0	0
Grand Total			3092	98.16	54	1.71	4	0.13

3.5.5 Educational Background of Affected Head of Households

Educational level of the heads of the households is presented in Table 3.5.6. Nearly one-third (32.54%) are illiterate; another one-third has less than Grade V education. About 20% have completed secondary or higher level of education. The statistics conforms to the national average.

Table 3.5.6 Level of Education of Head of the Household by Area

Area	East End-Mawa						West End-Janjira						Grand Total	
	Munshiganj				Sub Total		Shariatpur		Madaripur		Sub Total			
	Lauhajang		Sreenagar				Janjira		Shibchar					
Level of Education	No	%of Upazila	No	%of Upazila	No	% of G Total	No	% of Upazila	No	% of Upazila	No	% of GTotal	No	%of G total
Illiterate	392	31.89	21	17.95	412	30.68	363	44.98	250	25.00	613	33.92	1025	32.54
Literate but below Primary	394	32.14	31	26.50	425	31.65	281	34.82	365	36.50	646	35.75	1071	34.00
Primary	159	12.97	16	13.68	175	13.03	65	8.05	152	15.20	217	12.00	392	12.44
Secondary	236	19.25	44	37.61	280	20.85	79	9.79	173	17.30	252	13.95	532	16.89
Higher secondary	26	2.12	1	0.85	27	2.01	9	1.12	32	3.20	41	2.27	68	1.16
Graduation	15	1.22	2	1.71	17	1.27	0	00	18	1.80	18	6.98	35	1.11
Post Graduation	3	0.24	1	0.85	4	0.30	3	0.37	6	0.60	9	0.50	13	0.41
Others	2	0.16	1	0.85	3	0.22	7	0.87	4	0.40	11	0.61	14	0.44
Grand Total	1226	100	117	100	1343	100	807	100	807	100	1807	100	3150	100

3.5.6 Residual Homestead Land by Affected Households

More than 55 percent of the households will not have any residual land to live on (Table 3.5.7). This includes *nadibashi* settlers, who live on land provided by relative or on rental arrangements. Twenty-one percent will have than 5 decimal and 13% between 6 and 10 decimal. Households having more than 25 decimal residual lands are all in Janjira site. Heads of these households are powerful landowners and “big men” who provide shelter to *nadibashi* settlers on their land as a form of patronage.

Table 3.5.7 Extent of Residual (Homestead) Land by the Affected Households

Area	East End-Mawa						West End-Janjira						Grand Total	
	Munshiganj				Sub Total		Shariatpur		Madaripur		Sub Total			
	Lauhajang		Sreenagar				Janjira		Shibchar					
Amount of Land (Decimal)	No	%of Upazila	No	%of Upazila	No	%of GTotal	No	% of Upazila	No	% of Upazila	No	% of GTotal	No	% of G total
Nil	714	58.24	100	85.47	814	25.84	455	56.38	481	48.18	936	29.71	1750	55.56
Less than 5	406	33.12	17	14.53	423	13.42	49	6.07	195	19.50	244	7.74	667	21.17
6-10	100	8.16	0	0	100	3.17	93	11.52	204	20.40	297	9.42	397	12.60
11-15	4	0.33	0	0	4	0.12	45	5.58	49	4.90	94	2.98	98	3.11
16-20	1	0.08	0	0	1	0.03	97	12.02	40	4.00	137	4.34	138	4.38
21-25	1	0.08	0	0	1	0.03	4	0.50	8	0.80	12	0.38	13	0.41
26-30	0	0	0	0	0	0	4	0.50	8	0.80	12	0.38	12	0.38
31-35	0	0	0	0	0	0	48	5.95	6	0.60	54	1.71	54	1.71
36-40	0	0	0	0	0	0	6	0.74	2	0.20	8	0.25	8	0.25
41-45	0	0	0	0	0	0	0	0.00	0	0.00	0	0.00	0	0.00
46-50	0	0	0	0	0	0	1	0.12	3	0.30	4	0.12	4	0.13
51-55	0	0	0	0	0	0	0	0.00	1	0.10	1	0.03	1	0.03
56-60	0	0	0	0	0	0	1	0.12	1	0.10	2	0.06	2	0.06
60+	0	0.00	0	0	0	0	4	0.50	2	0.20	6	0.19	6	0.19
Grand Total	1226	100	117	100	1343	42.63	807	100	1000	100	1807	57.36	3160	100

3.5.7 Annual Income of Affected Households

About half of the affected households have an estimated annual income of Tk 30 to 60 thousand. About eight percent have income less than Taka 30 thousand per year (Table 3.5.8). These are the most vulnerable households who would need very special care during the process of resettlement. Household reporting large incomes have received remittance from overseas.

Table 3.5.8 Total Annual Income of the Affected Households (Taka)

Area	East End-Mawa					West End-Janjira					Grand Total	
	Munshiganj				Sub Total	Shariatpur		Madaripur		Sub Total		
	Lauhajang		Sreenagar			Janjira		Shibchar				
Income ('000TK)	No	%of Upazila	No	%of Upazila	No	% of GTotal	No	% of Upazila	No	% of Upazila	No	% of G total
Up to 15	28	2.28	02	1.71	30	09	1.12	10	1.00	19	49	1.56
15-30	93	7.59	19	16.24	112	52	6.44	77	7.70	129	241	7.65
30-45	255	20.80	20	17.09	275	234	29.00	243	24.30	477	752	23.87
45-60	240	19.58	30	25.64	270	221	27.39	297	29.70	518	788	25.02
60-75	154	12.56	10	8.55	164	88	10.90	147	14.70	235	399	12.67
75-90	79	6.44	10	8.55	89	48	5.94	50	5.00	98	187	5.94
90-105	59	4.81	04	3.42	63	34	4.21	34	3.40	68	131	4.16
105-120	77	6.28	06	5.13	83	49	6.07	58	5.80	107	190	6.03
120-135	27	2.20	00	0.00	27	08	0.99	15	1.50	23	50	1.59
135-150	35	2.85	00	0.00	35	14	1.73	11	1.10	25	60	1.90
150-165	20	1.63	01	0.85	21	04	0.50	05	0.50	9	30	0.95
165-180	31	2.53	01	0.85	32	08	0.99	16	1.60	24	56	1.78
180-195	11	0.90	00	0.00	11	03	0.37	03	0.30	6	17	0.54
195-210	12	0.98	00	0.00	12	03	0.37	07	0.70	10	22	0.70
210-225	08	0.65	00	0.00	08	04	0.50	02	0.20	6	14	0.44
225-240	17	1.39	03	2.56	20	07	0.87	08	0.80	15	35	1.11
240-255	04	0.33	02	1.71	06	01	0.12	03	0.30	4	10	0.32
255-270	03	0.24	01	0.85	04	00	0.00	00	0.00	0	4	0.13
270-290	06	0.49	01	0.85	07	01	0.12	01	0.10	2	9	0.29
290-305	03	0.24	00	0.00	03	06	0.74	03	0.30	9	12	0.38
350+	64	5.22	07	5.98	71	13	1.61	10	1.00	23	94	2.98
	1226	100	371	100	1343	807	100	1000	100	1807	3150	100

3.5.8 Occupational Background of Heads of Households

Table 3.5.9 presents principal occupational pattern of the heads of the affected households. About 40 percent have business or service as their principal occupation. Their numbers are more in the east side as compared to the west side of the river. On the other hand more than one quarter reported agriculture as principal occupation. Majority of them are from Janjira side. Very few depend on fishing (3%) as their principal occupation. More than 13 percent live on wage labor. Rickshaw/van pulling seems to be one of the prominent occupation of this project area. It is more prominent in the East side as compared to the West. About 6 percent of the head identified household work as their principal occupation. This percentage is similar to the percentage of female headed household as mentioned earlier. It is possible that despite earning a living, they identified themselves as just involved with household work. These households need special attention from the project during resettlement.

Table 3.5.9 Principal Occupation of the Head of the Affected Households

Area	East End-Mawa					West End-Janjira					Grand Total	
	Munshiganj				Sub Total	Shariatpur		Madaripur		Sub Total		
	Lauhajang		Sreenagar			Janjira		Shibchar				
Principal Occupation	No	%of Upazila	No	%of Upazila	No	No	% of Upazila	No	% of Upazila	No	No	% of G total
Agriculture	180	14.68	11	9.40	191	294	36.43	306	30.60	600	791	25.11
Fishing	23	1.88	0	00	23	57	7.06	17	1.70	74	97	3.08
Business	450	36.70	66	56.41	516	165	20.45	266	26.60	431	947	30.06
Service	182	14.85	12	10.26	194	28	3.47	91	9.10	119	313	9.94
Household Work	82	6.69	10	8.55	92	26	3.22	68	6.80	94	196	5.90
Labor	101	8.24	6	5.13	107	183	22.68	124	12.40	307	414	13.14
Mistr/Karigor	30	2.45	2	1.71	32	4	0.50	4	0.40	8	40	1.27
Driver	21	1.71	2	1.71	23	3	0.37	19	1.90	22	45	1.43
Rickshaw/ Van pullar	83	6.77	6	5.13	89	21	2.60	63	6.30	84	173	5.49
Hawker	2	0.16	0	00	2	1	0.12	7	0.70	8	10	0.32
Teacher	1	0.08	0	00	1	2	0.25	1	0.10	3	4	0.13
Tailor	29	2.37	1	0.85	30	6	0.74	4	0.40	10	40	1.27
Others	42	3.43	1	0.85	43	17	2.11	30	3.00	47	90	2.86
G Total	1226	100	117	100	1343	804	100	1000	100	1807	3150	100

3.6 LOSS OF COMMON PROPERTY RESOURCES

The Project will affect 65 CPRs of various types (Table 3.6.1). Of those, 38 are mosques, followed by Govt./NGO office (09), Madrassa (6) and school/colleges (4). Two graveyards are going to be affected; both of them are located in Janjira side. It is not clearly known how many people are using these CPRs. These community structures have to be reconstructed at project costs.

Table 3.6.1 Number of Affected Community Resource Properties

River Side	East End- Mawa				West End- Janjira				Total
	Munshiganj		Sub Total		Shariatpur	Madaripur	Sub Total		
Thana	Lauhajang	Sreenagar	No	% of total	Janjira	Shibchar	No.	% of Total	
CPRs									
School / College	00	01	01	25.00	00	03	03	75.00	04
Madrasha	02	00	02	33.33	00	04	04	66.67	06
Mosque	07	04	11	28.95	15	12	27	71.05	38
Club	01	00	01	50.00	00	01	01	50.00	02
Govt/NGO Office	07	00	07	77.78	00	02	02	22.22	09
Graveyard	00	00	00	00.00	01	01	02	100.0	02
Mazar	03	00	03	100.0	00	00	00	00.00	03
Khanka Sharif	00	00	00	00.00	01	00	01	100.0	01
Total	20	05	25	38.46	17	23	40	61.54	65

3.7 WOMEN AND WORK

Women in the area reported as being involved in household work, although 7 percent of the households are headed by females. Since there are several micro-credit programs run by NGOs, it is considered that a large number of women are involved in small business and marketing. Improved accessibility, particularly in Janjira site, will bring new economic and employment opportunities for women, particularly during construction and post-construction periods. There is a need for specific programs of information and training for women in this regard, and these are sorely lacking. One of the more positive impact of the project will be that women will be less isolated, better educated and more aware of the world beyond the village due to improved access provide by the new network of roads, particularly in Janjira site. This itself will go a long way in assisting women to make sure in the long run that receive an equitable share of the rewards of development.

3.8 SUMMARY PROJECT IMPACT – LOSSES AND RISKS

The impact of land acquisition of the project will be significant. The extent of land losses, particularly in Janjira, and displacement of households/businesses both in Mawa and Janjira are quite large. Many affected households will require relocation and assistance to resettle and re-establish them. The RAP should take into account the various losses, including the *nadibashi* settlers, to mitigate against negative impacts and associated risks such as loss of employment and livelihood sources. Further, the impacts of the project are likely to be different in Mawa and Janjira sites due to population density and loss of diversified resources such as land, business and access to river port and market. The RAP should address these issues carefully in resettlement planning and income restoration/social development programs.

Chapter 4 Disclosure and Public Consultation

4.1 INTRODUCTION

Disclosure of potential project impacts and consultation with the affected communities and other stakeholders has been a key element of the Padma Bridge project preparation work. The major activities and outcome are presented separately in *Disclosure and Community Consultation Report*.¹⁴ This chapter presents a summary of the key activities, issues arising out of the consultation meetings and general response of the people to the project. It also identifies further disclosure and consultation tasks for project implementation.

4.2 DISCLOSURE AND CONSULTATION MEETINGS

The Study Team members, assisted by sub-consultants, carried out disclosure and public consultation meetings during the social impact assessment phase. The Team conducted Information and Consultation Meetings (ICM), village-based Focus Group Discussion (FGD), and Participatory Rapid Appraisals (PRA). Table 4.2.1 presents a summary list of the various types of consultation meetings held at the project sites in Mawa and Janjira.

Table 4.2.1 Disclosure and Consultation Meetings

Type of Meeting	Site and Location	Number attended	Project Issues
Information and Consultation Meetings	Mawa – Kumar bog UP Office	37	<ul style="list-style-type: none"> ✓ Scope of project impacts ✓ Impact assessment and identification of APs ✓ GOB laws and JICA/donors requirements ✓ Compensation/resettlement issues & guidelines ✓ Responses to the project
	Mawa – Medinimondal UP Office	44	
	Janjira – Matborerchar UP Office	50	
	Janjira – Naodoba UP at Diara	65	
	Janjira – Naodoba at Madrasah	70	
Participatory Rapid Appraisals	Mawa – South Medinimondal Village	48	<ul style="list-style-type: none"> ✓ Discussion on project impacts ✓ Project impact assessment by the APs ✓ Local needs and concerns
	Janjira – Bakhorer Kandi Village	42	
	Janjira – Joyenuddin Matborer Kandi	52	
Focus Group Discussion	Mawa – Kandipara Village	35	<ul style="list-style-type: none"> ✓ Extent of losses – land/houses – by the APs ✓ Impact of erosion disasters and displacement ✓ Resettlement of landless/informal settlers ✓ Female-headed households and vulnerable groups ✓ Income and livelihoods ✓ Employment in project work
	Mawa – kumarbog Village	44	
	Janjira - Bakhorer Kandi Village	71	
	Janjira – Sikderer Kandi Village	33	
	Janjira – Charjanajat ghat	40	
	Janjira – Diara/Naodoba Village	27	
Study Tour by APs	Visit to Jamuna Resettlement Sites in Bhuapur and Sirajganj	40	<ul style="list-style-type: none"> ✓ The visit was aimed at explaining Jamuna resettlement “model” and to build up confidence among the APs for resettlement

The meetings were attended by various categories of potentially affected persons and stakeholders, including local *upazila* (sub-district) administration, Union *Parishad* (UP) chairmen/members, community leaders, political party members, school teachers, and representatives of local business communities. The Study Team members made initial presentations outlining the project and its impacts, with the help of drawings on the ground and maps so that affected people and communities could understand the scope of the impact and respond as desired by them. The participation by the villagers was very spontaneous, friendly, and interactive as well as informative. Figure 4.2.1 identifies project locations where ICM, FGDs, and PRA were conducted during the feasibility study period. The

¹⁴ *Disclosure and Community Consultation Report*, Bangladesh Consultants Limited (November 2004). This report is annexed in Vol. 10 – Supporting Studies, JICA-Padma Feasibility Study Reports (January 2005).

outcomes were used to prepare policy framework to address various concerns and issues raised by the affected people.

In addition, a group of 40 persons consisting of locally elected officials (including women members of local union councils), community leaders/opinion-makers from Mawa and Janjira were taken to the Jamuna Project resettlement sites on October 30 on a day-trip. The objectives of the trip were to explain on-site the Jamuna “model” of resettlement, which consisted of: (i) “self-managed” resettlement by the affected households with all eligible benefits; (ii) “cluster” resettlement assisted by the project; and (iii) resettlement in project-sponsored “resettlement sites.” The study tour proved very effective, because the people were able to see for themselves the extent of resettlement work, including various civic amenities established by the project, carried out in the case of Jamuna. The trip also helped the Mawa/Janjira people in developing a “vision” of the project-sponsored resettlement sites in Padma Project.

