



# Report and Recommendation of the President to the Board of Directors

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Project Number: 35049  
November 2007

Proposed Technical Assistance Loan  
People's Republic of Bangladesh: Padma  
Multipurpose Bridge Design Project

Asian Development Bank

## CURRENCY EQUIVALENTS

(as of 2 November 2007)

Currency Unit – taka (Tk)

Tk1.00 = \$0.0146

\$1.00 = Tk68.645

## ABBREVIATIONS

ADB	–	Asian Development Bank
ADF	–	Asian Development Fund
BIWTA	–	Bangladesh Inland Waterways Transport Authority
BIWTC	–	Bangladesh Inland Waterways Transport Corporation
DFID	–	Department for International Development
DOE	–	Department of Environment
EIA	–	environmental impact assessment
EMP	–	environmental management plan
FIDIC	–	Fédération Internationale des Ingénieurs-conseils
FY	–	fiscal year
GDP	–	gross domestic product
JICA	–	Japan International Cooperation Agency
JBIC	–	Japan Bank for International Cooperation
JMBA	–	Jamuna Multipurpose Bridge Authority
LGED	–	Local Government Engineering Department
MOC	–	Ministry of Communications
O&M	–	operation and maintenance
PIU	–	project implementation unit
POE	–	panel of experts
PPP	–	public-private partnership
RHD	–	Roads and Highways Department
TA	–	technical assistance
TOR	–	term(s) of reference
UNESCAP	–	United Nations Economic and Social Commission for Asia and the Pacific

## WEIGHTS AND MEASURES

ha	–	hectare
km	–	kilometer
km <sup>2</sup>	–	square kilometer
m	–	meter

## GLOSSARY

ghat	–	a broad flight of steps to the bank of a river
thana	–	a unit of subdistricts represented by police station
union parishad	–	a local government constituted under the local government ordinance

## NOTE

In this report, "\$" refers to US dollars.

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## LOAN AND PROJECT SUMMARY

<b>Borrower</b>	People's Republic of Bangladesh
<b>Classification</b>	Targeting classification: General intervention Sector: Transport and communications Subsector: Roads and highways Theme: Sustainable economic growth Subtheme: Fostering physical infrastructure development
<b>Environment Assessment</b>	Category C
<b>Project Description</b>	The technical assistance (TA) loan is to develop the detailed design of the Padma bridge including river-training works and approach roads, and to assist the Jamuna Multipurpose Bridge Authority (JMBA) in engaging contractors.
<b>Rationale</b>	<p>The Padma River separates the southwest zone of Bangladesh from other parts of the country, especially from the north-central zone, where the national capital of Dhaka is located. Although there have been improvements to and development of the road network of the southwest zone, links with the rest of the country across the Padma River are still only by ferry. The capacity of ferry services is very limited, and waiting time at ferry ghats is about 1 hour for buses and light vehicles and 2 hours for trucks. In addition, the riverbanks of the Padma are very unstable, and the river width changes frequently, leaving approach ghats seasonally inoperative. The expansion of existing ferry terminals is made difficult by these conditions. Moreover, there is an urgent need to replace dangerous ferry and launch operations between Dhaka and the southwest region by safer and more reliable surface transport. Overloaded vessels frequently sink in this waterway when passing through the treacherously turbulent confluence of the Padma and Meghna rivers.</p> <p>The social, economic, and industrial underdevelopment of the southwest zone—which encompasses Bangladesh's second major port, Mongla; its third main city, Khulna; and the inland port at Benapole—is due in part to difficult access across the Padma River to the rest of the country. A bridge across the Padma River will certainly strengthen links between the southwest and north-central zones. A highway bridge, in particular, will enhance freight and passenger transportation between Dhaka and major points in the southwest zone and contribute substantially to the development of the southwest zone as well as to national economic growth.</p> <p>The TA loan will assist the Government in preparing the detailed engineering documents and procurement of Padma bridge construction.</p>

<b>Impact and Outcome</b>	The TA loan will facilitate project preparation for an investment loan to construct the Padma bridge connecting the economically depressed southwest zone to the economically more advanced eastern zone of the country. It will minimize technical uncertainty and ensure readiness to implement the follow-on loan project. The follow-on project will help the Government achieve poverty reduction through economic growth by improving transport efficiency and strengthening the integration of road networks.
<b>Project Investment Plan</b>	The investment cost of the project is estimated at \$22 million, including taxes and duties of \$2.8 million.
<b>Financing Plan</b>	The equivalent in various currencies of Special Drawing Rights 11,179,000 from the Special Fund resources of the Asian Development Bank (ADB) will be provided. The proposed loan will have a term of 32 years, including a grace period of 8 years, with an interest rate of 1.0% per annum during the grace period and 1.5% per annum thereafter.
<b>Estimated Project Completion Date</b>	28 February 2010
<b>Period of Loan Utilization</b>	1 March 2008–31 August 2010
<b>Executing Agency</b>	Jamuna Multipurpose Bridge Authority (JMBA)
<b>Implementation Arrangements</b>	Under JMBA, a project implementation unit (PIU) will be established and headed by the project director (chief engineer level) supported by a deputy project director, two project engineers, a finance and accounting staffer, and an administrative staffer. The PIU will be supported by two sets of independent monitoring arrangements. A team of checking engineers will be engaged and assigned outside of the PIU to independently review the design criteria, specifications, drawings, and other documents submitted by the design consultants and check the detailed design to ensure that it meets project objectives. An independent panel of experts (POE) will be established—again outside of the PIU—to independently guide, monitor, and advise on the detailed design.
<b>Consulting Services</b>	An international consulting firm associated with domestic consulting firms will prepare scheme designs; conduct necessary technical studies; and develop detailed engineering design and tender documents for the main bridge, approach roads, and river-training works, as well as assist JMBA in undertaking tender actions including contractors prequalification, preparation of selection criteria, tender evaluation, and final contract documentation. About 545 person-months of international consulting services and 399 person-months of domestic will be required from various experts.

The consultants will be selected and appointed by the quality-based selection method using full technical proposals in accordance with ADB's *Guidelines on the Use of Consultants* (2007, as amended from time to time).

At the request of the Government, ADB will carry out consultant selection on behalf of the Government, while the Government will retain its authority for contract negotiation and signing.

Individual consultants will be engaged by JMBA for the POE, and a firm will be engaged as checking engineers. The consultants will be experts of international repute. About 120 person-months of international inputs will be required for these services.

### **Project Benefits and Beneficiaries**

The TA loan will facilitate project preparation for an investment loan to construct the Padma bridge connecting the economically depressed southwest zone to the economically more advanced eastern zone of the country. It will minimize technical uncertainty and ensure readiness to implement the follow-on loan.

The Padma bridge will be a large-scale infrastructure project, and its construction and operation will significantly benefit various sectors of the economy of Bangladesh nationally and regionally. The road distance from Dhaka to nearly all major destinations in the southwest region will be reduced by 100 kilometers (km) or more, which will bring tremendous savings in passenger and commodity movement time and costs, as well as vehicle operation and maintenance costs, while lengthening the useful life of vehicles and reducing the import bill for fuels. With the bridge, capital inflow will increase, promoting industrial and commercial activity and improving economic and employment opportunities for local people, who will also gain better access to healthcare facilities and modern health technologies available at Dhaka. Easier communication will help expand education and training facilities, and the resulting skills development will ensure the availability of high-quality workers. The export of skilled workers will increase wage earnings. Riverbank protection will reduce bank erosion and the incidence of worsened vulnerability and poverty among people displaced by erosion. During construction, unemployed local people will get employment, and increased commercial activity will facilitate income generation among locals. The country will be physically integrated through the fixed link, reducing economic disparity and deprivation. An estimate of multiplier effects on the Padma bridge investment shows the bridge increasing the national GDP growth rate by 1.2% and the gross product in the southwest region by 35%, as well as generating additional employment opportunities of 743,000 person-years, which equals 1.2% of the total labor force of Bangladesh.

The southwest region has one of the highest poverty rates in a poverty-stricken country. About 42% of the national population lived in March 2004 below the absolute poverty line. In Khulna division in the southwest, the poverty incidence was 46%, which is much higher than Dhaka's 33%. The poor in the project area will reap immediate benefits from the bridge construction in the form of employment during construction, additional employment in relocated related activities, subsistence allowances and other benefits from resettlement, and increased trading income during construction. In the long-term, the impact of the bridge on poverty reduction will be even more significant, as the economic benefits generated by the bridge and accruing to the poor will be greater than their share of the GDP.

### **Risks and Assumptions**

The political and security situation could become unfavorable to the implementation of detailed engineering design for the Project and to the country's prioritization of resources for the main construction project. ADB will need to closely monitor the situation and coordinate with the local donors' group to ensure adequate protection.

Timely provision of the Government's counterpart funding is essential for the safe delivery of the Project on schedule and is particularly at risk when the finances of the Government are squeezed.

The findings from the social and environmental impact study will need to be discussed thoroughly with affected people during the detailed design stage. To achieve smooth implementation of the investment, the environmental and social concerns of affected people will need to be taken into account in developing the project design.

In view of massive land acquisition and resettlement induced by the bridge and its associated infrastructure, the Government should allocate sufficient resources to plan, operate, and manage land acquisition and resettlement, paying particular attention to restoring affected people's livelihood in a country where land is scarce and poverty is pervasive. The detailed design consultants will develop an income-restoration program to address livelihood issues. Since governance in matters related to resettlement and land acquisition will be a risk, an external monitoring mechanism will be developed.

To strengthen project implementation capacity, JMBA should be restructured as a division under the Ministry of Communications and have a separate land acquisition, resettlement, and environment unit as proposed by the Jamuna Bridge Impact Study. This study pointed out that establishing social and environmental units within JMBA, and with the necessary staff and support from management consultants, was essential to enabling the implementation of the plans for resettlement, land acquisition, and environmental management.



# BANGLADESH PADMA MULTIPURPOSE BRIDGE DESIGN PROJECT



- |  |                         |  |                        |
|--|-------------------------|--|------------------------|
|  | National Capital        |  | Railway                |
|  | Divisional Headquarters |  | River                  |
|  | District Headquarters   |  | District Boundary      |
|  | Town/Village            |  | Divisional Boundary    |
|  | National Highway        |  | International Boundary |
|  | Other Road              |  |                        |
|  | Project Bridge          |  |                        |
- Boundaries are not necessarily authoritative.

## I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed technical assistance loan to the People's Republic of Bangladesh for the Padma Multipurpose Bridge Design Project (the Project).

## II. RATIONALE: SECTOR PERFORMANCE, PROBLEMS, AND OPPORTUNITIES

### A. Performance Indicators and Analysis

2. The transport system in Bangladesh is extensive and diversified, comprising about 140,000 kilometers (km) of roads, 2,855 km of railroads, 5,970 km of perennial and seasonal waterways linking more than 15 major river ports and terminals spread all over the country, two major seaports, and seven airports. The primary road network, connecting national and regional roads and district roads, totals 20,800 km,<sup>1</sup> and secondary roads total 115,000 km. National and regional roads and district roads are administered by the Roads and Highways Department (RHD), and bridges of at least 1,500 meters (m) are administered by the Jamuna Multipurpose Bridge Authority within the Ministry of Communications (MOC). Secondary roads are administered by the Local Government Engineering Department (LGED) within the local government division.

3. The performance of the road sector has consistently improved in recent decades, aided by the extension of the road network and demand for road transport that increased rapidly in the 1990s at an average annual rate of 8.4% for passengers and 8.2% for freight, or almost double the average gross domestic product (GDP) growth of 4.7%. The modal share of transport has gradually shifted in favor of roads. From 1975 to 2005 the modal share of road transport rose from 54% to 70% for passenger traffic and from 35% to 72% for freight, making roads the principal mode of transport. The transport sector analysis is in Appendix 2.

4. Roads are important for the regional cooperation emphasized in the long-term development strategy of the Asian Development Bank (ADB). At the center of the South Asia growth quadrangle and surrounded by India, Nepal, Bhutan, and Myanmar, Bangladesh will accommodate most intraregional transit shipments in the region. Asian Highways, conceived and pursued by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) as a road network linking Asia and Europe, will pass through Bangladesh, making it the link between South and Southeast Asia. ADB's assistance for the road sector in Bangladesh should foster a conducive environment for regional cooperation and maximize development impact over South Asia.

### B. Analysis of Key Problems and Opportunities

#### 1. Transport Network in Bangladesh

5. The subcontinent's major rivers—the Padma, Jamuna (Brahmaputra), Ganges, and Meghna—have geographically divided Bangladesh since independence in 1971 into four principal zones: north-central (Dhaka Division), east (Chittagong and Sylhet divisions), northwest (Rajahahi Division), and southwest (Khulna and Barisal divisions). The road network has been developed and now provides good links connecting the northwest, north-central and

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<sup>1</sup> The primary road network comprises 3,086 km of national roads, 1,751 km of regional roads, and 15,962 km of district roads. District roads are the ones connecting national and regional roads.

east zones, encompassing the national capital, Dhaka. This development includes five highway bridges that have been constructed over the major rivers. Three bridges cross the Meghna River and its tributaries (Meghna bridge, Meghna-Gumti bridge and Bhairab bridge); one multipurpose (highway and railway) bridge crosses the Jamuna (Bangabandhu bridge); and one bridge crosses the Ganges (Paksey bridge).

6. The Padma River separates the southwest zone from other parts of the country, especially the north-central zone, where the national capital of Dhaka is located. Although there have been improvements and developments of the road network of the southwest zone, links with the rest of the country across the Padma River are still by ferry only. The transport capacity of ferry services is very limited, and waiting time at ferry ghats is about 1 hour for buses and light vehicles and 2 hours for trucks. In addition, the riverbanks of the Padma are very unstable, and the river width changes frequently, leaving approach ghats seasonally operative and complicating the expansion of existing ferry terminals. Moreover, there is an urgent need to replace dangerous ferry and launch operations between Dhaka and the southwest region by a safer and more reliable surface transport system. Overloaded vessels frequently sink in the waterways passing through the treacherously turbulent confluence of the Padma and Meghna rivers.

7. The social, economic, and industrial underdevelopment of the southwest zone—which encompasses Bangladesh’s second major port, Mongla; its third main city, Khulna; and the inland port at Benapole—is due in part to difficult access across the Padma River to the rest of the country. A bridge across the Padma River will certainly strengthen links between the southwest and north-central zones. A highway bridge in particular will enhance freight and passenger transportation between Dhaka and major points in the southwest zone, thereby contributing substantially to the development of the southwest zone as well as to national economic growth.

8. Bangladesh will bestride Asian Highway Route A-1, which is planned under UNESCAP to connect Asia to Europe (Tokyo, Japan, to Kapikule, Turkey, via Pusan, Beijing, Delhi, and Istanbul). One section of this corridor is to connect Kolkata in India to Dhaka through Mawa and Bhanga in the area near the Padma River, which will become an important highway for trade goods between Bangladesh and India.

## **2. ADB’s Strategy for Transport Sector Development**

9. Addressing transport bottlenecks has become more urgent in the era of global trade following the lapse of the Multi-Fiber Arrangement, to reduce the cost of doing business and improve the overall investment climate. ADB's public sector operations will build on several decades of progress by encouraging the progressive adoption of policy and institutional reforms in the transport sector by (i) adopting a holistic view and network approach to the transport sector, with a focus on its sustainability and the effects of development on the environment and society; (ii) assuming a major role in helping the Government sequence its transport reforms to improve the safety, efficiency, and quality of service; (iii) supporting private sector participation and partnership in infrastructure operation and management; (iv) improving sector governance, including that of the Chittagong Port Authority, RHD, and Bangladesh Railway; and (v) promoting subregional cooperation by developing strategic transport links and cross-border arrangements.

10. In line with this strategic direction, ADB's Bangladesh country strategy and program 2006–2010<sup>2</sup> spelled out that

- (i) future ADB assistance in the sector would be linked to (a) continued institutional reform of RHD with due attention to improved governance and transparency including capacity building, (b) sustainable financing of road maintenance including the establishment of an appropriate mechanism for funding operation and maintenance (O&M), and (c) improved road safety;
- (ii) support would be provided for the development of the Padma bridge, building on lessons learned from the path-breaking Jamuna Bridge Project;
- (iii) this mega project would link the eastern and southwestern parts of Bangladesh at Mawa-Jajira to provide a strategic overland route between Bangladesh and its neighboring countries through India; and
- (iv) assistance would also be provided to identify opportunities to involve the private sector to ensure that the bridge is operated and managed on a financially sustainable basis.

### 3. Government's Strategy for Transport Sector Development

11. **Road Transport.** The critical problem facing the road sector is the maintenance and improvement of the network to raise the quality and safety of road operations. Various options for financing road maintenance and operations will be explored. The establishment of an autonomous road maintenance fund to ensure adequate and stable recurrent financing of roads will be considered. The multi-modal transport system link will be expanded to include, among other areas, the Export Processing Zone and areas producing coal, hard rock, mining fertilizer, cement, and tea for the speedy and efficient movement of cargo and passengers. Monitoring indicators will be set to assess progress in such key areas as increased allocations for maintenance and levels of cost recovery and more effective road traffic management to improve road safety, traffic control, and overloading enforcement.

12. The rural road network has reached an extent that makes it appropriate to invest in quality rather than expansion. This will mean greater emphasis on high-quality construction using labor-based technologies, maintaining and upgrading the existing network, and undertaking selective expansion to ensure balanced rural-urban linkages. In doing so, more emphasis needs to be given to developing growth centers and rural roads to connect villages with growth centers and feeder roads, as well as providing rural roads with such drainage structures as bridges and culverts.

13. The Government will accord priority to (i) increasing expenditures on maintenance; (ii) constructing a coastal highway link; (iii) preparing an integrated road master plan with RHD, Dhaka Transport Coordination Board, and LGED; (iv) establishing a national highway authority; (v) constructing the Padma bridge by JMBA; (vi) upgrading of Dhaka–Chittagong, Dhaka–Khulna, Dhaka–Sylhet, and Dhaka–Tangail roads to four lanes; (vii) constructing flyovers at railway crossings on important highways; (viii) constructing the Dhaka–Chittagong expressway; and (ix) constructing a ring road on the outskirts of Dhaka.

14. **Railway Transport.** The role of Bangladesh Railway in the economy has been constrained by its limited infrastructure and low efficiency of services vis-à-vis competing modes of transportation. Sustained reforms are to enhance the contribution of railways to the economy and to contain the adverse budgetary impact of its operations. The reconstruction of Bangladesh

<sup>2</sup> ADB. 2005. *Bangladesh: Country Strategy and Program 200-2010*. Manila.

Railway—including corporatization and commercialization with private participation—are critical to developing the sector and improving the efficiency of services. Linking Bangladesh Railway with the railways of neighboring countries through strategic partnership has a high potential for catalyzing economic growth, poverty reduction, and the commercial viability of the sector.

