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Report No: 56512-BD

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF SDR779.3 MILLION
(US\$1.2 BILLION EQUIVALENT)

TO THE

PEOPLE'S REPUBLIC OF BANGLADESH

FOR A

PADMA MULTIPURPOSE BRIDGE PROJECT (PMBP)

January 24, 2011

**Sustainable Development Department
Transport Sector Unit
South Asia Region**

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CURRENCY EQUIVALENTS

Exchange Rate Effective October 2010

Currency Unit	=	Bangladesh Taka (Tk)
US\$1	=	70 Taka
US\$1	=	78 Japanese Yen
SDR	=	US\$

Fiscal Year

July 1 – June 30

Weight and Measures

Metric System

1 meter (m)	=	3.280 feet	1 hectare (ha)	=	2.470 acres
1 Kilometer (km)	=	0.620 miles	1 cubic meter (m ³)	=	35.310 cubic feet
1 million acre feet (MAF)	=	1.234 billion cubic meters			
1 cubic foot/second (cfs)	=	0.0283 cubic meters/sec (m ³ /sec)			

ABBREVIATIONS AND ACRONYMS

AD	Additional Director	EMP	Environmental Management Plan
ADB	Asian Development Bank	ERR	Economic Rate of Return
AH	Affected Household	FBS	Fixed Budget Selection
AH1	Asian Highway 1	FM	Financial Method
AP	Affected Persons	FS	Feasibility Study
BBA	Bangladesh Bridge Authority	GAP	Gender Action Plan
BEC	Bid Evaluation Committee	GDP	Gross Domestic Product
BER	Bid Evaluation Report	GoB	Government of Bangladesh
BOC	Bid Opening Committee	GPN	General Procurement Notice
BOM	Bid Opening Minutes	GRC	Grievance Redress Committee
BR	Bangladesh Railway	GRM	Grievance Redress Mechanism
CAS	Country Assistance Strategy	GRP	Gross Regional Product
CCL	Cash Compensation under the Law	Ha	Hectare
CGE	Computable General Equilibrium	HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
CMMF	Charland Impact Monitoring and Management Framework	IBRD	International Bank for Reconstruction and Development
CPAR	Country Procurement Assessment Report	ICB	International Competitive Bidding
CPTU	Central Procurement Technical Unit	ICC	Information, Consultation and Communication
CQ	Consultants' Qualification	ICR	Implementation Completion Report
CSC	Construction Supervision Consultants	ICS	Individual Consultant Selection
DC	Design Consultant	IDA	International Development Agency
DD	Deputy Director	IDB	Islamic Development Bank
DDC	Detail Design Consultant	IDC	Interest During Construction
DFC	Dedicated Freight Corridor	IFR	Interim Financial Report
dgMarket	Development Gateway Market	INGO	International Non Government Organization
DOE	Department of Environment	IPOE	Independent Panel of Experts
DP	Development Partner	IUFR	Interim Unaudited Financial Report
EA	Executive Agency	JB	Jamuna Bridge
EIA	Environmental Impact Assessment		

JICA	Japan International Cooperation Agency	QCBS	Quality and Cost Based Selection
JMBA	Jamuna Multipurpose Bridge Authority	RAP	Resettlement Action Plan
Kg	Kilogram	RTW	River Training Work
Km	Kilometer	RU	Resettlement Unit
KV	Killvolt	SA	Service Area
LAP	Land Acquisition Plan	SAM	Social Accounting Matrix
LARP	Land Acquisition and Resettlement Plan	SAP	Social Action Plan
LCS	Least Cost Selection	SASDT	South Asia Sustainable Development Transport
M&E	Monitoring & Evaluation	SDAP	Social Development Action Plan
MOC	Ministry of Communications	SFMS	Sr. Financial Management Specialist
MOEF	Ministry of Environment and Forestry	SIL	Specific Investment Loan
MOU	Memorandum of Understanding	SSS	Single Source Selection
MSC	Management Support Consultant	STI	Sexually Transmitted Infections
NCB	National Competitive Bidding	SWR	Southwest Region
NGO	Non Government Organization	TA	Technical Assistance
O&M	Operation and Maintenance	TOR	Terms of Reference
ORAF	Operational Risk Assessment Framework	UNDB	United Nations Development Business
PB	Padma Bridge	VOT	Value of Time
PCC	Project Coordination Committee	WEB	Wider Economic Benefits
PD	Project Director		
PDO	Project Development Objectives		
PHAP	Public Health Action Plan		
PIC	Public Information Centre		
PIU	Project Implementation Unit		
PMBP	Padma Multipurpose Bridge Project		
PMO	Project Management Office		
PMU	Project Management Unit		
POE	Panel of Experts		
PPA	Public Procurement Act		
PPF	Project Preparation Facility		
PPR	Public Procurement Rules		
PPRP	Public Procurement Reform Project		
PQ	Pre-qualification		
P-RAM	Procurement Risk Assessment Management System		
PRMP	Procurement Risk Mitigation Plan		
PSC	Project Steering Committee		
PVAC	Property Valuation Committee		
PWD	Public Works Department		
QBS	Quality Based Selection		

Vice President:	Isabel Guerrero
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Sector Director/Manager:	John Henry Stein/Michel Audigé
Task Team Leader:	Masood Ahmad

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BANGLADESH
PADMA MULTIPURPOSE BRIDGE PROJECT (PMBP)

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BANGLADESH
PADMA MULTIPURPOSE BRIDGE PROJECT (PMBP)
PROJECT APPRAISAL DOCUMENT
South Asia Regional, SASDT

<p>Date: January 24, 2011 Country Director: Ellen Goldstein Sector Manager/Director: Michel Audigé/ John Henry Stein Project ID: P111017 Lending instrument: Specific Investment Loan</p>	<p>Team Leader: Masood Ahmad Sectors: Roads and Highways (90%); Flood Protection (10%) Themes: Trade facilitation and market access (50%); Access to urban services and housing (25%) other Economic Management (25%) Environmental screening category: Full; Category A</p>					
Project Financing Data:						
<input type="checkbox"/> Loan <input checked="" type="checkbox"/> Credit <input type="checkbox"/> Grant <input type="checkbox"/> Guarantee <input type="checkbox"/> Other: For Loans/Credits/Others: Total Bank financing (US\$m.): 1,200 Proposed terms: Standard IDA Terms.						
Project Financing Plan (US\$ m.)						
Source	Local	Foreign	Total			
Borrower	560.0	-	560.0			
IDA	300.0	900.0	1,200.0			
Asian Development Bank-ADF	20.0	56.0	76.0			
Asian Development Bank-OCR	70.0	469.0	539.0			
Japan International Cooperation (JICA)	30.0	370.0	400.0			
Islamic Development Bank	50.0	90.0	140.0			
Total	1,030.0	1,885.0	2,915.0			
Borrower: People's Republic of Bangladesh						
Responsible Agency: Bangladesh Bridge Authority						
Estimated disbursements (Bank FY/US\$ m)						
FY	FY11	FY12	FY13	FY14	FY15	FY16
Annual	50	250	350	300	200	50
Cumulative	50	300	650	950	1,150	1,200
Project implementation period: Start: March 1, 2011; End: February 29, 2016						
Expected effectiveness date: May 31, 2011						
Expected closing date: August 31, 2016						
Does the project depart from the Country Assistance Strategy (CAS) in content or other significant respects?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Does the project require any exceptions from Bank policies?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Have these been approved by Bank management?			<input type="checkbox"/> Yes <input type="checkbox"/> No			
Is approval for any policy exception sought from the Board?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Does the project meet the Regional criteria for readiness for implementation?			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			

Project development objective:

The Project objective is to connect the south- western region to the rest of the country in order to stimulate economic growth by facilitating inter-regional, cross-river transport of passengers and freight, and transmission of natural gas, telecommunication and electricity in a cost effective manner.

Project description:

Component A: Main Bridge and Approach Roads (US\$1,626.2 Million). This component will include construction of foundation, substructure and superstructure of the main bridge and services on the bridge, road viaducts, approach roads, toll plazas and bridge end facilities. This would be a “rail ready” road bridge.

Component B: River Training Works (US\$799.9 Million). Construction of river training works to guide the river and keep it stable under the bridge in the long run.

Component C: Implementation of Social Action and Environmental Management Plans (US\$291.9 Million). This will support implementation of the social action plan including the resettlement action plan, and environmental management plan.

Component D: Construction Supervision, Monitoring and Evaluation of the Project Impact and Social and Environmental Management Plans (US\$72 Million). Support for technical assistance to carry out the construction supervision, monitoring and evaluation of the project progress, quality, impact as well as independent supervision of the Social and Environmental Management Plans.

Component E: Project Management Support, Capacity Building of BBA, Technical Assistance and Training (US\$26.0 Million). To support BBA’s efforts in project management, and to strengthen BBA to manage the infrastructure in the long run.

Note: Service charges/commitment charges and interest during project period and refinancing of PPF are US\$99 million, cost of all components listed above is US\$2,816 million and total cost is US\$2,915 million.

Safeguard policies triggered?