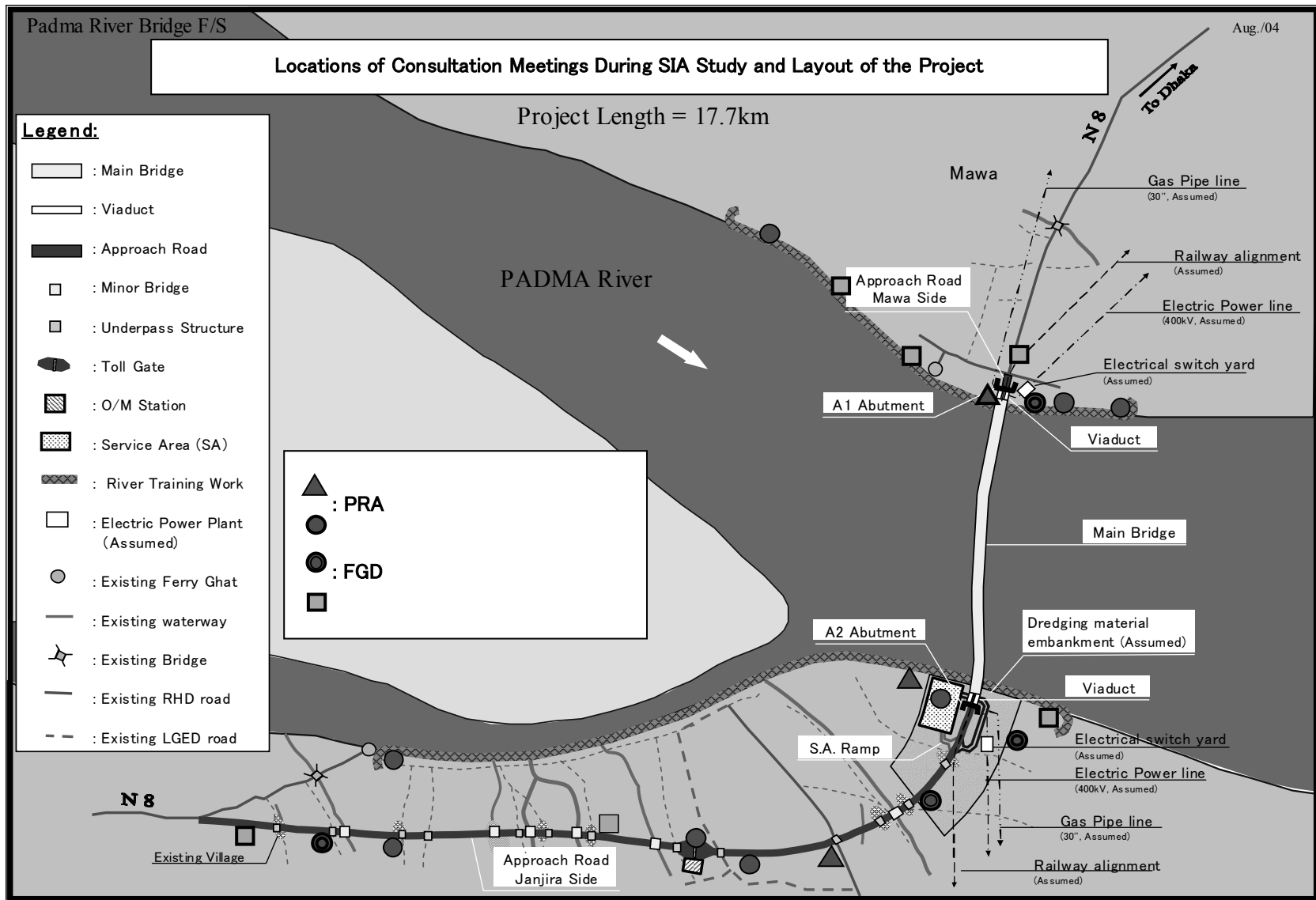


Figure 4.2.1 Locations of Consultation Meetings

4.3 CONSULTATION STRATEGY AND ACTIVITIES

A disclosure consultation strategy was developed for consistency in the presentation of project briefs and materials for information and consultation meetings. The principle is presented in Table 4.3.1. The entire disclosure and consultation was guided by the task contained in the table.

Table 4.3.1 Stakeholders Meetings and Major Activities

Sl. No	Major Activity	Description of Tasks
A. PLANNING PHASE		
1	Methodology Followed for effective DPC	
	Information gathering	<ul style="list-style-type: none"> Review of JICA guidelines on disclosure and public consultation. Review of other donors' guideline on disclosure and public consultation. Review of available literature on disclosure and consultation method followed in other donor funded infrastructure projects and good practices.
	Information Disclosure	<ul style="list-style-type: none"> Dialogue with local people through public meetings. Information and Consultation Meetings (ICM) in the locality. Disclosure of the project component and related issues among stakeholders of all levels through conducting public meeting organized by prior notice. Focus Group Discussion with local stakeholders, with primary focus with the project affected people (directly and indirectly affected people irrespective of gender and social status). Disclosure of the Land Acquisition and Resettlement Issues among the potential affected persons through the NGO workers who would conduct the Socio-economic census survey on potential affected household, CBEs, and other organizations. Making guided tour of representative of local people with selective local level affected people, elites, elected representatives and other local level stakeholders to Jamuna Bridge project Resettlement sites to observe resettlement activities undertaken by JMBA.
	Consultation	<ul style="list-style-type: none"> Consultation of resettlement and rehabilitation issues with all level stakeholders and gather feedback on potential risks and probable mitigation measures. Review the project plan by the experts to accommodate the suggestions made by the respondents in the focus group discussion and gives feedback and explanation about the status among the stakeholders. Encourage all level stakeholders to participate in the consultation by receiving views from representatives from different groups including directly and indirectly affected households, agriculture land loser, Owner and employee of CBEs, fishermen, local traders, women and others.
	Participatory Decision Making	<ul style="list-style-type: none"> Participatory Decision were made through Participatory Rural Appraisal (PRA) method by involving 40-45 people in four locations with directly and indirectly affected people, local elites, women representatives of the affected households.
2	Identification of Stakeholders	
	Primary Stakeholders	<ul style="list-style-type: none"> Directly affected households, agriculture and other type land owner, Business and Industry owners, other property owner along the RoW Indirectly affected persons including house and CBE renters, Uthulis, sharecroppers, wage labors/employees of firms/business affected by RoW, Implementing agencies involved including Local government, local administration, Deputy Commissioners office (DC land), JMBA, Ministry of Communication, GoB, Donors, Department of Agriculture, Fisheries Department, Public Works Department, Forestry Department and other departments involved in assessing the value of the lost property

Sl. No	Major Activity	Description of Tasks
	Secondary Stakeholders	<ul style="list-style-type: none"> • Local government/Community Leaders, Locally active NGOs, Women groups, Local level investors, Local elites • Users of the affected community properties (mosque, school/madrassa, samitees, graveyards, etc.), local level travelers, • GoB laws and policy regulatory agencies, Consultants, implementing NGOs

4.4 PROJECT BRIEFS AND ISSUES

The Study Team presented extensive briefs/presentations on various aspects of the project, its impacts and measures that would likely be taken, based on GOB laws and other “best practices” in resettlement derived from the Jamuna resettlement experience. The objectives of the briefs were to inform and to encourage the affected people to provide their responses so that appropriate policy framework could be developed for adequate compensation and resettlement of the affected persons. Some of the major issues are thematically summarized in this section.

4.4.1 Impacts and Losses

- Land will be required for the project. Land will be acquisitioned for permanent use and requisitioned for temporary use.
- All possible alternatives for the bridge, approaches and river bank protection works have been considered on the basis of various parameters addressed by specialists. By adopting the optimum locations and ROWs, the land requirements have been reduced to bare minimum. Thereby probable impacts on the likely affected person have been largely reduced compared to such land acquisitions in the case of Jamuna Multipurpose Bridge.
- The currently estimated land acquisition for permanent works will entail, 62.5 ha (154 acres) in Mawa end and 366.5 ha (905 acres) in the Janjira end.
- The higher requirement of land in the Janjira side is due to the long (11 Km) approach road, some 11 Km bank protection work, the toll plaza and the service area as against 6 Km of bank protection work only in the Mawa side.
- There will be no approach road, no toll plaza and no service area in the Mawa side.
- In addition some 30 ha (74 acres) land will have to be requisitioned in Mawa side as against 144 ha (356 acres) in the Janjira side, which will be derequisitioned after completion of the related works.
- The Affected Persons/Families (APs) and businesses will have to part with their lands, structures, livelihoods, sources of income and community properties.

4.4.2 Resettlement and Compensation Packages

Although GOB has no set policy for Resettlement and Compensation except compensation paid under Cash Compensation by Law (CCL), the donors have well documented resettlement and compensation policies for all persons affected by a project and these have been implemented in major projects like the Jamuna Bridge in the recent past and will be applied in this project also. The major features are:

- The land acquired shall be compensated at market prices, the Deputy Commissioner will pay the part payable under law and the difference between DC’s payment and market price will be paid by the project separately through engagement of NGOs.
- All compensations shall be evaluated and paid at replacement cost
- There shall be three types of resettlements: (i) self-managed resettlement – APs shall received their eligible compensation and resettle on their own; (ii) “cluster”

resettlement where APs related by kinship will move as a group and resettle on purchased land in the form of *bari*; and (iii) APs shall be resettled by the project at project sponsored resettlement sites with basic amenities like roads, drainage, water, power, schools, clinics, mosques and community centers etc

- Those who will purchase lands, the transaction taxes and registration cost shall also be paid by the project.
- The APs losing structures shall be allowed replacement cost for their structures and transfer cost to new locations and reconstruction grant, in addition they shall be allowed to take away the structures also.
- Non-title holders on the households land shall get the cost of structures lost, transfer and reconstruction grant
- APs, if needed, will be assisted by the project, local community leaders and well-to-do landowners to find alternate land for resettlement
- Civic amenities shall be provided to “host villages” to enhance absorbing capacity of hosting resettlers
- Training needs assessment shall be conducted and training for alternative skills and income restoration in post-resettlement period will be provided
- Special attention and enhanced resettlement packages for women headed families, disabled person and vulnerable groups shall be considered, additionally they will be assisted in the process
- Crop losses shall be compensated
- Losses to fisheries, orchards, plantations and household trees shall be compensated
- Wage losses by sharecroppers, labors and employees shall be compensated
- Religions and community properties shall be relocated/reconstructed at project cost

4.4.3 Resettlement Planning and Management

- A comprehensive resettlement plan shall be prepared and executed
- Determination of market/replacement costs of various losses shall be done by legally constituted bodies comprising members from administration, project authorities, local community leaders and stakeholders’ representatives
- Disputes and grievance resolution shall be done by legally constituted bodies with representatives from various stakeholders
- Basic payments under law shall be paid by the DC
- The difference between the payments by DC and market value shall be paid by account payee cheques to the owners/affected persons
- Monitoring and evaluation of implementation of the resettlement plan shall be done by various agencies at different stages of implementation

4.4.4 Advice, Advocacy and Assurances

- APs not to involve in false statements to the surveyors, raising fake structures to obtain extra compensation, indulge in fraudulent practices or influence others to do so.
- Titles on land are a prerequisite to compensation payment. DC’s office while paying compensation under law will also establish the ownership/title. Most of the landowners appear not to have currently established titles (mutation). Without that the payment by the project will not be possible or will be delayed. The APs have been advised to start processing mutation of their lands.
- All possible assistance will be provided to the APs in the resettlement and restoration of livelihoods.
- Local elites and leaders will be motivated to assist the APs to find lands for purchase to the extent possible.
- The resettlement sties will have all amenities like water supply, sanitation drainage

services and school, mosque, clinic facilities. Such facilities will be extended to host villages also. The livelihood is expected to be better or at least equal to pre project condition.

- Land development issue will be addressed.

4.5 OVERVIEW OF RESPONSES

4.5.1 General Responses and Concerns

In general, the responses by the potential APs were favorable to the project. However, some concerns were raised with respect to land, property and resource losses and consequent marginalization and income losses. The disclosure of the comprehensive resettlement process and compensation packages was welcomed by the people. Still then, concern over delays in compensation payment and harassment in receiving compensation payments from the government were expressed. The Study Team was requested to recommend measures to eliminate/reduce these delays/ harassments.

All APs unequivocally opined in favor of acquiring minimum quantum of land and expressed that land was in scarce in the areas. Even if land is made available by joint efforts of the GOB, the consultants, the implementing NGOs and the local community leaders, it would be expensive and time consuming to develop these lands for house construction. Another major concern was unclear ownership/titles on land. The titles on CS and RS records are not same. After 1947 partition of the Subcontinent, majority of Hindu communities left for India through exchange/sale and on oral understanding among the parties and the records of those lands are yet to be rationally resolved. The APs may become victims of the situation for not having clear records on their lands being occupied or possessed so long. They expressed apprehension about being denied of the compensation payment and requested, if a modus operandi could be worked out or recommended.

A common question was whether the bridge and its river training/bank protection works would eliminate/reduce annual floods and river bank erosion. This concern was particularly raised in the context of recent large scale bank erosion in the fringes of Lauhaganj town where the existence of the town is threatened. Another question was raised whether the unemployed youth population of the APs of the areas will be employed in the construction of the bridge and the river training works.

4.5.2 Specific Findings on Selected Issues

(1) Local Support to the Bridge Project

The project-affected people overwhelmingly support the construction of the bridge. They expressed that it was the demand of their souls and would like to see the bridge a reality within their lifetime. The reason cited include: (i) ease transportation and communication; (ii) save time and money to commute to Dhaka and other key destinations; (iii) create new jobs and increase economic activities; and (iv) encourage establishment of new industries with massive employment opportunities.

A standing support to the project was on the ground on river training and protection work, which will save the localities from future erosion endemic to the project area. This will further reduce the suffering of the erosion displaced (*nadibhasi*) people.

(2) Response to Land Acquisition and Population Displacement

The bridge and associated infrastructures will require land. Land will be acquisitioned for permanent use and requisitioned for temporary use (during construction only). The area is

thickly populated and the land is a scarce commodity. Even if market/replacement price of land is given it may be such that all the APs losing land may not get land for purchase. In view of the above, all the participants in the ICM, FGD and PRAs particularly the APs demanded that the land acquisition should be minimum and wherever possible settlements should be avoided. The project should have provision to assist the APs to find replacement land in and around the area as much as possible to help retain the traditional family and socio-cultural bonds.

The recorded price of land in the DC office is different than that in the prevailing market. They felt assured when it was announced that market price/replacement cost of all lands will be ensured. The base price (Cash Compensation under Law) called CCL will be paid by the DC and the difference between CCL and the market price (more known as MARV) in the Land Acquisition and Resettlement scenario will be paid by account payee cheques at the doorsteps of the APs by an implementing NGO as was the practice in other similar recently executed projects. The APs in general expressed satisfaction of having received adequate/satisfactory compensation package for lands and properties acquired during the execution of N8 (South West Road Network Development Project).

The marginal landowners as well as landless, squatters and *nadibhasi* (erosion induced displaced people) living on others lands by renting or otherwise wanted to know about the amount of land, its price, services and facilities to be developed in the project sponsored resettlement sites, the package was disclosed to them and they were satisfied. It was also disclosed that APs resettling in nearby villages will also get some incremental services and facilities extended in the host village, which appeared to satisfy them. They also expressed that in allotting plots in the resettlement sites, the plot sizes should be commensurate with the APs family size. The resettlement sites should be developed near business/growth centers so that the settled families have access to income sources/income generating activities.

(3) Concerns Expressed by Nadibhasi

The *nadibhasi* people wanted to know whether they are entitled to compensation payment. The answer was obviously no – not all *nadibhasi* and only those affected due to the bridge will only be compensated and resettled. If the lands on which they are presently settled are acquired, they will be entitled to resettlement.

The *nadibhasis* generally earn their livelihoods by harnessing the aquatic resources like fishing, carrying passengers/commodities/by boat, working in ferries and launches and *ghats*, farming and rearing cattle and goats in the *chars* and therefore they prefer to settle near the river banks. If they have to go, their traditional income generating activities will suffer and they will be economically losers. Change of profession like a boatmen becoming a rickshaw puller can feel humiliated. Among the *nadibhasi*, women and the children are usually engaged in cattle and goat rearing, home poultry farming. These will be disturbed and the women and children will be disadvantaged and the family income may dwindle.