15. The Government will place the emphasis on (i) reducing Bangladesh Railway's net operating loss and expanding its capacity for freight traffic, (ii) transparent accounting of system losses at various level of operation, (iii) regaining passenger traffic, (iv) improving tracks and the signaling system, (v) adopting public service obligation involving all branch lines to serve the local poor people in backward and remote areas, (vi) providing adequate funds for routine and periodic maintenance, (vii) adopting modern methods of track maintenance, and (ix) outsourcing infrastructure development and maintenance works to the private sector.

16. **Inland Waterway Transport.** The inland waterway system carries a large volume of total freight but is not used to its full potential due to the silting of waterways, lack of ghat berthing facilities, and obstructions caused by low or narrow road bridges and irrigation channel sluice gates. To better realize the full potential of the inland waterways, the following factors, among others, will be considered: (i) inter-project coordination to facilitate clearances under road bridges and the needs of country boats in siting and designing sluice gates, (ii) encouraging local authorities to organize self-financed ghat facilities through user charges, and (iii) setting and enforcing standards for the bridge network and berthing facilities.

17. The Government will look into the possibility of (i) promoting private sector investment, (ii) improving cost recovery mechanisms, (iii) promoting water transportation in the south and west zones, (iv) introducing computerized data processing, (v) providing necessary subsidies for coastal passenger services, (vi) improving the operational efficiency of coastal routes, and (vii) introducing sea truck and hydrofoil services to St. Martins Island.

#### 4. Project Preparation Activities Undertaken

18. In 2000, the Government conducted a pre-feasibility study for constructing a bridge across the Padma River to connect the southwest zone to the north and east zones. The pre-feasibility report<sup>3</sup> established the technical and economic viability of the Padma bridge and recommended several potential sites. In 2001, at the request of the Government, the Japan International Cooperation Agency (JICA) commenced a full-fledged feasibility study for the Padma bridge. In February 2004, the feasibility study team recommended in their interim report the Mawa-Janjira site as the crossing location of the Padma bridge, which was concurred with and confirmed by the Government in July 2004. In 2005, the feasibility study team submitted their final report,<sup>4</sup> which reaffirmed the technical and economic viability of the Padma bridge and recommended the construction of (i) a two-lane dual carriageway cable-stayed (or extradosed) bridge measuring 5,580 m long and 25 m wide with provision of future rail tracks, (ii) a two-lane, dual carriageway approach road 12 km long and 25 m wide, and (iii) bank protection works along 16.3 km of river. The estimated cost was \$1.26 billion at 2004 prices.

19. In the course of conducting the feasibility study, the Government requested key aid agencies—i.e., the Japan Bank for International Cooperation (JBIC), World Bank, and ADB—to extend their support for the construction of the Padma bridge through a similar cofinancing

<sup>3</sup> Rendel, Palmer and Tritton, Nedeco, and Bangladesh Consultants Ltd. 2000. *Padma Bridge Study-Prefeasibility Report*. Tokyo.

<sup>4</sup> Japan International Cooperation Agency. 2005. *The Feasibility Study of the Padma Bridge*. Tokyo.

arrangement adopted for construction of the Jamuna bridge.<sup>5</sup> The key aid agencies came to an understanding that (i) such a large project could hardly be financed by a single aid agency, (ii) the exemplary donor coordination and cooperation rendered for constructing the Jamuna bridge should be replicated for constructing the Padma bridge, and (iii) subsequent project preparation works would be jointly coordinated through donors' local consultative group meetings.

20. With the JICA feasibility study's recommendation in hand to move ahead, the Government requested ADB to extend its support for TA to supplement JICA's feasibility study and a TA loan to supplement JICA's detailed design consultancy. In 2005, ADB provided TA<sup>6</sup> to complement JICA's feasibility study, particularly for establishing the robust financial viability of the Project and for developing a public-private partnership (PPP) scheme for financing with commercial and revenue risks transferred to the private sector. The final TA report, issued in May 2007, confirmed the technical and economic viability of the Padma bridge project with a modified project cost of \$1.48 billion at 2006 prices.

## 5. External Assistance

21. JBIC, World Bank, Department for International Development (DFID), and JICA are major aid agencies that have supported the road sector in Bangladesh. The People's Republic of China, Denmark, Italy, Kuwait, Netherlands, and Switzerland also provided bilateral support. Aid agency assistance has been closely coordinated through local consultative group meetings that address all issues related to the road sector. JBIC, World Bank, and ADB supported the construction of the Jamuna Multipurpose Bridge, which was the most expensive and one of the most technically challenging transport infrastructure investment ever attempted in Bangladesh. JBIC financed the construction of the Paksey and Rupsa bridges, which connected the northwest to the southwest and help direct cross-border traffic from Nepal and Bhutan to Mongla Port. With these bridges constructed, ADB's Road Network Improvement and Maintenance Project in the northwest and initiative to facilitate cross-border traffic through Bangladesh came to have more critical development impact. External assistance to the road sector is summarized in Appendix 3.

## 6. Lessons Learned

22. The project completion report<sup>7</sup> of the Jamuna Multipurpose Bridge Project spelled out critical factors for the successful delivery of such a large-scale multipurpose bridge project as follows:

- (i) Project preparation should adopt a participatory approach involving all stakeholders, particularly for preparing environmental and social mitigation measures.
- (ii) The successful implementation of large and complex projects critically requires a capable executing agency with strong project-management skills supported by good consultants, which requires in turn more attention and resources invested in capacity building and the institutional development of the executing agency.
- (iii) Project design should address expected impacts on poverty and contain a methodology and procedure for collecting and analyzing data required for evaluating impacts on and benefits for the poor.

<sup>5</sup> For the Jamuna Multipurpose Bridge Project, JBIC, World Bank, and ADB each committed \$200 million. The project ended up with the actual cost of \$753.7 million funded with \$200 million from JBIC, \$199.1 million from the World Bank, \$207.0 from ADB, and \$147.6 million in Government counterfunding.

<sup>6</sup> ADB. 2005. *Bangladesh: Preparing the Padma Multipurpose Bridge Project*. Manila.

<sup>7</sup> ADB. 2000. *Bangladesh: Jamuna Multipurpose Project Completion Report*. Manila.

23. In 2001, ADB provided TA<sup>8</sup> for the Jamuna Bridge Impact Study. The TA report recommended the following aspects be considered in the design and construction of the Padma bridge:

- (i) There should be greater attention paid to social and environmental components in the project design stage. The preparation and, more importantly, implementation of the social and environmental components of large civil works projects must be given the same attention as the preparation of the physical components.
- (ii) The management structure is of critical importance to the implementation of environmental and social aspects of the project. The establishment of social and environmental units within the Jamuna Multipurpose Bridge Authority (JMBA), with the necessary staff and support from the management consultants, was instrumental in enabling the implementation of the plans for resettlement, land acquisition, and environment management.
- (iii) Poverty reduction should be more overtly recognized as going beyond the goal of merely not inflicting economic damage. The Jamuna bridge resettlement program attempted to improve the lot of impoverished affected people who did not own homesteads but lost their place of residence by providing squatters with a homestead plot of 100 square meters either through the purchase of private land or at a resettlement site.
- (iv) Project-induced increases in demand for land and the subsequent impact on property values should be taken into account both as a positive means of cross-subsidizing poverty reduction in the design of the Padma bridge and in terms of their adverse impacts on, and compensation paid to, relocated people thrown onto the open market.
- (v) Compensation packages should take into account worsening land scarcity and higher property values. The cash-for-land policy was widely acclaimed because it reduced the risks associated with occupational changes but is likely to achieve its objectives only if property values are adequately taken into account.
- (vi) A large-scale infrastructure project such as the Padma bridge should be broadly conceived in economic development terms. Land resource opportunities generated by the Padma bridge should be analyzed in a broader context than narrowly focused transport economics and incorporated into the project design.

24. The terms of reference for the detailed design take into account the lessons learned through the Jamuna Multipurpose Bridge, particularly the importance of the participatory approach to be undertaken at a pre-design stage, the implementation of environmental and social aspects of the project, and institutional capacity development.

## **7. Policy Dialogue**

25. Policy dialogue was conducted with the Government to determine institutional arrangements for the design and construction of the Padma bridge and its operation after construction. The Government will

- (i) establish a competent bridge authority through a restructured JMBA to be headed by an executive director, who will be the secretary of bridge division

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<sup>8</sup> ADB. 2001. *Bangladesh: Jamuna Bridge Impact Study Technical Assistance*. Manila.

- under MOC dealing with the authority<sup>9</sup> and have a separate land acquisition and resettlement unit;
- (ii) develop a technically and financially sustainable operation and maintenance scheme applicable to major bridges including the Padma bridge;
  - (iii) adopt the Fédération Internationale des Ingénieurs-Conseils (FIDIC or International Federation of Consulting Engineers) mechanism for construction supervision; and
  - (iv) delegate authority for recruiting detailed design consultants to ADB to expedite their engagement, while retaining its authority for contract negotiation and contract signing.

### **III. THE PROPOSED PROJECT**

#### **A. Impact and Outcome**

26. The TA loan will be to facilitate project preparation for an investment loan to construct the Padma bridge connecting the economically depressed southwest zone to the economically more advanced eastern zone of the country. It will minimize technical uncertainty and ensure readiness to implement the follow-on loan project. The follow-on project will help the Government achieve poverty reduction through economic growth by improving transport efficiency and strengthening integrated road networks.

#### **B. Outputs**

27. The Project will develop detailed design of the Padma bridge, including river-training works and approach roads, and assist JMBA in engaging contractors, which will be carried out through four continual processes of (i) scheme design, (ii) technical studies, (iii) detail design, and (iv) tender action.

##### **1. Scheme Design**

28. Notwithstanding previous feasibility studies, the Project will develop outline designs for different options for the main bridge, approach roads, and the river-training works to enable the options to be objectively compared with each other. Each option will be developed in sufficient detail to demonstrate that the project objectives and design criteria have been complied with, allow accurate estimation of construction costs, and enable a detailed construction program to be prepared. Then an objective method for comparing the options will be formulated to select the preferred scheme design.

29. To develop different options for scheme designs, design criteria should be established. In the process of scheme design, the Project will prepare comprehensive design criteria that achieve the objectives of the Project. The design criteria will include all rail-related elements including track and track-support systems regardless of whether or not the railway will be installed immediately following completion of the crossing. Similarly the design criteria shall include all aspects relating to the installation or future installation of utilities on the bridge. It

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<sup>9</sup> The Jamuna Multipurpose Bridge Authority Ordinance 1985, as amended up to 23 November 1998, assigns the executive director of JMBA as a member-cum-secretary of the authority while including a secretary of MOC as a member-cum-vice chairman of the authority. This structure effectively places the executive director, the chief executive of JMBA, under the secretary of MOC, which weakens the chief executive of JMBA and makes JMBA's business processes ineffective.



should clearly state all assumptions regarding loads imposed on the bridge and the expected bridge movements so that the effects of these movements can be accounted for in the design of the utilities. Preliminary design criteria are in Appendix 4.

30. As part of scheme design, (i) a comprehensive and detailed cost estimate will be prepared, (ii) an economic and financial evaluation model will be developed comparable to those produced in the earlier feasibility studies to verify the economic and financial viability of the scheme designs, (iii) a strategy for the Padma bridge will be developed for JMBA to contact out O&M including toll collection after construction; and (iv) possibilities for PPP for either construction or O&M of the bridge will be looked into—probably, for the former, through gap funding arrangements.

31. The outputs of this stage include (i) confirmation of the scope of construction works; (ii) a report on possibilities for PPP; (iii) confirmation of contract strategy; (iv) a final alignment; (v) updated plans for land acquisition, resettlement, and environment management; (vi) an environmental impact assessment and environment management plan for the Padma bridge and new resettlement sites; (vii) design criteria; (viii) a project cost estimate and cost sensitivity analysis; (ix) technical specifications and tender documents for technical studies; (x) an O&M strategy; (xi) an economic and financial evaluation; (xii) a scheme design report including scheme design drawings and performance specifications for proprietary elements and typical details; and (xiii) photomontage or computer-generated images showing the proposed scheme.

## **2. Technical Studies**

32. Technical studies prior to or during the detailed design phase will be needed to provide important information that will reduce uncertainty associated with technical and commercial aspects of the Project. The technical studies will include (i) geotechnical investigations; (ii) wind tunnel testing; (iii) topographic surveying; (iv) bathymetric surveying; and (v) river flow, scour and hydrological studies, and physical modeling. The Project will determine the extent of the studies listed above and any other studies considered appropriate to the overall objective of reducing risk to an acceptable level.

33. Once technical studies are completed, the technical, commercial, economic, and other implications of the results will be assessed. This will lead to the revision of the design criteria, updating of scheme designs, and updating of the project cost estimate as required to reflect the results of the studies. In addition, interpretative reports summarizing the engineering issues arising from the technical studies will be prepared, including geotechnical interpretative reports, aerodynamic stability reports, and any other reports required to assist with the timely and efficient progress of contractor engagement.

34. The outputs of this stage will include (i) interpretative reports for all technical studies and (ii) an assessment of implications on scheme design including, where relevant, changes to (a) design criteria, (b) the scheme design report, (c) the project cost estimate and cost sensitivity analysis, (d) the economic and financial evaluation, and (e) other relevant findings.

## **3. Detailed Design**

35. The Project will prepare the detailed engineering design and all tender documentation for all of the works based on the selected final scheme design using state-of-the-art techniques, methods, and standards to produce an efficient, robust, and buildable design that complies fully with the agreed design criteria in conformity with international codes and standards and, where

relevant, published design and detailing guides. The detailed engineering design will show what assumptions have been made regarding the construction sequence and methods and, where relevant, assumptions regarding creep, shrinkage, and other time-dependent effects. The design and specifications will state the pre-cambers required or alternately specify requirements for the contractor to determine pre-cambers or casting curves. As part of detailed engineering design, illustrative designs, design specifications, and construction specifications will be prepared, on the basis of which the project cost estimate and the O&M cost estimate will be updated.

36. All contract documents for each construction contract will be prepared including materials and workmanship specifications, bills of quantities, instructions to tenderers, and any further documentation required to complete the tender packages. The design will be accompanied by a comprehensive standalone materials and workmanship specification. The specification will utilize, wherever possible and appropriate, international codes or standards for supplying component materials, measuring, and testing. The specification will include tolerances that reflect assumptions made in the design. Conditions will be prepared for each contract based on an agreed standard form such as one published by FIDIC.

37. The outputs of this stage will include (i) detailed engineering design drawings for all elements of the works sufficient to enable construction to progress, (ii) materials and workmanship specifications, (iii) final design criteria, (iv) design reports, (v) design certificates, (vi) bills of quantities and schedules of activities, (vii) contract conditions, (viii) instructions to tenderers, (ix) all further tender documents sufficient to permit competitive tenders to be sought in the international market, (x) a project cost estimate and expenditure profile, (xi) an O&M manual, and (xii) estimates of future bridge O&M costs.

#### **4. Tender Action**

38. The Project will assist JMBA with the prequalification procedure for each of the contracts, which will include preparing prequalification and selection criteria, assistance with advertising, reviewing and assessing submissions, interviewing, and preparing a prequalification report. The Project will prepare, in advance, a tender evaluation strategy based on agreed technical and commercial criteria, and assist JMBA in assessing all tenders and making recommendations as to which contractor should be selected for each contract.

39. The outputs of this stage will include (i) contractor prequalification and selection criteria; (ii) comprehensive responses to all tender queries; (iii) a tender evaluation strategy; (iv) a tender assessment report, where relevant, including (a) technical evaluation of construction proposals, (b) financial evaluation of commercial proposals, and (c) review of construction schedule and resource mobilization; and (v) final contract documentation.

#### **C. Special Features**

40. Throughout the design stages, the work of detailed engineering design consultants will be reviewed, monitored, checked, and guided by two sets of external monitoring arrangements to ensure that the final output of the design consultants meets project objectives. Firstly, the Project will engage a team of checking engineers who will review the design criteria, specifications, drawings, and other documents submitted by the design consultants and check the detailed design to ensure that it meets the project objectives and is safe, buildable, and economic. The checking engineers will perform a fully independent structural analysis, both static and dynamic, to determine the load effects in the structure and to check the compliance of

the design with requirements and design criteria. The checking engineers will be separately engaged by JMBA.

41. Secondly, the Project will establish an independent panel of experts (POE) to guide, monitor, and advise on the detailed design. The POE will consist of internationally recognized experts in various specialties required by the Project and will be selected by JMBA in consultation with the development partners including ADB, World Bank, JBIC, and JICA. The POE will be an effective means of ensuring transparency and governance in determining the alignment of the bridge and the access roads and the scope of river-training works, which will have considerable socioeconomic implications on the economy at large as well as on potentially affected people. The POE will meet with the design consultants at regular intervals throughout all phases of the Project and may request additional justification from the design consultants for any aspect of the Project.

#### D. Project Investment Plan

42. The project investment cost is estimated at \$22.0 million equivalent, including taxes and duties of \$2.8 million. The detailed cost estimates are in Appendix 5.

**Table 1: Project Investment Plan**  
(\$ million)

Item	Amounts <sup>a</sup>
<b>A. Base Cost<sup>b</sup></b>	
1. Detailed Design Consultant	16.9
2. Independent Checking Engineer and Panel of Experts	3.1
3. Incremental Administrative Support	0.5
<b>Subtotal (A)</b>	<b>20.5</b>
<b>B. Contingencies<sup>c</sup></b>	<b>1.3</b>
<b>C. Financing Charges During Implementation</b>	<b>0.2</b>
<b>Total (A+B+C)</b>	<b>22.0</b>

<sup>a</sup> Includes taxes and duties of \$2.8 million.

<sup>b</sup> In mid-2007 prices.

<sup>c</sup> Physical contingencies computed at 5% and price contingencies at 0.8% on foreign exchange costs and local currency costs.

Source: Asian Development Bank estimates.

#### E. Financing Plan

43. It is proposed that ADB provide a loan of \$17.6 million equivalent from its Special Funds resources. The loan will have a term of 32 years, including a grace period of 8 years and an interest charge of 1.0% per year during the grace period and 1.5% per annum thereafter. The Government will transfer the loan proceeds to the Executing Agency, JMBA, through its fiscal budgetary allocation in the form of a government grant.

**Table 2: Financing Plan**  
(\$ million)

<b>Source</b>	<b>Total</b>	<b>%</b>
Asian Development Bank	17.6	80
Government	4.4	20
<b>Total</b>	<b>22.0</b>	<b>100</b>

Source: Asian Development Bank estimates.