Environmental Assessment (OP/BP 4.01)	<input checked="" type="radio"/> Yes	<input type="radio"/> No
Natural Habitats (OP/BP 4.04)	<input checked="" type="radio"/> Yes	<input type="radio"/> No
Forests (OP/BP 4.36)	<input checked="" type="radio"/> Yes	<input type="radio"/> No
Pest Management (OP 4.09)	<input type="radio"/> Yes	<input checked="" type="radio"/> No
Physical Cultural Resources (OP/BP 4.11)	<input checked="" type="radio"/> Yes	<input type="radio"/> No
Indigenous Peoples (OP/BP 4.10)	<input type="radio"/> Yes	<input checked="" type="radio"/> No
Involuntary Resettlement (OP/BP 4.12)	<input checked="" type="radio"/> Yes	<input type="radio"/> No
Safety of Dams (OP/BP 4.37)	<input type="radio"/> Yes	<input checked="" type="radio"/> No
Projects on International Waters (OP/BP 7.50)	<input type="radio"/> Yes	<input checked="" type="radio"/> No
Projects in Disputed Areas (OP/BP 7.60)	<input type="radio"/> Yes	<input checked="" type="radio"/> No

Conditions and Legal Covenants:

Financing Agreement Reference	Description of Condition/Covenant	Date Due
Project Agreement (PA) Schedule Section I A 1 and 3	Bangladesh Bridge Authority (BBA) would, till completion of the Project, with terms of reference, composition and staffing acceptable to IDA: (i) maintain the Project Coordination Committee (PCC); (ii) the Project Management Unit (PMU); (iii) the Project Steering Committee (PSC) and (iv) the Project Audit Committee.	Throughout project implementation period.
PA Schedule Section I A 4 (a)	BBA would maintain the construction supervision consultants (CSC) and management support consultants (MSC), under the terms of reference satisfactory to the Association.	Throughout project implementation period
PA Schedule Section II B	BBA would ensure that independent auditors carry out the Project and BBA entity audits in accordance with scope and TORs acceptable to the Association, which shall include special examination of the controls and compliance with the agreed-upon procurement procedures.	Annually
PA Schedule Section I A 4 (b)	BBA would establish procurement documentation and record keeping systems, including a website showing the status of procurement of various contracts and their performance, and make both fully operational, and put in place a procurement complaint handling system by no later than December 31, 2011.	December 31, 2011
PA Schedule Section II A 2	BBA will: (i) monitor the physical and financial progress of the Project, implementation of the SAP and EMP, and the project impact studies; (ii) analyze the data on key performance indicators on a regular basis; (iii) prepare and submit quarterly progress reports within 45 days following each quarter; and (iv) submit annual progress reports each year by September 30 of each year, and annual work plans for the following year, each year by March 31.	45 days after each quarter, September 30 each year; and March 31 each year
PA Schedule Section II A 2 (d)	The mid-term review of the Project would be undertaken by October 31, 2014.	October 31, 2014
PA Schedule Section I C	BBA would implement social and environmental plans (SAP including RAP and EMP), monitor and evaluate them and keep the Bank and other Development Partners (DPs) suitably informed of the progress in implementation.	Throughout the Project implementation period.
PA Schedule Section IV 2	BBA would set up a grievance redressal mechanism by June 30, 2011, in a manner and substance satisfactory to the Association in order to receive and expeditiously handle any stakeholders' and/or affected persons' complaints related to the Project.	Throughout Project implementation period.

Financing Agreement Reference	Description of Condition/Covenant	Date Due
PA Schedule Section II B5, 6	<p>(a) BBA shall, as soon as possible but before award of civil works contracts for the main bridge or river training works, or by such date agreed with the Association, raise the Jamuna Bridge toll rates applicable to various vehicle categories by an overall average of not less than 40% on the existing toll rates. BBA shall notify the Association once the toll increase is in effect;</p> <p>(b) BBA shall: (a) by December 31, 2012 complete a study in accordance with appropriate methodology and terms of reference, satisfactory to the Association, on: the level and structure of tolls and other user charges to be levied on the Jamuna Bridge, and the Padma Bridge after its completion; and future tariff and financial policies for BBA; and (b) by June 30, 2013 propose to the Association for its review: (i) the level and structure of such tolls and user charges to be applied upon opening of the bridge for traffic, which shall generate an operating cash flow (net of operations and maintenance expenses) sufficient to cover debt service requirements of BBA; and (ii) future tariff, preferably use of a formula based approach linked with inflation or other appropriate indicators that would make tariff adjustments automatic and less controversial, and financial and institutional policies for BBA;</p> <p>(c) BBA shall promptly thereafter increase the tolls and take all the proposed measures mentioned in paragraph (b) above, modified as needed to take into account the Association's comments thereon, in accordance with the schedule identified therein.</p>	<p>As soon as possible but before award of contracts for Main Bridge and River Training Works</p> <p>December 31, 2012 and June 30, 2013</p> <p>Promptly after June 30, 2013</p>
FA Section 3.02 (b)	GoB shall take all necessary measures to enable BBA to comply with its financial obligations, including approval of toll increases, other matters, and autonomy in decision-making.	Throughout project period
FA Schedule 2 Section I B.	<p>GoB shall make available the agreed counterpart contributions to BBA as a grant. Such contributions would be made at intervals satisfactory to the Association as necessary or required by BBA to carry out the Project in accordance with the project implementation program.</p> <p>GoB shall onlend the proceeds of the Credit to BBA under a subsidiary agreement to be entered into between the GoB and BBA, under terms and conditions approved by the Association, which shall include inter alia, that:</p> <p>(a) The proceeds of the Credit shall be relent to BBA on the same terms and conditions of the Credit; and</p> <p>(b) The re-payment of each maturity by BBA to the GoB shall be made in Bangladeshi currency. The rate of exchange to be applied to the repayment in Bangladeshi currency of the amount payable by BBA to GoB shall be the rate of exchange applicable on the date of the repayment.</p>	<p>Throughout Project implementation period</p> <p>Subsidiary agreement between GoB and BBA would be signed before credit effectiveness.</p>

Financing Agreement Reference	Description of Condition/Covenant	Date Due
PA Schedule Section IV	<p>BBA shall:</p> <ul style="list-style-type: none"> (a) not later than the start of the civil works for the main bridge or the river training works (parts A and B of the Project) open and maintain in a commercial bank, under terms and conditions satisfactory to the Association, a Padma Bridge Fund of at least US\$15 million equivalent which shall be used by BBA to finance expenditures of an emergency nature during construction of the Padma Bridge; (b) gradually increase the level of the Padma Bridge Fund to US\$50 million equivalent after completion of the project; and (c) six months prior to completion of the Project establish an environmental and social fund of US\$10 million equivalent, under terms and conditions satisfactory to Association, to address any outstanding environmental and social/resettlement issues after completion and closing of the Project and loans/credits. 	As defined in clauses (a), (b) and (c)
PA Schedule Section I A2	BBA shall maintain a Safety Review Panel composed of national and international experts to carry out safety reviews of the bridges under its jurisdiction (including the Jamuna and Padma Bridges), recommend solutions, guidelines and methodologies to improve safety of such bridges and to provide advice and supervision support during the implementation of bridge repairs.	Throughout the project period
PA Schedule Section I A4 (c)	BBA shall, six months prior to completion of the bridge facilities, would enter into a five-year contract with an internationally reputable firm for monitoring and operation and maintenance of the Padma Bridge and associated infrastructure also for carrying out major repairs and their detailed design as guided by the safety review panel;	Six months prior to completion of the bridge facilities.
FA Schedule 2 Section I C and PA Schedule Section I B	The GoB and BBA shall carry out the Governance and Accountability Action Plan (provided in Annex 5.1) in accordance with its terms.	Throughout Project implementation period.
FA Article V 5.01 (a) (b)	<p>Conditions of Effectiveness.</p> <ul style="list-style-type: none"> (a) The Subsidiary Agreement to onlend the proceeds of the credit to BBA shall be executed by the GoB and BBA; and (b) ADB and JICA Loan Agreements shall be executed by the Borrower, and their relevant financiers, and all conditions precedent to their effectiveness, other than requiring effectiveness of the Credit Agreement, shall be fulfilled. 	Effectiveness

I. STRATEGIC CONTEXT

A. Country Context

1. Bangladesh, with an average of about 1,084 inhabitants per square kilometers, is among the most densely-populated countries in the world. It remains a low-income country, with a per capita income of US\$ 645 (Atlas method) in FY10 and an estimated 40 percent of its population living in poverty.

2. Geography is a strong determinant of Bangladesh's development. The country is bounded by India on the west, north, and north-east, Myanmar on the south-east, and the Bay of Bengal on the south. Eighty percent of its area consists of floodplains created by more than 300 rivers and channels, including three major rivers: the Ganges, the Brahmaputra, and the Meghna. Bangladesh forms only a small part of a large regional hydrologic system—less than 10 percent of the river basin falls within the national territory. Its southern part is nestled in the Bay of Bengal with a 710 km long coastal belt that is home to nearly 35 million people. Bangladesh's geographical position and very high population density makes it extremely vulnerable to natural disasters including floods, droughts, and cyclones. Global climate change has magnified these vulnerabilities.

3. Due to this dynamic riverine morphology, the development of transport and communication networks across the floodplain is a challenge, particularly the construction of fixed crossings over major rivers. The first fixed crossing across the Brahmaputra/Jamuna River was undertaken in 1998 with the construction of the Jamuna Bridge, which connected the eastern part of the country to the north-west. The proposed Padma Multipurpose Bridge will be the second large fixed crossing, and will connect the southwest region (SWR) with the rest of the country.

4. The Project is a centerpiece of the country assistance strategy (CAS) for fiscal year (FY) F2011-14 which would support Bangladesh's ambitions by contributing to accelerated, sustainable and inclusive growth, underpinned by stronger governance at central and local levels. The project is expected to have a transformative impact on the socio-economic development of the country as a whole, and on the southwest region in particular.

5. **Economic Developments.** Despite periods of political turmoil and frequent natural disasters, the past decade in Bangladesh has been marked by sustained growth, stable macroeconomic management, significant poverty reduction and rapid social transformation and human development. During FY01-09, GDP grew by a healthy 5.8 percent per annum (including 6.3 percent per annum in FY06-09), accelerating by one percentage point compared to the previous decade. Despite natural disasters and political volatility, GDP growth has been remarkably stable, with a low standard deviation of 0.7 during this decade (half the volatility of growth in the 1980s). Growth has been led by industry and services sectors, while agriculture - as in other South Asian countries - has performed less well with an average annual growth rate of only 3 percent. Remittances and exports have been twin drivers of the Bangladeshi economy as well as the balance of payments.