(4) Concerns Expressed by Women/Vulnerable Groups

In FGDs, women expressed their helplessness in the process of moving out from their lands and resettlement compared to their male counterparts. Some of them even went to say if my land and house goes what will happen to me. Some told that they are engaged in some income generating activities within and in the periphery of their households and they feel that they will lose those due to diminished opportunities in new locations.

Women in general expressed that they may be all losers because their rights on the ancestral lands are not properly recorded/established in the light of the Islamic laws. They are afraid

of not getting their share of compensation, particularly those women who are married out. The participants/APs were advised to clear their rights on lands and establish shares of all members, male or female, of the family clearly determined. The women were also advised to be vigilant about it. Women headed households/women widowed/divorced living with family/in laws/singly expressed concern about their fates. They were assured of special treatment like compensation plus assistance in the resettlement process. Destitute and disabled members of families concerns were also expressed and they were also assured of special treatment in the resettlement process.

(5) Common Property Resources

A number of common property resources (CPRs) such as mosques, temples, schools, *madrassa*, local markets will likely be affected and will require relocation. The Study Team members assured that all affected CPRs will be re-established at project costs.

4.6 SUMMARY OF FINDINGS

Table 4.6.1 presents a summary of the project impacts, responses and findings. These findings have been considered for the development of eligibility and entitlement matrix in Chapter 5.

Table 4.6.1 Summary of Findings

Type of Impact	Responses	Findings
Land Acquisition & Population Displacement	<ul style="list-style-type: none"> • Land acquisition is obvious • With Land acquisition population will be displaced • Compensation for land and all losses to structures, resources, business and trades and income generation for all APs to be provided 	<ul style="list-style-type: none"> • Land acquisition should be limited to minimum, for that all possible alternatives to be studied • Land acquisition should avoid settlements as far as possible • All compensation to be paid at replacement value • The difference between recorded price of land at Sub-Registrar's office and that in the market should be reckoned • Tree resources felled should be compensated at market price and vigorous replantation effort should be in place at embankments and resettlement sites. • As land is scarce, assistance should be provided to find alternative land for purchase • Land development cost to be included in compensation package • Structures lost should be compensated at market price plus cost of transfer and reconstruction
Resettlement Strategies	<ul style="list-style-type: none"> • Multiple strategies will be adopted in resettlement management in the project 	<ul style="list-style-type: none"> • Crop lost should be compensated • Business lost should be compensated plus transfer and reconstruction • Loss of trades, skills, change of profession should be considered, skill training to be provided and APs to be assisted in new IGAs. • Resettlement sites to be developed for marginal landowners and landless and destitute with utilities and services • Land prices at Resettlement sites to be minimum and land sizes proportional to family sizes should be allotted to the APs • Delays, harassments and corruption should be avoided in payment of compensation

Type of Impact	Responses	Findings
		<ul style="list-style-type: none"> • There should be a way out for lands having unclear title/ownership but occupied/possessed by present owners • Sufficient time should be allowed between serving notice of acquisition, receiving compensation and moving out.
Impact on the Nadibhasi (erosion induced APs), Sheltered People	<ul style="list-style-type: none"> • Whether they will receive compensation for their land which is not theirs, belongs to others and they are using it by renting/leasing or free through mutual understanding • They prefer to live along the riverbanks because their livelihoods depends on activities centered around the river, fishing, carrying passenger and commodity by boat, farming, cattle and goat rearing in the shoals • The owners of the lands on which they live may be prompted to evict them in order to establish unencumbered possession on the lands 	<ul style="list-style-type: none"> • They now know that they will not receive compensation for lands but other losses will be compensated • They would like to be resettled within close proximity of the river to retain their traditional trades and way of life • They should not be disturbed by the landowners until the lands are acquired and the existing understandings/ agreements should be honoured • Change of profession like a boatman becoming a rickshaw puller was very much disliked • They are not that much interested to go to the resettlement sites leaving the openness and vast expanse of the rivers/shoals to limited space at resettlement sites • The flood season bankline and the winter season bankline are different. Whether land for bank protection works could be acquired along the winter banklines.
Impacts on the Women and Vulnerable Groups	<ul style="list-style-type: none"> • Women headed households are disadvantaged compared to their male counterparts • Women widowed/ divorced living with fathers' family/in-laws' family or singly apprehend becoming destitute • Their rights on ancestral/in laws properties may not be established and they may be deprived of due share of compensation moneys • They are now engaged in traditional homestead small trades like home poultry, cattle and goat rearing, backyard kitchen gardening, embroidery, serving in the homes of well-to-do neighbors. All these will be lost and they felt helpless about all these • Vulnerable/ destitute felt encouraged at the disclosure of the fact that their interests will also be specially taken care of. Similar was the responses from the families having disabled members 	<ul style="list-style-type: none"> • The women APs should be resettled with compensation and assistance in all respects • Their rights/shares on land according to laws of the land and religious principles should be safeguarded • Their traditional homestead trades and IGAs should be recognized and appropriately compensated and rehabilitated. They should be assisted to reestablished their lost IGAs • They should be given appropriate employment in the bridge construction work without any wage discrimination • Destitute/landless/disabled persons may be given shelters in the resettlement sites on priority basis. They should be encouraged and assisted to form groups, given skill training and assisted in starting new IGAs and new trades including credit and supervision. • There should be sufficient watch and enforcement of social/religious principles to protect the women APs and their families from gender discrimination and various abuses • The losses to hawkers and small businesses should be recognized and compensated

4.7 DPC -TASKS FOR PROJECT IMPLEMENTATION

As evident from previous sections, the Study Team conducted a series of disclosure and public consultation sessions during the preparatory stage of the project. The people likely to be affected are fairly informed about the project scope and the extent of land acquisition. Similarly, they are also familiar with the compensation principles/guidelines and resettlement strategies to be adopted in the project. However, the disclosure and consultation should continue during the detailed design period and implementation of the project. Table 4.7.1 list a set of DPC tasks that would be useful in effective implementation of the project.

Table 4.7.1 DPC - Tasks for Project Implementation

Sl. No	Major Activity	Description of Tasks
1	Detailed Design and Implementation of RP	<ul style="list-style-type: none"> • Disclosure of entitlements to the APs through public meetings, FGD and distributing translation of RP in Bangla in brief. • Disclosure meetings with all types of APs by organizing meetings with different groups with special attention to the women APs and disables by implementing NGO. • Distributing leaflets, posters in the locality about all the entitlements and mechanism of achieving those. • Formation of different committees like Grievance Redressal Committee (GRS), Resettlement Advisory Committee (RAC) etc. by incorporating representatives of APs, Local public representatives, Women representative of APs, Implementing NGO and chaired by Implementing agency. • Maintaining liaison with DC office, implementing agency and APs through Implementing NGO to pay the entitlements and vacate the land to handover to the contractor on time. • Development of Resettlement sites and inform about its status and criteria to have plots and allocation of plots to eligible and interested APs • Helping APs to move to relocation site or host village and facilitate for self relocation by NGO.
2	Project Construction Phase	<ul style="list-style-type: none"> • Continue paying entitlements to APs by Implementing NGO • Maintaining liaison with DC office, implementing agency and APs through Implementing NGO to pay the entitlements and vacate the land to handover to the contractor on time and resolving any unexpected problem. • Accepting grievances submitted by the APs and place for proper redressal arrangement by the implementing NGO. • Provide Information to APs about working opportunities, to contractor about the availability of workers from APs and to the implanting agency about the status of APs' employment by the NGO. • Regular progress and evaluation meetings of different committees. • Implementing NGO will submit progress reports regularly to the implementing agency.
	Post Construction/ M&E Phase	<ul style="list-style-type: none"> • Evaluate The status of Resettlement implementation by external experts through various methods by collecting data from the field • Implementing NGO would prepare an evaluation report through consultation with the stakeholders
3	Delivery and Implementation of DPC	
	Methods to be followed	<ul style="list-style-type: none"> • Identify community focal point. • Organize APs Liaison group. • Local level Meetings in the affected villages and project sites with stakeholders. • Community mobilization through meetings and sensitization

Sl. No	Major Activity	Description of Tasks
DPC Materials for Implementation Phase		
4		
	Materials to be used	<ul style="list-style-type: none"> • Posters, leaflets, brochures, news in local papers, translation of entitlements mentioned in RP and other information materials (in Bengali language) on the project impacts • Brochures on compensation policy, resettlement benefits and project schedules • Copies of RP and its summary in Bengali and other key documents.
	Reporting	<ul style="list-style-type: none"> • Notification of Meetings, detail agenda, minutes of meetings and decisions. • List of participants by locality and varieties of groups. • Record of agreed follow up actions.
5	Resources and Responsibilities	
	Resources	<ul style="list-style-type: none"> • Budget covering all expenses in RP • Additional manpower employed in DC office
	Responsibilities	<ul style="list-style-type: none"> • Contract NGOs for RP implementation • Establish local Advisory Committees to assist the implementing agency • JMBA to monitor the implementation of DPC • External monitoring of DPC in interval basis as mentioned in RP/scheduled by donors

Chapter 5 Resettlement Framework, Entitlement Matrix and Cost Estimates

5.1 LEGAL FRAMEWORK FOR LA – A REVIEW

The first land acquisition law in the sub-continent was promulgated in 1870. It was amended by the Land Acquisition Act, 1894 (Act I of 1894). While the land acquisition act of 1894 remained enforce, the East Bengal (Emergency) Requisition of Property Act was promulgated in 1948 after the partition of India. The 1948 Requisition of Property Act was replaced by the Acquisition and Requisition of Immovable Property Ordinance II of 1982. The Ordinance II governs all cases of acquisition and requisition by the government of immovable property for any public purpose or in the public interest. The owners affected by such acquisition are eligible to compensation for losses. The Ordinance requires that compensation be paid for (i) land and assets permanently acquired (including standing crops, trees, houses); and (ii) any other damages caused by such acquisition. In determining the compensation, the Deputy Commissioner (DC) considers the value of land transaction for the past 12 months in the project area, plus a 50 percent solatium on the assessed value of the property for compulsory acquisition.¹⁵ The compensation thus paid does not constitute market or replacement value of the property acquired. The 1994 amendment made provisions for payment of crop compensation to tenant cultivators. However, the Ordinance does neither cover project-affected persons without titles or ownership records such as informal settlers/squatters nor recognize loss of income and livelihoods. Moreover, it does not take into account the adverse impact of dislocation. Further, very little resettlement assistance is offered under the law. In sum, resettlement of affected persons (APs) is not an integral part of the land acquisition process in Bangladesh.

5.2 JICA AND DONORS' GUIDELINES

JICA¹⁶ and other donor agencies such as ADB¹⁷ and the World Bank¹⁸ have broad principles to minimize displacement, and require time-bound action plans with measures to restore or improve incomes of those unavoidably affected by project development. ADB's poverty reduction strategy¹⁹ reinforces the importance of mitigating the risks of displacement, and taking steps to improve the conditions for the poor and vulnerable groups in particular. The guidelines require (i) avoiding involuntary resettlement where feasible, (ii) minimize resettlement where population displacement is unavoidable, and (iii) ensure that displaced people receive assistance under the project, so that they would be at least as well off as they would have been in absence of the project. Table 5.2.1 presents a comparative view of the requirements by these agencies on resettlement management in development projects.

¹⁵ The solatium was raised from 25 percent to 50 percent through an amendment in 1993.

¹⁶ JICA, *Guidelines for Environmental and Social Considerations* (2004).

¹⁷ ADB, *Involuntary Resettlement* (1995).

¹⁸ World Bank, Operational Directive 4.12 *Involuntary Resettlement* (2002).

¹⁹ ADB, *Fighting Poverty in Asia and Pacific - the Poverty Reduction Strategy*. 1999.

Table 5.2.1 Comparison of JICA, ADB and WB Policies

Issues	JICA	ADB	World Bank
Avoidance of dislocation	Involuntary resettlement and loss of means of livelihood are to be avoided where feasible by exploring all viable alternatives.	Involuntary resettlement should be avoided where feasible.	Involuntary resettlement should be avoided or minimized where feasible.
Minimize impact	After thorough examination, effective measures should be taken to minimize impacts and compensation for losses must be ensured.	Where population displacement is unavoidable, it should be minimized.	Where displacement is unavoidable, resettlement plan should be developed.
Enable affected people to be at least up to pre-project level	People to be resettled involuntarily must be sufficiently compensated and supported by project proponents. Proponents make effort to enable affected people to improve their standard of living or at least to restore them to pre-project level.	People unavoidably displaced should be compensated and assisted so that their economic and social future would be as generally favorable as it would have been in absence of the project.	Displaced persons should be compensated for their losses at full replacement cost and assisted in their efforts to improve former living standard or at least to restore them.
Disclosure/ Consultation regarding compensation with affected people	Minimization of impact and payment of compensation for losses must be agreed upon with the people affected.	People affected should be informed and consulted on resettlement and compensation options. As far as possible involuntary resettlement should be conceived and executed as a part of the project.	All involuntary resettlement should be conceived and accepted as development programs, with resettlers provided sufficient investment re-sources and opportunities to share in project benefit.
Participation of the stakeholders from planning through implementation	Appropriate participation by affected people and their communities must be promoted in the planning, implementation and monitoring of involuntary resettlement plans and measures against loss of their means of livelihood	Existing social and cultural institutions of resettlers and their hosts should be supported and used, resettlers integrated economically and socially into host communities.	Community participation in planning and implementing resettlement should be encouraged. Appropriate patterns of social organizations should be established. Existing social and cultural institutions of settlers and their hosts should be supported and used and resettlers integrated economically and socially into host communities.
Special attention to the vulnerable APs	Appropriate consideration must be given to vulnerable social groups such as women, children, the elderly, and the poor and ethnic minorities.	Absence of a formal legal title to land should not be a bar to compensation; particular attention should be paid to household headed by women and other vulnerable groups.	Land, housing, infrastructure and other compensation should be provided to adversely affected population, indigenous groups, ethnic minorities etc. Absence of legal title to land by such groups should not be a bar to such compensation.
Budgeting		The full costs of resettlement and compensation should be included in the presentation of project costs and benefits.	
Source of fund		Costs of resettlement and compensation may be considered for inclusion in Bank loan financing for the project.	

Involuntary or development-induced resettlement, therefore, needs to be an integral part of project design covering compensation for lost assets and loss of livelihood and income based on full replacement cost and paid in timely manner. The affected persons must receive assistance for relocation including provision for relocation sites with appropriate facilities and services. Finally, resettlement management should be perceived and executed as a development project.

5.3 RESETTLEMENT EXPERIENCE IN BANGLADESH

Official statistics on project-related displacement are rarely available in Bangladesh. Through the 1970s and 1980s, many irrigation, flood control, hydropower, and urban/industrial development projects were completed, without any resettlement plan despite foreknowledge of large-scale land acquisition and population displacement. For instance, the Kaptai Hydroelectric Dam Project, completed in 1961, displaced close to 90,000 members of the indigenous/tribal in the Chittagong Hill Tracts.²⁰ The displaced people, mostly member of the Chakma tribe, were never adequately rehabilitated.²¹

To date, Bangladesh government has no clearly formulated resettlement policy for persons affected by development projects. As indicated earlier, the 1982 Ordinance is the key legal instrument to acquire land for public sector projects. It delegates acquisition and/or requisition power to DCs, including valuation of property and payments of compensation for acquired assets. It is well known in Bangladesh that the registered value of land is only about half of market value because people devalue land in transactions to avoid, or pay, lower registration fees. As a result, compensation for land is always less than the market or replacement value of the property. As a result, when government acquires land for development purposes, it creates tension and uncertainties among the affected population due to absence of improved policy framework and lack of adequate assistance to the affected people, particularly the non-titled persons – the rural poor, landless, women and other disadvantaged groups. The Jamuna Bridge Project led to the first lengthy discussion and review of the issues related to development-induced displacement²² and established the “tradition” for a formal resettlement plan for project-affected persons.

5.4 “BEST PRACTICES” EXAMPLES FROM BANGLADESH

In recent years, due to donors’ policy requirements and persistence to mitigate project-induced displacement, some improvements in the form of “best practices” are noticeable in many projects funded by JBIC, DFID, ADB and WB (for example, Jamuna Multipurpose Bridge Project, Bhairab Bridge Project, Paksey Bridge Project, Rupsa Bridge Project, Riverbank Protection Project, and Southwest Road Network Project). The best practices include: (i) time-bound comprehensive resettlement plan for project-affected persons; (ii) consultation with stakeholders; (iii) entitlement matrix, based on types of losses by the affected people; (iii) provision for replacement value of assets (land and housing); (iv) shifting allowances for relocation; (v) involvement of APs in resettlement implementation; (vi) grievance redressal provision for dispute resolution; (vii) training/income restoration program; (viii) special attention to women and vulnerable groups; and (ix) civic amenities in resettlement sites/host communities in resettlement management. The “best practices” are fairly rooted in the development scenario, particularly in the case of donor-funded projects.