## **F. Implementation Arrangements**

### **1. Project Management**

44. JMBA will be the Executing Agency of the Project. A project implementation unit (PIU) will be established under JMBA, which will be headed by the project director (chief engineer level) supported by a deputy project director, project engineers as required, a finance and accounting staffer, and an administrative staffer. The PIU will be supported by two sets of independent monitoring arrangements. Checking engineers will be engaged and assigned outside of the PIU to independently review the design criteria, specifications, drawings, and other documents submitted by the design consultants and check the detailed design to ensure that it meets project objectives. The POE will be established—again outside of the PIU—to independently guide, monitor, and advise on the detailed design.

45. The PIU will (i) monitor the progress of day-to-day project implementation, (ii) provide assistance to the design consultant team in carrying out their tasks, (iii) act as a coordinator for checking engineers and the POE so that they can function properly, (iv) prepare withdrawal applications for design consultants, (v) prepare project progress and status reports as required, and (vi) maintain project accounts and loan financial records for auditing. The structure of project implementation arrangements is in Appendix 6.

### **2. Implementation Period**

46. The Project will be implemented over 2 years from March 2008 to February 2010. Details of the implementation schedule are in Appendix 7.

### **3. Consulting Services**

47. An international consulting firm associated with national consulting firms will prepare scheme designs; conduct necessary technical studies; develop detailed engineering design and tender documents for the main bridge, approach roads, and river-training works; and assist JMBA in undertaking tender actions including contractor prequalification, the preparation of selection criteria, tender evaluation, and final contract documentation. About 545 person-months of international and 399 person-months of national consulting services will be required for various experts. Outline terms of reference for these services are in Appendix 8. Detailed terms of reference are in Supplementary Appendix A.

48. The consultants will be selected and appointed by the quality-based selection method using full technical proposals in accordance with ADB's *Guidelines on the Use of Consultants* (2007, as amended from time to time). The quality-based selection method is adopted because the detailed design entails high failure costs, which would have significantly impact

communities, the environment, and government finances. It is envisaged that the detailed design consultant, subject to satisfactory performance, may be engaged as the construction supervisor under the follow-on loan. The contract for the Project will cover only detailed design. The procurement plan is in Appendix 9.

49. At the request of the Government, ADB will carry out consultant selection for the design consultant on behalf of the Government, while the Government will retain its authority for contract negotiation and contract signing. After the completion of the Jamuna Multipurpose Bridge, JMBA was downsized and has mainly carried out O&M of the Jamuna Multipurpose Bridge. JMBA's staff skills mix has been realigned in line with the change in its core function from managing the construction of a large bridge to its O&M. While JMBA's staff strength will be upgraded as it undertakes the construction of the Padma bridge, its current capacity is hardly on a par with complex construction management works. Considering insufficient capacity in JMBA, and that stakeholders cannot afford to delay consultant recruitment, the Government and ADB agreed that ADB would carry out consultant recruitment and selection on behalf of the Government.

50. The POE, consisting of internationally recognized experts in various specialties required by the Project, will be selected by JMBA in consultation with the local donors' group including ADB, World Bank, JBIC, and JICA. The composition of the POE, comprising approximately 50 person-months, is expected to include experts with skills in bridge and structural engineering, highway engineering, river training works, environment and resettlement impact assessment, and structured financing for concession arrangements. Recruitment will be carried out on an individual basis, as no firm would be able to assemble a team of internationally reputed experts required for the POE, each of whose contribution depends on individual experiences and knowledge. The outline terms of reference for the POE are in Appendix 10.

51. A firm of senior engineers, with total inputs of about 70 person-months, will be recruited as the checking engineers using the quality- and cost-based method. The checking engineers will review and comment on (i) design drawings, (ii) design statements or reports, (iii) design criteria documents, (iv) site survey and geotechnical investigation reports, (v) materials and workmanship specifications, (vi) wind tunnel test proposals and reports, (vii) the scope and requirements of all technical studies and any special investigations proposed, (viii) the construction method and erection sequence assumptions, (ix) other reports relating to the design and construction, and (x) the design program and project management information. The terms of reference (TOR) of the checking engineers will be developed by the design consultant, and will be reviewed and recommended by the POE to JMBA.

#### **4. Anticorruption Policy**

52. ADB's *Anticorruption Policy* (1998, as amended to date) was explained to and discussed with the Government and JMBA. Consistent with its commitment to good governance, accountability, and transparency, ADB reserves the right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive, or coercive practices relating to the Project. To support these efforts, relevant provisions of ADB's *Anticorruption Policy* are included in the loan regulations and the bidding documents for the Project. In particular, all contracts financed by ADB in connection with the Project shall include provisions specifying the right of ADB to audit and examine the records and accounts of JMBA and consultants and other service providers as they relate to the Project. The Government will also allow and assist ADB representatives' carrying out random spot checks on the work in progress and the utilization of funds for the Project.

## **5. Disbursement Arrangements**

53. Loan funds will be disbursed in accordance with ADB's *Loan Disbursement Handbook* (2007, as amended from time to time). An imprest account will be established under JMBA to disburse the incremental administrative support component in accordance with ADB's *Loan Disbursement Handbook*. The initial amount to be deposited into the imprest account will be 6 months of estimated expenditures or 10% of the loan amount allocated for the incremental administrative support component, whichever is lower. Statement of expenditure procedures will be used for reimbursing eligible expenditures and liquidating the imprest account for any individual payment transaction up to \$3,000 equivalent. The ceiling for statement of expenditure will be in line with ADB's *Loan Disbursement Handbook* (2007, as amended from time to time) and applicable for contracts below \$100,000.

## **6. Accounting, Auditing, and Reporting**

### **a. Accounts and Audit**

54. JMBA will maintain separate records and accounts adequate to identify the goods and services financed from loan proceeds, financing resources received, expenditures incurred for the Project, and local funds. The accounts will be set up in accordance with sound accounting principles. In addition to the audit conducted by the comptroller and auditor general, consolidated project accounts and related financial statements will be audited annually by recognized private sector auditors acceptable to ADB. The audited reports and related financial statements will be submitted to ADB not later than 6 months after the end of the fiscal year to which they relate.

### **b. Reports**

55. The consultant appointed under the Project will submit monthly progress reports to JMBA and ADB. JMBA will ensure that the consultant includes in the reports the status of land acquisition and resettlement and other activities that will take place concurrently with project implementation but are not directly included in the scope of engineering services. Within 3 months of the Project's physical completion, the Government will prepare a completion report in a format acceptable to ADB.

## **7. Project Review**

56. ADB staff will review project implementation through regular or special review missions. Based on the project schedule, a mid-term review will be carried out around January or February 2009. Terms of reference for the midterm review will be included in the project administration memorandum to be prepared by ADB's inception mission for the Project.

## **8. Advance Action on Recruitment of Consultants**

57. ADB allows advanced recruitment of consultants for detailed design and construction supervision on the understanding that such action will not necessarily commit ADB to financing the Project or the ensuing investment project.

## **IV. PROJECT BENEFITS, IMPACTS, ASSUMPTIONS, AND RISKS**

### **A. Socioeconomic Benefits and Impacts**

58. The Padma bridge will be a large-scale infrastructure project, and its construction and operation will significantly benefit various sectors of the economy of Bangladesh nationally and regionally. The road distance from Dhaka to nearly all major destinations in the southwest region will be reduced by 100 kilometers (km) or more, which will bring tremendous savings in passenger and commodity movement time and costs, as well as vehicle operation and maintenance costs, while lengthening the useful life of vehicles and reducing the import bill for fuels. With the bridge, capital inflow will increase, promoting industrial and commercial activity and improving economic and employment opportunities for local people, who will also gain better access to healthcare facilities and modern health technologies available at Dhaka. Easier communication will help expand education and training facilities, and the resulting skills development will ensure the availability of high-quality workers. The export of skilled workers will increase wage earnings. Riverbank protection will reduce bank erosion and the incidence of worsened vulnerability and poverty among people displaced by erosion. During construction, unemployed local people will get employment, and increased commercial activity will facilitate income generation among locals. The country will be physically integrated through the fixed link, reducing economic disparity and deprivation. An estimate of multiplier effects on the Padma bridge investment shows the bridge increasing the national GDP growth rate by 1.2% and the gross product in the southwest region by 35%, as well as generating additional employment opportunities of 743,000 person-years, which equals 1.2% of the total labor force of Bangladesh (footnote 2). The economic internal rate of return of the main investment was estimated at 14.8% by the JICA study (footnote 2) and at 17.6% by ADB's supplementary TA (footnote 4)

59. The southwest region has one of the highest poverty rates in a poverty-stricken country. About 42% of the national population lived in March 2004 below the absolute poverty line. In Khulna Division in the southwest, the poverty incidence was 46%, which is much higher than Dhaka's 33%. The poor in the project area will reap immediate benefits from the bridge construction in the form of employment during construction, additional employment in relocated related activities, subsistence allowances and other benefits from resettlement, and increased trading income during construction. In the long-term, the impact of the bridge on poverty reduction will be even more significant, as the economic benefits generated by the bridge and accruing to the poor will be greater than their share of the GDP. The summary poverty reduction and social strategy is in Appendix 11.

### **B. Land Acquisition, Resettlement, and Environmental Impact**

60. An assessment of land acquisition and resettlement conducted as part of the feasibility study found that the project will need to acquire 755 hectares (ha) of land for the construction of the bridge and its associated infrastructure, including the development of five resettlement sites. In addition, about 163 ha of land will be temporarily required for construction sites for a period of about 6 years. The project also requires the acquisition of bank-line and eroded land. The assessment predicts that (i) the project will displace about 20,000 people from their homesteads

and business enterprises, (ii) 30,000 people in 10,000 households will lose their income and livelihoods due to the loss of agricultural land, and (iii) 25,000 people will suffer income loss from affected fisheries, services, trading and transportation, and wage employment. Some of these people will be affected indirectly upon the opening of the bridge to traffic. Altogether, about 75,000 people in 22,000 households will be affected directly and indirectly.

61. The Land Acquisition Ordinance of 1982 establishes procedures to redress grievances arising out of ownership of land. Recourse to law is, however, always a complicated and time-consuming process, which usually discriminates against the poor for their lack of knowledge and resources for litigation. Some grievances can be easily resolved out of court through a traditional grievance redress mechanism, i.e., a community-based grievance redress committee, which proved its effectiveness for the Jamuna Multipurpose Bridge Project. Grievance redress committees will be established in each union where land acquisition will take place. Each committee will consist of (i) a representative of JMBA, at the level of deputy director or assistant director; (ii) the area manager of the implementing nongovernment organization; (iii) the chairman of the union parishad where the complaint is registered; (iv) one representative of affected people; (v) a female member of the local union parishad; (vi) a headmaster of a local high school primary school and (vii) a representative from concerned deputy commissioner office. The committee will be constituted under an administrative order of the Ministry of Communications. The main task of the committee will be to hear the grievances of individuals affected by land acquisition. Where a grievance relates to the issues covered by the arbitration procedures outlined in the Land Acquisition Ordinance of 1982, the committee will advise the complainant to seek redress in the appropriate court of law. Where a grievance relates to project-specific definition of entitlements and entitled persons, the committee is empowered to give a verdict that will be final.

62. While the proposed TA loan is classified as a “C” project, the proposed investment is classified as an “A” project in accordance to the ADB’s *Environmental Assessment Requirement 2003*. The proposed investment is also classified as a red project in accordance with the Bangladesh Environmental Conservation Act 1995. Therefore, the environmental impact assessment (EIA) will be updated for the Padma bridge during detailed design. In addition, the EIA for the new resettlement site will also be updated in accordance with ADB’s environmental requirements. The EIA for the Padma bridge and new resettlement site, including the environmental management plan (EMP) will be prepared in accordance with the Government and ADB’s environmental assessment requirement. The feasibility study included the initial EIA, the findings of which will be used as a basis to determine the scope of the EIA. The EIA report, including the EMP, that will be updated as part of this detailed design funded by this proposed loan will be submitted to the Department of Environment as the basis for obtaining environmental clearance.

63. The salient findings from the initial environmental assessment study were reported as part of the feasibility study but have not yet been included in the proposed mitigation measures and proper management plan. The salient findings include the following:

- (i) The impact of the bridge on regional hydrology and flooding patterns, as the high-water level of the Padma River rises due to the bridge construction, is not expected to be significant, but detailed assessment will be required.
- (ii) Adequate openings on the planned right bank approach road are required for drainage.
- (iii) Limited erosion and siltation is expected, but detailed assessment will be required.



- (iv) About 325,000 trees will need to be cut for the Project, requiring a detailed assessment to identify appropriate mitigation measures.
- (v) About 58 ponds covering 4.18 ha and 74 ditches covering 2.66 ha will be affected by the Project.
- (vi) Fish production losses of about 11 tons per year may be compensated by fish culture in new ponds in borrow pits.
- (vii) No ecologically protected and sensitive area will be affected by the investment project, and there is no exclusive habitat of any endangered species near the Project site. However, the Padma River is known as a secondary habitat of two critically endangered species, the gangetic gharial and dolphin, whose main habitat is the Ganges River.
- (viii) The Padma River is an important migratory route for hilsa fish.

64. The Project will prepare a land acquisition plan, resettlement plan, EIA, and EMP on the basis of the detailed design of the bridge, fully taking into consideration the lessons learned from the Jamuna Multipurpose Bridge Project, particularly the importance of adopting a participatory approach during the pre-design stage and of institutional capacity development.

### **C. Risks**

65. The implementation of the Project should properly manage the following risks:

- (i) The political and security situation could be unfavorable to the implementation of the detailed engineering design of the Project and to the country's prioritization of resources for the main construction project. ADB will need to closely monitor the situation and coordinate with the local donors' group to ensure adequate protection.
- (ii) Timely provision of the Government's counterpart funding is essential for the safe delivery of the Project on schedule but may be particularly at risk when the finances of the Government are squeezed.
- (iii) The findings from the social and environmental impact study will need to be discussed thoroughly with affected people during the stage of detailed design. To achieve smooth implementation of the investment, the environmental and social concerns of affected people will need to be taken into account in developing the project design.
- (iv) In view of the massive land acquisition and resettlement induced by the bridge and its associated infrastructure, the Government should allocate sufficient resources to plan, operate, and manage land acquisition and resettlement, paying particular attention to restoring affected people's livelihood in a country where land is scarce and poverty is high. The detailed design consultants will develop an income-restoration program to address livelihood issues. Since governance in matters related to resettlement and land acquisition will be a risk, an external monitoring mechanism will be developed.
- (v) To strengthen project implementation capacity, JMBA should be restructured as a division under MOC and have a separate land acquisition, resettlement, and environment unit as proposed by the Jamuna Bridge Impact Study. The study pointed out that the establishment of social and environmental units within JMBA, with the necessary staff and support from management consultants, was instrumental in enabling the implementation of the resettlement, land acquisition, and environment management plans.

## V. ASSURANCES AND CONDITIONS

### A. Specific Assurances

66. In addition to the standard assurances, the Government has given the following assurances, which will be incorporated in the legal documents:

67. The Government will provide counterpart funding for the Project in a timely manner in accordance with its annual approved development plan allocation and in accordance with the project financing plan.

68. **Land Acquisition and Resettlement Plan.** The Government will ensure that a resettlement plan is updated based on detailed design of the Project and in accordance with its applicable laws and regulations, ADB's *Policy on Involuntary Resettlement* (1995), *Operation Manual F2 on Involuntary Resettlement* (2003), *Handbook on Resettlement: A Guide to Good Practice* (1998), and *Policy on Indigenous Peoples* (1998) and submit it to ADB for review and approval.

69. The Government will ensure that land acquisition to be undertaken during the detailed design stage proceed in accordance with its applicable laws and ADB's *Policy on Involuntary Resettlement* (1995) and *Operation Manual F2 on Involuntary Resettlement* (2003), as set out in the agreed upon resettlement plan, which includes (i) compensation and entitlements to affected people as stipulated in the resettlement plan; (ii) timely provision of funds and disbursements to affected people; (iii) adequate supervision, monitoring, and reporting by the JMBA; (iv) adequate information dissemination and consultation with affected people; (v) documentation of consultation and grievances; and (vi) regular reporting of progress to ADB.

70. The Government will ensure that the resettlement plan should include establishment of a grievance redress committee in each union where land acquisition will take place. A grievance redress committee will consist of (i) a representative from JMBA at the level of deputy/assistant director, (ii) the area manager of nongovernment organization concerned, (iii) the chairperson of the Union Parishad where the complaint is registered, (iv) a representative from affected people, (v) a woman member of the union Parishad, (vi) a head master of local high/primary school, and (vii) a representative from concerned deputy commissioner office. The grievance redress committee shall be entitled to give a verdict regarding a Project specific definition of entitlements and entitled persons.

71. **Environment.** The Government will ensure that the EIA including the EMP for the proposed Padma Bridge and also for the new resettlement site are in accordance with the Government and ADB's environmental assessment requirement. The Government will ensure that adequate consultation with affected people as part of the preparation of these environmental assessment studies will be carried out and the environmental concerns of affected people will be addressed in the project design.

72. **Selection of Consultants.** ADB will carry out consultant selection processes for the design consultant on behalf of the Government in accordance with ADB's *Guidelines on the Use of Consultants*, while the Government will retain its authority for contract negotiation and contract signing. In selecting the independent checking engineer and appointing members of panel of experts of Bangladesh nationality, the Government will obtain ADB's prior concurrence. In appointing members of panel of experts, JMBA, will prepare a short list, which should be approved by ADB.

73. **Bid Documents.** The Borrower will ensure that all works contract documents to be prepared under the Project for the ensuing investment project will incorporate provisions and budget to the effect that contractors (i) comply with all applicable labor laws and related international treaty obligations and do not employ child labor, as defined under Bangladesh law; (ii) provide safe working conditions for male and female workers; (iii) implement the provisions set forth in the Project-specific Gender Strategy; and (iv) carry out HIV/AIDS and human trafficking prevention and awareness campaigns in the campsites and corridors of influence.

74. **Construction Supervision.** The Government will adopt the FIDIC mechanism for construction supervision. All design and construction contracts must adopt standard FIDIC forms of contract, which must be applied without any modification of the normal responsibilities of the parties.

75. **Operation and Maintenance.** The Government will develop a technically and financially sustainable operation and maintenance scheme applicable to major bridges including the Padma bridge.

#### **B. Conditions for Loan Effectiveness**

76. **Restructuring of JMBA.** The Government will restructure JMBA to be headed by an executive director who will be the secretary of bridge division under MOC dealing with the authority; have a separate land acquisition, resettlement, and environment unit; and be supported by capable staff resources. The restructuring of JMBA should be approved by the Cabinet before the loan becomes effective.

77. **Subsidiary Loan Agreement.** The Government will execute the subsidiary loan agreement, prepared in a form and substance acceptable to ADB.