6. Sustained macroeconomic stabilization measures have underpinned GDP growth, and resulted in lower inflation and smaller internal/external balances in the 1990s and the past decade. Responsible fiscal and monetary policies have kept inflation in single digits. Fiscal prudence has also kept public borrowing in check, preventing the crowding out of private investment. Meanwhile, fiscal and monetary discipline along with periodic adjustments in the exchange rate, have helped keep the external sector in balance. On the structural side, wide-ranging reforms have increased the market orientation of the economy. These include easing of trade and exchange restrictions, relaxation of restrictions on private investment, reform of state-owned banks, and deepening of agriculture reforms. The country has a relatively low risk of debt distress. Continued prudent foreign borrowing amid robust economic growth and recent real appreciation of the taka has put the external debt to GDP ratio on a declining path. However, if domestic public debt is

also taken into account, the risk of debt distress is somewhat more elevated, with the ratio of total public debt to GDP projected to remain at around 44 percent of GDP over the medium term.

7. The recent economic performance of Bangladesh continues to be encouraging as: (a) the global economic crises did little to dampen growth in Bangladesh so far, with real GDP growing at around 5.8 percent in last two years showing only a slight deceleration from FY04-08; (b) inflationary pressures arose largely due to increase in food prices ; (c) the overall fiscal deficit remained at 4 percent (same as in FY09) and external current account surplus has increased (over 50% higher than last year), foreign exchange reserves, currently stand at around US\$11 billion or equivalent of about 5.5 month of imports; (d) a low risk of debt distress based on external debt as shown by the joint IMF-World Bank debt sustainability analysis. Over medium term, strong economic growth is likely to be sustained in Bangladesh and real GDP growth is projected to be around 6.1-6.3% in FY11 although downside risks remain, particularly related to serious energy shortages. Growth of around 6 percent per annum is insufficient to achieve Bangladesh's goals for development and poverty reduction. The country aims to boost growth to at least 8 percent per annum to achieve middle-income status by 2021. To do so in an inclusive way that maximizes poverty reduction, Government will need to dramatically upgrade energy and transport infrastructure. The Padma bridge is an important aspect of unlocking isolated regions and populations, enhancing connectivity for economic activity throughout the country and fostering better links to neighboring India and beyond for long-term trade, investment and growth.

8. **Public Expenditure and Development Budget.** The FY11 budget is moderately expansionary, in the face of uncertain global prospects. Its successful implementation will hinge on the rapid execution of fiscal reforms aimed at increasing the tax take and improving Annual Development Program (ADP) implementation. Overall, the budget deficit is projected to rise to 5 percent of GDP from the Government's expected FY10 outturn of 4 percent of GDP. The rise in deficit is projected to be financed entirely through domestic borrowing. Consequently, domestic financing of the deficit is projected to rise from 2.0 percent of GDP in the FY10 revised budget to 3.0 percent in the FY11 budget, while external financing would remain unchanged at 2 percent of GDP. The primary deficit (overall budget deficit minus interest) is projected to increase from 2.4 percent of GDP in FY10 to 3.2 percent in FY11.

9. Fiscal space for development spending—including for large-scale infrastructure projects—is quite limited in Bangladesh, with the Annual Development Program (government's capital budget) for this year equivalent to only about 5 percent of GDP, up from less than 4 percent the year before. About half is financed from external resources. Government has budgeted its counterpart contributions for the PMBP within the prioritization of the Annual Development Program this year. The PMBP is more than 80 percent foreign-financed, and the project is self-financing through future bridge tolls. Therefore, future debt service or other Padma-related public spending will not crowd out development spending in the future.

B. Sectoral and Institutional Context

10. Bangladesh has a vast network of highways and rural roads, inland waterways, two seaports, maritime shipping, a railway system, and civil aviation and a national airliner. Yet, this has not always been the case. At the time of the Indian sub-continent's partition in 1947, the landmass comprising today's Bangladesh was served primarily by a network of inland waterways that provided informal boat services to isolated rural communities and some long-distance cargo and passenger services. The road network was almost non-existent, with only 600 km of narrow paved roads. The railways inherited from the British Indian Railway system were a disjointed network of about 2,800 km in route length, separated by the Jamuna/Padma River with two separate and incompatible gauges.

11. From this low-level of transport endowment, Bangladesh has made big strides to develop a modern transport system to support the needs of a developing economy. Most of the improvement has happened in the roads, followed by the ports and civil aviation. The road network expanded to an

impressive 271,000 km. Bangladesh has developed major road corridors connecting Dhaka with key economic centers and towns, and a network of village roads connecting communities to market centers and the main roads. New bridges connect communities with road transport and integrate whole regions, including the Jamuna Bridge (with official name as Bangabandhu Bridge) which combined roadways, a rail track and a natural gas pipeline, providing uninterrupted northeast-northwest road and rail connection for the first time. Completion of the Jamuna Bridge had a transformational effect on the Northwest Region, and the proposed Padma Bridge is expected to do the same for the Southwest region.

12. **Transport demand has grown vigorously.** The economic expansion and social development witnessed in Bangladesh since independence was accompanied by rapid growth in transport demand, at 9 percent per year. Much of this growth was met by road transport, which emerged as a dominant mode of transport over the years. The share of passenger transport demand provided by road transport increased from 54 percent in 1975 to 88 percent in 2005, while rail declined from 30 to 4 percent and inland water transport from 16 to 8 percent. A similar change also happened for freight transport demand.

13. The key challenges the transport sector faces include: (a) **Road transport** falls short of quality and safety. Roads have been under-maintained, and rural roads should better benefit the poor; (b) **Bangladesh Railway** has played a limited role in the economy, due to the limited infrastructure, poor condition of the physical assets, and low efficiency of services vis-à-vis competing transportation modes. Railway reform is urgently needed; (c) **Inland waterways system** is not used to its full potential, due in part to inadequate dredging and shortage of berthing facilities. While lack of resources is the main cause, the quality of sector management and services provided by the operators has also contributed to inland water transport's overall decline; (d) **Seaports** are a bottleneck to trade. Due to several reforms in the last few years, Chittagong Port has achieved large improvements in port efficiency (turn-around time for container ships) and in the reduction of cost of doing business. The country's other seaport, Mongla, is grossly under-used because among other things, there is no bridge over the Padma River to facilitate road and rail connections to Dhaka; (f) **State airline is struggling to survive.** A major reform in air transport occurred in 2007 when the state-owned Biman Bangladesh Airlines became a public limited company. A more rewarding approach for Government efforts may be to aid the Bangladeshi private carriers to acquire Biman's route operating rights, and to negotiate royalties with foreign carriers wishing to fly into Dhaka.

14. **Budget for Transport Sector.** The dense land use and the flat terrain are advantages when it comes to supplying infrastructure. Countries with such advantages need to spend a smaller share of GDP to ensure connectivity to their population: 1.5-2 percent of GDP may be adequate, if well used and sustained over time. Public expenditure in the transport sector was Taka 413 billion (\$6.7 billion) during fiscal years 2002-3 to 2006-07. This constituted about 2.2 percent of GDP, which is comparable to many other countries in the world. Of this, 69 percent was allocated to development projects through the Annual Development Plan, and 31 percent was allocated to recurrent and maintenance expenditure through the Revenue Budget. Adding in funds to clear the backlog of deferred maintenance, 2.5 percent of GDP may be a reasonable budget share, recognizing other priorities that the Government has to fund. That said, Bangladesh faces the special challenges of financing certain mega-projects of long-term significance to the structuring of the economy, which are hard to reconcile with the regular budgets: the proposed Padma Bridge, the rail-based mass transit network for Dhaka that is being debated, and expansion of capacity on the Dhaka-Chittagong corridor –road or rail or both.

15. The state budget is small: government revenues are only 11 percent of GDP. Funding these mega-projects will require either an exceptional share of the state budget at its present level, or a big increase in the collection of tax revenues. Perhaps most practical in short to medium run is to structure such investments to be self-financing through collection of tolls, as was the case for the Jamuna Bridge.

16. **Transport Sector Institutions.** Four separate line ministries –communication (road, rail and bridges), shipping (inland water transport and ports), aviation and local government (rural roads)—plus

other ministries such as planning and finance, are involved in the transport sector. In addition, there are nine parastatals. The result has been a lack of integrated sector planning and policy development. The second issue is the poor performance of most of the transport parastatals. The implementation of transport policy approved in April 2004 is also hampered by the weak institutional framework governing the sector.

17. **For construction of the Jamuna Bridge**, the Jamuna Multipurpose Bridge Authority (JMBA) was established in 1985. At completion of the Jamuna Bridge, the BBA was established by GoB by a gazette notification (October 6, 2009) by amendment to the JMBA Ordinance. The BBA is headed by an Executive Director with status of a Secretary of GoB. Subsequently, by Cabinet Division's Gazette notification on March 31, 2008, two divisions were created under the Ministry of Communication (MOC), the Roads and Railways Division, and the Bridges Division. BBA is now an authority under the Bridges Division with a Board. The Executive Director of BBA is concurrently the Secretary of the Bridges Division. The mandate of the BBA is development and O&M of the bridges having length of 1.5 kilometers or more, flyovers, toll roads, elevated expressways, causeways, etc.

18. BBA is a relatively lean and more effective organization than other transport sector institutions. Its performance has been good in planning and development of Jamuna Bridge and also in preparation of feasibility studies, designs, other preparatory work for the Padma Bridge. Though it has full mandate and authority to take all decisions related to planning, financing, development procurement and O&M of infrastructure it owns, in practice it refers key issues to the MOC and the Cabinet for decision. It lacks capacity in carrying out development of large infrastructure projects which is being strengthened. Given that BBA is a separate authority and not a department of MOC, and given the nature of PMBP with just a few large international contracts, the project can be effectively implemented by strengthening BBA (which started through the Project Preparation Facility (PPF) funds and will continue throughout the project period) and proper ring-fencing as proposed under implementing arrangements for the Project.