Despite project-specific and ad-hoc measures, findings from the *Evaluation of Resettlement Experience in Selected Projects*²³ indicate major problems in land acquisition and resettlement management in Bangladesh – for example, long delays in payment of compensation and resettlement assistance, lack of adequate consultation with APs, weak income restoration program, and weak coordination and monitoring of resettlement

²⁰ An early account of the Kaptai Dam Project can be found in David Sopher, “Population Dislocation in the Hill Tracts,” *Geographical Review*, Vol. 53 (1963).

²¹ For an analysis of the long-term impact and socio-political response to dislocation of the hill tribes, see M. Q. Zaman, “Crisis in the Chittagong Hill Tracts: Ethnicity and Integration,” *Economic and Political Weekly*, Vol. 17:3(1982).

²² For an overview of the issues, see M. Q. Zaman, “Development and Displacement in Bangladesh: Toward a Resettlement Policy,” *Asian Survey*, Vol. 36(7), 1996.

²³ *Evaluation of Resettlement Experience in Selected Projects* (Draft Final Reports Vol. II), Asian Development Bank and Roads and Highways Department, Dhaka, December 2003.

activities. The *Special Evaluation Study*²⁴ found that the ability to implement resettlement plan efficiently and effectively depends on clear policy guidelines and legal framework, as well as awareness, skill and experience of project staff, and strong institutional capacity for resettlement implementation.

5.5 PROJECT LA&R GUIDELINES AND COMPENSATION/RESETTLEMENT FRAMEWORK

In the light of the types of losses presented in Chapter 3 and the past resettlement experience in Bangladesh, a project-specific land acquisition and resettlement that matches international donor requirements and standards is recommended for project implementation. The framework requires that (i) detailed project design and implementation arrangements carefully considers alternative options to further minimize resettlement; (ii) prepare land acquisition and resettlement action plans to mitigate adverse impacts, including replacement costs for all assets acquired and resettlement assistant; (iii) restore the lost incomes of the affected people and businesses; and (iv) enhance capacity of the executing agency for resettlement operations and managements. Land acquisition and resettlement of the APs in the project will be carried out in accordance with the following guidelines:

- 1) Land acquisition will be carried out in a way to minimize the adverse impacts on the APs. This will be done in consultation with the people to be affected.
- 2) Affected people will receive replacement value of the land and other assets. Likewise, loss of standing crops and productive trees will be compensated at market price.
- 3) Owners of residential/commercial units will be compensated at replacement costs. Renters/lease holders affected by loss of living quarters will receive compensation due to indirect impact of the project.
- 4) Affected community structures or common property resources will be re-built or replaced at market prices under project financing.
- 5) The needs of women and other vulnerable groups will be identified and provisions made for social development support, employment, and means of subsistence to improve their status/livelihood.
- 6) JMBA/EA and implementing agency/NGO will assist APs and owners of businesses in all aspects regarding relocation and resettlement. The EA will involve all stakeholders in the decision-making process concerning relocation and resettlement.
- 7) JMBA/Project Management Consultants will guide, supervise and monitor the land acquisition, compensation payments, and resettlement of the APs, including grievance redressal and resolution of disputed claims for compensation.

The Compensation/Resettlement Framework contains the following packages, which are designed to cover compensation for lost assets and restore or enhance the livelihoods of all categories (direct, indirect, title holders, and non-title holders) of affected people (Table 5.5.1).

²⁴*Special Evaluation Study on the Impact of Involuntary Resettlement*, Asian Development Bank, Manila, September 2000.

Table 5.5.1 Compensation/Resettlement Framework and Beneficiaries

	Compensation Packages	Beneficiaries
1	Replacement value of agricultural land to titled owners by DC office Additional cash grant based on MARV to match market value of the land	<ul style="list-style-type: none"> • Households affected by loss of agricultural land • Households affected by loss of agricultural land
2	Cash grant for loss of access to land by tenant/sharecroppers	<ul style="list-style-type: none"> • Tenant/sharecroppers affected by land acquisition for ROW
3	Compensation for crops, tree and perennial	<ul style="list-style-type: none"> • Households affected by loss of crops/trees/pond-fish • Tenant farmers to receive 50% of the compensation for crop loss, if applicable
4	Replacement house plots/cash for homestead land (by owners) at market value	<ul style="list-style-type: none"> • All homestead/house plot owners affected by the Project
5	One-time cash grant for alternative housing to APs without titles to homestead land/structure	<ul style="list-style-type: none"> • Renters, leaseholders, squatters affected by the Project
6	Cash compensation for residential/commercial structures at replacement cost Cash compensation to renters/non-titled businesses for loss of business premise	<ul style="list-style-type: none"> • Households/business (owners only) affected by the Project • One-time cash grant to business establishments to re-establish business
7	Transfer/shifting cost for relocation Additional assistance to female headed households	<ul style="list-style-type: none"> • All APs (rented, squatters included) to assist in the relocation • Female headed households to hire hands for relocation
8	Cash assistance for income restoration Roadside plantation and Social Forestry Program	<ul style="list-style-type: none"> • All affected households/CBE employees and indirectly affected persons for loss of work, income, and business • Vulnerable groups such as women and landless people for alternative income generation program
9	Reconstruction of community facilities or resources affected by the project	<ul style="list-style-type: none"> • All partially and fully affected community facilities will be reconstructed in consultation with affected communities
10	Civic amenities in host areas to increase carrying capacity of the host villages	<ul style="list-style-type: none"> • Relocated areas/villages where APs will move in small groups
11	Social Development Fund to assist restoration of income and livelihood in post-resettlement period	<ul style="list-style-type: none"> • Affected households with particular attention to female-headed households and other vulnerable groups and those under the official poverty line.

The APs will not only receive replacement land or cash for land and other assets at the market price, many additional measures have been taken - for example, shifting or moving allowance, assistance to owners of businesses, assistance to female-headed households, income restoration and social development program - to help the project-affected persons regain or improve their lives in post-resettlement period. These entitlements are further explained listed in the Entitlement Matrix (Table 5.5).

5.6 RESETTLEMENT STRATEGIES AND OPTIONS

5.6.1 Extent of Displacement

The SES identified the extent of displacement of households and other establishments due to acquisition of land for the project. According to current estimates, the project will likely relocate 3,150 households, 277 CBEs and 65 CPRs partially or entirely from their current locations. Among them, a large majority is from Janjira site where many of the associated infrastructures (i.e., approach roads, toll plaza, service area, construction yard/project

management office, river training and protection works, etc.) will be established.

5.6.2 Relocation and the Local Samaj²⁵

People of the project area mostly depend on agricultural land, especially in Janjira site. However, land is scarce due to endemic erosion in the floodplain. Moreover, the distribution of land is very skewed and concentrated in some *gusthis* (patrilineage) in the *char* areas. The patrilineal groups are organized along kin and other social relationships and maintain through patronages such as providing “free land” and/or rental to *nadibashi* (displaced by erosion) relatives/fellow villagers for settlement within the *samaj*, which also maintain distinct social “boundaries.” The *samaj* in effect is a mutual assistance group and considered the primary political arena/field in Janjira site. The leadership is vested more often among a set of people variously called *matabbar*, *mondal*, *dhali*, *sikder* and *sarder*. These leaders are typically rich peasants who have abilities and networks to organize and mediate with the “outside” world. This was clearly evident during the field surveys and consultation meetings. Indeed, many local villages are named after leader(s) or patron family – for example, Matoborer Char, Sikderkandi, and Matborkandi. Each *samaj* in char villages is identified with or named after its most power *matabbar* (for example, Khaleque Dhali’s *samaj*). In sum, the *samaj* reflects local “brotherhood” of the landed “big men” who act as arbiters of local disputes and maintain solidarity as well as orderly life in the community.²⁶ Given the social conditions in Janjira, opportunities as well as preferences for relocation will likely be influenced by the traditional *samaj* group and patronage systems. As a result, due attention must be paid to *samaj* in deciding resettlement sites and relocation. Therefore, the *samaj* leaders must be consulted during resettlement site identification/selection. As *samaj*-based resettlement strategy may be helpful in the case of Janjira site.

5.6.3 Relocation Options and Strategies

The Study Team discussed various options and strategies with the affected people in PRAs and FGDs. The SES included specific question with regard to choice(s) for resettlement. Table 5.6.1 lists the responses and preferences.

Table 5.6.1 Resettlement Preferences by Affected Persons

Location	Preferences for Resettlement								Total	
	Self-managed						Resettlement Sites			
	Owned land		Purchased land		Total		No	%	No	%
	No	%	No	%	No	%				
Mawa Site	22	1.64	1084	80.71	1106	82.35	237	17.65	1343	100
Janjira Site	93	5.15	1207	66.80	1300	71.94	507	28.06	1807	100
Total	115	3.65	2291	72.73	2406	76.38	744	23.62	3150	100

As in Table 5.6.1, over three-fourth (76%) of those requiring relocation prefer self-managed resettlement while the rest (24 %) expressed views for relocation in project-sponsored resettlement sites. Only few of them (3.6%) have plans to resettle on their own land but majority desires to purchase land to re-build their houses and resettle on their own. In the case of Jamuna also, three-fourth of the displaced families chose the “self-managed” resettlement option and re-established them in the existing villages.²⁷

²⁵ The *samaj* is a patron-based social group widely found, particularly in the floodplain villages. It is often the largest intra and/or inter-village informal but important social organization of mutual reliance, organized primarily on the principle of patronage. For details, see M.Q. Zaman, *The Socioeconomic and Political Dynamics of Riverbank Erosion Hazard and Population Resettlement in Bangladesh*, Ph.D. Dissertation, University of Manitoba, Canada, 1988.

²⁶ M. Q. Zaman, “The Role of Social Relations in the Response to Riverbank Erosion Hazards and Population Resettlement in Bangladesh.” In *Natural Disasters and Cultural Responses* (ed), A. Oliver-Smith, Studies in Third World Societies, Vol. 36; Williamsburg: College of William and Mary, 1986.

²⁷ *Special Evaluation Study on the Impact of Involuntary Resettlement* cited earlier (see Annex 13 – Jamuna Multipurpose Bridge Project).

Self-Managed resettlement allows affected households to make individual decisions and choices with regard to new house site or location for resettlement. This is usually influenced by availability of land for house construction, kinship, and other social relationships. The three options are discussed below.

(1) Self-Managed Resettlement by affected households

Affected households will self-relocate to their preferred places in the same or nearby villages having received all eligible benefits as per the policy framework and entitlement matrix. Self managed resettlement could be on their lands in the same *mouza*/village or in nearby village through purchase of new land for housing and resettlement. In most instances, they would need to develop the land, as this area is predominantly a low-lying area. So they would need time to develop the land prior to construction work. The self-managed strategy would reduce social disruption and allow the affected families to stay around their own social and kin groups according to their own choices. The affected households will need to be assisted in the relocation process by the INGO and pay all eligible compensation, transfer cost and income restoration allowances in advance so that relocation is completed prior to commencement of civil works.

(2) Small Group Resettlement

The affected households in groups of 10 to 15 families typically related by kin or other social ties will be encouraged to resettle in “clusters.” This is another form of self-relocation enabling the affected families to remain together for mutual self-help. The project may provide additional support to host village in the form of civic amenities (for example, provision of tube-well for drinking water and sanitation and others). This will enhance the carrying capacity of the host village and improve settlers-hosts relationship in the resettled village.

(3) Project Sponsored Resettlement Sites

APs are expected to receive adequate compensation for replacement agricultural and homestead land and some incentive in the form of salvageable materials, trees, house construction grant, transfer/relocation grant, transition allowances etc. As indicated earlier (Table 5.2), many would prefer and indeed encouraged going for self resettlement. However, there would be others – about 25% according to the survey data – who would require assistance for resettlement. These include landless, marginal farmers, *nadibashi*, and members of vulnerable groups such as female-headed households who may not succeed in resettling themselves on their own. As part of the safety net, the resettlement framework will keep provisions for “homestead-losers” at the resettlement sites. Given the project locations, at least 4 sites would be required (Mawa-1 and Janjira -3 sites). The sites should be selected in consultation with the affected people during the detailed design period. Each site will contain basic civic amenities like the resettlement sites at the Jamuna Bridge. Preference will be given to those most vulnerable families having 2.5 dec. homesteads and losing most of it by acquisition. As the APs are from different localities along the ROW, the resettlement sites should be identified in proximity to their place of origin as well “central” places with access to market and job opportunities.

5.6.4 Resettlers-Host Relation

The resettlement strategies in this project preclude any resettlers-host conflict because the households will largely remain with the same general area of the existing villages and thus they will maintain their pre-existing social ties and networks. Project will provide infrastructure facilities to enhance the carrying capacity of the villages where 30 or more families resettle. It is expected that these facilities will help to strengthen the mutual

relation among the host villagers and the resettlers. Therefore, no conflict or tension is anticipated. If necessary, JMBA and the implementing NGO will conduct meetings with host communities in post-resettlement period to establish a congenial atmosphere among them.

5.6.5 Need for Resettlement Assistance

During the survey, the heads of households and businesses expressed their needs for assistance during relocation and in post relocation period (Table 5.6.2). A large majority (77%) of the respondents need assistance from the executing agency to buy land to relocate and resettle, followed by shifting of structure (13%), and business (5%). The EA will form Land Purchase Groups consisting of concerned *upazila* officials, UP chairman/members, local elite, NGO members and representatives of the affected people. The functions of LPG will be to find availability of land for purchase by intending APs and to negotiate purchase value on behalf of the buyers(s). This will help affected persons to purchase land in the locality to re-construct their houses and re-establish businesses.

Table 5.6.2 Resettlement Assistance

SL No.	Assistance sought for	Number	Percentage (%)
1.	Buying land	2766	76.71
2.	Shifting of Structure	477	13.23
3.	Reconstruction of structure	146	4.05
4.	Re-establishment of business	164	4.55
5.	Employment	4	0.11
6.	Debt repayment	3	0.08
7.	Vocational Training	3	0.08
8.	Others	43	1.19
Total		3606	100.00

5.6.6 Community Response to the project

Majority of the project affected persons who participated in the group discussion, stakeholders meetings and participatory rural appraisal meetings have highlighted the social and economic benefits from the project. Local administration and people's representatives like chairmen and members of the Union *Parishad* have assured the project authority all kinds of cooperation from them for implementation of the project. Potential affected persons also indicated that the improvement of the road network would save travel time and improve communications due to road straightening and widening. This will also make communication easier and less costly and facilitate growth of different type of factories, industries, commercial enterprises and tourism which may open up new opportunities for business and employment in the project area. This will also enhance health care facilities and provide better quality of education. Finally, local villagers also see benefits from river training and protection works. This will provide them some stability in the settlement in contrast to almost annual displacement migration caused by flooding and erosions.

5.7 INCOME RESTORATION ASSISTANCE

Affected households and business establishments requiring relocation may suffer temporarily due to loss of workdays/income and businesses caused by dislocation. This especially true for the wage earners as well day laborers. The study observed that there are some women, minors are directly or indirectly involved with fish business as well as informal employment for the support services in the ferry ghat. Dislocation due to the project will affect these groups very adversely. Income Restoration Assistance (IRA) in the form of supervised grant should be paid to eligible APs. The primary objective of this

additional assistance is to allow displaced APs and owners of business establishments to settle in their new place of residence and businesses, respectively. All income restoration programs should start in post-resettlement period, based on fresh surveys and criteria for eligibility. IRA program shall include (i) cash assistance to support lost income; (ii) assistance to re-establish business; (iii) special assistance for vulnerable groups; (iv) social development fund (SDF) for income-generation; (v) employment in project construction; and (vi) roadside plantation and social forestry. All income restoration programs should start in post-resettlement period, based on fresh surveys and criteria for eligibility.

5.7.1 Cash Assistance to Support Lost Income

The APs, including those experiencing indirect or secondary impact, will be eligible for assistance due to loss of employment/workdays (daily wage labor, second/third income-earners) due to dislocation and relocation. A one-time cash grant will be paid to all eligible APs. It is expected that the APs would be able to regain their losses and/ or find alternative employment within this period. Indeed approach road construction activities will create a steady labor market for employment locally at least for few years. The income restoration assistance will be an added help in the restoration of income caused by dislocation.