### **VI. RECOMMENDATION**

78. I am satisfied that the proposed technical assistance loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve the loan in various currencies equivalent to Special Drawing Rights 11,179,000 to the People's Republic of Bangladesh for the Padma Multipurpose Bridge Design Project from ADB's Special Funds resources with an interest charge at the rate of 1.0% per annum during the grace period and 1.5% per annum thereafter; a term of 32 years, including a grace period of 8 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft Loan Agreement presented to the Board.

HARUHIKO KURODA  
President

14 November 2007

### DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
<b>Impact</b> Facilitated project preparation for an investment loan to construct the Padma bridge	Preparation of technically sound detailed design of the Padma bridge, river-training works, and the access roads  Selection of a technically and financially qualified contractor for construction of the Padma bridge	Asian Development Bank's (ADB) project performance audit report  ADB's review missions  Project completion report	<b>Assumption</b> Political and security situation improves and is stable
<b>Outcome</b> Detailed design of the Padma bridge and other auxiliary works agreed by the Government and ADB	Submission of acceptable detailed design by June 2009	ADB review missions  Project completion report	<b>Assumption</b> Government's timely provision of counterpart funding
<b>Outputs</b> Scheme designs Technical studies Detailed design Tender action Environmental impact assessment Resettlement plan Land acquisition plan	Scheme design report by June 2008 Interpretative reports for technical studies (including additional studies) by October 2008 Detailed design reports and design certificates including the methodology and procedures for poverty impact assessment by June 2009 Tender documents by August 2009 Construction contract documentation by February 2010	ADB missions to monitor the implementation of the project  Consultant's progress report	<b>Assumptions</b> Restructuring of the Jamuna Multipurpose Bridge Authority to strengthen the project implementation capacity  Provision of capable counterpart staff from the Jamuna Multipurpose Bridge Authority
<b>Activities with Milestones</b> Preparation of request for proposal by August 2007 Short-listing of consultants and issuance of request for proposal by 15 September 2007 Evaluation of proposals by December 2007 Contract negotiation by 15 January 2008 Contract award by February 2008 Mobilization of consultants by 1 March 2008 Detailed design and tender action for construction contracts by February 2010			<b>Inputs</b> ADB's loan of \$17.6 million  Government's financing of \$4.4 million

## BANGLADESH TRANSPORT SECTOR ANALYSIS

### A. Overview of the Transport Sector

1. An adequate and efficient transport system is a prerequisite to economic development. It is recognized that investment to improve transport efficiency is the key to expanding and integrating markets. The transport system in Bangladesh comprises roads, railways, inland waterways, two seaports, maritime shipping, and civil aviation.

2. Transport demand in Bangladesh has grown faster than the GDP, doubling between 1974 and 1984 to 35 billion passenger-kilometers. In 1996, it reached 72 billion passenger-kilometers. Freight transport has increased at a similar rate and reached 10 billion ton-kilometers in 1996. However, the shares of transport modes have not increased in the same proportion. The road sector carries the majority of passenger traffic, having increased from 54% in 1974 to 73% in 1996, mainly at the expense of rail. In the freight sector, transport by water is more dominant but with a slightly eroding share of 37% in 1974 and 30% in 1996. In comparison, road transport increased to 63% in 1996, again mainly at the expense of rail transport. Thus, the faster expansion of the country's road network, as well as the increase in road vehicle numbers, has made the road sector dominant, though freight transport by water remains substantial.

3. The transport sector in Bangladesh is confronted with numerous problems. Some are common to all sub-sectors while some are sub-sector specific. Major common problems are the following:

- (i) **Physical constraints.** These arise from difficult terrain, numerous river crossings, periodic flooding, poor soil condition, siltation and erosion of rivers, riverbank sliding, etc.
- (ii) **Maintenance deficiencies.** Proper maintenance and timely rehabilitation of the transport network, rolling stock, and capital assets is lacking. Development funds are allocated largely by the Planning Commission, while the funds for maintenance are allocated by the Ministry of Finance as part of current expenditure. There is very little coordination between these two agencies in determining development and maintenance allocations.
- (iii) **Unrealistic pricing policy.** Although pricing should ideally be based on cost recovery, in reality it is not commensurate to the cost of providing services. Fares and rates in all transport sub-sectors are fixed well below the combined cost of transport. This has resulted in perpetual losses in the total transport sector and put pressure on the total allocation for other sectors of the economy.
- (iv) **Inherent weaknesses of the institutional and policy framework.** These have turned the transport parastatals into perpetual loss-making concerns.
- (v) **Poor liquidity position of most of the transport sector parastatals.** Almost all parastatals have accumulated substantial long-term debts. Poor financial performance has caused debt servicing by the parastatals to deteriorate, placing a heavy burden on the government budget.
- (vi) **Waste of resources because of incoherent planning.** Allocations to the transport sector during planning rarely considers inter-modal priorities based on cost effectiveness and an optimal modal mix.
- (vii) **Investment and operation problems.** These arise from inadequate coordination among ministries and parastatals.

## B. Subsector Profile

### 1. Road Sector

4. The Government's responsibility for roads is divided between the Roads and Highways Department (RHD), which is responsible for the planning, construction, and maintenance of national highways, regional highways, and zila roads (formerly feeder road A), and the Local Government Engineering Department (LGED), which is responsible for upazila roads, union roads, and village roads (formerly feeder road B).

5. National highways connect the national capital with district headquarters, port cities, and international highways. Regional highways connect different regions and district headquarters not connected by national highways. Feeder roads are of two types, namely zila roads (formerly feeder road A) and upazila roads, union roads, and village roads (formerly feeder road B). Zila roads connect the thana headquarters with upazila headquarters. Upazila roads connect important growth centers to the main arterial road network. Union roads connect union headquarters with growth centers or local markets or with each other. Village roads connect villages with union headquarters, local markets, farms, and ghats or with each other.

6. In mid-2003, the total length of road network under RHD was 21,000 kilometers (km), of which 12,500 km was paved and 8,500 km was earthen. National highways total 3,090 km (15%), regional highways 1,750 km (8%), and feeder roads 16,000 km (77%). At the end of 2000, the total length of different categories of road under LGED stood at 41,179 km (62%) paved and 24,717 km (38%) earthen.

7. Table 1 shows the number of vehicles registered in Bangladesh over a recent 6-year period. Non-motorized vehicles are regulated by local authorities, and their actual number is unknown. The table below indicates that some 594,000 vehicles were registered in 2001, with 46% being motorcycles. Few motorcycles can be observed in the Dhaka region, as they are more abundant mainly in northern areas of the country. While buses and minibuses make up only 5% of vehicles, they are important for carrying large numbers of passengers over long distances.

**Table A2.1: Number of Registered Vehicles in Bangladesh**

Type	1995	1996	1997	1998	1999	2000	2001	AAGR (%)
Car/Taxi	63,218	74,493	82,861	88,840	94,042	98,682	106,028	9.09
Jeep/Microbus	29,207	32,015	33,774	36,479	38,748	40,260	43,337	6.81
Bus	13,406	13,287	13,386	13,762	13,939	14,269	14,859	1.74
Minibus	10,466	11,052	11,918	12,520	12,999	13,399	14,597	5.72
Truck	33,210	35,475	36,257	38,990	41,008	43,728	46,203	5.67
Autorickshaw/Tempo	52,340	62,548	69,094	73,497	75,637	78,767	79,144	7.31
Motorcycle	178,257	188,669	200,749	215,274	231,785	246,395	271,204	7.25
Other	8,161	8,685	10,286	11,534	14,151	15,511	18,402	14.65
<b>Total</b>	<b>388,265</b>	<b>426,224</b>	<b>458,325</b>	<b>490,896</b>	<b>522,309</b>	<b>551,011</b>	<b>593,774</b>	<b>7.34</b>

AAGR = annual average growth rate.

Source: Bangladesh Road Transport Authority.

8. Whereas in 1971 there were around 40,000 motor vehicles, at present there are almost 600,000, following an average growth rate of around 10% per year. In the future, as the country becomes more prosperous, high growth can be expected in light vehicles. Different vehicles

have different rates of utilization. For example, in Bangladesh commercial vehicles, and in particular buses, are used intensively. Large buses operating on intercity routes are utilized up to 80% of the time, while most other vehicles average around 60% utilization.

9. The main problems associated with road transport are (i) inadequate allocation of funds for the maintenance of roads and vehicles; (ii) losses due to operating old, dilapidated vehicles; (iii) heavy management with excess manpower; (iv) poor maintenance and rehabilitation of road infrastructure; (v) poor administration of road safety measures and environmental issues; (vi) mixing of motorized and non-motorized traffic; (vii) lack of all weather accessibility because of high investment costs due to periodic flooding and the consequent height requirement of road embankments; and (viii) numerous river crossings requiring many bridges and/or ferry links.

## **2. Railway Sector**

10. Bangladesh Railway is the only mode of transport operated by the public sector. Rail transport consists of both broad-gauge and meter-gauge lines. Broad gauge accounts for 34%, while meter gauge accounts for 66%. Bangladesh railway operates all over the country through 255 stations in the eastern region and 234 stations in the western region. Bangladesh Railway provides three types of rail services: intercity, mail express, and local passenger. In FY1995, intercity trains carried 22% of total rail passengers, express trains 39%, and local trains 39%. Railway freight traffic has declined over the years. In 1969 freight traffic carried by rail was about 4.9 million tons, declining by 1994 to 2.7 million tons. Ton-km has also reduced over the years. Net ton-kms in 1994/95 stood at 759 million, declining from 1,265 million in 1969/70. Railway freight traffic constituted only 7% of the total freight traffic in 1996/97. Major commodities carried by rail are food grain, fertilizer, cement, coal, stone and ballast, petroleum products, jute, salt, and sugarcane.

11. A notable improvement in the rail network is provided by Jamuna Multipurpose Bridge. In August 2003 the rail link opened over this bridge from Dhaka to the northwest region, but only for passenger services.

12. The main problems associated with rail transport are (i) financial losses with the diversion of passenger and freight traffic from rail transport to road transport; (ii) excess overhead expenditures, low operating revenue, and high operating costs; (iii) losses from ticketless travel, especially on local trains; (iv) poor operational efficiency because of inadequate fund allocation for the maintenance of tracks and rolling stocks; and (v) the failure of railway management to operate railways with commercial considerations.

## **3. Inland Waterway Sector**

13. The basic inland waterway transport system comprises a triangle of two seaports, Chittagong and Mongla, with the Dhaka-Narayanganj metropolitan area. While the total length of waterways is around 14,000 km, the length of navigable waterways is 5,968 km in the rainy season and 3,600 km in the dry season. There are 23 coastal island ports and seven ferry ghats located at Paturia, Nagarbari, Daulatdia, Bhuapur, Sirajganj, Mawa, and Char Janajat. In addition there are 233 Bangladesh Inland Waterways Transport Authority (BIWTA) launch ghats and over 1,000 other ghats around the country.

14. More than half of the country's land area and 75% of its commercial activities are situated within 10 km of a navigable waterway during all seasons. The waterways are developed and maintained by BIWTA and, despite problems of siltation and reduced stream flow

during the dry season, provide a cost-effective means of transport. The Bangladesh Inland Waterways Transport Corporation (BIWTC) maintains a few intercity passenger traffic lines and limited inland waterway cargo traffic. The private sector provides the majority of inland water services. The service providers are organized into a number of associations. The eleven major ports are administered and managed by BIWTA. Contracts are made with the private sector operators to deliver the necessary services.

15. The main problems associated with water transport are (i) siltation of inland waterways and lack of adequate navigation aids; (ii) poor operational efficiency of the BIWTC fleet (most of the vessels in its fleet are old and costly in terms of fuel consumption and maintenance and repair costs); (iii) heavy losses from unprofitable BIWTC passenger services on coastal routes and inefficient cargo services on other routes; (iv) poor operational efficiency of Chittagong Port from inadequate arrangements for carriages as well as for loading and unloading containers; (v) operational problems because of siltation of channels from anchorage to the port area (proper dredging cannot be undertaken because of financial constraints of port authorities); and (vi) operational problems at Mongla Port due to siltation of approach channels and the lack of multipurpose berths and ancillary equipment.

## **C. Transport Sector Management**

### **1. Sector Management Structure**

16. The transport sector consists of a number of sub-sectors including roads, railways, inland waterways, maritime shipping and civil aviation. The transport sector is managed and developed by four line ministries: Ministry of Communications (MOC) for road and rail; Ministry of Shipping for water transport and ports; Ministry of Civil Aviation for air transport; and Ministry of Local Government, Rural Development, and Cooperatives for rural roads. Below the ministry level there are nine parastatals involved in transport operations: Bangladesh Railway, Bangladesh Road Transport Corporation, BIWTC, BIWTA, Bangladesh Shipping Corporation, Civil Aviation Authority of Bangladesh, Biman Bangladesh Airlines, Chittagong Port Authority, and Mongla Port Authority. In addition, there is the relatively new Jamuna Bridge Division under MOC, with the Jamuna Multipurpose Bridge Authority, established in 1985, placed under the Jamuna Bridge Division in 1995.

### **2. Government's Sector Expenditure**

17. The development of an adequate and efficient transport system is seen by the Government of Bangladesh as a prerequisite for both initiating and sustaining economic development. The Government is committed to the development of the transport sector, which is evident from the allocation of public sector funding during the fiscal years of 1997–2002. The total public sector outlay for the period from 1997 to 2002 is estimated to be Tk859 billion, of which Tk110 billion (13%) is allocated to the transport sector. This is the second largest proportion of the public budget, the largest proportion of Tk129 billion (15% of the total budget) being for education.

### **3. Government's Transport Sector Strategy**

18. **Road Transport.** The critical problem facing the road sector is the maintenance and improvement of the network to raise the quality and safety of road operations. Various options for financing road maintenance and operations will be explored. The establishment of an autonomous road maintenance fund to ensure adequate and stable recurrent financing of roads



will be considered. The multimodal transport system link will be expanded to include, among other areas, the Export Processing Zone and areas producing coal, hard rock, mining fertilizer, cement, and tea for the speedy and efficient movement of cargo and passengers. Monitoring indicators will be set to assess progress in such key areas as increased allocations for maintenance and levels of cost recovery and more effective road traffic management to improve road safety, traffic control, and overloading enforcement.

19. To ensure a sound road transport system, the responsibility for management of different types of roads among RHD, LGED, and municipal government institutions will be clearly assigned. Similarly, effective coordination among relevant ministries and agencies, and formal mechanisms of interaction with nongovernment stakeholders, will be instituted. To ensure the satisfactory performance of responsibilities, high priority should be given to building up the capacity of agencies like the Bangladesh Road Transport Authority and local government institutions.

20. The rural road network has reached an extent that makes it appropriate to invest in quality rather than expansion. This will mean greater emphasis on high-quality construction using labor-based technologies, maintaining and upgrading the existing network, and undertaking selective expansion to ensure balanced rural-urban linkages. In doing so, more emphasis needs to be given to developing growth centers and rural roads to connect villages with growth centers and feeder roads, as well as providing rural roads with such drainage structures as bridges and culverts.

21. Pressure is increasing on urban transport systems in most cities. Ownership of motor vehicles is growing faster than the population. This growth exceeds the accommodating ability of road space. This has become a major impediment of the efficient working of road systems and the urban economy in Dhaka. This mega city of 10 million people living in a very limited area cannot meet transport needs with surface modes of transport only. It is imperative to build underground and other mass transit systems.

22. **Railway Transport.** The role of Bangladesh Railway in the economy has been constrained by its limited infrastructure and low efficiency of services vis-à-vis competing modes of transportation. Sustained reforms are to enhance the contribution of railways to the economy and contain the adverse budgetary impact of its operations. The reorganization of Bangladesh Railway—including corporatization and commercialization with private participation—are critical to developing the sector and improving the efficiency of services. Linking Bangladesh Railway with the railways of neighboring countries through strategic partnership has a high potential for catalyzing economic growth, poverty reduction, and the commercial viability of the sector..

23. **Inland Waterway Transport.** The inland waterway system carries a large volume of total freight but is not used to its full potential due to the silting of waterways, lack of ghat berthing facilities, and obstructions caused by low or narrow road bridges and irrigation channel sluice gates. To better realize the full potential of the inland waterways, the following factors, among others, will be considered: (i) inter-project coordination to facilitate clearances under road bridges and the needs of country boats when siting and designing sluice gates, (ii) encouraging local authorities to organize self-financed ghat facilities through user charges, and (iii) setting and enforcing standards for the bridge network and berthing facilities.

## EXTERNAL ASSISTANCE TO THE ROAD SECTOR, 1977–2006

Source	Project	Amount (\$ million)	Year of Approval
<b>A. Asian Development Bank</b>	• Khulna-Mongla Road	15.00	1977
	• Feeder Roads Improvement	58.00	1985
	• Road Improvement	137.50	1987
	• Flood Damage Restoration	40.00	1988
	• Second Flood Damage Restoration	80.00	1989
	• Cyclone Damaged Roads Reconstruction	28.80	1991
	• Road Overlay and Improvement Project	68.00	1993
	• Jamuna Multipurpose Bridge	200.00	1994
	• Jamuna Bridge Access Roads Project	74.25	1997
	• Flood Damage Rehabilitation Project (1998)	45.60	1998
	• Southwest Road Network Development Project	115.00	1999
	• Road Maintenance and Improvement	68.70	2000
	• Road Network Improvement and Maintenance	65.00	2002
	• Road Network Improvement and Maintenance-II	126.00	2004
	• Emergency Flood Damage Rehabilitation Project	50.50	2005
<b>Subtotal (A)</b>	<b>1,172.35</b>		
<b>B. World Bank</b>	• Second Highway	10.00	1979
	• First Highway Supplemental	6.00	1982
	• Road Rehabilitation and Maintenance	102.00	1987
	• Flood Damage Rehabilitation	25.00	1989
	• Second Road Rehabilitation and Maintenance	146.80	1994
	• Jamuna Multipurpose Bridge	200.00	1994
	• Third Road Rehabilitation and Maintenance	270.96	1998
<b>Subtotal (B)</b>	<b>785.76</b>		
<b>C. Japan</b>	• Upazila Connecting Roads (JICA)	4.40	1985
	• Construction of Meghna Bridge (JICA)	56.00	1986
	• Construction of Meghna-Gumuti Bridge (JICA)	74.00	1991
	• Jamuna Multipurpose Bridge (JBIC)	200.00	1994
	• Jamuna Bridge Access Road Project (JBIC)	50.40	1997
	• Construction of Small and Medium Bridges on Dhaka-Chittagong Highway (JICA)	21.23	1998
	• Meghna Bridge Resettlement Project (JICA)	1.66	1999
	• Paksey Bridge (JBIC)	116.93	1997
• Rupsa Bridge (JBIC)	77.85	2001	
<b>Subtotal (C)</b>	<b>602.47</b>		
<b>D. People's Republic of China</b>	• Buriganga Bridge	19.00	1986
	• Shambhuganj Bridge	14.00	1989
	• Mohananda Bridge	6.50	1991
	• Karatua Bridge	8.50	1996
	• Gabkhan Bridge	10.30	1988

<b>Subtotal (D)</b>		<b>58.30</b>	
<b>Source</b>	<b>Project</b>	<b>Amount (\$ million)</b>	<b>Year of Approval</b>
<b>E. United Kingdom</b>	• Bailey Bridges	25.00	1981
	• Gorai River Bridge	69.00	1986
	• Institutional Development Component-2	10.00	1994
	• Institutional Development Component-3	7.00	1999
	• Bridge Improvement and Maintenance Project-2	20.90	1995
	• Bhairab Bridge	37.94	1998
	• Reconstruction of Narrow Bridge and Culvert	11.00	1999
	<b>Subtotal (E)</b>	<b>180.84</b>	
<b>F. Denmark</b>	• Road Maintenance Equipment	3.50	1981
	• Supply of Road Rollers	2.50	1983
	• Dhaka-Aricha Highway	30.00	1993
	• Important Road Rehabilitation in Patuakhali and Barguna	33.70	1999
	<b>Subtotal (F)</b>	<b>69.70</b>	
<b>G. Kuwait</b>	• Doarika-Shikerpur Bridge Project	21.63	1998
	• Sylhet-Tamabil Jaflong Road Project	22.00	1996
	• Third Karnaphuli Bridge	53.58	2005
	<b>Subtotal (G)</b>	<b>97.13</b>	

JBIC = Japan Bank for International Cooperation, JICA = Japan International Cooperation Agency.  
Source: Asian Development Bank estimates.