Southwest Region (SWR)

19. Bangladesh is divided into four major regions by the Ganges, Brahmaputra and Meghna rivers¹ (see Map IBRD 38325). Of particular relevance to this project is the southwest region (SWR), which covers approximately 27 percent of the country and contains nearly a quarter of its population. At the time of independence from Great Britain in 1947, this region lost a major trade connection to Calcutta, which was a major commercial center and trading hub for the region. Today, this region has remained one of the least developed parts of Bangladesh, primarily due to lack of connectivity to the rest of the country.

20. The proportion of the population below the poverty line in the SWR remains about 5 percentage points higher than in the rest of the country. Taking the core districts of the SWR, Khulna and Barisal,² the difference of percentage of population under poverty line is even more glaring—almost 10 percentage points higher than the national average. This region includes several *upazilas* with the highest incidences of extreme poverty; the two poorest districts in the country are in the south-west region. Household income and expenditure data also show a similar difference between the SWR and the rest of the country. Besides loss of old trade connections and limited linkages with growing centers of activity (that explain the region's slow growth of manufacturing and other non-farm activities), agricultural growth has been comparatively slow in this area. This is due to the lack of access to markets and soil degradation due to saline intrusion and lack of fresh water in the dry seasons.

¹The Brahmaputra River on entry into Bangladesh is called the Jamuna River. The Ganges River upon entry into Bangladesh is called the Padma River. The river is called the Padma River after the confluence of the Padma and Jamuna Rivers. When the Meghan River joins from the eastern side it is called Meghna River and discharges into the Bay of Bengal.

² The core southwest area would include the following zilas: Bagherhat, Barguna, Barisal, Bhola, Chuadanga, Faridpur, Gopalganj, Jessore, Jhalokhati, Jhenaidah, Khulna, Kushtia, Madaripur, Magura, Meherpur, Narail, Patuakhali, Pirojpur, Rajbari, Shariatpur and Sathkira

21. Compounding isolation and relative poverty, the SWR is more vulnerable than other regions to natural calamities. The incidence of cyclones and tidal floods and impact of climate change are more pronounced in this region. This area was severely affected by two recent cyclones--Sidr in 2007 and Aila in 2009. The communities in this region also face several unique geographical challenges. For example, saline groundwater in the SWR makes groundwater irrigated agriculture impossible, especially during the dry season. The region also contains areas that are the most vulnerable to climate change and sea level rise.

22. The SWR suffers from transport and road bottlenecks. The most important bottleneck is the lack of a bridge on the Padma River, which keeps the region more isolated from the eastern and north-east areas. Besides this lack of connection, the density of other road and transportation systems is much less developed than in other regions. The SWR river transportation system is facing increasing congestion and problems of siltation. At present, six river ports in the SWR are operating at levels much below capacity due to a lack of proper dredging and maintenance.

23. The SWR has the second largest sea port of the country—Mongla port— which is operating at 20 percent of its capacity. The key constraints facing Mongla port include the following: (i) absence of a bridge over the Padma river that adds to the long travel time between Dhaka and Mongla (even though the road distance between Dhaka and Mongla is shorter than Chittagong --170 km versus 264 km --the travel time is longer due to the absence of a bridge); (ii) the decline in jute exports, which used to be the main cargo for Mongla port; (iii) the lack of a rail connection between Mongla port and the existing rail network and obsolete handling equipment at the port; and (iv) the draft restriction in the port channels due to chronic siltation problem. Padma Bridge will ease the key constraint of travel time and difficulty, while other constraints can be removed by additional, selective investments.

24. The SWR has a limited supply of power. Rural electrification in this region is much less developed than in other regions: only 24% of rural households in the Barisal division have electricity connections, compared to 35% nationally. A survey of rural enterprises shows that the enterprises in Khulna and Barisal areas use modern sources of power (such as gas and electricity) much less frequently than in other regions.

25. **Characteristics of Padma River.** The Padma is the third largest river in the world in terms of mean average annual discharge and the second largest river in terms of sediment transport. The Padma River is fundamentally different from its two tributaries, the Ganges and Brahmaputra. While the Ganges is a more-predictably meandering river, in places contained by natural nodal points, the Brahmaputra is one of the largest braided sand-bed rivers in the world, characterized by short temporal bursts of erosion and deposition. The combined flow forms the young Padma River. While it flows mostly as a single thread channel at the bridge area, there have been periods when multiple channels occur. At present the Padma is in a stage of transforming again from a straight channel at the bridge site into a meandering one. This means the existing south bank upstream of the bridge will likely experience major erosion again. Historically, the location where the bridge is to be built has not been stable and major parts of the south bank approach road are situated on young deposits of old major channels. Since 2005, the river has eroded about 0.5 km of the south bank. However, this location is better than the available alternatives. In contrast, the north (Mawa) bank is characterized by very slow erosion processes and can be termed as quite stable. For more information on the river morphology and hydraulics see Annex 2.1.

26. **The Proposed Padma Multipurpose Bridge Project (PMBP)** is a large-scale infrastructure project that will significantly benefit diverse sectors of the economy in Bangladesh. Currently, the Padma River isolates the SWR of Bangladesh from other parts of the country. Despite substantial improvements and development in the road network in Bangladesh, this zone remains beyond the advantages of an integrated road network due to the lack of a bridge over the Padma River. Currently, transportation between the SWR and the rest of the country across the Padma River can only be done by ferry. The capacity of ferry services is very limited, given the waiting time at *ferry ghats* (docking stations) of more

than 2 hours for buses and light vehicles and more than 10 hours for trucks. In addition, the riverbanks of the Padma are unstable, leaving approach *ferry ghats* seasonally inoperative. The expansion of existing ferry terminals is difficult due to these conditions.

27. The proposed bridge will provide direct links between two major seaports of the country and will be an integral part of the Asian Highway No 1 and Trans-Asian railway network systems (Sylhet-Kanchpur-Dhaka-Mawa-Jessore-Benapole, connecting Calcutta to the eastern part of India on the eastern side of Bangladesh). The distance from Dhaka to nearly all major destinations in the SWR will be reduced by 100 kilometers (km) or more with greater reduction in transport time. A multi-purpose bridge will enhance freight, passenger transportation, and utility crossings (high pressure gas transmission, high voltage power transmission, and optical fiber telecommunication cable) between Dhaka and major points in the southwest zone. It will contribute substantially to the development of the southwest zone as well as to national and regional economic growth. The Project will boost the GDP of the SWR and the country and generate substantial employment opportunities. Its river training works will also help control river erosion in these areas which is a recurrent acute problem in Bangladesh and one of the major causes of landlessness and extreme poverty.

28. **Plans for Development of Railway in the Southwest Region.** Bangladesh Railway (BR) is a large Government undertaking and employs 37,000 staff. Its network comprises 2,835 km of railway track. In FY 2008, BR carried 53.8 million passengers and 3.3 million tons of freight. In the SWR, BR is currently running 134 passenger trains and 20 freight trains daily. Because of a missing link between Dhaka and Southwest, regional movement of passenger and freight by railway suffered. Once the Padma Bridge is built, the railway connection between Dhaka and the SWR can be developed. This would lead to manifold increase in the movement of passenger and goods between Dhaka and SWR and movement of freight between Dhaka-Mongla port reducing the congestion at the Chittagong port

29. The Bangladesh Railway has taken up a scheme of four projects (Dhaka-Mawaa-Janjira-Bhanga-link, Faridpur-Pakuria link, Bhanga-Jessore link, and Bhanga-Barisal link) of constructing new railway lines to connect Dhaka over the Padma Bridge and southwest region (308 km of new railway track) with an estimated cost of about US\$ 1.5 billion. A plan has been prepared for these rail connections for which implementation could take a decade to get underway. The railway on Padma Bridge will form part of the Trans Asian railway, provision for the Indian dedicated freight network loading has been kept on the bridge. This would be a rail-ready bridge, and the track will be put in place when the link between Dhaka and SWR is established. The railway line was also established a few years after the opening of the Jamuna Bridge.

30. **Regional connectivity.** Padma Bridge is an important transport infrastructure to ensure physical continuity along the longest corridor defined under the Asian Highway Network³ linking Tokyo to Istanbul (AH1: 20,557 km or 12,845 miles). At regional level, AH1 runs from Kabul to Dhaka, via Lahore, Delhi and Kolkata. Beyond improving significantly the road connection between two major highly populated urban areas of the South Asian Region, i.e., Kolkata (16 million inhabitants) and Dhaka (12 million inhabitants) and opening a continuous road connection between the SWR and Dhaka, Padma Bridge also opens alternative routes for the North Western Region of Bangladesh for using Mongla port, the second major port in Bangladesh. Beyond Bangladesh, trade to/from Nepal would also directly benefit from Padma Bridge, offering a competitive alternative in the current use of the highly congested port of Kolkata for Nepalese trade.

³ The Asian Highway (AH) [project](#), also known as the Great Asian Highway, is a cooperative project among countries in Asia and Europe and the [United Nations Economic and Social Commission for Asia and the Pacific](#) (ESCAP), to improve the [highway](#) systems in Asia. Agreements have been signed by 32 countries to allow the highway to cross the continent and also reach to Europe. Some of the countries taking part in the highway project are India, [Sri Lanka](#), Pakistan, China, Japan, [South Korea](#) and [Bangladesh](#)

Southwest Region –Comprehensive Development Program

31. The bridge would have considerable spill-over (wider economic) effects. But these effects, as well as direct (traffic) benefits, can be expanded with selected investments, in addition to the Padma Bridge. In fact, to maximize the multiplier effects of the Padma Bridge Project, and to accelerate growth and poverty reduction in the SWR, a more integrated and cross-sectoral approach would be highly desirable. Given the mega investment, the Padma Bridge Project has to be used as an anchor investment for other selective complementary and supplementary investments to fully exploit the opportunities opened by the bridge for the SWR, and thereby help contribute to the growth and progress of the entire country in a major way. The Bank and the GoB have started the preparation of a comprehensive development program that would achieve this objective. The studies and preparation of program are still ongoing and they are expected to be completed by June 2011, with the final report issued in October 2011.