5.7.2 Assistance to Re-establish Business

There will be provision in the matrix to provide assistance to affected business establishments to restore and regain their businesses. All titled/non-titled owners of business will receive a cash grant for loss of business premise plus shifting or moving allowance, and one-time cash grant for loss of workday/employment. This assistance is intended to help them to re-establish businesses in new locations. All APs will likely continue their previous occupations and commercial activities in post-relocation period. In addition, a business premise at a place near the Service Area may be constructed to restore affected businesses on lease and/or rental basis.

5.7.3 Special Assistance for Vulnerable Groups

JICA Policy specifies that vulnerable groups merit special attention in planning and implementing resettlement, and that resettlement represents an opportunity to help them improve their status. Vulnerable groups are those likely to be particularly disadvantaged as a consequence of resettlement. The Policy further specifies that, where adversely affected people are particularly vulnerable resettlement and compensation decisions should be preceded by a social preparation phase to build up their capacity to deal with the issues. Vulnerable members include poor women, physically handicapped, child workers, and the very poor.

5.7.4 Assistance for Additional Income Generation through Social Development

A Social Development Fund (SDP) will be established from the project to assist the affected households particularly the Vulnerable Groups like women, child workers, disabled, and elderly without family support etc. in restoring their income in post- resettlement period. The implementing NGO will conduct a need assessment survey during implementation period to identify beneficiary groups and provide them long time benefit in the shape of micro-credit for investment in skilled development training and productive avocation like small business and other self-employment project. This particular activity will closely follow the Bhairab “model” for supervised grant for small business for female-headed households and vulnerable groups.²⁸ The budget will keep provision for the Fund.

²⁸ Seminar on Social Action Plan, Phase II - Bhairab Bridge Project, Halcrow Group, Dhaka 2004.

5.7.5 Employment in Construction

The Project construction activities will require many unskilled laborers and skilled staff for earthworks in road embankment and construction of bridge, culvert, offices and management work for a period of about 5 years. JMBA will make provision in the contract with the contractors for preferential employment of qualified APs in the recruitment of local laborers, including affected women in road turfing. Employment in the project construction will be an added source of income in the income restoration processes of APs. The RAP implementing NGO will prepare lists of women workers available to work on site and hand over to the local contractors. The supervision/management consultants will monitor this through monthly statements of labor employed from affected categories.

5.7.6 Roadside Plantation and Social Forestry

JMBA will undertake plantation scheme to stabilize the embankment against erosion and rain cut, especially in those sections where the embankment is likely to be exposed to annual flooding. Tree plantation, particularly with fast fruit growing and timber trees along the route embankment, will substantially contribute to mitigation of environment hazard as well as provide a source of income for APs, especially women and landless households in the project area. The RAP Implementing Agency/NGO assisted by a Gender/Community Development Specialist will organize plantation program through engaging women and other vulnerable groups. Selection of species, design plan, and other technical support (for example, training) for roadside planting will be provided by JMBA and other appropriate agencies, including Departments of Forestry/Environment, GOB.

5.8 ENTITLEMENT MATRIX

The entitlement matrix (Annex I -Table 5.5) is based on the LA&R Guidelines and Compensation/ Resettlement Framework outlined earlier. It provides (i) entitlement provisions; (ii) eligibility; (iii) application guidelines; (iv) implementation issues; and (v) organization(s) responsible to carry out the tasks. The matrix includes 13 major categories, which are compensable under the project. These are:

- (i) Loss of agricultural and commercial lands
- (ii) Loss of homestead land
- (iii) Loss of households/homestead and other physical structures
- (iv) Loss of structures used for commercial and industrial activity
- (v) Loss of timber, fruit-bearing trees, and bamboo and banana groves
- (vi) Loss of standing crops
- (vii) Loss of ponds and fish stock
- (viii) Loss of usufruct rights in mortgaged-in/out and *khai-khalashi* lands
- (ix) Loss of income from displaced commercial/industrial premises
- (x) Temporary loss of income (wage earners – agriculture, commercial/industrial)
- (xi) Loss of income from rented residential/commercial premises
- (xii) Adverse impact on host population in post-resettlement period
- (xiii) People adversely affected by the bridge (for example, change in water level up/downstream or in unforeseeable ways)

During the detailed design period, households and/or persons affected by types of losses will be identified against each category listed above to design appropriate mitigation measures and resettlement assistance.

5.9 PRELIMINARY COST ESTIMATE AND BUDGET

Table 5.6 contains a preliminary cost estimates for land acquisition and resettlement. A land

market survey (LMS) was conducted to assess the replacement value of land in the project area. The LMS considered available registered transaction value of land from government Land Registration Office, conducted surveys in the project area on the present market value (based on potential buyers/sellers' estimate), and consulted local experts/knowledgeable persons in making the assessment. As a result, the average value of land was increased by 3 to 4 times than the registered value.²⁹ The estimated cost is Taka 4324 million or US\$72 million (@ Taka 60 for 1\$). The cost estimate includes land acquisition and related costs, cost for structures, trees, and income restoration/social development grants, NGO costs, monitoring and project administration costs. Details of the cost estimates are in Annex II (Table 5.9.1).

Table 5.9.1 Preliminary Cost Estimates

Sl. No*	Item	Estimated Costs/ Taka in Million
A-G	Compensation for land acquisition (all types), stamp duty/registration, crop loss, payments for structures (all types), and trees at market rates	2897.47
H-V	Transition allowance, house construction grant, shifting allowance, land development cost, special assistance to female-headed households, resettlement site development, social development fund (SDF) for training/skill development and income restoration	889.18
W-X	Others (e.g. monitoring, hiring of NGO for RAP implementation, updating database through Joint Verification, allocation for indirectly affected persons and any unforeseen impacts)	533.36
Total		4320.01
* Corresponds to numbers (in alphabets) used in the cost estimates presented in Annex II. The table presents a summary of the cost estimates; for details, see Annex II.		

²⁹ For details, see *Padma Bridge Feasibility Study - Land Market Survey* (Bangladesh Consultants Ltd, Dhaka, October 2004)

Chapter 6 Implementation and Monitoring Issues

6.1 INTRODUCTION

Land acquisition and resettlement management in the Padma Bridge Project would be a very challenging task. A successful Implementation would require (i) clear understanding of the tasks involved – their sequencing and linkages; (ii) a well conceived organizational set up with well-trained efficient staff to carryout various tasks; and (iii) a carefully prepared work plan or activity schedule synchronizing resettlement with the construction schedules. The implementation should be based on the principle that all APs are paid their due compensation and assisted in resettlement of the project-affected people.

6.2 CAPACITY BUILDING FOR RESETTLEMENT MANAGEMENT

There is a need for a dedicated organizational set-up for resettlement management. The key organizations/agencies responsible for implementation of RAP involve:

- JMBA as the Executing Agency (EA) for the Project
- Deputy Commissioner(s) of the concerned Districts
- Local government Institution like Union *Parishad* which represents the APs in all forums in connection with land acquisition and resettlement; and
- Experienced NGOs, assisting the JMBA for implementing and monitoring the RAP.

These organizations/agencies are very much important to carry on a time-bound (i) Land Acquisition Plan and (ii) Resettlement Action Plan. In order to achieve capacity building of these bodies, specific terms of reference, legal/administrative authority, intensive training/workshop focusing on the tasks and processes and responsibilities, are considered imperative. In this connection the roles of the Project Resettlement Unit, the Project Director (Resettlement Unit), the Deputy Commissioner of the District and the NGO for LA & RP implementation are described below:

6.3 ROLE OF RESETTLEMENT UNIT

JMBA-RU will be located at the HQ. Two Field Offices will be opened – one each in Mawa and Janjira site. The main tasks of the Resettlement Unit under the responsibility of the Project Director are:

- Overall planning, management and monitoring of the resettlement program
- Synchronization of resettlement activity with JMBA construction schedule
- Design and set up, with the help of computer consultants, necessary computer facilities to prepare ID and entitlement files of APs, to monitor and evaluate its implementation
- Ensure that all eligible APs are identified, provided with their respective entitlement according to the resettlement policy and are relocated as per the implementation schedule and with minimum hardship
- Liaison with the DC's office regarding timely acquisition of lands required for JMBA and payment of compensation and ensure that these activities are completed as per schedule
- Ensure that all APs are informed about their entitlement and provided with the necessary ID card as proof of their eligibility to resettlement benefits
- Form Land Purchase Groups (LPGs) and ensure their smooth functioning including disposal of grievance through grievance redress mechanism
- Monitor the effectiveness of entitlement packages and when necessary, propose modification to JMBA management;

- Prepare Terms of Reference for NGOs/other agencies that are to execute specified components of resettlement program on behalf of JMBA-RU
- Select and appoint such agencies, monitor their progress and take remedial action when required. Prepare monthly and quarterly progress reports to JMBA management
- Prepare Terms of Reference for a “Post-Resettlement Survey” select and appoint appropriate agency to execute this survey some 2-3 years after each resettlement phase
- Propose to the JMBA any remedial action based on the Post-Resettlement Survey
- Payment of additional grant for replacement land, house/building construction grant, dismantling and removal assistance and all other financial assistances stipulated under the resettlement policy to all eligible APs
- Design resettlement sites in Mawa and Janjira ends with utilities and services (following the Jamuna model)
- Propose appointment of structure assessment team to determine realistic replacement costs of standard types of houses and other structures and accordingly recommend compensation rates for all structures that will be acquired in future
- Update, if required, the land market survey to determine the replacement cost of land in and around project area and accordingly recommend maximum allowable value for replacement land
- Estimate surplus lands and land required for commercial plots and device procedures for allotment in consultation with Project Director/Deputy Project Director, Consultant and NGO
- Identify EPs who have already vacated from the project affected area through information campaign and survey, plan resettlement measures for them according to the resettlement policy and implement the plan
- Coordinate with related agencies regarding possible adverse impact on population because of the changed river regime and where necessary assist JMBA to design and carry out mitigation measures
- Arrange and organize afforestation programs on JMBA surplus lands and in host areas with the help of Forest Department and / or NGOs
- Negotiate with JMBA contractors for arranging employment for APs in construction works;
- Develop area development programs including expansion of community facilities like education, sanitation, health, drinking water supply, etc. in host villages in consultation with the host population
- Study and monitor unforeseen adverse effects during and after construction and to take necessary mitigation measures
- Liaise with other government and non government agencies in the country on matters of mutual interest related to resettlement.

6.4 ROLE OF THE PROJECT DIRECTOR (PD) OF JMBA-RESETTLEMENT UNIT

The Project Director (Resettlement) will be the head of the Resettlement Unit at JMBA and he/she will work under the overall guidance and supervision of the Executive Director/Secretary-JMBA. The Project Director will be directly responsible for executing all tasks assigned to the Resettlement Unit and any other tasks assigned to him by the Executive Director from time to time. The PD will be assisted by three Deputy PDs and six Assistant PDs for HQ and field level management of the resettlement operations. The PD, as the head of the Resettlement Unit, will:

- (a) Prepare job descriptions for Deputy Directors (HQ and field), delegate tasks, responsibilities and powers to them, and supervise their work.
- (b) Plan, organize and manage the implementation of RAP in consultation with other participating agencies and in accordance with the time schedules.

- (c) In consultation with Executive Director and GOB carry out negotiations with NGOs and other participating agencies, contract specific tasks and activities with them and ensure that those agencies carry out and complete activities according to the agreement with JMBA.
- (d) In consultation with Executive Director and GoB, negotiate and finalize with banks, financing including micro-financing institutions operational and financial modalities of credit schemes and operations that form part of the resettlement program, and, ensure that such arrangements and agreements are working.
- (e) Identify and bring to the notice of the Executive Director any policy, administrative or financial actions that are necessary at the government level for smooth implementation of RAP.
- (f) Ensure that, funds necessary to carry out resettlement activities in the field are released to field offices, NGOs and other agencies assigned with resettlement task(s) on time and such activities are carried out without any administrative hindrance.
- (g) Monitor closely the implementation of RAP and whenever necessary propose modification/improvement to JMBA and to the donors.
- (h) Submit comprehensive periodic progress reports to JMBA management and through them to GOB and donors.

The PD/RU will be the full administrative and financial power to manage the resettlement project in all matters including the following: (i) full powers to appoint work-charged staff up to certain levels with prior sanction of the post. In cases of recruitment, promotion, transfer and disciplinary action against staff, normal rules of the Government will be followed; (ii) administrative control over all officers and staff of the Resettlement Unit, and (iii) subject to availability of fund and within PCP/PP provision the PD will exercise the full financial powers in matters relating to resettlement project:

- Regarding finalization of tenders of resettlement project, the PD will form tender evaluation in line with the GOB Procurement Policy and process the selection and award.
- All kinds of bills relating to the resettlement project will be finalized and approved by the PD and payments will be made through cash/cheque by JMBA accounts unit. The resettlement project accounts unit will assist PD in the process of finalization and approving of all kinds of bills. For reconciliation of accounts a quarterly meeting will be held with resettlement accounts and JMBA accounts and will be audited annually.
- Salary and all allowance of officers and staff either deputed or recruited in RU will be prepared and passed by PD. Payment of salary will be made by JMBA accounts through cash/cheque. Tour program of PD will be approved by ED, and the other staff by PD.

6.5 ROLE OF THE DEPUTY COMMISSIONER

The Deputy Commissioner has a key role in the implementation process. He has the legal responsibility of acquiring land & paying compensation directly to the APs as envisaged under the Acquisition and Requisition of Immovable Property Ordinance, 1982 and subsequent amendments made there under. Furthermore, he has access to official land records and the Legal/ Administrative authority for determining updated title of land and eligibility of APs for compensation under law (CCL) for land as well as several other assets covered by law. There is definite need to enhance the capacity of the offices of the concerned DCs with additional senior LA staff to process the LA request speedily and smoothly. The EA and the implementing NGO assisting the EA will work with the representatives of the Deputy Commissioners during Joint Verification of affected properties and the market survey of the properties for ascertaining current replacement value before budgeting for total compensation payable to the APs.

The conduct of these joint verification and market surveys and reconciliation of the 'market

value' and 'replacement value' will require a great deal of mutual understanding among the DC's office, JMBA and the implementing NGO. It is, therefore, essential that the Deputy Commissioners' accept the involvement of their representatives in Joint Verification and Market Surveys, budgeting of compensation, updating of land records of APs and in reconciliation of CCL with the additional compensation to be paid by the JMBA through the NGO.

The DC offices will receive funds for CCL from the JMBA and effect payment to the directly affected persons immediately to facilitate quick disbursement of differentials, if any, by the JMBA through the NGO. Participation of the Deputy Commissioner will be necessary in host area meetings. Similarly DCs' intervention/assistance will be required in matters such as land registration, disposal of land ownership disputes, allotment of char land and other surplus land.

6.6 ROLE OF IMPLEMENTING NGOS

It has now been generally recognized that the task of successfully implementing a RAP requires certain attitude, experience and skill in dealing with the grass root people, which are best available among some reputable NGOs in the country. Therefore, it has been adopted as government policy to commission the services of such an NGO to assist in the implementation of a RAP. The principal task of the NGO is to identify the project affected land, households/business enterprises and persons, estimating their losses and dislocations, work out their entitlement packages and prepare a compensation budget. The next main task is to assist the JMBA in disbursing entitlements which are beyond the purview of CCL. Again NGOs also play important role in ensuring that legitimate grievances of the APs are redressed and vulnerable are paid special attention. NGO is also required to undertake efforts to mitigate some community level dislocations caused by the project.

6.7 IMPORTANT BODIES ASSISTING IMPLEMENTATION OF RAP: JVT, PVAT, GRC AND RAC

To arrive at a fair standard of compensation sufficient to cover present Replacement Value of the lost resources, formation of a Joint Verification Team (JVT) and likewise a Property Valuation Advisory Team (PVAT) is considered important for each district. Again, to devise a mechanism to dispose of the complaints as per LARP, setting up a Grievance Redress Committee (GRC) for each area is also felt indispensable. In order to ensure collective sharing of responsibilities, JVT and PVAT need to be formed with representatives, drawn from the JMBA, District Administration, implementing NGO and GRC formed with representatives of the JMBA, NGO, APs including local UP Chairman and women members of UP under an administrative order of the Ministry of Communications with appropriate legal authority.