## PRELIMINARY DESIGN CRITERIA

### A. Project Scope

1. The Padma Multipurpose Bridge Design Project (the Project) comprises the following six main elements. The design consultant shall determine the optimum arrangement for the construction contracts for the different elements, taking into account the interfaces and relationships among them. Each element may be procured under a separate construction contract or, alternatively, some elements may be combined into a single contract to produce a smaller number of separate contracts.

2. **River-Training Works.** Extensive river-training works are required on each side of the river to confine the flow of the river within the extent of the main bridge and prevent erosion and possible undermining of the abutments and approaches.

3. **Main Bridge Across the Padma River.** The main bridge is a multi-span structure approximately 5.6 kilometers (km) long crossing the Padma River. As the future rail line will run between the two carriageways, the bridge will include a short viaduct at each end to link with approach embankments and carry one carriageway of the highway over the railway so that the highway and railway may diverge at each end.

4. **Eastern Approaches.** On the east side (left bank) the Project includes a short length of approach road embankment and the toll plaza for westbound traffic. In addition, provision shall be made for the future railway approach embankment, and the extent of the works to be provided under this Project is to be determined by the design consultant to suit the final road and rail alignment.

5. **Western Approaches.** On the west side (right bank) the Project includes approximately 12 km of approach road embankment and the toll plaza for eastbound traffic. This approach road includes several bridges and culverts. In addition, provision shall be made for the future railway approach embankment, and the extent of the works to be provided under this Project is to be determined by the design consultant to suit the final road and rail alignment. The railway works on the west side may include space for a future railway station.

6. **Associated Bridge End Facilities (East Side).** The bridge end facilities on the east (Mawa) side will include, in addition to any other requirements that the design consultant may determine, the following:

- (i) toll plaza and toll collection facilities for westbound traffic;
- (ii) weigh-in-motion station and weigh bridge;
- (iii) service area with offices and facilities for future operation and maintenance staff;
- (iv) small compound with offices and accommodation facilities to be used by the contractor, engineer, and client during construction and also by the client and others during the ongoing operation phase;
- (v) whatever end facilities are required to connect the high-voltage power cables on the bridge with the surrounding power transmission network;
- (vi) whatever end facilities are required to connect the gas pipes on the bridge with the surrounding gas pipe system;
- (vii) whatever end facilities are required to connect the telecommunications and other services carried by the bridge with the surrounding networks; and
- (viii) all necessary safety and security provisions associated with the above.

7. **Associated Bridge End Facilities (West Side).** The bridge end facilities on the west (Janjira) side will include, in addition to any other requirements that the design consultant may determine, the following:

- (i) toll plaza and toll collection facilities for eastbound traffic;
- (ii) weigh-in-motion station and weigh bridge;
- (iii) service area with offices and facilities for future operation and maintenance staff;
- (iv) large compound with offices and accommodation facilities to be used by the contractor, engineer, and client during construction and designed to be converted into a major hotel and tourist resort with leisure and recreation facilities (part of this compound shall be designated for use by the client and others during the ongoing operation phase);
- (v) visitor center to house a permanent exhibition describing the project and other matters of interest in the area, which can be used as a tourist attraction and educational facility during construction to explain the works and celebrate the achievement of planning, designing, and constructing such a crossing;
- (vi) whatever end facilities are required to connect the high-voltage power cables on the bridge with the surrounding power transmission network;
- (vii) whatever end facilities are required to connect the gas pipes on the bridge with the surrounding gas pipe system;
- (viii) whatever end facilities are required to connect the telecommunications and other services carried by the bridge with the surrounding networks; and
- (ix) all necessary safety and security provisions associated with the above.

8. The design consultant is required to determine the precise scope, content, and extent of each element of the works after detailed consultation with the parties involved, and to carefully define the precise boundary between each element of the works to be carried out under separate contracts.

9. The design life for the crossing shall be 100 years. This requirement defines the basis for the derivation of the characteristic imposed loads and environmental effects to be considered in the design. The assumption of a design life of 100 years does not mean that the crossing will not be fit for its purpose at the end of that period, or that it will continue to be serviceable for that period without adequate inspection and maintenance and the repair and replacement of certain materials and components. The definition of a design life presupposes the establishment and routine operation of an adequate and thorough inspection and maintenance regime covering all accessible structural and nonstructural parts.

10. Thus it is to be expected that some materials and components such as bridge deck surfacing, bearings, movement joints, corrosion protection paint systems, safety barriers, and certain other parts will require repair and/or replacement at much shorter intervals. The following minimum periods are given as guidance to what would be expected as minimum service life for the various components and are to be verified by the design consultant:

- (i) Bridge deck surfacing: period to first resurfacing > 25 years.
- (ii) Bridge bearings: period to first major maintenance/replacement > 40 years.
- (iii) Movement joints: period to first major maintenance/replacement > 25 years.
- (iv) Corrosion protection: period to first re-coating > 20 years.
- (v) Corrosion protection: period between subsequent re-coatings > 10 years.

## **B. Crossing Facilities**

11. The bridge is to carry the following facilities:

- (i) **Highway.** The bridge is required to carry dual two-lane carriageways with a design traffic speed of 100 km per hour (km/hr). Each carriageway shall comprise two traffic lanes each 3.5 meters (m) wide and a hard shoulder 2.5 m wide. The bridge is intended to carry motorized vehicles only, not pedestrians, cycles, or rickshaws, and no special provision shall be made for a cycle or pedestrian path on any part of the bridge.
- (ii) **Railway.** Provision shall be made for the future addition of a single-track broad-gauge railway along the centerline of the bridge. The design rail speed is 60 km/hr. Different locations of the railway in the bridge cross section have been considered in the feasibility studies and development of the project, including the option of placing the railway on one edge of the bridge, as it is on the Jamuna bridge, but there is a strong preference for the railway to be carried along the bridge centerline at the Padma crossing. A central corridor shall be provided for the future rail provision. The bridge shall be designed for the loadings arising from the proposed future railway from the outset, including all realistic combinations of railway loading with highway and other imposed and environmental load effects. There must be no need for future strengthening of the bridge to accommodate the railway when it is added at a future date. A walkway for use by railway maintenance staff and to permit safe emergency egress from the train shall be provided along one or both sides of the track.
- (iii) **Power transmission line.** The bridge will be required to carry a 400 kilovolt (kV) power transmission line as part of the developing power supply network in southwest Bangladesh. The Jamuna bridge carries a 230 kV power transmission line overhead on tapering cylindrical masts, but this type of solution is not preferred for the Padma bridge. The preferred solution is for the power cables to be carried in a special duct supported on a cantilevered section of the deck along one edge of the bridge girder. This will require that special safety and security precautions are adopted and incorporated into the design of the system.
- (iv) **High-pressure gas main.** The bridge is to carry a gas pipe 30 inches (76 centimeters) in diameter, which is expected to operate at a pressure of 1,000 pounds per square inch. The gas pipe shall be supported either under the cantilevered section of deck on the opposite side of the bridge from the power cables or in an alternative position taking due account of the requirement for easy access for maintenance and the need to ensure the safety and security of the gas pipe. The gas pipe shall not be carried inside a closed box girder bridge superstructure.
- (v) **Ducts for telecommunication cables and other services.** The bridge is required to carry telecommunications cables with additional capacity in the form of at least three empty ducts for the addition of future cables. It is to be expected that this will involve the provision of about six continuous ducts with an internal diameter not less than 150 millimeters. A continuous power supply system shall be provided within the bridge to provide lighting for safe passage through and inspection of the interior. In addition, suitable electrical outlets shall be provided at regular intervals along the bridge interior for the purpose of powering hand tools and equipment.
- (vi) **Traveling maintenance trolley system.** To facilitate longitudinal access through the bridge for inspection and maintenance staff, and to enable the rapid transfer of materials and equipment along the bridge to facilitate inspection and maintenance work, a traveling maintenance trolley system shall be provided. The particular performance requirements of the trolley system shall be developed by the design consultant in line with similar facilities provided on other long bridges.

## C. Design Standards and Requirements

12. The design consultant shall determine the most appropriate and applicable standards and codes of practice to be adopted in the design of the various elements of the works, taking into account any national requirements and preferences in Bangladesh as well as current international best practice. Where an element of the works is not adequately covered by recognized, published codes and standards, the design consultant shall develop and propose suitable design standards.

### 1. River-training Works

13. The design consultant shall propose appropriate standards and criteria for the design and construction of river-training works. In arriving at these standards and criteria, it shall study all available and relevant international standards and codes of best practice for river-training works and the stabilization of soft riverbanks, and make reference to the work carried out in connection with the Jamuna bridge project and other relevant documents, including the following:

- (i) study reports and design documents for the Jamuna bridge, 1989–1998;
- (ii) *Standard Design Manual*, Bangladesh Water Development Board, 1994;
- (iii) *Evaluation Report of Bank Protection and River Training Pilot Project and Guidelines and Design Manual for Standardized Bank Protection Structures* (FAP-21/22, 2001);
- (iv) reports on the Jamuna-Meghna River Erosion Mitigation Project (2002) and other riverbank protection projects in Bangladesh; and
- (v) standards, guidelines, and research papers in India, Japan, and other countries.

14. In addition, the design consultant shall take note of the results of recent monitoring of riverbed scour adjacent to the guide bunds at the Jamuna bridge and take them into consideration when developing appropriate design criteria.

### 2. Bridge Structural Design

15. The design consultant will propose appropriate structural design standards and criteria to be used as the bases for designing the main bridge. It is expected that these will be based on either British or American standards, but the design consultant may also wish to consider other suitable, well-established international standards. The design consultant shall ensure that the standards adopted for the project represent a coherent, consistent, and comprehensive set of design rules for all aspects of the structural design.

16. It is noted that British Standard BS5400, the comprehensive design standard for bridges previously used for the design of the Jamuna bridge, is due to be withdrawn in the near future with the advent of the Structural Eurocodes in Europe. Nevertheless, the design consultant may propose them if he determines that they would be the most appropriate set of standards to use for the Padma project. Alternatively, the design consultant may wish to propose a set of design standards based on American Association of State Highway and Transportation Officials standards or a combination of British and American standards where this would be more appropriate.

17. If a combination of standards is proposed, the design consultant shall take care to ensure full compatibility in the different approaches to the definition of characteristic loads and partial safety factors so as to achieve consistency in the safety margins to be built into the

design. The design consultant shall present a well-argued case for whichever set of design criteria is proposed and shall obtain the approval of the client before proceeding with the detailed design.

### **3 Railway Standards**

18. The requirements of Bangladesh Railway shall be taken into account in deriving the appropriate design standards for the railway, bearing in mind that the provision of the railway itself is expected to be under a subsequent contract placed after the bridge is completed. The following basic requirements have so far been established but need to be reviewed by the design consultant in determining the appropriate design standards:

- (i) The bridge is to carry a single broad-gauge (1,676 millimeter) non-electrified track.
- (ii) Foreign railways standards and criteria are to be considered because there is a possibility that freight wagons owned by those railways may use the bridge in the future.
- (iii) The proposed train speed limit on the bridge is 60 km/hr.
- (iv) Train length is limited to 528 meters and weight to 19,570 kilonewtons. The rail clearance envelope dimensions and rail track construction details shall be agreed with Bangladesh Railway to define the geometric and loading criteria to be used in the design of the bridge.

### **4. Approach Roads and Embankments**

19. Once it is constructed, the project highway will become a part of the National Highway No. 8 of Bangladesh. In addition, the highway is listed in the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) Intergovernmental Agreement of 26 April 2004 as a link of Asian Highway Route 1. Therefore, in addition to considering the most appropriate international highway design standards to be adopted for the design of the approach roads, the design consultant shall take note of the following two relevant design standards: (i) Roads and Highway Department (RHD) Geometric Design Standards of Bangladesh and (ii) Asian Highway Classification and Design Standards of UNESCAP. These two standards would suggest different classifications for the project highway as follows: (i) type 2 (design speed 80 km/hr) of the RHD Geometric Design Standards, and (ii) primary, level terrain (design speed 120 km/hr) of the Asian Highway Classification and Design Standards.

20. The design consultant shall determine the most appropriate set of standards and criteria for the highway to suit the proposed design speed of 100 km/hr. The entire route between the toll plazas is to be a controlled, tolled crossing, and unauthorized access shall be prevented by suitable security systems. The design of the approach roads across open country on embankments shall take this into account.

### **5. Power Transmission Lines**

21. The bridge is to carry a 400 kV power line comprising at least six high-voltage power cables. There is currently no other 400 kV power line in Bangladesh, so the design consultant shall refer to current international best practice from other countries in determining the appropriate design standards to be adopted in this case.



22. The preferred solution proposed in the Japan International Cooperation Agency (JICA) report after consultation with the Ministry of Power and the Power Grid Company of Bangladesh is for the cables to be carried in a duct along the edge of the bridge rather than overhead on tall masts. This solution has arisen partly because of the preference identified in the JICA report for an extradosed (or cable stayed) structural system for the bridge, which would be incompatible with overhead power lines. There are some advantages and some disadvantages to this proposal, and the design consultant shall evaluate them when arriving at the optimal final design.

23. With the cable duct along the edge of the bridge deck, access to the cables is much easier than with an overhead system, and the design will need to incorporate special measures to ensure safety and security. Unauthorized access to the cables shall be prevented, but suitable provision for controlled access for inspection and maintenance staff shall be made. The design shall include a suitable safety fence outside the duct at the edge of the bridge or a continuous clip-on safety rail system for use with a safety harness to ensure the safety of inspection and maintenance staff.

24. It is to be expected that the cables will be placed in a bed of sand within the duct, and that if necessary the duct can be mounted on resilient mountings to absorb vibrations from passing road and rail traffic and to provide added electrical isolation. With an overhead power line system, movement joints would not be necessary. Placing the cables in a duct requires suitable movement joints at intervals to accommodate thermal expansion and contraction. The design consultant shall develop an appropriate solution using U-bends or other devices to accommodate the necessary movements, taking care to ensure that such joints are visually unobtrusive but also accessible for inspection and maintenance.

25. At each end of the bridge, the cables will emerge from the bridge duct and pass into an insulator arrangement and thence to the overland overhead transmission line mast system. Particular care is needed at these points to ensure safety and prevent unauthorized access to the power cables. The arrangement of the bridge end facility is to be determined by the design consultant in consultation with the Power Grid Company of Bangladesh so that sufficient space is provided and suitable arrangements are included in the construction contracts. The actual supply and installation of the power cables and all associated connection facilities at each end will be under a separate contract after completion of bridge construction.

## **6. High Pressure Gas Main**

26. The high-pressure gas main shall be designed in accordance with the requirements of Petrobangla with reference to appropriate recognized international design standards such as the American Petroleum Institute (API) and American National Standards Institute (ANSI) codes as well as the Bangladesh Natural Gas Safety Rules 1993.

27. The gas supply requirement is currently identified as a single gas pipe 30 inches (76 centimeters) in diameter and operating at a pressure of 1,000 pounds per square inch. The design consultant shall study options for the bridge to carry the same gas supply capacity but with two smaller gas pipes instead of one large one to provide some redundancy in the system for maintenance or in case of any other reason to shut a pipe down. In this case, the two pipes shall not be carried side-by-side but shall be suitably separated to provide the necessary safety distance between them as required by normal safety standards. Such options may include carrying one pipe above and one below the cantilevered bridge deck, or placing one pipe in the

central corridor adjacent to the railway line behind a suitable safety barrier, perhaps beneath the walkway.

28. The number, size, and location of the gas pipe(s) in the bridge cross section is to be decided by the design consultant after design development and after further consultation with Petrobangla and others to suit the final design of the bridge. The gas pipe(s) will require movement joints at intervals to be determined by the design consultant. Such joints may involve large U-bends or special in-line concertina or sliding type joints. From the point of view of aesthetics, the in-line type of joint is preferred since U-bends tend to be very large and require large supporting platforms mounted outside of the bridge. The design consultant shall devise a joint type and arrangement that suit the functional requirements and provide easy access for inspection and maintenance without spoiling the overall appearance of the bridge. The pipe supports shall be designed to be as neat and tidy as possible, with a minimum of sliding or moving joints.

## **7. Telecommunications and Other Small Electrical and Data Services**

29. The design consultant shall propose suitable design standards based on current international best practice for the design of the ducts within the bridge girder for future telecommunications and small power and data cables. The ducts shall be placed within the bridge deck structure at a location where they are unlikely to get damaged but where they are readily accessible for inspection and maintenance. They shall be designed in accordance with the requirements of Bangladesh Telegraph and Telephone Board, including the adequate provision of movement joints and service chambers as required. The ducts shall be arranged in two groups within the bridge cross section, separated by a distance of at least 3 meters, so that sensitive data cables need not be placed immediately adjacent to any electrical supply cables that may cause interference.

## **8. Drainage**

30. As rainwater drainage from the bridge may be permitted to discharge into the river; there is no requirement for a piped drainage system on the bridge to take rainwater runoff back to the abutments. However, it is undesirable to allow potential pollution of the waterway from spillage of oil, fuel, or other potential contaminants on the roadway. Therefore the design consultant shall consider the provision of a drainage system that includes separation sumps to catch potential contaminants and prevent them from discharging directly into the river.