32. The preliminary findings of the on-going study on south-west development indicates that with the opening of the bridge, the likely sources of growth of south-west region will consist of the following activities: (a) South-west having considerable marshy land, fisheries will have a huge potential. Already shrimp cultivation is an important activity and will likely become a significant source of growth. (b) In crop agriculture, jute was an important cash crop in the region and recently its prospect of revival seems stronger than before. Rice production will have better prospects especially with some saline-resistant rice seeds. Besides, saline resistant rice, some crops (such as maize, mong-dal and chillies) are naturally saline resistant and will have good prospects. Potato and oil-seed production also have good prospects. (c) Livestock and poultry have been an important activity and will become even more important in future. (d) As for agro-processing and manufacturing, dairy processing, fish processing and fish products, grain milling and various food products; jute processing and jute textile manufacture, and saw milling and furniture making, small and medium scale manufacturing have stronger prospects. With the opening of the bridge and concomitant development of the region, one can expect migration of garment factories and other industrial activities to the region. (e) Trade and tourism could be another important source of growth. Besides internal trade, trade with India will receive a boost from lower transport time and cost. With improved connectivity, tourism to some popular tourist spots (including the world-class Sundarban mangrove forests) in coastal area of Barisal has strong prospects.

33. Aside from the lack of a bridge over the Padma River, the study analyzed other constraints that hinder growth of the region (as well as identified factors that hamper better coping of the natural disasters). Based on preliminary findings, a tentative program has been developed consisting of essentially two broad types: (a) additional, complementary investments that are needed to extend and deepen the benefits already expected from commissioning of the bridge; and (b) adjustment or realignment that will have to be made to take the bridge into account so that the existing development programs become more effective and productive.

34. Key elements of the program may include the following:

- (i) Development of a multi-model transport linkage within SWRs and with Dhaka.
 - (a) This includes western and southern bypass of Dhaka by a toll expressway to provide better access to the bridge for traffic from the north and west of Dhaka and from the Chittagong road now causing congestion in the Dhaka city, and widening of Dhaka-Mawa-Bhanga road to provide a fast connection to SWR. This would be start of the Dhaka Beltway which can be completed by construction of eastern bypass. Dhaka beltway would also be the main element for reducing congestion and expansion of Dhaka metropolitan area that is becoming unlivable due to extraordinary density and congestion. Thus, in addition to improving connectivity to the Padma Bridge and SWR, this investment has substantial merits on its own due to the considerable impact it can have in reducing congestion in Dhaka city and its expansion;

- (b) Improvement of road and transport infrastructure in the SWR such as improvement of Mawa-Barisal-Patuakhali road, Mongla-Bagerhat-Khulna road, Patuakhali-Khulna road, Bhatiapara-Narial-Jessor-Benapole road, Faridpur-Barisal road, and Madripur-Bandar-Muktapure road. In addition, five smaller bridges will have to be completed to connect a few important urban centers and tourist spots in the region— Patuakhali and Barisal coastal area.
 - (c) Development of rail network in particular four links (i.e. Dhaka-Mawaa-Bhanga-Janjira, Faridpur-Pakuria, Bhanga-Jessore, and Bhanga-Barisal) covering about 308 km to connect SWR to Dhaka. In addition, there would be need for extension of a rail link to Mongla port particularly in the second phase of Mongla port development when the port is moved further out to the sea;
- (ii) Revival of Mongla port, and establishment of export free zones. This is to be achieved in three phases, starting from improvement of the existing port facility, moving the port to an outer point or close to sea to avoid dredging issues and get better draft. The port closer to sea should be developed with facilities for import of Liquefied Natural Gas (LNG). This would allow installation of a power generation plant close to the port and the electricity from which can be transmitted to SWR and Dhaka through the transmission line across the Padma River. Development of Mongla Port would be next pivotal investment for Bangladesh after the Padma Bridge around which additional investments can (such as imported gas based power plant) be centered to remove the constraints to growth and for the regional connectivity, transit and trade with other countries in the region;
 - (iii) Improved power connection and supply. To improve connectivity the electrical grid, the plan is to install new substations and to construct about 2,000 km of distribution lines. In the long run, this could be increased to about 1,500 MW of new electrical generation plants based on domestic and important gas as mentioned above close to Mongla and at Khula and Bhola where gas is available;
 - (iv) Maximizing farm and non-farm growth possibilities, diversification of crops and agriculture in saline environment, availing trade potential within the country due to connectivity and with India. This includes dairy and fish processing, in particular shrimp, saw milling, jute textile and jute-bailing. With transport and energy constraints removed the small and medium enterprises such as garment industry, export oriented small scale manufacturing etc. will have strong prospects for growth;
 - (v) Improved infrastructure and capability for disaster risk management, coastal and river bank protection and restoration of fresh water flows during dry season; and
 - (vi) Institutional development and capacity building of local, regional and national institutions to support the integrated development program, and provision of services, etc. which is crucial for implementation of the investments, realization and appropriate distribution of benefits and impact on poverty reduction.

35. The preliminary estimates are that the cost of the comprehensive development program over 20 years would be about US\$6 billion or about US\$300 million per year. The phasing of each investment under the program is to be done considering the absorptive capacity of the regional and national institutions and by ensuring proper linkages with the ongoing and planned development program for the region to realize full benefits of each investment. The program with proper phasing and planning will fit within the available fiscal space under the development budget of the country. Besides improvements in the existing road network and completing and improving any missing links, the highest priority would be (a) the Dhaka Beltway which is to be developed in three phases over about 12-14 years period; (b) Mongla port development also in three phases in about 15 years period; (c) power generation and improving connectivity to the grid over a 10-12 year period; and (d) institutional development and reform throughout the program period. The Bank and the Government are working together to include the elements of this program into the Government development plan after the completion the SWR Comprehensive Development Program.

Rationale for Bank's involvement

36. The construction of the bridge over the Padma River is a top development priority agenda for the Government of Bangladesh (GoB) that will benefit not only the SWR, but the country as a whole. The Bank has a long history of partnership and collaboration with Bangladesh in the water and transport sectors, and is seen as a trusted partner and a coordinator for international financial institutions and other development partners. It has provided previous support to large scale infrastructure interventions including the financing of the Jamuna Multipurpose Bridge. Thus, the Bank has experience in delivering technically complex and challenging operations working with institutions with relatively low capacity and weak governance.

37. The Bank has also been providing support to the Bangladesh Bridge Authority (BBA), the entity responsible for the Jamuna and Padma Bridges and all bridges longer than 1.5 km. The GoB not only regards the Bank as a primary source of financing but also a source of technical knowledge, professional and policy advice, and expertise in the sector. The Bank is viewed as an entity that can support strong management of a large international project (since the contracts will likely interest international contractors and consultants, BBA would have to deal with these contractors and possibly their Governments) and thus was asked by the GoB to provide a leading/coordinating role in the development and implementation of this Project. Given the governance environment in the country, the Bank has a comparative advantage in ensuring that the resources will be utilized effectively for the country. In sum, Bank is well placed to assist the country with this Project to support accelerated, sustainable growth in line with the CAS objectives.

C. Higher level objectives to which the project contributes

38. Bangladesh has ambitious aspirations of reaching middle-income country status and reducing the poverty rate from 40 percent to 15 percent of the population by 2021. To achieve this goal an annual growth rate of around eight percent per annum would be required. This would call for massive infrastructure investments both to stimulate the growth and to meet the requirements of the expanding economy. The Bank supports a goal for accelerated growth, and the Project is a centerpiece of the Bank's Country Assistance Strategy (CAS) for FY11-14. The Project contributes to the overarching goal of the country by connecting and making a large region more accessible. The analysis shows that the benefits of the Project would be equivalent to annual increase of at least 1.7 percent of SWR GDP in value and of the 0.56 percent of annual increase of national GDP. The poverty reduction rate would increase by 1.0 percentage points in the SWR and by 0.8 the percentage points at the national level. The impacts are quite similar to the Jamuna Bridge (connecting the Northwest Region to the country), which were estimated about five years after the opening of the bridge.

II. PROJECT DEVELOPMENT OBJECTIVE (PDO)

A. PDO

39. The Project development objective is to connect the south- western region to the rest of the country in order to stimulate economic growth by facilitating inter-regional, cross-river transport of passengers and freight, and transmission of natural gas, telecommunication and electricity in a cost effective manner.

1. Project Beneficiaries.

40. The Project would provide benefits for diverse sectors of the economy in Bangladesh. The Project is transformational in nature with significant countrywide benefits. In particular, beneficiaries would be the people of the Southwest region (over 30 million people) who would be integrated into the rest of the country through safe and reliable linkages across the banks of the Padma River. The extent of

benefits would vary depending upon vicinity to the bridge. The project impact area is classified into four main areas: local south zone, local north zone, south western Bangladesh and the rest of Bangladesh. The project would have positive benefits for households in all regions, but would have the highest benefits for the local south and north zones, followed by the south western Bangladesh and remaining Bangladesh (Table 1).

41. With the completion of the proposed Padma Bridge, distances to almost all the major destinations from Dhaka would be reduced by 100 km or more, and travel time would be reduced by 2 hours for cars and more than 10 hours for trucks. This would bring positive economic impacts for trade, transportation, agriculture, education, health and other sectors, to lives and livelihoods of the people in the region and the country as a whole. The benefits are clearly recognized by the local communities in the region.