6.8 RESETTLEMENT ADVISORY COMMITTEE: FORMATION AND ROLE

During implementation stage, the NGO will form a Resettlement Advisory Committee (RAC) at each side with the approval of the Project Director, JMBA-RU in order to involve the local communities and APs in the implementation process. The RAC shall consist of the Assistant Director, JMBA (Chairman) and representatives from various stakeholders in the area. The Area Manager of the implementing NGO will act as Member-Secretary. The Committee will ensure local participation, provide local inputs and assist in all matters related to implementation of the RAP. The formation of GRC and its functions are discussed separately in the next section.

6.9 THE GRIEVANCE REDRESS COMMITTEE: FORMATION AND ROLE

The complex land record system in Bangladesh leaves considerable room for conflicts over titles to land and properties involving land, structures, trees, ponds, etc. Grievances may also be aired about the road alignment and/or the valuation of land and/or other property in determining compensation. There are established procedures in the L.A. Ordinance of 1982 about redress of some of these grievances. But recourse to law is always a complicated process, which usually discriminates against the poor with their lack of resources for litigation and is always time consuming. There are grievances, which can be easily resolved out of court if the law is properly explained and fair play made clear. It is with these objectives that Grievance Redress Committees set-up in each bank where land acquisition will be taking place. The GRC will generally consist of:

- a representative of JMBA, as convener;
- the Area Manager of the NGO as Member- Secretary;
- the Chairman of the UP where the complainant is registered as entitled person or his authorized member;
- One representative of APs; and
- Women member of the local Union Parishad.

The committee will be constituted under an administrative order of the Ministry of Communications. The main task of the GRC is to hear individual grievances of people affected by land acquisition in relation to the Resettlement Framework and Policy for the project. Where a grievance concerns issues covered by the Arbitration procedures outlined in the 1982 Ordinance, the committee will advise the complainant to seek redress in the appropriate court of law. Where a grievance relates to project specific definitions of entitlements and entitled persons, the Committee is empowered to make recommendation for approval by the Project Director.

A project affected person/or an entitled person has one month's time to appeal to the GRC after receipt/issue of Identity Cards or knowledge of his/her personal entitlements made public through publication of booklet. The appeal has to be in writing and be submitted to the Field Office of the JMBA. The GRC shall handle an appeal not later than one month after it has been received. The GRC shall keep written reports of all appeals received, and minutes of their meetings. JMBA Field Office will act as the secretariat of the GRC.

6.10 ROLE OF RESETTLEMENT MANAGEMENT CONSULTANTS TEAM

The Management Consultants Team acting on behalf of the Project and JMBA will ensure that sound methodologies and practices are used in the implementation of RAP. The consultants will advise on any changes in the modalities of the implementation work, participate in meetings with the contracted agency/NGO and JMBA, and monitor the work of the implementing agency in the field. The consultants will also review on behalf of PD-JMBA the implementation progress report submitted by the contracted agency/NGO on a regular basis.

6.11 MONITORING AND EVALUATION

Monitoring is an integral part of project implementation, which must be taken care of if the implementation has to proceed according to projected plan and schedule. Evaluation (pre-, mid- or post-) on the other hand is needed to bring the implementation on the right track towards attainment of project objectives and, if the situation demands, by rectification of the policies and strategies of the project originally set for.

6.11.1 Objectives:

The objectives of setting up a monitoring and evaluation systems (MES) are to:

- collect, analyze, report and use information about progress of resettlement;
- ensure that inputs are being provided on time, procedures are being followed and outputs are monitored and verified;
- ensure timely management action if there appears to be any failure in system due to management lapse; and
- ensure necessary corrective measures at policy level, if it is seen that there is a failure in system due to flaw in the design i.e. wrong theory, hypothesis or assumption, to ensure necessary corrective action at policy level; and to build up a benchmark database for the purpose of evaluation; both during course and ex post facto.

6.11.2 Institutional Framework for Supervision

Land Acquisition/Resettlement Plan implementation will be supervised and monitored by the Project Director, JMBA in coordination with the Deputy Project Director, Assistant Director, JMBA field officials and the staff of implementing NGO. The monitoring will be done both internally and externally to provide feedback to the JMBA on implementation of the RAP and effectiveness of the resettlement Policy.

The procedures for internal and external monitoring are discussed further, including reporting requirements. Intermittent monitoring and post-evaluation of resettlement activities will be carried out by the donors through an Independent Monitoring Team to assess the impact, sustainability of the resettlement program and to learn lessons for future policy formulation and planning.

6.11.3 Internal Monitoring

The internal monitoring by the EA will deal with all aspects of land acquisition and resettlement at the Project as well as field levels. The project management particularly, the Project Director, assisted by the JMBA field officers, will be mainly responsible to monitor the progress of all resettlement activities at the Project level, which include the following:

- information campaign and consultation with the APs;
- status of land acquisition for various road sections;
- land compensation payments;
- compensation for lost structures and assets;
- relocation of APs;
- land transfer from DCs and handing over to the contractors;
- payment of income/business restoration assistance; and
- implementation of roadside tree plantation program for vulnerable groups.

The benchmark for project level monitoring will come from land acquisition data and the social impact assessment. Further, the implementing agency will conduct field monitoring and assess the daily operation of land acquisition and resettlement activities. The mechanisms to be used in the field level monitoring include:

- review of AP files;
- informal sample surveys of APs
- key informal interviews;
- in-depth case studies; and
- community participatory meetings.

6.11.4 External Monitoring

The Resettlement Specialist of the Management Consultant Team (MCT)) will conduct external monitoring during the implementation of the project. External monitoring involves review of resettlement implementation, verification of the results of internal monitoring in the field, consultation with APs, officials and community leaders for preparing review reports. The specific tasks and methodology for external monitoring shall include:

- review of pre-project baseline data on APs;
- identification and selection of an appropriate set of indicators for gathering and analyzing information of resettlement impact;
- use of various formal and informal surveys for impact;
- use of various formal and informal surveys for impact analysis; and
- an assessment of resettlement efficiency, effectiveness, impact and sustainability, drawing lessons as a guide to future resettlement policy making and planning.

The external monitoring for resettlement will start as soon as the Management Consultant Team is mobilized. However, the Resettlement Consultant will continue monitoring the land acquisition, land schedule, compensation, relocation, implementing NGO activities, etc. External monitoring and supervision of the RAP implementation will continue throughout the implementation of the Project. The following should be considered as the basis for indicators in monitoring and evaluation of the resettlement project:

- Socio-economic conditions of the affected households/businesses (by gender)
- payments of compensations and various entitlements as per RAP
- changes in housing and income level as an impact of the Project
- rehabilitation of the affected people/businesses
- income restoration/social forestry program for vulnerable groups
- consultation with APs, particularly women/vulnerable groups
- grievance redressal cases
- levels of satisfaction of the APs in the post- relocated period; and
- over all effectiveness of the resettlement operations.

The monitoring report will inform the EA of the progress in the implementation of the RAP and make appropriate recommendations. JMBA will be responsible for undertaking any remedial measures to improve the implementation practices.

6.11.5 Independent Monitoring Team

A separate independent monitoring team will be responsible for monitoring and evaluation of the land acquisition, payments of compensation and RAP implementation. The team will be made of both international and locally available resettlement experts/consultants or a firm with relevant experience. The modalities will be further streamlined during the preparation of RAP. A post-resettlement impact evaluation will be carried out by the independent team to assess whether adverse impacts of the projects have been mitigated and/or addressed adequately, and APs have been able to restore and/or improve their pre-project standard of living as a result of resettlement and development.

6.11.6 Resettlement Databank

All resettlement-related data, including land acquisition, will be computerized through MIS by the implementing NGO. The data bank will act as the key source of information for implementation and monitoring purposes. EP files on individual households will be prepared for checking and verification purposes. The file will contain detailed

socio-demographic data on individual households, lost assets, compensation entitlements and payments, and relocation. The databank will enhance institutional capacity of both JMBA and the implementing NGO in resettlement management of the Project.

6.11.7 Reporting Requirements

During the implementation phase, the Project Director will prepare quarterly reports on the progress of resettlement activities and forward copies of the report to the Donors. A format for resettlement implementation monitoring to be devised for quarterly monitoring and data collection by field officials. The Resettlement Consultant of MCT will submit Monthly Resettlement Progress Monitoring Report to the JMBA and the Donors.

Chapter 7 Outstanding Tasks for Project Processing

7.1 INTRODUCTION

The scope of work and terms of reference for the study was limited to social impact assessment and formulation of a resettlement framework, including a preliminary cost estimate and a review of issues relevant to resettlement project implementation. In addition, the study concentrated on disclosure and community consultation and social analysis of the project affected and benefit areas. As a result, two important tasks remained at the completion of the present study. These include (i) preparation of a Land Acquisition Plan (LAP); and (ii) preparation of a Resettlement Action Plan (RAP). The preliminary technical design provides a framework, which will be further examined and finalized during the detailed design stage. Given this, it was deemed not appropriate to prepare the LAP and RAP. Instead, it was considered best to leave the tasks to JMBA and to the detailed design consultants. This chapter lists some of the outstanding work to be completed for further processing of the bridge project.

7.2 LAND ACQUISITION PLAN

JMBA will require preparing a Draft Land Acquisition Plan (LAP) prior to start of the detailed design for the project. The LAP will be based on the feasibility study and ROW/alignment as available. The LAP shall be updated further as per the detailed design and scope of land acquisition by the detailed design consultants. The requiring body (i.e., JMBA) will need to submit proposals for acquisition of land to the concerned DCs with the following papers and documents:

- 1) Mouza maps showing the alignments of the project
- 2) Lay-out of the plan
- 3) Administrative approval of the Ministry of Communications
- 4) Minimum requirements certificate
- 5) Schedule of land show names of owners and class of land
- 6) Contract to abide by the decision of the acquiring authority (i.e., DC)
- 7) Project Proforma of the project

The LA procedures are very complex and long drawn. Table 7.2.1 summarizes the procedures.

Table 7.2.1 Land Acquisition Process

Steps	Procedure
1	JMBA provides general information to the Ministry of Communications (MOC) about the project
2	JMBA hires NGO/agency to prepare detail LA Plan and then submit to JMBA
3	JMBA formally submits LA application to the Ministry of Communications
4	MOC forwards the LA application to the Ministry of Land (MOL)
5	MOL requests the concerned DCs for the processing of the LA and to examine the application
6	After District Land Acquisition Committee (DLAC) meeting, DCs report the examination results to MOL
7	MOL takes the matter to the Central Land Acquisition Committee (CLAC) and receives approval of CLAC and Prime Minister's Office (PMO)
8	After approval from CLAC, MOL requests DCs to proceed with land acquisition
9	Then DCs will conduct Joint Verification (JV) along with JMBA, NGOs and land owner
10	DCs comply with land owners' objections, and together with their opinion, report to MOL and formally announce the proposed land acquisition to the public through the Bangladesh Gazette
11	MOL examines the report from DCs and makes final Government decision on the proposed land acquisition
12	After the approval of the Ministry, DCs inform land owners directly u/s3 of the Ordinance of the acquisition order
13	The land owner(s) then make a declaration to the DCs of how much of their property is affected by the LA Order with 15 days of receiving the notification of acquisition
14	DCs examine the declaration of land owners and land prices in the area in the previous 12 months and then decide the compensation to be paid to each land owner.
15	DCs claim land acquisition expenses from JMBA
16	JMBA remits land acquisition expense to DCs
17	DCs pay compensation to land owners and ownership of the acquired land is transferred to JMBA with 7 days of payments

It usually takes about 2 years to complete the steps from 1 to 17. On payment of compensation to project-affected persons, the acquisition will be published in the Gazette u/s 11(1) of the 1982 Ordinance. However, payments of compensation by DCs may take several years to complete due to, among others, adequate and/or lack of legal papers by establishing title rights. As a result, project-affected persons often suffer the most. The following is a long list papers that need to be submitted by land owners to the Land Acquisition Office (LAO) for receiving compensation for land acquired.

- 1) Petition to the LAO containing (a) LA case number; (ii) serial number of the award, and (c) name of the *mouza*
- 2) Two attested photos of the petitioner
- 3) An agreement on a Taka 5 stamp with commitment to return the money drawn either fraudulently or through mistakes
- 4) Nationality certificate of the person issued by UP chairman
- 5) Rent receipt (up-to-date)
- 6) A form duly filled in (available at the LAO Office)
- 7) Attested photo copy of the deeds (at the time of receiving money, original copy is required to be shown)
- 8) Heirship certificate issued by the UP chairman
- 9) In case of more than one owner (i.e., co-sharer), no objection letter on a Taka 10 stamp with attested photo of the co-sharer
- 10) Petition of the amendment of awards to the LAO (if necessary) with reference to the change of ownership or in case of sale where no mutation has been done.
- 11) All signatures must be attested by the UP chairman

The implementing NGO must inform the above as part of information campaign to the affected persons and communities. In addition, APs may need assistance from NGOs to complete the process. JMBA/NGOs should take initiative with regard to speeding up the

process and payments of compensation prior to demolition and dislocation.

7.3 PREPARATION OF RESETTLEMENT ACTION PLAN (RAP)

The present study has identified the losses, compensation packages, outlined resettlement framework and indicative budget on the basis of cost figures available at the present point of time. Based on the Social Impact and Resettlement Framework, JMBA shall prepare a Draft RAP prior to start of the detailed design work. The RAP should contain an inventory of assets, based on additional surveys/studies indicated in the Feasibility Study Report. To save time, both LAP and RAP should be prepared simultaneously. JMBA will also be responsible to conduct additional studies as indicated here in this report as part of the Draft RAP preparation. The Draft RAP will be updated by the detailed design consultants, based on the final project design.

7.4 HIRING OF NGOS FOR SOCIAL PREPARATION AND RAP IMPLEMENTATION

Engagement of NGOs early on for social preparation of the APs and RAP implementation would be useful. It has been proved so in several other donor-funded projects in Bangladesh. Since RAP implementation will be a challenging task, competent and experienced NGOs should be hired by JMBA.

7.5 REVIEW OF THE BANKLINE/CHARLAND OWNERSHIP ISSUES

About one-third of the land to be acquired is eroded and/or bankline. This will turn into a very critical issue in acquisition and compensation payments due to apparent lack of clarity on the ownership of eroded and bankline. The bankline is considered as being the slope of the floodplain, affected by erosion. However, in the active floodplain it changes almost annually in the floodplain. The law requires that the concerned Assistant Collector (AC) office draws an alluvial and dilluvial line (AD Line) annually to demarcate the bankline in order to establish *khas* (or government) rights over land areas lost to the river (i.e., eroded lands). In reality, the AC office rarely does this. As a result, lands eroded – for example, in the last 10 years or more – are still cultivable land on government records. Owner(s) of such land normally continue to pay taxes to keep their title rights, at least for the first few years after erosion.

In the absence of an established AD line, the low water level (LWL) or PW2 is considered the AD line, because people cultivate land above the LWL during dry season. In case this land is required for any public purpose and/or project construction, it should be acquired and affected owners should be compensated. However, in legal terms, eroded lands (*sikosti*) inside the AD line (i.e., underwater land towards the river) are considered *khas* land only after declaration by AC, following demarcation of AD line. Legal owners of eroded lands are eligible to titles if the lands re-appear as a natural process within the 30 years from the date of erosion.³⁰ However, if the Government undertakes any development work such as bank protection, the owners will cease their potential claims. This added complexity is due to lack of up-to-date land records and maps, particularly for riverine areas. Therefore, the issues are not only complex, but require further investigations to address issues like (a) ownership rights and (b) compensation of *khas* land.

7.6 STUDY OF IMPACTS ON CHARLANDS

Although the bridge construction will not constrict the river itself, there could be some

³⁰ *The East Bengal State Acquisition and Tenancy Act* (1951, revised 1994). See A. K. M. Siddique, *Common Land Laws and Rules*, Dhaka, August 2001.

unforeseen impacts on the shoals (chars). The Padma chars are quite densely settled and crops are produced during the *kharip* season. Any impact on these people and their assets/properties and crops shall have to be identified and compensated for in the case of negative impacts of the bridge construction.