31. The outlets from the sumps that discharge water into the river shall be designed as suitable spouts to ensure that the water flows freely away from the structure to prevent wetting and possible staining of concrete surfaces or any other parts of the structure. Particular care shall be taken to prevent water entering the structure or any parts intended to remain dry, and to prevent water from reaching the bearings and other components susceptible to corrosion. Movement joints shall be detailed to ensure that any water penetrating the joint does not stain or damage structural parts or components underneath.

## DETAILED COST ESTIMATES

Table A5.1: Detailed Cost Estimates by Expenditure Category<sup>a</sup>

Item	Tk Million			\$ Million			% Base Cost
	Foreign	Local	Total	Foreign	Local	Total	
<b>A. Base Cost<sup>b</sup></b>							
1. Detailed Design Consultant	814	334	1,147	12.0	4.9	16.9	81.9
2. Independent Checking Engineer and Panel of Experts	167	52	219	2.5	0.8	3.2	15.7
3. Incremental Administrative Support	0	34	34	0.0	0.5	0.5	2.4
<b>Subtotal (A)</b>	<b>981</b>	<b>420</b>	<b>1,401</b>	<b>14.4</b>	<b>6.2</b>	<b>20.6</b>	<b>100.0</b>
<b>B. Contingencies<sup>c</sup></b>							
1. Physical	48	20	68	0.7	0.3	1.0	4.9
2. Price	10	4	14	0.1	0.1	0.2	1.0
<b>Subtotal (B)</b>	<b>57</b>	<b>24</b>	<b>82</b>	<b>0.8</b>	<b>0.4</b>	<b>1.2</b>	<b>5.8</b>
<b>C. Financing Charges During Implementation</b>	<b>14</b>	<b>0</b>	<b>14</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>1.0</b>
<b>Total</b>	<b>1,052</b>	<b>444</b>	<b>1,496</b>	<b>15.5</b>	<b>6.5</b>	<b>22.0</b>	<b>106.8</b>

<sup>a</sup> Includes taxes and duties of \$2.8 million.

<sup>b</sup> In 2007 prices.

<sup>c</sup> Physical contingencies computed at 5% and price contingencies at 0.8% on foreign exchange costs and local currency costs.

Source: Asian Development Bank estimates.

**Table A5.2: Detailed Cost Estimates by Financier**  
(\$ million)

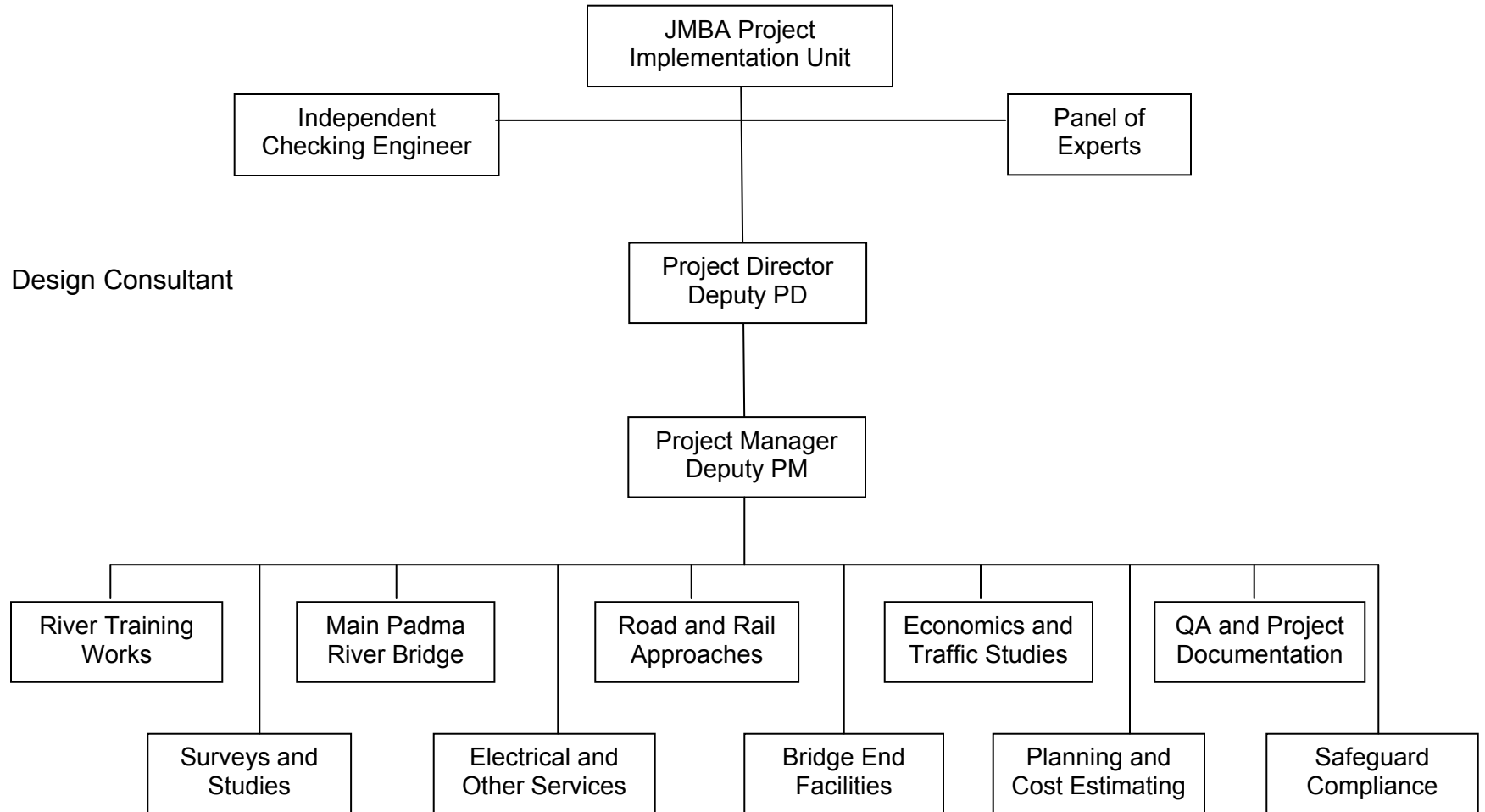
Item	Cost	ADB		Government	
		\$	% of Cost Category	\$	% of Cost Category
<b>A. Base Cost</b>					
1. Detailed Design Consultant	16.9	14.6	86	2.3	14
2. Independent Checking Engineer and Panel of Experts	3.2	2.7	84	0.5	16
3. Incremental Administrative Support	0.5	0.1	20	0.4	80
<b>Subtotal (A)</b>	<b>20.6</b>	<b>17.4</b>	<b>84</b>	<b>3.2</b>	<b>16</b>
<b>B. Contingencies</b>					
1. Physical	1.0	0.0	0	1.0	100
2. Price	0.2	0.0	0	0.2	100
<b>Subtotal (B)</b>	<b>1.2</b>	<b>0.0</b>	<b>0</b>	<b>1.2</b>	<b>100</b>
<b>C. Financing Charges During Implementation</b>	<b>0.2</b>	<b>0.2</b>	<b>100</b>	<b>0.0</b>	<b>0</b>
<b>Total</b>	<b>22.0</b>	<b>17.6</b>	<b>80</b>	<b>4.4</b>	<b>20</b>

ADB = Asian Development Bank.

Source: Asian Development Bank estimates.

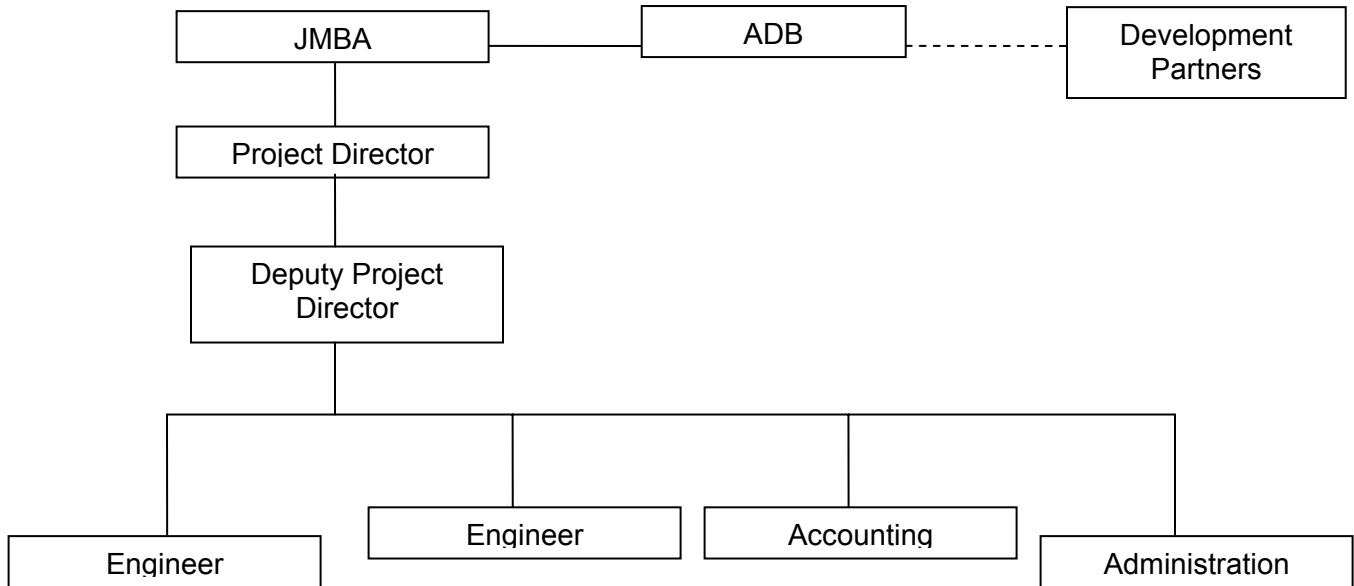
**PROJECT IMPLEMENTATION ARRANGEMENTS**

**Figure A6.1: Structure of Project Implementation**



JMBA = Jamuna Multipurpose Bridge Authority, PD = project director, PM = project manager, QA = quality assurance.  
 Source: Asian Development Bank.

**Figure A6.2: Project Implementation Unit**



ADB = Asian Development Bank, JMBA = Jamuna Multipurpose Bridge Authority.  
 Source: ADB.

## IMPLEMENTATION SCHEDULE (Design and Tender Activities)

Activity	2008												2009												2010										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb									
Design Consultant Selection																																			
A. Design Consultant (DC)																																			
1. Scheme Design																																			
2. Additional Study																																			
3. Detail Design																																			
4. Tender Action																																			
B. Checking Engineer (CE)																																			
1. Check of DC's outputs																																			
2. Milestone																																			
													C1				C2				C3														
C. Panel of Expert																																			
1. Check of Outputs of DC and CE																																			
			P1		P2				P3				P4																						

CE= Checking Engineer, DC = Design Consultant.

C1: (i) Completion of scheme design check, (ii) completion of detail design criteria check, and (iii) identification of additional study.

C2: (i) Completion of result of additional study, and (ii) completion of updated detail design criteria check.

C3: (i) Completion of detail design check and (ii) completion of prequalification and selection criteria check.

P1: (i) Check scheme design criteria, (ii) check terms of reference for CE, and (iii) evaluation shortlist of CE.

P2: Check outputs of DC and CE.

P3: Check outputs of DC and CE.

P4: Check outputs of DC and CE.

Source: Asian Development Bank estimates.

## OUTLINE TERMS OF REFERENCE FOR DETAILED DESIGN CONSULTANTS

### A. Objectives

1. The design consultant for the Padma Multipurpose Bridge Design Project (the Project) will prepare detailed engineering documentation required for implementation. In summary, the design consultant will (i) develop design criteria, (ii) prepare scheme designs for all elements of the Project, (iii) prepare detailed designs for a significant part of the Project, (iv) prepare a strategy for the operation and maintenance (O&M) of the bridge, (v) define requirements for any further investigations or tests, (vi) prepare tender documents for all elements of the Project, and (vii) assist with the prequalification and appointment of contractors who will be responsible for construction.

### B. Scope of Works

#### 1. Scheme Design

2. **Review Previous Studies.** A number of previous studies have been undertaken in connection with establishing a fixed crossing at the selected site; they are summarized as follows: (i) *Padma Bridge Study – Prefeasibility Report*, by Rendel, Palmer & Tritton, Nedeco and Bangladesh Consultants Ltd (February 2000); (ii) *The Feasibility Study of the Padma Bridge*, prepared by Nippon Koei Co., Ltd., in association with Construction Project Consultants, Inc., under contract to the Japan International Cooperation Agency (JICA) (March 2005); (iii) *Preparing the Padma Multipurpose Bridge Project*, by STUP Consultants P. Ltd. (September 2006); and (iv) *Land Acquisition Plan (LAP), Resettlement Action Plan (RAP) & Environmental Management Plan (EMP)*, prepared by Bangladesh Consultants Ltd. (June 2006). These reports summarize the considerable amount of work already undertaken to date. The design consultant shall review these reports and verify any technical, economic, or commercial findings given in them that have a direct bearing on the Project as it develops.

3. **Confirm Scope of Construction Works.** The design consultant is required to review the scope of works proposed in the various preliminary studies and confirm the scope of the construction works. This includes determining the full requirements for all aspects of the Project including the main bridge, approaches, bridge end facilities, river-training works, and all other works that are required to achieve the project objectives.

4. **Review and Confirm Contract Strategy.** It is anticipated that the Project will be constructed under several contracts awarded to different contractors. The design consultant is required to define the precise split of responsibility between the individual construction contracts and to define the interfaces. The initial break down of construction contracts, which shall be reviewed and modified as necessary by the design consultant as required, is as follows:

**Table A8.1: Contract Packages**

Package	Type of Work
Contract 1	Main Bridge
Contract 2	River-training Works
Contract 3	Approach Roads and Bridge End Facilities (Mawa Side)
Contract 4	Approach Roads and Bridge End Facilities (Janjira Side)
Contract 5	Site Accommodation for Engineers and Contractors staff

Source: Asian Development Bank estimates and consultant's report.



5. **Bridge End Facilities.** The bridge end facilities include, in addition to any other requirements that the design consultant may determine, the following:

- (i) toll plaza and toll collection facilities for traffic;
- (ii) weigh-in-motion station and weigh bridge;
- (iii) service area with offices and facilities for future operation and maintenance staff;
- (iv) small compound with offices and accommodation facilities to be used by the contractor, engineer, and client during construction and also by the client and others during the ongoing operation phase;
- (v) whatever end facilities are required to connect the high-voltage power cables on the bridge with the surrounding power transmission network;
- (vi) whatever end facilities are required to connect the gas pipes on the bridge with the surrounding gas pipe system;
- (vii) whatever end facilities are required to connect the telecommunications and other services carried by the bridge with the surrounding networks; and
- (viii) all necessary safety and security provisions associated with the above.

6. **Develop Design Criteria.** The consultant shall prepare comprehensive design criteria that achieve the objectives of the Project. The design criteria shall be prepared and presented in such a way that they can be readily applied by the design consultant, panel of experts (POE), checking engineer, and any other design consultant such as one that may be engaged under a design and construct contract. The design criteria shall include all rail-related elements including track and track support systems regardless of whether or not the railway will be installed immediately following the completion of the crossing. Similarly, the design criteria shall include all aspects relating to the installation or future installation of utilities on the bridge. It should clearly state all assumptions regarding loads imposed on the bridge and the expected bridge movements so that the effects of these movements can be accounted for in the design of the utilities.

7. **Develop Scheme Design.** Notwithstanding earlier feasibility studies, the design consultant is required to develop outline designs for a number of different options for the main bridge, approach roads, and, if appropriate, river-training works to enable options to be objectively compared with one another. Each option shall be developed in sufficient detail to demonstrate that the project objectives and design criteria have been complied with and to enable preliminary construction costs to be estimated and a construction program to be prepared. The design consultant shall then formulate an objective method for comparing the options to select the preferred scheme design.

8. **Project Program.** The design consultant is required to prepare a program for all aspects of the Project including activities within the design consultant's scope and those undertaken by others, hereafter referred to as the project program. The project program should reflect the agreed procurement strategy and scheme designs for all elements of the Project. It should be achievable and be accompanied by a commentary that identifies options or alternative scenarios where appropriate.

9. **Develop O&M Strategy.** It is anticipated that an operation and maintenance (O&M) contractor will be appointed for the Project by the Jamuna Multipurpose Bridge Authority (JMBA) under a 5-year contract tendered on a competitive basis in strategy similar to that adopted for the Jamuna bridge.

10. **Risk Register.** The design consultant is required to prepare and maintain for the duration of the Project a detailed risk register. This register will identify technical, commercial,

contractual, environmental, program, financing, and other risks. It will identify the probability of occurrence, mitigating measures required, residual risks, and consequences should the risk come to pass. It should identify those responsible for addressing the risks and at what stage the risks are to be addressed.

11. **Define Additional Studies.** Additional studies prior to or during the detailed design phase are expected to be needed to provide important information that will reduce uncertainty associated with technical, program, and commercial aspects of the Project. The additional studies are expected to include (i) geotechnical investigations; (ii) wind tunnel testing; (iii) a topographic survey; (iv) a bathymetric survey; and (v) river flow, scour, and hydrological studies and physical modeling. The design consultant shall identify the extent of the above studies and any other studies considered appropriate that may serve the overall objective of reducing risk to an acceptable level. As part of this undertaking the design consultant should define in detail where and, if appropriate, how the additional studies should be executed and what their objectives are.

12. **Specifications and Contract Documents for Additional Studies.** The design consultant shall prepare and agree a strategy for undertaking the additional studies along with cost estimates and, as noted earlier, a program for completion. The design consultant is required to prepare comprehensive detailed technical specification setting out the objectives of the studies, the required deliverables, and what information will be provided by the design consultant to form part of the studies. These technical specifications should, where appropriate, set out the minimum requirements for tests, e.g., scale, duration, sample type, etc.

13. **Terms of Reference for Checking Engineers.** The roles of the checking engineers will be to review the design criteria, specifications, drawings, and other documents submitted by the design consultant and to check the detailed design to ensure that it meets the project objectives and is safe, buildable, and economic. The scope of the checking engineers' check is expected to be limited to the main bridge but may also include river-training works and other civil engineering works forming part of the Project if agreed with JMBA. The proposed terms of reference (TOR) should be endorsed by the POE.

14. **Assist JMBA with Appointment of Checking Engineers.** The checking engineers will be appointed by JMBA. The design consultant shall assist JMBA with every aspect of the checking engineers' appointment including preparing tender documents and submission requirements, prequalification, assessment of tenders, and final appointment. The curricula vitae of the candidates should be reviewed and accepted by the POE.