Table 1: People and Households benefiting (Millions)

Zone	Districts	Division	Population	Households
Local South Zone	Faridpur, Gopalganj Madiripur	Dhaka	4.7	1.04
Local North Zone	Dhaka, Munshiganj	Dhaka	0.8	0.17
South Western Bangladesh	Shariatpur, Rajbari, Barisal, Khulna	Barisal, Khulna, Dhaka	29.2	6.8
Remainder of Bangladesh			116.2	26.3

2. PDO Level Results Indicators

42. Progress towards achieving the development objective will be measured through the following key performance indicators:

- Connectivity between the Southwest region and rest of the country is established
- Quantum of passenger and freight traffic crossing over the bridge and transmission of natural gas and telecommunication systems over the Padma River;
- River training works of bridge provide help in overall training of the river and areas in the vicinity of the bridge are protected from river bank erosion;
- Number of people directly benefiting from the bridge
- Savings in travel time by the bridge users

43. Some of the indicators will see progress during the project period (such as completion of bridge etc.), or towards the project's end such as the quantum of passengers, number of people directly benefiting from the bridge and savings in travel time. Progress on several other indicators would be realized several years after the project completion. These include economic growth and poverty reduction as well as transmission of gas and electricity. As with the Jamuna Bridge Project, post evaluation studies would have to be initiated five and ten years after the project completion in order to assess the impact of the project on the region surrounding both sides of the river.

III. PROJECT DESCRIPTION

A. Project Components

44. The Project is designed to support the development objectives. The Project consists of the following components (See Annex 2 for more details):

Component A: Main Bridge and Approach Roads (US\$1,626.2 million).

45. This component will include construction of the foundation, substructure and superstructure of the main bridge and services on the bridge, road viaducts, approach roads, toll plazas and various bridge end facilities. This would be a “rail ready” road bridge. The bridge design incorporates adaptation to impacts of long term climate change and can withstand earthquake loading.

A1: Main Bridge and construction Yards (US\$1,397.3 Million)

A1.1: Main Bridge and viaducts (US\$1,339.8 million). The main bridge would be about 6.15 km long consisting of a two-level steel truss bridge with a concrete top deck slab. It would accommodate a four lane divided highway on the top (about 22.5 meter wide) and would have provision for a single rail track on the lower deck. It would allow passing of a high pressure gas pipeline, and a fibre optic cable. The crossing for power transmission to support 400KV line would be installed about 1 km downstream from the main bridge using piers similar to the bridge with a span of about 1 km (see Annex 2).

A1.2: Development of Construction Yards (US\$57.5 million). This would include preparation of construction yards for the main bridge contract covering some 147 hectares (ha) on both sides of the river. The high reflects the need to raise the land above flood level and establish river protection. This would be done prior to the award of the main bridge contract. The cost for installation of equipment etc. in the construction yard is included in component A1.1 of the project.

A2: Approach Roads and Bridge End Facilities (US\$228.9 million). This component would support construction of approach roads connecting the existing road work to the bridge. On the left bank side (Mawa side) only a limited stretch of road (about 1.5 km) needs to be constructed. One culvert would be rehabilitated. The approach road on the right bank (Janjira side) is approximately about 10.5 km, which includes 5 small bridges (total length 270m), 20 culverts and 8 underpasses. Provision has been made for about 10 km of local service roads, access roads, roundabouts, etc..

The component would also finance the toll plazas on both ends of the bridge along with the equipment and facilities for collection of toll. Toll plazas on the Mawa and Janjira sides would be identical, with ancillary facilities and weighbridge. On the Mawa side one Service Area (SA-1, about 27 ha) and on Janjira side service areas SA2 (about 64 ha) and SA3 (about 6.6 ha) for housing the construction supervision consultants (CSC) and management support consultants (MSC) on site with all basic amenities (office, dormitory, mess, residences etc.) would be constructed, along with police stations and other faculties for operation of the bridge in the long run.

Component B: River Training Works (US\$799.9 million).

46. Padma is one of the major rivers in the world with an alluvial bed and complex morphology. The river has a tendency to shift westwards. Though the main consideration in site selection for the bridge is stability of the river, keeping the river stable under the bridge in the long run is a challenge. The river training works are designed to meet this challenge. The left side (Mawa side) bank is relatively high and stable. The river training works (RTWs) on the Mawa side are about 1.5 km long and about 1 km on upstream side. On the Janjira side construction of RTWs is more extensive and heavily designed. The length of the RTWs on the Janjira side would be about 10.5 km.

Component C: Implementation of Social Action and Environmental Management Plans (US\$291.9 million).

C1: Social Action Plan (US\$273.2 million). The PMBP is a large, complex and challenging project involving a variety of issues ranging from land acquisition, physical and economic

displacement, impacts on vulnerable groups and other unanticipated impacts. This component would support implementation of the Social Action Plan including the Resettlement Action Plans (RAP), public health action, gender action, *charland* monitoring and public consultation plans

C2: Environmental Management Plan (US\$18.7 million). This would support implementation of the environmental management plan (EMP). Though much of the EMP activities have been included on the construction contracts under other components, some activities, like tree plantations, development of protected area on *charland*, community environment management plan etc. may be funded under this component.

Component D: Construction Supervision, Monitoring and Evaluation of the Project Impact and Social and Environmental Management Plans (US\$72 million).

D1: Construction Supervision and Implementation Support (US\$65 million). This component will cover the cost of consulting and other services for project implementation, including construction supervision and project management support.

D2: Monitoring and Evaluation of the Project Impact and Social and Environmental Management Plans (US\$7 million). This would support monitoring and evaluation (M&E) of the project implementation activities, the socio-economic, physical, environmental impact, and supervision of implementation of EMP and RAP. As such, it would provide continuous feedback to the Government of Bangladesh (GoB), Project Coordination Committee (PCC), Project Steering Committee (PSC), BBA and the project cofinanciers/development partners (DPs). This component would also provide support for BBA in project management. For implementation of this component, an independent consultant team, namely the Management Support Consultants (MSC), would be recruited under the project.

Component E: Project Management Support, Capacity Building of BBA, Technical Assistance and Training (US\$26.0 million).

E1: Project Management Support and Audits (US\$7.0 million). This component will support the BBA in implementing the project related activities. It will include support for operation of Project Management Unit (PMU) and audits etc.

E2. Strengthening of BBA, IPOE and Technical Assistance (US\$14.0 million). This component would build the capacity of the BBA to effectively implement the project, O&M of the bridges it manages and carrying out its full functions as defined in its mandate. This would include, but not be limited to: (i) enhancing BBA's capacity in planning and programming, engineering and O&M of the bridges, financial management, procurement, and management of the environment and social issues; (ii) technical assistance and training in such areas as designing of bridges, river training works, approach road, hydraulics; detailed designs of structures; contract administration and construction supervision; procurement; operations and management planning; asset management plans; financial management; and legal issues (this will include on the job training, post graduate programs, seminars, workshops, and study tours, etc); and (iii) an independent panel of experts for design and construction quality and safety enhancement or any other issues that may have to be addressed during project implementation.

E3. Strategic Studies (US\$5 million). This component would support strategic studies to address technical, financial or management issues, mitigation measures and pilot projects that may be identified during the project implementation and agreed upon with the Association.

B. Project Financing

1. **Lending Instrument.** The lending instrument is Specific Investment Loan (SIL)

2. Project Financing Plan

47. The project financing plan is provided in the Table 2. The Project would be financed by an IDA credit (US\$1,200 million), an ADB credit of US\$76 million and a loan of US\$539 million, a JICA credit of US\$400 million, an Islamic Development Bank (IDB) loan of US\$140 million and funds from the Government of Bangladesh (about US\$560 million). The total cost is about US\$2,915 million with a tax content estimate around 19.5% (about US\$549.1 million). With these commitments the Project is fully financed by the DPs and the GoB and there is no financing gap. However, additional availability of concessional funds for the Project would reduce pressure on the GoB's development budget thus allowing reallocation of scarce development funds to other programs which cannot be funded by entities like BBA through generation of their own resources.

Table 2: Project Cost by Components and Financing Arrangements (US\$ Million)

Component	Total	IDA	ADB	JICA	IDB	GoB
A. Main Bridge						
A1.1 Main Bridge Facilities and Viaducts	1,339.8	500.0	300.0	400.0		139.8
A1.2 Construction Yards	57.5					57.5
A2 Approach Roads and facilities						
A2.1 Mawa Side	35.0	35.0				
A2.2 Janjira Side	193.9	35.0			140.0	18.9
Sub-total A	1,626.2	570.0	300.0	400.0	140.0	216.2
B. River Training Works	799.9	275.0	248.0			276.9
C. Implementation of SAP and EMP						
C1. Social Action Plan (SAP)	273.2	206.3				66.9
C2. Environmental Management Plan	18.7	18.7				0
Sub-Total C	291.9	225.0	0.0	0.0	0.0	66.9
D. Consultancies for Supervision						
D1 Construction supervision and PM support	65.0	65.0				
D2 M&E and supervision of EMP and SDAP	7.0	7.0				
Sub-total D	72.0	72.0	0.0	0.0	0.0	0.0
E. Project Management, TA, Training						
E1 PM support and audits	7.0	7.0				
E2 BBA strength, TA, POE, training	14.0	14.0				
E3 Strategic studies	5.0	5.0				
Sub-total E	26.0	26.0	0.0	0.0	0.0	0.0
Total Project Cost	2,816.0	1,168.0	548.0	400.0	140.0	560.0
Interest/service Charge during Project	96.0	29.0	67.0			
Refinancing of PPF Advance	3.0	3.0				
Total Project Cost	2,915.0	1,200.0	615.0	400.0	140.0	560.0

48. **Capitalization of Service and Commitment Charges.** BBA is a financially autonomous entity and its revenue comes from the collection of tolls from the bridge and all debt service would be paid by the BBA. The service and commitment charge during the project period is substantial (US\$29 million), and financing this would be a strain on the resources BBA can make available for the construction of Padma Bridge. After completion of the Project, BBA will have income from the bridge toll and will be able to repay the loans and service charges. For effective implementation of the project, it is proposed that

the service and commitment charges on the IDA credit during the period be financed from the proceeds of IDA Credit. Also the charges for the ADB loan would be capitalized, while similar charges for JICA loan (which are very small) would be paid by BBA.