7.7 TRAINING NEEDS FOR IGAS

As is the past experience in similar project implementation such as the Jamuna Bridge, nearly 50% of the APs did not buy land against lost lands; many decided to invest in business or changed profession. This means that APs may need assistance and guidance for investment choices. Some businesses and professions may be lost altogether and the people affected may need to change professions. These will involve identification of alternative jobs/skills, skills training needs assessment and training programs. The trained APs in new trades and profession may be in need of capital and equipment to start new businesses/trades. Credit facilities may have to be extended and some vulnerable groups may need to form cooperatives/associations, informal groups and skill training, credit and supervision may be necessary. These will have to be assessed and extended.

7.8 DEVELOPMENT OF RESETTLEMENT SITE(S)

The landless, marginal landholders, vulnerable groups and squatters etc will have to be resettled in project sponsored resettlement sites with provision for employment/access to IGAs. The resettlement sites must be identified and cost estimates for RS sites must be included in the Draft RAP. Given the locations and distance covered by the approach road on the right bank, four resettlement sites (RS Site) would be required (1 in Mawa and 3 in Janjira). In Mawa, the northern-end of the market past the ferry ghat may be considered a potential site. In Janjira, three sites – one each at the bridge landing area in Naodoba, Kutubpur, and Mataborerchar – may be considered. The site selection must be conducted in consultation with the affected communities. For all RS sites, lands have to be acquired, developed, utilities and services to be developed and O&M issues to be addressed. These aspects shall have to be planned and implemented.

7.9 INTERNAL/EXTERNAL MONITORING AND EVALUATION

The implementation of the RAP shall be periodically monitored and performance/target achievements evaluated by internal and external auditors. The deficiencies and inadequacies reported shall have to be addressed appropriately and in time.

7.10 KEY OUTSTANDING ACTIVITIES

The feasibility study has recommended an implementation plan for further processing of the project, starting with some outstanding tasks (for example, draft LAP and RAP) to be completed by JMBA with its own resources. The detailed design work is likely to commence in the 4th quarter of 2005. The LAP and RAP will be updated during the detailed design period.

Table 7.10.1 provides a schedule for completing the outstanding tasks, including those to be conducted by detailed design consultants as part of pre-construction work. Some of the activities can be conducted simultaneously to save time and to complete the project preparation work. Many resettlement-related works will continue through the construction and post construction period. The RAP to be prepared must contain a time-bound plan for resettlement/income restoration activities and monitoring work to be carried out during construction and post-construction period. Presently, the project construction work is targeted for 4th quarter of 2008 to be completed in March 2013.

Table 7.10.1 Bar Chart of Key Activities for Project Preparation

Tasks to be carried out by JMBA and Detailed Design Consultants (Pre-construction period) for project construction			2005			2006			2007			2008			2009	
Main Task	Activity	Time Required	2	3	4	1	2	3	4	1	2	3	4	1	2	
Preparation of LAP and RAP	• Land Survey/ LA Plan and RAP	6 months	■	■												
	• Review and approval of LAP/RAP by MOC				■											
	• Updating and Finalization of LAP/RAP by DD Consultants	6 months			■	■										
	• Submission of revised LAP and RAP for approval by MOC/MOL and DCs for LA processing	3 months					■									
	• Establishment of RU in JMBA	3 months			■											
	• Notification u/s3 to land owners for acquisition	3 months						■								
	• Joint Verification of Acquired Assets	3 months							■							
	• Submission of LA costs estimates to JMBA/MOC by DCs	3 months								■						
	• Payments of compensation for acquisition	12 months									■	■	■	■		
	• Bid for construction of Resettlement sites – Public Notice to bid and other preparations – July 2006								■							
	• Bid open and evaluation – Sept 2006									■						
	• Negotiation and contracting – Dec 2006										■					
	• Construction work – Jan-December/07	12 months									■	■	■	■		
	• Relocation of Affected persons	6 months											■	■		
	• Supervision and monitoring by CS consultancy – Oct08-March 2013														■	■
• Construction of the bridge facilities – Oct/2008															■	

ANNEX I COMPENSATION POLICY FOR RESETTLEMENT AND REHABILITATION OF PROJECT AFFECTED PERSON/ENTITLEMENT MATRIX PADMA BRIDGE CONSTRUCTION PROJECT

CATEGORY 1: LOSS OF AGRICULTURAL AND COMMERCIAL LANDS

<i>Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<p>1. Replacement land or CCL which includes 50% premium plus the differential cost between MARV as determined by JVT and PVAT</p> <p>2. Stamp duties and Registration fees on purchase of replacement land by the APs, if purchase is made within 12 months of receiving CCL or during implementation period (whichever is longer) and will be upto the amount of land one can buy using the compensation money.</p> <p>3. Transition allowance for loss of income from cultivated land.</p> <p>4. For Homestead and Commercial Lands, Land Development Costs @ 30% of MARV</p>	<p>1. Legal owner(s) as determined by the DC during the process of CCL payment and / or determined by court in cases of legal disputes.</p> <p>2. Transition allowance will be valid only for owner-cultivators as per project-specific policy (col 5).</p>	<p>1. Legal owners will be assisted by NGO/JMBA to establish legal appropriate evidence after notice under section 3 is served.</p> <p>2. If acquisition begins more than 12 months after JVS, the replacement value will be updated @ 10% per annum.</p> <p>3. If replacement value is greater than CCL, the difference will be paid by JMBA through NGO.</p>	<p>1. NGO will examine whether they have the required legal documents, and advise and assist with any issues that might delay receipt of CCL</p>	<p>1. Landowners (and others) will be informed of the details of the compensation policies payment procedures, stamp duty refund etc.</p> <p>2. PVAT will determine the mouza-wise current market prices of the lands, considering land type in terms of number and types of crops produced a year, flooding, irrigation facilities, accessibility and other factors that might influence the market prices.</p> <p>3. Current market prices of land determined by PVAT will be the basis for determining the replacement value</p> <p>4. Title updating and determination of the usufructuary and other rights will be made before issuance of notice under section 6 (assisted by NGO).</p> <p>5. For losses of upto 1 (one) acre of land entitlement as transition allowance will be Tk. 3,000/- and for loss of land above 1 (one) acre, it will be Tk. 6,000/=.</p> <p>6. The implementing NGO shall strongly encourage and motivate the EPs to purchase land or invest the money in productive/income generating activities.</p>	<p>1. JMBA, through NGO, will carry out information dissemination on RAP policies, and assist the APs in updating their ownership & other records.</p> <p>2. Difference between CCL and Replacement Value, if any, and the Transfer Allowance will be paid directly to the APs by JMBA through NGO.</p> <p>3. Stamp duties will be paid directly to the APs (on production of receipt of buying stamps) by JMBA through NGO.</p>

CATEGORY 2: LOSS OF HOMESTEAD LAND

<i>Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<p>1. Replacement land or CCL and the differential cost between MARV (as determined by JVT and PVAT) and CCL.</p> <p>2. Stamp duties and Registration fees on purchase of replacement land by the APs, if purchase is made within 12 months of receiving CCL or during implementation period (whichever is longer) and will be upto the amount of land one can buy using the compensation money.</p> <p>3. Land Development @ 30% of MARV at new locations</p>	<p>1. Legal owner(s) as determined during the process of making CCL payment by DC and/or determined by court in cases of legal disputes.</p>	<p>1. Legal owners will be assisted by NGO/ JMBA to establish appropriate legal evidence after notice under section 3 is served.</p> <p>2. If replacement value is greater than CCL, the difference will be paid by JMBA through NGO subject to purchase/ arrangement of land for homestead.</p> <p>3. If acquisition begins more than 12 months after JVS, the replacement value will be updated @ 10% per annum.</p>	<p>1. NGO will examine whether they have the required legal documents, and advise and assist with any issues that might delay receipt of CCL.</p> <p>2. NGO will organize the APs into Land Purchase Groups (LPGs) and advise and assist them finding, negotiating and purchasing private lands for relocation.</p>	<p>1. Landowners (and others) will be informed of the details of the compensation policies, payment procedures, stamp duty refund</p> <p>2. Current market prices of land determined by PVAT will be the basis for determining the replacement values.</p> <p>3. Title updating and determination of the usufructuary and other rights will be made before issuance of notice under section 6 (assisted by NGO).</p>	<p>1. JMBA, through NGO, will carry out information dissemination on RAP policies, and assist the APs in updating their ownership & other records.</p> <p>2. Difference between CCL and MARV will be paid directly to the APs by JMBA through NGO.</p> <p>3. Stamp duties will be paid directly to the APs (on production of receipt of buying stamps) by JMBA through NGO.</p>

CATEGORY 3: LOSS OF HOUSEHOLDS/HOMESTEAD AND OTHER PHYSICAL STRUCTURES

(Except Commercial or Industrial)

<i>Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<p>1. Replacement Value of Structures CCL and the MARV for legal owner</p> <p>2. Transfer Grants (TG) @ Tk.2000/-, Tk. 5000/- and Tk. 10000/- over CCL for kutchha, semi pucca & pucca structures.</p> <p>3. Owner will be allowed to take all salvageable materials (free of cost) without delaying the project works.</p> <p>4. Construction Grant (CG) @ 15%, 20% and 30% over Replacement Value for kutchha, semi pucca & pucca structures.</p> <p>5. Special assistance for female-headed households @ Tk. 2000, Tk. 3000 and Tk. 5000 for katchha, semi-pucca and pucca structures</p> <p>6. Serial Nos 2, 3, 4 & 5 will be applicable to squatter households (based on above parameters, rate to be calculated on Market Value of structures by JVT/PVAT).</p> <p>7.Special Assistance of Tk. 5000/- for each disabled AP.</p>	<p>1. Legal owner as determined by the DC during the CCL payment process and/or determined by court in cases of legal disputes.</p> <p>2. Socially recognized owners for structures built on public lands, as recognized by BSES and verified by JVT.</p>	<p>1. Applicable to all structures standing on the acquired lands at the time of issuance of notice under section 3, or on public lands to be vacated for the project.</p> <p>2. Additional assistance of Tk 5,000/- for each of female headed HH and disabled to be paid at the time of moving.</p> <p>3. JVT will distinguish between genuine and fraudulent structures and record the losses accordingly.</p>	<p>1. NGO will check whether or not the APs have the required legal documents, advise and assist APs with any issues that might delay receipt of CCL</p> <p>2. A plot at normal resettlement site for the most vulnerable EPs destitutes and squatters HH to be arranged by the project.</p>	<p>1. JVT will verify floor areas and materials based on BSES data and JVT & PAVT will assess the replacement value.</p> <p>2. Compensation must be paid before EP dismantles and removes the structures.</p> <p>3. HCG will be paid when EP has purchased/ arranged replacement homelot or structure within 12 months of receipt of CCL and is ready to start construction of new house.</p> <p>4. If the entitlement is greater than the amount assessed by the DC, the additional amount will be paid by JMBA through NGO.</p> <p>5. Notice under section 3 will establish the cut-off date for all structures not covered under CCL.</p>	<p>1. DC pays the CCL to all legal owners.</p> <p>2. JMBA, through NGO, pay all owners recognized by BSES and verified by JVS.</p>

CATEGORY 4: LOSS OF STRUCTURES USED FOR COMMERCIAL & INDUSTRIAL ACTIVITY

<i>Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<p>1. Replacement Value for legal owner.</p> <p>2. Transfer Grants (TG) @ Tk.2000/- Tk.5000/- and Tk.10,000/- for katcha, semi pucca and pucca structures.</p> <p>3. Owner will be allowed to take all salvageable materials (free of cost) without delaying project works.</p> <p>4. Construction Grant (CG) @ 15%, 20% and 30% over Replacement Value for kutca, semi pucca and pucca structure.</p> <p>5. Serial Nos 2, 3 & 4 will be applicable for squatter unit (Based on above parameter, rate to be calculated on Market Value of structures by JVT/PVAT).</p>	<p>1. Legal owner as determined by the DC during the CCL payment process.</p> <p>2. Socially recognized owners for structures built on public lands, as recognized by BSES and visited by JVT.</p>	<p>1. Applicable to all structures standing on the acquired lands at the time of issuance of Notice 3, or on public lands to be vacated for the project.</p> <p>2. JVT will distinguish between genuine and fraudulent structures and record losses accordingly.</p>	<p>1. CG will be paid when EPs have purchased/ arranged replacement land or structure within 12 months of receipt of CCL and is ready to start construction of new house.</p> <p>2. NGO will examine whether they have the required legal documents, and advise and assist resolution of any issues that might delay receipt of CCL.</p> <p>3. A business premise for each loser at a place near service area arranged by the project.</p>	<p>1. JVT will verify floor areas and materials based on BSES data and JVT & PAVT will assess the replacement value.</p> <p>2. Compensation must be paid before EP dismantles and removes the materials.</p> <p>3. If the entitlement is greater than the amount assessed by the DC, the additional amount will be paid by JMBA through NGO.</p> <p>4. Notice under section 3 will establish the cut-off date for all structures not covered under CCL.</p>	<p>1. DC pays the CCL to all legal owners.</p> <p>2. JMBA, through NGO, pay all owners recognized by BSES and verified by JVT.</p>

CATEGORY 5: LOSS OF TIMBER AND FRUIT BEARING TREES, AND BAMBOO AND BANANA GROVES

<i>Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<p>1. <i>Timber trees and bamboo's</i>: Estimated current value of individual trees and bamboo's determined by PVAT and JVT.</p> <p>2. <i>Fruit-bearing trees (without timber)</i>: If the tree is at or near fruit-bearing stage estimated current value of the tree determined by PVAT and JVT.</p> <p>3. <i>Fruit-bearing trees with timber</i>: If the tree is at or near fruit-bearing stage, value of timber + 30% of the timber value as compensation for fruits to be determined by PVAT and JVT.</p> <p>4. <i>Banana groves</i>: Estimated current value of one-time crop of each grown-up tree determined by PVAT and JVT.</p> <p>5. Owners will be allowed to fell and take the trees and fruits, after payment of compensation without delaying the project works.</p>	<p>1. Legal owner as determined by the DC during CCL payment process.</p> <p>2. Socially recognized owners of trees grown on public lands, as recognized by BSES and verified by JVS.</p>	<p>1. Estimated market value of different species of trees as determined by PVAT and JVT based on categories: big, medium, small and plant (Saplings recently planted).</p> <p>2. Value of perennial fruits to be determined as three years value of crop at harvest price.</p>	<p>1. NGO to explain the RAP policies regarding compensation for the trees of different species and size and make the EPs aware that they could take the trees and fruits.</p> <p>2. JMBA will distribute sapling (fruit/ timber) through the implementing NGO @ 5 numbers per household.</p>	<p>1. Standard rates for trees of different species are available with the Department of Forestry. Valuation by BSES will also be available.</p> <p>2. The implementing NGO will ensure plantation and post replantation care.</p>	<p>1. DC will pay the CCL to the legal owners.</p> <p>2. JMBA, through NGO, will pay the difference if any, to the owners not covered CCL.</p>

CATEGORY 6: LOSS OF STANDING CROPS

<i>Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<ol style="list-style-type: none"> 1. Compensation for standing crops, if any, affected at the time of property handover. 2. Owner will be allowed to take plants and crops, if any. 	<ol style="list-style-type: none"> 1. Cultivator (person who planted the crop) whether owner, leaseholder, tenant, sharecropper, etc. (on formal or informal arrangements) as determined by JVT. 	<ol style="list-style-type: none"> 1. Estimated market value at harvest, to be determined by PVAT and JVT. 	None	<ol style="list-style-type: none"> 1. Market value at harvest will be established by JVT and PVAT or on-site verification before handover, if the BSES is conducted during the non-agricultural season. 2. Verify whether or not crop is there in the field on the acquired properties at the time of handover. 	<ol style="list-style-type: none"> 1. The DC will pay the compensation to the legal owners. 2. JMBA, through NGO, will pay the difference to the owners if CCL and market value are different.

CATEGORY 7: LOSS OF PONDS AND FISH STOCK

<i>Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<ol style="list-style-type: none"> 1. Replacement Value of pond, including cost of land and digging, whichever is greater. 2. 25% of average value of fish stock per decimal of pond area, as compensation for loss of income. 3. The EP will be allowed to harvest and take away the fish. 	<ol style="list-style-type: none"> Legal owner of the pond and fish as determined by the DC during CCL payment. or, Socially recognized owner of the fish, as determined by BSES and verified by JVS. 	<ol style="list-style-type: none"> 1. Legal owner will get the compensation if both pond and fish stock are owned by him/her. 2. If the fishpond is on public land and not under lease from GoB, the EP is entitled to compensation for 25% of the existing fish stock and is allowed to take the fish. 	None	<ol style="list-style-type: none"> 1. Magnitude of fish stock and value to be determined by PVAT and JVT. 2. Verify if the legal owner is also the owner of the fish-stock. 	<ol style="list-style-type: none"> 1. The DC will pay the CCL to the legal owners. 2. JMBA, through NGO, will pay the difference if any, not covered under CCL to the owners.