15. **Project Cost Estimate.** The design consultant shall prepare a preliminary cost estimate broken down into the different contracts showing the projected expenditure profile throughout the Project on a month-by-month basis for each construction contract and any other works associated with the Project.

16. **Economic and Financial Evaluation.** The design consultant shall develop economic and financial models like those produced in earlier feasibility studies. They shall include evaluations that are directly comparable to those produced previously but should be expanded and refined in whatever way that the design consultant sees as appropriate. The economic evaluation will output the predicted economic internal rate of return, benefit-to-cost ratio, and net present value for the Project. Sensitivity studies should be undertaken in a way similar to those done at the feasibility stage. The financial evaluation aims to measure and evaluate financial aspects of the Project including, but not limited to, (i) analysis of toll rates and predicted traffic

volume, (ii) analysis of revenue from charges levied to utility companies, (iii) tax and customs revenues, (iv) project construction and O&M costs, and (v) analysis of probable financing methods, both private and conventional. From this financial evaluation the design consultant shall prepare income and expenditure profiles for the Project.

17. **Review Possibilities for Public-Private Partnerships.** The design consultant is required to appoint an expert in public-private partnership (PPP) and finance to review options for PPP on any aspects of the Project. Some work has already been undertaken looking at PPP options. This is to be reviewed and updated for both the construction and post-construction stages. In addition the design consultant shall explore, with JMBA and donor agencies, the possibility of gap funding on PPP schemes. It is currently considered that there is limited scope for PPP involvement in the project but that the greatest opportunity for PPP is most likely in the O&M stage of the Project. The design consultant shall report on any identified PPP opportunities and pay particular attention to any possible PPP models for the O&M phase, making recommendations on the preferred options.

18. **Scheme Design Reports.** At a point in the program to be approved by JMBA, the design consultant shall submit an interim scheme design report. This shall include details and general arrangement drawings of the options considered and a preliminary assessment of the preferred option. The design consultant shall make a presentation of the interim scheme design to JMBA, other representatives of the Government, donor agencies, and other relevant authorities. Any comments received from relevant parties shall be considered and incorporated into the development of the final scheme design. The design consultant shall prepare and submit a final scheme design report that will include general arrangement drawings and presentation images for planning and promotional purposes. The report will include comprehensive details of the studies in sufficient detail to allow close scrutiny by others. The report must set out a full justification for the recommendations made.

## 2. Additional Studies

19. The design consultant shall propose additional studies and surveys required to complete the detailed design. The agreed additional studies shall be carried out under the full responsibility of the design consultant, regardless of any subcontracting arrangement that may be needed. If any subcontracting arrangement is required, the design consultant is responsible for recruitment, technical supervision of the additional studies, and finalization of the final reports of the studies.

20. The design consultant shall assess the implications of the results of the additional studies and, where relevant, identify any requirements for further testing that may have arisen. The design consultant shall seek approval to undertake such further testing. The implications of the results of the additional tests will be fully evaluated by the design consultant. The design criteria should be revised as required to reflect the results of the additional studies. In addition, the design consultant shall ascertain the technical, commercial, economic, and other implications arising from the results of the additional studies. Further detailed analysis and development of the scheme design is assumed to be undertaken at the commencement of tender actions. After completion of the additional studies, the design consultant will be required to update the project cost estimate and the project program. As in scheme design, the project cost estimate and project program must be comprehensive in their coverage and should include sensitivity studies.

### 3. Detailed Design

21. **Update Final Scheme Design.** As soon as possible in the detailed design phase, the design consultant shall update the final scheme design based on the results and findings of the additional studies. This update shall take into account any reports prepared as part of the additional studies and any interpretative reports prepared by the design consultant or others.

22. **Detailed Engineering Design.** Based on the agreed contract strategy, the design consultant is required to prepare detailed designs for all parts of the Project except those identified as being for detailed design by contractors. The design consultant shall use state-of-the-art techniques and standards to produce an efficient, robust, and buildable design that complies fully with the agreed design criteria developed in scheme design. The design shall conform to international codes and standards, and, where relevant, reference shall be made to published design and detailing guides. Proprietary analytical software should generally be independently verified and in all cases benchmarked against known or published solutions. Analytical techniques used in the detailed design should be described in the design report.

23. **Design Certificates.** The design consultant shall submit to JMBA design certificates signed by the design consultant's project director that itemize all drawings and, if appropriate, bar-bending schedules for all detailed design elements of the Project except where detailed designs are to be prepared by contractors. The certificates shall be in an agreed format and reflect the design consultant's obligations under contract.

24. **Liaison with Checking Engineers.** The design consultant is required to liaise and cooperate in a proactive manner with the checking engineers supplying design information for checking in accordance with an agreed schedule. The checking engineers will be required to provide check certificates as a key deliverable. The check certificates will state that the checking engineers are satisfied that the design complies with the design criteria. It is the design consultant's responsibility to resolve all technical issues raised by the checking engineers relating to the design in order to get to the stage where the checking engineers are in a position to sign the check certificates.

25. **Design Checks for Other Structures.** All detailed engineering designs not checked by the checking engineers shall be subject to a check by separate teams within the design consultant's organization who have not been involved in preparing the detailed design. The design consultant shall submit a design check certificate for all such designs in an agreed format to JMBA.

26. **Special Investigations.** Special Investigations may be required to prove the validity of particular aspects or details of the detailed engineering design. If the design consultant or JMBA determines that special investigations are required during the detailed design stage, the design consultant shall prepare all necessary technical specifications and other tender documentation; tender, supervise, and assess the results of these tests; and report on the same to JMBA.

27. **Confirm Scope of Each Construction Contract.** Taking into consideration the detailed design, the design consultant is required to confirm or modify, as required, the precise scope of each construction contract as proposed in the scheme design.

28. **Design Specifications for Contractor Designed Elements.** The design consultant shall prepare illustrative designs and design and construction specifications, based on the final scheme designs, for all contractor-designed elements.

29. **Update Project Cost Estimate and Project Program.** The design consultant is required to update the project cost estimate, project program, and expenditure profile on a month-by-month basis to reflect the detailed design. Estimated construction supervision costs should be identified along with anticipated running costs of JMBA staff dedicated to the Padma project during the construction phase. The cost estimate should clearly identify the estimated value of each contract in both local and foreign currency, including supervision contracts, along with contingencies and allowances for currency fluctuations.

30. **O&M Cost Estimate.** With due consideration for the choice of standard contracting arrangements (similar to that used for the O&M of the Jamuna bridge), PPP or otherwise, the design consultant shall develop a maintenance intervention schedule for the first 30 and 60 years after bridge opening based on the detailed design. The schedule should identify the likely activities and anticipated costs.

31. **JMBA O&M Requirements.** Based on the O&M strategy developed, the design consultant shall advise JMBA regarding the organizational structure of JMBA through the O&M period. This shall include staff levels and requirements and equipment to enable it to operate and maintain the Padma bridge effectively.

32. **O&M Manuals.** For elements of the works for which the design consultant is responsible in the detailed engineering design, the design consultant shall prepare maintenance manuals that include outline method statements for key maintenance procedures, e.g., bearing replacement, stay replacement, etc.

33. **Prepare Contact Documents.** The design consultant shall prepare all additional contract documents for each construction contract including materials and workmanship specifications, bills of quantities, instructions to tenderers, and any further documentation required to complete the tender packages to the satisfaction of the JMBA and other interested Government departments.

34. **Prepare Detailed Design Report.** The design consultant shall prepare a detailed design report for the Project that comprehensively describes the design process, methods, assumptions, analytical techniques, and software used to develop the detailed engineering design and final scheme designs (for design-and-build contracts).

#### 4. Tender Action

35. **Contractor Prequalification.** The design consultant shall assist JMBA with the prequalification procedure for each of the contracts. This shall include preparing prequalification and selection criteria, assisting with advertising, reviewing and assessing submissions, interviewing, and preparing a prequalification report that shall include a recommended list of prequalified contractors.

36. **Assistance During Tender Period.** JMBA will be responsible for administering tender procedures including issuing all tender-invitation documents and responding to queries raised by contractors. The design consultant shall provide whatever support to JMBA required throughout the tender period. The design consultant shall attend briefing sessions with contractors as required by JMBA throughout the tender period.

37. **Tender Evaluation.** The design consultant will be responsible for assessing all tenders and making recommendations as to which contractor should be selected for each contract. This

shall include preparing, in advance, a tender evaluation strategy based on agreed technical and commercial criteria. The design consultant shall review each tender for completeness and compliance with the tender documentation, thereafter thoroughly reviewing each tender to ensure the technical and commercial feasibility of the proposals.

## 5. Land Acquisition Plan and Resettlement Plan

38. The design consultant is responsible for preparing a resettlement plan as required, ensuring that resettlement studies are conducted in line with ADB's *Policy on Involuntary Resettlement* (1995), *Operations Manual (OM)/F2 on Involuntary Resettlement* (2003) and other related policies such as the *Public Communications Policy* (2005) so that an ADB mission can prepare the required documents for ADB financing. The consultant may use the *Handbook on Resettlement—A Guide to Good Practices* as a guide. The consultant will ensure that affected people are consulted and that resettlement information is disclosed to affected people as required under OM/F2 and the *Public Communication Policy* (2005).

39. Specifically, the consultant will conduct tasks including, but not limited to, those listed below. The consultant will also refer to the recent findings of ADB's TA 6091-REG: Capacity Building for Resettlement Risk Management.

40. To prepare and update the resettlement plan, the design consultant will undertake the following tasks:

### a. International Resettlement Specialist

41. The following are tasks specific to the international resettlement specialist:
- (i) Provide overall guidance and instruction to the national resettlement specialist in all aspects and take overall responsibility for the delivery of expected results.
  - (ii) Identify the project-related interests of key stakeholders (in particular of poor and vulnerable groups) and barriers that are likely to prevent them from participating in and benefiting from project resources. Suggest possible strategies for addressing their concerns.
  - (iii) Design a methodology for assessing the poverty impact of the main investment project and develop procedures for collecting and analyzing data required for the evaluation of such impacts and benefits.
  - (iii) Identify covenants or policy changes necessary to ensure the protection of people at risk and vulnerable groups during project implementation.
  - (iv) Review and finalize (a) a resettlement plan prepared by the national resettlement specialist and confirm compliance with ADB's safeguard policies and (b) a gender action plan prepared by the gender specialist and confirm compliance with ADB's Gender and Development policy objectives.
  - (v) Provide guidance and training workshops to the Executing Agency (EA) and nongovernment organizations (NGOs) on ADB's *Policy on Involuntary Resettlement* (1995), *Operations Manual (OM)/F2 on Involuntary Resettlement* (2003), and other related policies, as well as on procedural requirements and required activities for each stage of resettlement plan implementation.
  - (vi) Identify requirements for additional capacity building for the EA's implementation of land acquisition and resettlement activities.

### **b. National Resettlement Specialist**

42. The following are tasks specific to the national resettlement specialist:
- (i) Conduct a 100% census survey that is based on the detailed design and assesses the impacts on people, property, common property resources, and loss of livelihood.
  - (ii) Record all untitled occupants so that identity cards can be issued to ensure there is no further influx of people into the project area. The recorded date will serve as an eligibility cut-off date for untitled occupants. Document fully all consultations with affected people, including the list of participants and the participation of officials of the EA, as applicable and to the extent possible, and make the records available to the EA.
  - (iii) Work closely with (a) the design engineer to ensure designs that avoid or minimize land acquisition to the extent possible, documenting all the information, and (b) relevant local government authorities, while staying in close touch with developments currently underway in preparing a national resettlement policy.
  - (iv) Assess and analyze land-for-land options to the extent possible for affected households that are dependent on such land-based livelihoods as livestock raising and do not have the skills and capacity to undertake alternative livelihoods.
  - (v) Based on the identified direct or indirect impacts by the Project, design a detailed plan and scoping for the income-restoration program for the short and long term (including a social development fund) in agreement with JMBA. Conduct needs assessments of the affected people for skills development, capital support feasibility, and marketing facilities while designing the income-restoration program. Assess the availability of those facilities at the resettlement sites. Also, review the EA's on-going projects (Jamuna bridge, etc.) on income restoration and identify best practices and lessons learned.
  - (vi) Develop a detailed mechanism of grievance redress. Formulate grievance redress committees in each union where land acquisition and resettlement will take place and provide a list of them in the updated resettlement plan.
  - (vii) Develop a management information system and enter all the baseline data generated by the census/socio-economic survey, joint verification team/property valuation advisory team surveys and the monitoring and evaluation system.
  - (viii) Prepare TOR and tender documents for NGOs for implementing the resettlement plan and help the EA recruit NGOs.
  - (ix) Revise implementation budgets, sources, and timing of funding and the task schedule.
  - (x) Develop a detailed internal and external monitoring mechanism to monitor land acquisition and resettlement.
  - (xi) Consult with affected people and disclose to them final resettlement plan in accordance with ADB's *Public Communications Policy* (2005).
  - (xii) Identify whether the Project will be located in, or pass through, areas of significant indigenous people's settlements based on detailed design and, if any impacts on indigenous peoples are identified, prepare an indigenous peoples development plan in accordance with ADB's *Policy on Indigenous Peoples* or integrate specific actions in favor of indigenous peoples in the resettlement plan.
  - (xiii) Incorporate any other suggestions of ADB or the EA until they accept the reports.
43. The design consultant will (i) prepare a screening and impact categorization form for involuntary resettlement for the Project, (ii) finalize an updated resettlement plan based on the

detailed design, (iii) prepare an indigenous peoples screening and impact categorization checklist, (iv) prepare an indigenous peoples development plan if required, and (v) prepare the summary poverty reduction and social strategies after incorporating comments from ADB and the EA.

44. The design consultant will prepare a detailed engineering design for (i) all resettlement sites, which should include both commercial and housing plots, civic facilities, and basic utility infrastructure as necessary; (ii) affected common resource properties; (iii) the Mawa fish market with proper access to Dhaka–Mawa highway; and (iv) the Kabutarkhola Bazaar.

45. The design consultant will (i) prepare a land acquisition plan (as required by the Land Acquisition Act 1894) for land to be acquired for the Project, including resettlement sites based on the detailed design, and (ii) help the EA to prepare all necessary documents for initiating land acquisition as stipulated in land acquisition laws in Bangladesh.

## 6. Environmental Impact Assessment

46. For environmental impact assessment (EIA), the design consultant will undertake the following tasks:

- (i) Review all available reports from previous initial environmental studies and take into account ADB and Government requirements on an EIA.
- (ii) Based on this review, prepare a scoping document with detailed information on the boundaries of the study, the environmental aspects to be included in it, and its approach and methodology, including sampling methods. The scoping document should be presented as a draft TOR for the EIA study.
- (iii) Submit the draft TOR for the EIA to the Department of Environment (DOE) for approval.
- (iv) Undertake the EIA.
- (v) Prepare the EIA report and its summary. This EIA report should include the detailed environmental management plan, which will be included in the bidding document.
- (vi) The EIA should address all potential direct and indirect environmental impacts of the Project. The assessment of environmental impact should be presented in project cycle order: pre-construction, construction, and operation. In each stage of the project cycle, include the environmental impacts of all project components (river-training works, main and associated bridges, and eastern and western approach facilities).
- (vii) The environmental aspects to be studied should cover physical environment, ecological environment, and social areas related to environmental concerns.
- (viii) During the EIA, consultations occurring in least two steps need to be carried out with affected people. The first consultation aims to gather environmental concerns from affected people, and the second aims to share the result of the assessment and the proposed mitigation measures. The list of people attending the consultation, the time and location, and the subject discussed should be recorded in systematic manner and attached to the EIA report as an appendix.
- (ix) Submit the report to DOE and make a presentation as required by DOE to obtain a non-objection certificate.
- (x) Finalize the report to accommodate inputs from DOE and ADB.
- (xi) Detailed guidance on how to prepare the EIA should be obtained from ADB's *Environmental Assessment Guidelines* (2003) and the Government guideline for preparing EIAs from DOE.



## 7. Gender Specialist

47. In preparing a gender action plan, the design consultant will include the following tasks:
- (i) Develop components ensuring women's participation in the planning, design, and implementation of the program.
  - (ii) Review documentation for the project area and make recommendations as appropriate to address ADB's gender and development policy objectives.
  - (iii) Conduct an analysis of men and women's access to resources and services.
  - (iv) Conduct an analysis of men and women's roles in decision making, division of labor, development priorities, and other variables that will impact on their participation in the Project and guide project design to avoid increasing the burden on women.
  - (v) Assess the absorptive capacity, considering how women and men will participate in the project—their motivation, knowledge, skills, and organizational resources—and how the Project will fit into their society.
  - (vi) Design mechanisms that will ensure women's access to project benefits.
  - (vii) Identify female staff required for project implementation and their training needs. Prepare plans for gender-related training according to the needs of the staff of line departments, other organizations, and beneficiaries.
  - (viii) Together with other team members, assess and propose opportunities for women affected by the Project for income generation through agriculture, livestock, forestry, and other proposed project activities.
  - (ix) Assess the most crucial issues in women's health, nutrition, functional literacy, and skills development, and assist in designing related activities with possibilities to link with ongoing social sector programs.
  - (x) Identify institutions (governmental and nongovernmental) with a focus on women or an interest in gender and development that may contribute to project design, implementation, and monitoring and evaluation.
  - (xi) Assess the capacity of the proposed implementing agency to deliver services to women in terms of the composition of its staff members.
  - (xii) Prepare TOR and tender documents for NGOs for implementing the gender action plan and assist the EA in recruiting NGOs.
  - (xiii) Develop a management program for sexually transmitted infections and human trafficking in light of the Bangladesh's National Strategic Plan for HIV/AIDS 2004–2010 to address these issues during the construction period.