49. The main bridge contract (Component A1) would be jointly financed by IDA, ADB, JICA and the GoB. The approach roads (Component A2) would be financed in parallel by IDA and IDB with counterpart contributions by GoB. The river training works contract (Component B) would be financed by IDA, ADB and GoB. All other contract/components would be financed by IDA and GoB as indicated in the Table 2.

50. **Coordination among Development Partners (DPs).** The Project would be implemented using the Bank's policies in relation to, *inter alia*, procurement, safeguards, fraud and corruption, financial management, communication, etc. Within these limits, issues that have arisen so far as a result of the DPs' different policy regimes have been dealt with pragmatically, and have been addressed through consultations and the sharing of documents among DPs. For example, all DPs agreed to apply the safeguards policies of the DP whose policies provide for the strictest standards, and to use two-stage procurement procedures for the Main Bridge and RTWs contracts. This process is expected to continue throughout Project implementation by trying to accommodate, to the extent permitted under Bank policies, the concerns and procedures of the other DPs.

51. A Memorandum of Understanding (MOU) is expected to be signed among all DPs after the DPs' financing agreements have been signed. The MOU would provide, among other things, for (a) cooperation and monitoring arrangements among DPs in the safeguards area during implementation (b) the establishment and functioning of a DPs' coordination committee, composed of representatives of each DP, to ensure smooth implementation and monitoring of the Project (c) the use of World Bank Standard Bidding Documents for jointly financed contracts, specifying the application of the World Bank Procurement and Consultant Guidelines (d) the right of GoB to approach any of the DPs, in the context of disbursement under jointly financed contracts, seeking to withdraw the entire amount of that DP's financing, subject to any retention conditions and upper limit of DPs' contribution (e) IDA to act as the Coordinating Donor, and to communicate various decisions related to the Project to the Borrower; and (f) a consultation process among the DPs to resolve issues relating to inconsistent policies and procedures among the different DPs, but provision that in the event that an agreement cannot be reached, the decisions on procurement and safeguards taken by IDA will prevail.

52. Advance procurement has been initiated for the two large contracts for construction of the Main Bridge (to be financed by IDA, ADB, JICA and GoB) and the River Training Works (to be financed by IDA, ADB and GoB). The pool of applicants for pre-qualification for these two contracts includes no applicant that is debarred by any of the DPs. Given that the DPs' respective debarment lists are not identical, should a firm debarred by ADB be proposed as a subcontractor or supplier in connection with either contract, or should such a firm submit bids for the jointly financed contracts either as a prime contractor or subcontractor (in the unlikely event that the current pre-qualification process is abandoned), IDA will explore all avenues, including seeking a policy waiver from its Board of Executive Directors, to ensure that it does not finance such a firm.

C. Lessons learned and reflected in the project design

53. The project design draws on lessons learned from infrastructure projects both in and outside Bangladesh, most notably the Jamuna Bridge Project in Bangladesh. Bank-wide experience has shown that infrastructure is crucial for socio-economic development and this is particularly true in case of Bangladesh which has a significant infrastructure gap and where the country is divided in four parts by the major rivers. The primary lesson incorporated in the project is that of improving connectivity between regions of the country creates an enabling environment for exchange of goods and people in the country and regionally. Other lessons include: (i) project design should be based on thorough analysis,

and investigation using state-of-the-art design concepts and methods. The designs of the main bridge, RTWs and related infrastructures are based on a series of studies, site investigation and using the best talent and methodologies available in the world; (ii) design (and bidding documents) of key works should be completed prior to negotiations; (iii) upstream detailed assessment and plans for social and environmental issues should be carried out early in the preparation; (iv) extensive *a priori* consultation is needed with various stakeholders and consideration of alternatives to minimize the adverse affects and to make interventions most effective; (v) proper review of construction planning to identify and minimize negative effects during construction and operation of the river and navigation network without major interruptions, and preparation of necessary mitigation measures; (vi) implementation of the project works through large civil contracts following the best contract management models whereby competent consultants with adequate resources provide the best construction supervision (vii) deal up front with any resettlement and land acquisition issues; (viii) contingencies planning based on risk analysis so that the people are not affected by the construction works, thus proper plans would be in place in case of any disturbances, floods, and other disasters, (ix) strong government leadership and properly staffed project management office, indispensable to effective project preparation and implementation; (x) procurement needs to be flexible and procurement processes should start early, and retroactive financing can be very helpful to ensure an early project start-up; (xi) the speed of appraisal and implementation is critical to project success; (xii) use of checking engineer and independent panel of experts to oversee the technical designs and analysis; and (xii) dealing with the long term sustainability and O&M issues.

Lessons Learned from the Jamuna Bridge Project

54. The Jamuna Bridge was completed in 1998 fulfilling the long standing desire, since the beginning of the 20th century, to construct a permanent, all-season, Northwest-east linkage. It was a brave step at the time to bridge the braiding river like Jamuna with continuous shifting channels and movement of its course in lateral direction such that at any point along its course neither the overall width of the river nor its location stays the same for a long period of time, unless it is forced to do so through river training works. The project was funded by IDA, ADB, JICA and GoB. IDA helped in preparation of the project also (using UNDP technical assistance funds) and was lead donor for the project.

55. The Jamuna Bridge project has been a transformational operation with very high impact on the economic opportunities, economic growth and poverty reduction in the north-west region. This was also shown by 2007 *ex-post* impact assessment that carried out a careful study of project villages (which were most impacted by outcomes of the bridge) and control villages (not benefiting by the bridge). The study concluded that per capita income in project villages increased at least 3 percent per annum; in contrast, the income in control villages increased at less than one percent per annum during the same period. The decline in extreme poverty in project villages was 2.5 times more than that of control villages.

56. The PMBP being a project in the same environment with many of the same actors involved, lessons learned from the Jamuna Bridge Project are being fully internalized in the project preparation, design of environmental and social safeguards, engineering designs for the bridge, river training works, institutional arrangements, construction and implementation, O&M plans. These include:

- (i) thorough consideration of environmental and social issues and preparation of EMP and SAP using the concept of “development and enhancement approach” instead of mitigation and compensation approach, in particular a long term livelihood restoration program and development of ecological enhancement sites. Ensuring that fund would remain available for addressing any outstanding EMP and SAP issues even after closure of the Project. Comprehensive prior consultations and the design of an effective communications strategy during construction;
- (ii) preparation of high quality designs using internationally available expertise and review by an independent panel of experts;

- (iii) due attention to procurement packaging and procurement procedures to get the best construction expertise available in the world. This includes large packages (Main Bridge covering all aspects river training works and approach roads) and thorough procedure for pre-qualification of the contractors followed by a two-stage bidding procedure. Strengthening of BBA's capacity in project management and provision of advisors and project management consultants. The construction to be supervised by international consultants who are to be designated as the "engineer" in works contracts;
- (iv) well planned construction schedule, including the location of construction yards and plants, traffic movement, identification of areas for borrowed material, land required for contractors and camps and other construction purposes. Design of the operation of ferries, ongoing traffic and other uses of river during construction and thorough contingency planning for unexpected events, floods, accidents;
- (v) ensuring strong commitment by the GoB and the DPs to address any design and implementation issues and design of proper coordination among the development partners;
- (vi) establishment of a thorough monitoring program to identify issues early on. This would consist of:
 - (a) monitoring by PMU with dedicated staff for Engineering, and Environment and Social aspects;
 - (b) support from the project implementation consultants;
 - (c) independent M&E consultancy to monitor progress and supervise the EMP and SAP activities;
 - (d) bidding documents would require the contractor to have dedicated staff for monitoring EMP implementation;
 - (e) the Bank Project team would place a consultant in the country who would visit the project site on a regular basis (at least twice a week) in the first two years of the project when construction will take place, keeping the Bank and the Project Coordination Committee informed of any issue arising during project implementation.

57. **Operations and maintenance.** After completion of the Jamuna Bridge, for O&M of the infrastructure a contract was awarded based on international competitive bidding procedure. Overall O&M of the bridge has been satisfactory. Adequate funds have always been available with BBA to carry out the O&M, including any major repairs that may be required for the bridge and associated infrastructure. Despite this, a few major maintenance aspects seem to have been ignored for a long time. These include: (a) fixing up of cracks that appeared on the surface of the bridge a while back. There seem to be several points of views for reasons and explanations provided for emergence of these cracks on which there is no agreement among the technical specialists. All agree that these cracks are not detrimental to the structural integrity of the bridge. However, they need to be fixed, and if they are left for a long time they would damage the structure. It has taken a long time to agree on a solution for fixing the cracks. The second major item that has been pending is repair to the west guide bund which was damaged during floods after completion of the project. This involves strengthening the guide bunds and widening the falling apron on both sides of the bridge. Gaps between appointments of the O&M operators have exacerbated the delays.

58. Measures are underway to address the delayed O&M. The design has been prepared and the bids have been invited from the international contractors for fixing the cracks and strengthening the deck surface. The estimated cost of this contract is about US\$50 million, and implementation is estimated at about one year. Designs are also being carried out for strengthening of the guide bunds. The estimated cost of these works is about US\$30 million, and would be carried out in two years.

59. The main reasons for delays in carrying out these repairs, though funds have always been available with BBA, seem to be lack of timely assessment of technical aspects of damage, scope and nature of the repairs required, agreement on appropriate solution, and slow and avoidance to take controversial decision that would be under scrutiny and publicized at national level. Based on this lesson learned, it has been agreed that the bridge safety review system of BBA would be enhanced and strengthened to allow timely decision making with assigned responsibility. A regular annual and three-year intensive safety review system would be instituted by the BBA for all infrastructure it owns.. Such a

safety review would be carried out by a panel of experts with appropriate skills, and consisting of national, international and expatriate experts that would visit the site, carry out the review and assessment and provide proposals for the appropriate solution and methodology to design such a solution. The panel will issue these reports to BBA (they would be discussed by the BBA Board), to the Cabinet, and these reports would also be made available to the public and other stakeholders. The panel would also carry out an advisory/supervisory role in the implementation of the major repairs as it does during construction of the bridge.