CATEGORY 8: LOSS OF USUFRUCT RIGHTS IN MORTGAGED-IN, LEASED-IN AND KHAI-KHALASHI LAND

<i>Definition of Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<p>1. If Legal Agreement exists: CCL, plus difference between CCL and MARV determined by PVAT and JVT whichever is greater.</p> <p>2. If no Legal Agreement exists: The legal owner collects compensation from DC and pays the mortgagee any amount outstanding on the acquired property. The implementing NGO will ensure that.</p> <p>3. Transition Allowance for actual cultivator to cover the loss of income from the land.</p>	<p>1. Mortgagee/ lease holder holding the legal papers,</p> <p>2. Socially recognized mortgagee or person holding lease or khai-khalashi rights, in cases of oral agreement.</p>	<p>1. With Legal Agreement: Legal owner and mortgagee / leaseholder will be paid CCL by DC as per the law.</p> <p>2. With Verbal Agreement: Legal owner will be paid CCL by DC. The legal owner will pay the outstanding liabilities to the mortgagee/ leaseholder/holder of khai-khalashi right.</p> <p>3. In cases, where CCL is smaller than the replacement value, legal owner will get the additional payment from JMBA if (i) all liabilities are already paid up; (ii) if not, the legal owner will get the residual payment after all liabilities are paid up.</p> <p>4. Transition allowance will be paid to to the actual cultivator of the acquired land.</p>	None	<p>1. JVT will identify, by checking with each landowners and others, any persons who presently have interest in the acquired land due to mortgage, lease or khai-khalashi right.</p> <p>2. Any disputes over status of present interest in the land will be resolved through grievance redress procedure. Once resolved, NGO will ensure payment of all outstanding liabilities on the land to the appropriate persons.</p> <p>3. Transition allowance to cover loss of income will be paid to the present cultivator of the land (mortgagee or legal owner or leaseholder or the person with khai-khalashi right) as per project specific policy prescribed in Category: 1 col 5. sl. 5.</p>	<p>1. DC will pay the legal owner / mortgagee / leaseholder, if the contract is executed legally, OR to the legal owner if the agreement is verbal.</p> <p>2. NGO will mediate payment of any outstanding liability to the mortgagee / leaseholder / person with khai-khalashi right.</p> <p>3. JMBA, through NGO, will make the payment of Transition Allowance.</p>

CATEGORY 9: LOSS OF INCOME FROM DISPLACED COMMERCIAL/INDUSTRIAL PREMISES

<i>Definition of Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<p>1. Compensation for loss of business for restoring income.</p> <p>2. One-time moving assistance only for the tenants.</p>	<p>1. Any businessman or artisan operating in premises, at the time of issuance of Notice under Section 3.</p> <p>2. One-time moving assistance only for tenants (business operators not receiving reconstruction grant)</p>	<p>1. Compensation is based on average annual turnover for three weeks (average value as determined by JVT and PVAT)</p> <p>2. Moving assistance is equivalent to compensation for regular wage rate x 90 days, to be determined PVAT.</p>	<p>1. EPs will be brought under income generating program through the implementing NGO.</p>	<p>1. Primary eligibility to be based on shopkeepers and businessmen identified in the BSES and verified by JVT. Further claims and grievances, if any, will be settled by the grievance redress committee.</p>	<p>1. Cash grant will be paid by JMBA through NGO.</p>

CATEGORY 10: TEMPORARY LOSS OF INCOME (WAGE EARNERS IN AGRICULTURE, COMMERCE & INDUSTRY)

<i>Definition of Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
<p>1. Grant to cover temporary loss of regular wage income.</p> <p>2. Income Restoration Assistance to vulnerable groups from Social Development Fund to be created by the Project.</p>	<p>1. Regular wage earners affected by the acquisition.</p>	<p>1. Grant for wage loss for farm labour @ of Tk.100/- for 90 days and that for non-farm labour @ Tk.120 for 60 days.</p>	<p>1. EPs will be brought under income generating program through the implementing NGO.</p> <p>2. Involvement of APs in Construction Work.</p> <p>3. Involvement of APs in tree plantation and social afforestation.</p> <p>4. A plot at resettlement site for most vulnerable EPs distitutes and squatters to be arranged by the project.</p>	<p>1. EP must be employee of landowner or business located in the acquired lands for at least six months in the last twelve months, as determined by JVT.</p> <p>2. Assessment of need of vulnerable group to be made before operation.</p>	<p>1. Grant to be paid by JMBA through NGO.</p>

CATEGORY 11: LOSS OF INCOME FROM RENTED RESIDENTIAL / COMMERCIAL PREMISES

<i>Definition of Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
1. Rental Assistance of Tk.2500 for loss of income from leased/rented structures.	1. Owner of the rented premises.	1. Shifting allowance / moving assistance is meant for alternative housing.	EPs will be brought under income generating program through the implementing NGO.	1. Socio-economic survey to identify the owner of the business premises duly verified by JVT.	1. Grant to be paid by JMBA through NGO.

CATEGORY 12: ADVERSE IMPACT ON HOST POPULATION DUE TO DISLOCATION OF APs DURING AND AFTER IMPLEMENTATION OF PROJECT

<i>Definition of Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
1. Provision for Tubewell for pure drinking water and slab latrine for Sanitation. 2. Improvement of education and other public services.	1. Displaced relocated household /affected or host area/villages where displacees have resettled..	1. Investment in the host area to improve health, education, and other public services.	Afforestation programme in host area.	1. Assessment of community needs 2. Implementation of mitigation measures.	1. JMBA-Resettlement Unit (RU), NGO 2. Trust fund of GoB

CATEGORY 13: PEOPLE ADVERSELY AFFECTED BY BRIDGE E.G. CHANGE IN WATER LEVELS UPSTREAM, OR DOWNSTREAM, OR IN UNFORESEEABLE WAYS

<i>Definition of Entitlement</i>	<i>Definition of Entitled Person (EP)</i>	<i>Application Guidelines</i>	<i>Additional Services</i>	<i>Implementation Issues</i>	<i>Responsible Organization</i>
1	2	3	4	5	6
1. Assistance to mitigate impacts.	1. Person affected adversely by the bridge, other than the above categories.	1. Assistance will be made available to EPs as soon as they might be affected.	1. Additional assistance will be identified as per the nature of the impact (s).	1. The mitigation measure are proposed under the EAP, RU and Environmental unit will closely coordinate its activities and monitor and mitigate adverse impacts. 2. Plan for mitigation will be developed by the JMBA.	1. JMBA-RU, NGO and other relevant agencies. 2. JMBA-Environmental Unit (EU).

ANNEX II COST ESTIMATES

Area : ALL (East End & West End)

Sl. No.	Category of loss	Quantity in ha/sft/No.	Rate in Tk.	Amount in Million Tk.
A	Land with Types (Land to be Acquired)			
1	(a) Settlements (Homestead), East (ha)	40.88	11,115,000	454.40
	(b) Settlements (Homestead), West (ha)	91.24	7,410,000	676.12
2	(a) Agriculture, East (ha)	8.91	5,804,500	51.70
	(b) Agriculture, West (ha)	418.33	1,482,000	619.96
3	(a) Commercial, East (ha)	5.12	11,115,000	56.89
	(b) Commercial, West (ha)	0.83	7,410,000	6.16
4	(a) Waterbodies, East (ha)	7.59	5,804,500	44.08
	(b) Waterbodies, West (ha)	43.60	2,593,500	113.08
	Sub Total Land Acquisition, East	62.50		607.06
	Sub Total Land Acquisition, West	554.00		1415.31
B	Stamp duty and Registration fees (@ 15% for 50% of land acquired), East			45.53
	Stamp duty and Registration fees (@ 15% for 50% of land acquired), West			106.15
C	Crop, East @ of Tk. 61,750/ha	8.91	61,750	0.55
	Crop, West @ of Tk. 61,750/ha	418.33	61,750	25.83
D	Fishstock, East @ of Tk. 74,100/ha Water area	7.59	74,100	0.56
	Fishstock, West @ of Tk. 74,100/ha Water area	43.60	74,100	3.23
E	Structures			
1	(a) Katcha, East (Sft)	105,809	200	21.16
	(b) Katcha, West (Sft)	110,688	200	22.14
2	(a) Semi Pucca, East (Sft)	31,629	300	9.49
	(b) Semi Pucca, West (Sft)	8,927	300	2.68
3	(a) Pucca, East (Sft)	179,741	600	107.84
	(b) Pucca, West (Sft)	5,569	600	3.34
4	(a) Thatched, East (Sft)	50,702	90	4.56
	(b) Thatched, West (Sft)	229,951	90	20.70
5	(a) Tin, East (Sft)	777,520	240	186.60
	(b) Tin, West (Sft)	643,150	240	154.36
	Other Structures :			
6	Latrin (Katcha), East (Sft)	165	1,200	0.20
	Latrin (Katcha), West (Sft)	1,147	1,200	1.38
7	Latrin (Slab), East (Sft)	3,934	2,000	7.87
	Latrin (Slab), West (Sft)	1,637	2,000	3.27
8	Latrin (Pucca), East (Sft)	871	24,000	20.90
	Latrin (Pucca), West (Sft)	191	24,000	4.58
9	Tubewell, East (No)	661	10,500	6.94
	Tubewell, West (No)	1,599	10,500	16.79
10	Chatal, East (No)	4,800	26	0.12
	Chatal, West (No)		26	
11	Boundary Wall (Tin), East (Sft)	1,590	50	0.08
	Boundary Wall (Tin), West (Sft)	853	50	0.04
12	Boundary Wall (Pucca), East (Sft)	1,332	350	0.47
	Boundary Wall (Pucca), West (Sft)	5,518	350	0.19
13	RCC Pillar, East (No)	74	350	0.03
	RCC Pillar, West (No)	-	350	-
	Sub Total of Structure, East			366.27

Sl. No.	Category of loss	Quantity in ha/sft/No.	Rate in Tk.	Amount in Million Tk.
	Sub Total of Structure, West			229.47
F	Trees (Calculation made on average rate)			
1	Large, East (No)	18,992	250	4.75
	Large, West (No)	155,644	230	35.80
2	Medium, East (No)	12,563	240	3.02
	Medium, West (No)	111,436	225	25.07
3	Small, East (No)	27,312	180	4.92
	Small, West (No)	93,453	170	15.89
4	Sapling, East (No)	25,062	10	0.25
	Sapling, West (No)	89,084	10	0.89
	Sub Total of Trees, East	83,929		12.93
	Sub Total of Trees, West	449,617		77.65
G	(a) Fruits (@ of 30% Big & Medium Fruits Tree Values: Tk. 6,568,500/- for 1 Years), East			1.97
	(b) Fruits (@ of 30% Big & Medium Fruits Tree Values: Tk. 16,507,010/- for 1 Years), West			4.95
	Sub Total (A-G), East			1034.88
	Sub Total (A-G), West			1862.59
H	Transition Allowances loss of income from cultivated land, East (No)	220	3,000	0.66
	Transition Allowances loss of income from cultivated land, West (No)	10,332	3,000	31.00
I	House Construction Grant (HCG)			
1	(a) Katcha (15% of Structure Value: Tk. 21,161,930/-), East			3.17
	(b) Katcha(15% of Structure Value: Tk. 22,137,600/-), West			3.32
2	(a) Semi Pucca (20% of Structure Value: Tk. 9,488,850/-), East			1.90
	(b) Semi Pucca (20% of Structure Value: Tk. 2,678,100/-), West			0.54
3	(a) Pucca (30% of Structure Value: Tk. 107,844,750/-), East			32.35
	(b) Pucca (30% of Structure Value: Tk. 3,341,400/-), West			1.00
	Sub Total of HCG, East			37.43
	Sub Total of HCG, West			4.86
J	House Transfer Grant (HTG) for structure			
1	(a) Katcha, East (No)	960	2,000	1.92
	(b) Katcha, West (No)	815	2,000	1.63
2	(a) Semi Pucca, East (No)	135	5,000	0.68
	(b) Semi Pucca, West (No)	44	5,000	0.22
3	(a) Pucca, East (No)	113	10,000	1.13
	(b) Pucca, West (No)	28	10,000	0.28
	Sub Total of HTG, East			3.73
	Sub Total of HTG, West			2.13
K	Land Development Grant (30% of Settlement & Commercial Land Value of Tk. 511,290,000/-), East			153.39
	Land Development Grant (30% of Settlement & Commercial Land Value of Tk. 682,274,268/-), West			204.68
L	Special Assistance for Female Headed Household, East (No)	123	5,000	0.62
	Special Assistance for Female Headed Household, West (No)	122	5,000	0.61

Sl. No.	Category of loss	Quantity in ha/sft/No.	Rate in Tk.	Amount in Million Tk.
M	Special Assistance for Disabled, East (No)	128	5,000	0.64
	Special Assistance for Disabled, West (No)	76	5,000	0.38
N	Rental Assistance for rented/leased Commercial & Residential Premises, East (No)	246	2,500	0.62
	Rental Assistance for rented/leased Commercial & Residential Premises, West (No)	25	2,500	0.06
O	Moving Assistance for tenant (Business Operator) [wage for 90 days], East (No)	381	120	4.11
	Moving Assistance for tenant (Business Operator) [wage for 90 days], West (No)	212	120	2.29
P	Income Restoration Grant for businessman or Artisan (3 weeks value of average annual turnover), East (No)	381	L.S	4.97
	Income Restoration Grant for businessman or Artisan (3 weeks value of average annual turnover), West (No)	212	L.S	1.59
Q	Income Restoration Grant for wage loser			
1	Non-farm Labour (for 60 days), East (No)	487	120/per day	4.38
	Non-farm Labour (for 60 days), West (No)	288	120/per day	2.59
2	Farm Labour (for 90 days), East (No)	156	100/per day	1.40
	Farm Labour (for 90 days), West (No)	367	100/per day	3.30
R	Cost of saplings (5 mango seedlings for each HH), East (No)	1345	10	0.07
	Cost of saplings (5 mango seedlings for each HH), West (No)	1805	10	0.09
S	Slab-Latrine for Relocated Household displaced by project, East (No)	1352	2000	2.70
	Slab-Latrine for Relocated Household displaced by project, West (No)	1789	2000	3.58
T	Hand Tube-well for host areas/villages where diplacees resettled, East (No)	136	10500	1.43
	Hand Tube-well for host areas/villages where diplacees resettled, West (No)	179	10500	1.88
U	Social Development Fund (skill training, credit operation, etc.), East		LS	50.00
	Social Development Fund (skill training, credit operation, etc.), West		LS	50.00
V	Cost for Resettlement sites and their development (2 sites), East		LS	134.00
	Cost for Resettlement sites and their development (2 sites), West		LS	180.00
	Sub Total (I-W), East			400.14
	Sub Total (I-W), West			489.04
W	Others			
1	External Monitoring, East		LS	10.00
	External Monitoring, West		LS	10.00
2	NGO operation for 10 years, East		LS	40.00
	NGO operation for 10 years, West		LS	50.00
3	Updating replacement value of land if acquisition begins 12 months after JVS, East		LS	85.22
	Updating replacement value of land if acquisition begins 12 months after JVS, West		LS	198.67
	Sub Total of Others (W.1-W.3), East			135.22
	Sub Total of Others (W.1-W.3), West			258.67
X	Block Allocation for Indirectly Affected Persons, interests and structures, East		LS	65.00

Sl. No.	Category of loss	Quantity in ha/sft/No.	Rate in Tk.	Amount in Million Tk.
	Block Allocation for Indirectly Affected Persons, interests and structures, West		LS	74.47
	<i>Total, East =</i>			<i>1635.23</i>
	<i>Total, West =</i>			<i>2684.77</i>
	Grand Total Tk. =			4320.01
	Grand Total US\$ = (1US\$ = Tk. 60.00)			\$72.00

Y *	Land to be requisitioned, East	30	370,500	11.12
	Land to be requisitioned, West	144	370,500	53.35

* The lands requisitioned will be handed over to the contractor and the contractor will pay the amounts to the Executing Agency. Hence, this cost is kept out of Resettlement Budget.