Table A8.2: Category of Experts for Detailed Design Consultants

Item	Number		Person-Months	
	International	Local	International	Local
<b>A. General Staff</b>				
Project Director	1	0	22	0
Deputy Project Director – PM	1	0	22	0
Deputy Project Director – PM	0	1		22
Contracts Engineer	1	0	9	0
QS – Cost Estimates	1	0	9	0
QS – BOQ	2	0	12	0
Chief Economist	1	0	4	0
Economist	1	0	4	0
Transport Planning Engineer	2	0	12	0
Senior Architect	1	0	4	0
Architect	1	0	16	0
Planning Engineer	1	0	5	0
QA and Miscellaneous	2	0	26	0
Railway Specialist	1	0	6	0
M and E (Utilities Interface)	0	2	0	24
Interface Engineer	1	0	12	0
Interface Engineer	0	1	0	6
Environmental Engineer	0	2	0	28
<b>Subtotal (A)</b>	<b>17</b>	<b>6</b>	<b>163</b>	<b>80</b>
<b>B. Main Bridge</b>				
Team Leader	2	0	33	0
Bridge Engineer	3	0	50	0
Assistant Bridge Engineer	5	0	60	0
Geotech Engineer	2	0	28	0
CAD	3	0	36	0
<b>Subtotal (B)</b>	<b>15</b>	<b>0</b>	<b>207</b>	<b>0</b>
<b>C. River Training Works</b>				
Team Leader	1	0	20	0
River Engineers	2	0	32	0
River Morphologist Hydraulics	1	0	10	0
Geotech Engineer	1	0	14	0
Assistant Engineer	3	0	46	0
CAD	2	0	12	0
Engineer	0	1	0	14
CAD	0	2	0	20
<b>Subtotal (C)</b>	<b>10</b>	<b>3</b>	<b>134</b>	<b>34</b>
<b>D. Approach Roads (Scheme Design only)</b>				
Team Leader	0	2	0	27
Geotech Engineer	0	2	0	20
Highway Engineer	0	2	0	24
Hydrologist	0	1	0	8
Assistant Engineer	0	3	0	34
CAD	0	3	0	26
<b>Subtotal (D)</b>	<b>0</b>	<b>13</b>	<b>0</b>	<b>139</b>

Item	Number		Person-Months	
	International	Local	International	Local
<b>E. Bridge End Facilities</b>				
Team Leader	1	0	17	0
Team Leader	0	1	0	17
Design Engineers	0	3	0	41
CAD	0	3	0	24
<b>Subtotal (E)</b>	<b>1</b>	<b>7</b>	<b>17</b>	<b>82</b>
<b>F. Additional Studies</b>				
Overall Team Leader	0	1	0	7
Engineers (contributions from other teams)	0	3	0	21
<b>Subtotal (F)</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>28</b>
<b>G. Safeguard Compliance Test</b>				
Resettlement Specialist	1	1	15	18
Gender Specialist	1	0	3	0
Environment Specialist	1	1	6	18
<b>Subtotal (G)</b>	<b>3</b>	<b>2</b>	<b>24</b>	<b>36</b>
<b>Total</b>	<b>46</b>	<b>35</b>	<b>545</b>	<b>399</b>

BOQ = bill of quantity, CAD = computer aided design, M and E = mechanical and electrical, QA = quality assurance, QS = quantity survey.

Source: Asian Development Bank estimates.

## PROCUREMENT PLAN

**Table A9.1: General Information**

<b>Project Information</b>	
<b>Country</b>	People's Republic of Bangladesh
<b>Name of Borrower</b>	People's Republic of Bangladesh
<b>Project Name</b>	Padma Multipurpose Bridge Design Project
<b>Loan or Technical Assistance Reference</b>	
<b>Date of Effectiveness</b>	
<b>Amount</b>	\$17.6 million
<b>Of which Committed, \$</b>	
<b>Executing Agency:</b>	Jamuna Multipurpose Bridge Authority
<b>Approval Date of Original Procurement Plan</b>	
<b>Approval of Most Recent Procurement Plan</b>	
<b>Publication for Local Advertisements<sup>a</sup></b>	July 2007
<b>Period Covered by this Plan</b>	July 2007–March 2010

**Table A9.2: Procurement Thresholds, Goods and Related Services, Works and Supply and Installation**

<b>Procurement Method</b>	<b>To be used above (Value \$):</b>
<b>International Competitive Bidding Works</b>	\$1 million
<b>Shopping</b>	Below \$100,000
<b>National Competitive Bidding Works</b>	\$ 100,000
<b>National Competitive Bidding Goods</b>	\$ 100,000
<b>Exceptional Methods</b>	
<b>Direct Contracting</b>	Certain minor equipment such as office equipment and computers estimated to cost, in the aggregate, the equivalent of \$10,000 may be procured through direct purchase.

**Table A9.3: Procurement Thresholds, Consultants Services**

<b>Procurement Method</b>	<b>To be used (Value \$):</b>
<b>Quality- and Cost-Based Selection</b>	Above \$200,000
<b>Consultants Qualifications Selection</b>	Below \$200,000
<b>Least-Cost Selection</b>	Below \$100,000
<b>Exceptional Methods</b>	
<b>Selection of an Individual Consultant</b>	Individual consultants will be employed by JMBA for project management.

<sup>a</sup> General procurement notice, invitations to prequalify and to bid, calls for expressions of interest.

**Table A9.4: List of Contract Packages in Excess of \$100,000, Goods, Works, and Consulting Services**

Ref	Contract Description	Estimated Cost (\$ million)	Procurement Method	Expected Date of Advertisement	Prior Review (Y/N)	Comments
<b>Consulting Services</b>						
ICB 1	Detailed design	14.6	QBS	ADBBO in July 2007	Y	RFP and shortlist  Technical evaluation report  Final evaluation report
ICB2	Checking engineer	1.8	QCBS	ADBBO in May 2008	Y	RFP and shortlist  Technical evaluation report  Final evaluation report
	Panel of experts	0.9	Individual			

ADBBO = Asian Development Bank Business Opportunities, ICB = international competitive bidding, QBS = quality-based selection, QCBS = quality- and cost-based selection, RFP = request for proposal, Y/N = yes or no.

Source: Asian Development Bank estimates.

## OUTLINE TERMS OF REFERENCE FOR PANEL OF EXPERTS

### A. Introduction

1. The panel of experts (POE) should consist of internationally renowned and respected individual engineers who are widely acknowledged to be experts in their field. The members of the POE should possess among them acknowledged expertise and experience in at least the following disciplines and skills: (i) design, construction, and maintenance of bridges over water with spans greater than 100 meters; (ii) design, construction, and maintenance of river-training works of a similar scale and importance to this Project; (iii) design and construction of deep piled foundations in soft river deposits, including knowledge of the effects of scour and the prediction of pile group flexibility; (iv) seismic design of bridges and structure with specific knowledge of the seismicity of the region; and (v) specific knowledge of the behavior and environment of the Padma River and the surrounding areas. It is possible that some of the members of the POE may possess expertise and experience in more than one of these areas. It is to be expected that the POE should include some members of the earlier POE for the Jamuna bridge project, since their experience there would be helpful in this case.

2. The POE should consist of not fewer than five and not more than eight individuals including the chair. It is expected that the POE will include some experts resident in Bangladesh and familiar with the procedures and systems for design and construction in Bangladesh, as well as other experts drawn from around the world. Ideally, the numbers of Bangladeshi and International experts should be approximately balanced.

### B. Scope of Works

3. The POE is required to provide expert advice in connection with the project as required from time to time by JMBA, and to carry out periodic reviews of the procedures followed and the results produced by the design consultant, checking engineers, and construction contractors throughout the Project.

4. The POE shall organize itself under the leadership and guidance of its chair so that any comments, suggestions, or advice from any of its members are assembled, reviewed, and agreed upon by all its members and submitted to JMBA as comments, suggestions, or advice from the POE as a whole.

5. During phase 1, the members of the POE will each receive from JMBA copies of monthly progress reports and selected other reports prepared by the design consultant and checking engineers. Any comments and observations on these reports made by the individual members of the POE as a result of their review shall be assembled by the chairman and submitted to JMBA within 21 days of receipt.

6. Similarly, during phase 2, the members of the POE will each receive from JMBA copies of monthly reports of progress on the construction works and selected other reports. Any comments and observations on these reports shall be assembled by the chair and submitted to JMBA within 21 days of receipt, as in phase 1.

7. Every 3 months or so throughout the Project, the POE shall assemble in Bangladesh for a mission to review and comment on the progress of the work. Each mission is expected to last approximately 1 week and should include meetings with JMBA, the design consultant, the contractors (during phase 2) and other key organizations to discuss matters of importance at

that time. During phase 2, these missions shall include a visit to the site to inspect the works and enquire about progress, quality control, materials and workmanship standards, etc.

8. At the end of each mission, the POE shall submit a report to JMBA making any observations, comments, or suggestions that the members of the POE collectively consider should be made, and collating together any interim comments that have been made by the POE members during the previous 3-month period.

9. On some occasions, JMBA may request one or more members of the POE to visit an off-site manufacturing, fabrication, or testing facility to conduct an inspection and provide a written report. This may either coincide with a normal 3-monthly mission to Bangladesh or require an additional visit.

10. In addition, the POE is expected to respond to any specific queries on particular technical issues on which JMBA may require independent expert advice during the course of the project. Such queries will be put to the POE through the chair, and the response will be provided through the chair.

11. In the event that any disagreement arises between the design consultants and the checking engineer regarding a matter relating to the acceptability or suitability of the design, the design criteria or any other matter that cannot easily be resolved between them, the POE may be asked by JMBA to review the issues in question and provide an independent opinion on the matter to help the design consultant and checking consultant reach agreement.

## SUMMARY POVERTY REDUCTION AND SOCIAL STRATEGY

### A. Linkages to the Country Poverty Analysis

<b>Is the sector identified as a national priority in country poverty analysis?</b>	<input checked="" type="checkbox"/> Yes  <input type="checkbox"/> No	<b>Is the sector identified as a national priority in country poverty partnership agreement?</b>	<input checked="" type="checkbox"/> Yes  <input type="checkbox"/> No
<p><b>Contribution of the sector or subsector to reduce poverty in Bangladesh</b></p> <p>The Padma bridge will be a large-scale infrastructure project, and its construction and operation will significantly benefit various sectors of the economy of Bangladesh nationally and regionally. The road distance from Dhaka to nearly all major destinations in the southwest region will be reduced by 100 kilometers (km) or more, which will bring tremendous savings in passenger and commodity movement time and costs, as well as vehicle operation and maintenance costs, while lengthening the useful life of vehicles and reducing the import bill for fuels. With the bridge, capital inflow will increase, promoting industrial and commercial activity and improving economic and employment opportunities for local people, who will also gain better access to healthcare facilities and modern health technologies available at Dhaka. Easier communication will help expand education and training facilities, and the resulting skills development will ensure the availability of high-quality workers. The export of skilled workers will increase wage earnings. Riverbank protection will reduce bank erosion and the incidence of worsened vulnerability and poverty among people displaced by erosion. During construction, unemployed local people will get employment, and increased commercial activity will facilitate income generation among locals. The country will be physically integrated through the fixed link, reducing economic disparity and deprivation. An estimate of multiplier effects on the Padma bridge investment shows the bridge increasing the national GDP growth rate by 1.2% and the gross product in the southwest region by 35%, as well as generating additional employment opportunities of 743,000 person-years, which equals 1.2% of the total labor force of Bangladesh.</p> <p>The southwest region has one of the highest poverty rates in a poverty-stricken country. About 42% of the national population lived in March 2004 below the absolute poverty line. In Khulna Division in the southwest, the poverty incidence was 46%, which is much higher than Dhaka's 33%. The poor in the project area will reap immediate benefits from the bridge construction in the form of employment during construction, additional employment in relocated related activities, subsistence allowances and other benefits from resettlement, and increased trading income during construction. In the long-term, the impact of the bridge on poverty reduction will be even more significant, as the economic benefits generated by the bridge and accruing to the poor will be greater than their share of the GDP.</p>			
<b>B. Poverty Analysis</b>		<b>Targeting Classification: General intervention</b>	
<p><b>What type of poverty analysis is needed?</b></p> <p>The southwest region of the country is isolated and comparatively underdeveloped. Construction of the proposed bridge over the Padma River at the Mawa-Janjira point at the junction of Munshiganj and Shariatpur districts of Dhaka Division will bring tangible economic growth and social benefits to the people of the country, particularly in the southwestern region. The impact of the bridge on poverty reduction will be measured using some indicators like (i) changes in the level of income and expenditure of the project impact area households; (ii) changes in type of work, employment, job turn-over, and average daily wage; (iii) changes in agriculture, business and prices; (iv) increased mobility, migration, and community action; and (v) changes in undertaking higher education, etc. The benchmark poverty situation will be assessed using a baseline survey before starting the Project to enable poverty monitoring.</p> <p>Although declining, the incidence of poverty is still very high in Bangladesh. According to the preliminary report of the household income and expenditure survey in 2005, 40% of the national population in 2005 lived below the absolute poverty line and about 25% below the hardcore poverty line. Barishal Division had the highest incidence of poverty in 2005, according to the report, with 52% of the people in the division living below the absolute poverty line, which is substantially higher than the national average. Poverty incidence in Khulna Division is about 46%. Dhaka Division (representing the project districts of Munshiganj, Shariatpur, and Madaripur) has the lowest incidence of poverty compared to the national average. About 32% people in Dhaka Division lived below the poverty line in 2005. The incidence of hardcore poverty in the project division is 19.9%, 35.5% in Barishal Division, and 31.6% in Khulna Division.</p>			



A socioeconomic survey conducted on 390 households in April–August 2006 in the project-influenced areas Mawa on the east bank of the Padma River and Janjira on the west bank indicated that the incidence of poverty in the area was lower than the division average. About 30% of the households in the project-affected area lived under the absolute poverty line, compared with 33% in Dhaka Division, in March 2004. Poverty incidence is higher on the Janjira side, almost double that of the Mawa side. Households living under hardcore poverty line are 7.5% on the Mawa side and 11.94% on the Janjira side. The households covered during the socioeconomic survey consider the perceived socioeconomic benefits of the Project in terms of improved access to socioeconomic services, increased employment opportunities, and improved transport services.

### C. Participation Process

**Is there a stakeholder analysis?**  Yes  No

The public consultation process began in the project area in 1999 as part of the first pre-feasibility study. The potentially affected communities and other stakeholders were consulted through a number of meetings during the second pre-feasibility study (2003–2004) and the feasibility study (2004–2005). As part of the preparation process of project preparatory technical assistance as of January–February 2006, JMBA officials and their consultants conducted a series of meetings with primary and secondary stakeholders in the project area.

People were consulted severally at different locations covering the whole project area through information and consultation meetings, participating rapid assessment, focus group discussion, and grassroots workshops at three locations (Bakhorer, Kandi, Mawa, and Naodoba) with the participation of all level of stakeholder during the resettlement action plan study. The potential impacts (negative and positive) of the Project were disclosed among the project community, and their views were recorded in the consultation process by Japan International Cooperation Agency study team (2004–2005) and the consultants of the Jamuna Multipurpose Bridge Authority (JMBA) resettlement action plan study. These consultation meetings provided the affected people with opportunities to express their concerns about land acquisition, compensation, and resettlement. The extensive consultative process raised the level of awareness of the Project and gained local support. Similarly, in April–September 2006 consultation meetings and focus group discussions at selected villages on both banks of the river at Mawa and Janjira were conducted. Ten villages were selected—three from the Mawa side, six from the Janjira side, and one from the upstream char land adjacent to the Kaorakandi ferry terminal—for consultation and a socioeconomic survey of sample households.

**Is there a participation strategy?**  Yes  No

To maximize the benefits of the Project to community members in the project area, the Jamuna Multipurpose Bridge Authority will encourage the contractors to hire labor from the local communities for civil works construction. Unemployed youths can be provided with training for various technical works at the construction site. There are examples from JMBA's experience of unskilled local laborers training on the job and being deployed by contractors to other projects, even outside the country. In the selection of resettlement sites and market relocation sites, local leaders and communities were consulted closely to direct the Project's benefits to the most critical areas. Local views and suggestions were given due consideration in developing project components and designing the resettlement and environmental management plans.

Stakeholders' participation will be encouraged in the design phase and will be ensured during implementation of the resettlement plan by involving local representatives in (i) the valuation of property to be acquired by setting up property valuation advisory committees, (ii) conflict resolution through resettlement advisory committees, (iii) grievance resolution through grievance redress committees, and (iv) identifying replacement land in land identification committees.

### D. Gender Development

#### Strategy to maximize impacts on women:

The proposed bridge project will displace 283 households headed by women, amounting to 9% of the total households to be displaced. About half of the affected people are female. The construction of the bridge will not only affect those displaced or losing their land and property, but also other people with some interest in it. This relates to social issues relating to women under traditional cultural and religious points of view. Especially on the Mawa side, the construction yard is proposed in a location surrounded by villages. The site is proposed to be linked with the riverbank at Kumarbhog using an existing road to ease the transportation of equipment and construction materials by river. The proposed relocation villages and the only market to be relocated also raise social issues, including gender issues, that

need to be addressed during the planning phase. The use of river by men and women from the neighboring villages is a factor in the management of the service area for the proposed bridge construction. It is anticipated that women will be at risk of sexually transmitted infections and human trafficking during construction.

A gender action plan will be developed in accordance with ADB's *Policy on Gender and Development* with the aim of (i) establishing and using temporary river ports at locations other than the present ones; (ii) developing construction yards; (iii) designing and developing the service area on the Janjira side; (iv) constructing river-training dykes on the Janjira side; (v) identifying, designing, and developing relocation villages, including the allocation and distribution of plots; (vi) identifying, designing, and developing a relocated market, including the allocation and distribution of commercial parcels of land; (vii) designing a framework for the determination of losses and entitlements under the resettlement plan; (viii) designing livelihood-reconstruction and income-restoration programs as components of the resettlement plan; (ix) employing unskilled and semi-skilled labor in civil works construction; and (x) designing a management plan to address the issues of sexually transmitted infections, including HIV/AIDS, and human trafficking.

Has an output been prepared?  Yes  No

### E. Social Safeguards and Other Social Risks

Item	Significant/ Not Significant/ None	Strategy to Address Issues	Plan Required
<b>Resettlement</b>	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	A full resettlement plan will be prepared in accordance with the <i>Policy on Involuntary Resettlement</i> of the Asian Development Bank (ADB) under this technical assistance (TA) loan on the basis of the detailed design of the bridge and approach roads. The design consultant is required to consider engineering designs that avoid or minimize land acquisition to the extent possible.	<input type="checkbox"/> Full <input type="checkbox"/> Short <input checked="" type="checkbox"/> None
<b>Affordability</b>	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	The study on public-private partnerships will have to consider the optimum toll rate to ensure that the poor obtain benefits by being road users.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Labor</b>	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	The Project will explore and establish a sound safety management system at the site with monitoring and safety audit functions to ensure the safety of laborers.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Indigenous Peoples</b>	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	No indigenous peoples were found residing in the project area during project preparatory TA study. However, under this TA loan further study will be conducted based on the detailed design. If any impacts on indigenous peoples are identified, then appropriate mitigation will be undertaken in the form of either the preparation of an indigenous peoples development plan in accordance with ADB's <i>Policy on Indigenous Peoples</i> (1998) or the integration of specific actions in favor of indigenous peoples in the related resettlement plan, depending on the magnitude of the project impacts and sensitivity of indigenous peoples issues.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Other Risks and/or Vulnerabilities</b>	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	The incidence of HIV/AIDS and human trafficking in Bangladesh is very low at present. However, the Project may threaten to worsen the situation as internal and external migrant workers gather at the construction sites. A plan for managing sexually transmitted infections will be designed in this TA loan to address HIV/AIDS and human trafficking issues during the construction period under the gender action plan.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No