60. Secondly, the contract for O&M operation would be issued six months prior to expiry of the ongoing O&M contract. The O&M contract would also cover carrying out of major repairs required including carrying the detailed design of such repairs under the overall guidance of BBA and safety review panel mentioned above.

D. Alternatives considered and reasons for rejection

61. A fixed crossing is essential to link the SWR with the rest of Bangladesh. Continuing with the *status quo* transportation by ferries and boats is not an option for the country and, in particular, for the SWR to develop faster and address long-term poverty issues.

62. **Bridge Site.** In locating the bridge, four sites were considered based on the plan form of the Padma River: Paturia-Goalundo, Dohar-Charbhardrasan, Mawa-Janjira and Chandpur-Bhedargani. After an initial screening, two sites –Mawa Janjira and Patuiria-Goalundo were selected based on comparative studies for physical, technical, economic, local infrastructural and social/environmental perspectives. The two sites were compared using a more in-depth analysis covering issues related to economic aspects, regional development, increased GDP, poverty reduction and social and environmental aspects. The Mawa-Janjira site was selected for construction of the proposed bridge due to, among other things, higher river bankline stability, higher traffic forecast, lower construction costs, better returns, and other indirect benefits such as improved accessibility to the SWR and foundation of an international road network.

63. **Main Bridge Design.** For the Main Bridge structure, five main superstructure concepts were investigated:

- Option 1: Single level bridge - variable depth concrete twin cell box girder, with and without extra dosed cables
- Option 2: Two level bridge - steel truss acting compositely with concrete upper deck
- Option 3: Two level bridge - extra dosed concrete truss
- Option 4: Two level bridge - variable depth concrete twin-box girders built precast segmental, and central railway envelope built in-situ, with sheltered utility envelopes
- Option 5: Two level bridge - constant depth single cell concrete box girder with side struts supporting thin cantilever wings, all precast segmental, with exposed utility envelopes

64. The options were evaluated principally with respect to construction costs, durability, future maintenance provisions, constructability, construction program, and aesthetics, leading to the selection of the two level, composite steel truss (Option 2). A further study of span lengths in the range of 120m to 180m was undertaken leading to the selected span of 150m.

65. For the foundation design, two main piling concepts have been investigated: driven tubular steel piles (raked or vertical), and vertical bored concrete piles. Investigations concluded raking steel piles to be the only viable option, the vertical bored piles were not found to be flexible enough when subjected to earthquake/seismic loading.

66. **Approach Roads.** Similarly, different alignments for the approach viaducts were considered, to match the several concepts (one-level and two-level) for the main spans, to ensure compatibility with the future railway, and to minimise land acquisition. Favourable construction cost and time led to the

adoption of precast beams for the approach viaducts. Different spans and cross sections were considered, leading to precast super T-beams for the road viaduct and I-beams for the railway viaduct. Steel and concrete piling options were considered, with vertical concrete piles preferred in the approach viaducts. The smaller bridges on the approach roads have similar structural form to the approach road viaduct of the main bridge.

67. **River Trainings Works (RTWs).** The differences in soil characteristics between the north bank and the south bank required different approaches to be adopted for the design of the river training works. The north bank at the bridge site includes erosion resistant strata and has been fairly stable for many decades. In contrast, the south bank with its loose, fine sand and silt soils is relatively unstable and has undergone periodic major shifts associated with overall changes in river channel patterns. Furthermore, the new south approach road parallels the south bank, which makes it vulnerable to future shifting. Therefore the river training works on the south bank need to account for the high potential for channel instability and future outflanking from upstream of the bridge approach works.

68. Initially three RTW layout concepts were investigated:

- Concept 1 – revetments along both north and south banks;
- Concept 2 – an 8km long guide bund on the south bank extending mainly upstream of the bridge centreline and curving into the present minor south channel with a revetment along the north bank.
- Concept 3 – continuous revetments or embankments on both sides of the river for 20km or more upstream of the bridge, intended to maintain the present favourable alignment through the life of the bridge.

69. Concept 3 was subsequently rejected as impractical due to construction time, cost and uncertainties over maintenance. The remaining concepts were modified and expanded during the course of the design. After assessing and reviewing a wide range of options, three river training alternatives were considered technically feasible and were subject to detailed assessment:

- Alternative 1 – revetments on both north and south banks
- Alternative 2 – guide bund placed on the south side of the river along the south bank of the minor channel and two hard points, shaped like short guide bunds were constructed further upstream along the south bank to protect the approach road.
- Alternative 2 Modified – similar to Alternative 2 but the two hard points were shifted northwards onto the char and the south channel was blocked off.

70. The above three alternatives were assessed based on their expected hydraulic performance, robustness, maintenance requirements and cost as well as social and environmental impacts. Based on this assessment, Alternative 1 was selected as the preferred alternative river training works design.

IV. IMPLEMENTATION

A. Institutional and implementation arrangements

71. The Bangladesh Bridge Authority (BBA) was created in 1985 through an ordinance as an independent Authority, reporting to the Bridges Division of the Ministry of Communication. BBA will be responsible for the execution and implementation of the Project through the Project Management Unit (PMU). The PMU has been strengthened by providing additional staff. It would be supported by consultants, advisors and appropriate Non-Governmental Organizations (NGOs) for implementation of the Project. For more detail, see Annex 3.

72. **Project Management Unit (PMU).** The PMU, created within the BBA structure, will be responsible for all aspects of project implementation and day-to-day operations and management. The

PMU will be headed by a Project Director with three units: (i) Procurement and Finance Unit; (ii) Engineering Unit; and (iii) Environment and Sociology or Safeguards Unit. Key specialists have been recruited, and the staffing with qualified personnel is largely completed.

73. The PMU would be supported by two sets of consultants, Construction Supervision Consultants (CSCs) who would help in construction supervision, contract management, and management aspects of the project. For civil works contracts, the Project Director will serve as the *Employer representative*, and the CSCs supervising consultant will serve as the *Engineer* for construction supervision. At the site, *Resident Engineers*, appointed by the CSCs, with a team of specialists and inspectors will supervise the Contractor. The Management Support Consultants (MSCs) would support in carrying out the role of the employer. The MSC would also supervise the implementation of SAP and EMP, and carry out independent M&E for the project activities and implementation.

74. The PMU would be responsible for implementation of components A, and B, through its engineering unit with support from the CSC and MSC. PMU would implement Component C in coordination with the Deputy Commissioners of the three districts in which the Project is located (Munshiganaj, Shariatpur, Madaripur) and the NGOs. The Centre for Environmental and Geographic Information Services (CEGIS) has been engaged to computerize land acquisition data with GPS reference. The Bangladesh Institute of Development Studies (BIDS) has been engaged to undertake surveys and verify field data for preparation of RAPs. An experienced NGO (Christian Commission for Development in Bangladesh -CCDB) has already been mobilized for implementation of the three RAPs at field level. Four more NGOs would be mobilized for various parts of SAP. IUCN is likely to support in implementation and monitoring of parts of EMP. PMU would also implement the Components D and E with the help of other BBA staff and its engineering, procurement and finance unit.

75. **Project Coordination Committee (PCC).** A Project Coordination Committee (PCC) has been constituted to oversee the Project, provide policy-level guidance and inter-agency coordination for the project. The PCC is chaired by the Minister of Finance, or another person acting on his/her behalf with Secretaries of Planning, Economic Relations Division, Finance, Bridge Division, Agriculture, Forest, Water Resources, Roads and Railway, Environment, Local Government, Implementation Monitoring and Evaluation Division (IMED), Member (Physical Infrastructure) Planning Commission, Chief Executive Officer of the selected NGOs, representatives of the local/district administration as its members and the Project Director of PMBP. The PD PMBP would be the secretary of the PCC.

76. **Project Steering Committee (PSC).** The PSC would help resolve project management issues and address day-to-day implementation problems. It would be chaired by the Secretary and Executive Director of BBA, and Secretaries of Planning, Economic Relations Division, Finance, Environment, Roads and Highways, Local Governments, Agriculture, Water Resources, Forest, IMED, Member (Physical Infrastructure) Planning Commission, Chief Executive Officer of the selected NGOs, Project Director and representatives of and the consultants (CSCs, and MSCs) will be members. The Project Director (PD) PMBP would be the secretary of the PSC.

B. Results Monitoring and Evaluation.

77. The BBA will submit quarterly reports in an appropriate format to the GoB/Ministry of Communication, PCC, and PSC and the Bank no later than 45 days after the end of each quarter. The PD/PMU will be responsible for preparation of the quarterly report that will cover the progress and expected completion dates for civil works and equipment supply contracts, progress on institutional components, implementation of SAP and EMP, training and studies, and activities of the BBA/PMUs engineering, M&E, procurement and financial consultants and NGOs. The reports will cover financial and procurement information, including: (a) comparison of actual physical and financial outputs with forecasts, and updated six-months project forecasts; (b) project financial statements, including sources

and application of funds, expenditures by category statement, and special accounts reconciliation statement; and (c) a procurement management report, showing status and contract commitments.

78. The PD/PMU will also prepare annual reports by no later than September 30 of each year of project implementation. The report will cover: (a) the progress of each component, implementation of key features of the environmental management plan, key performance indicators, operation of project facilities, and financial statements; and (b) the Annual Work Plan for implementation, annual funds required for implementation with breakdown by each co-financier, an updated disbursement profile, planned actions for mitigating negative effects during construction, and target indicators for the coming fiscal year. In addition semi-annual reviews by the DPs, detailed annual reviews would be undertaken in October each year. A mid-term review of the Project would be undertaken by October 31, 2014. An Implementation Completion Report (ICR) would be submitted to the Bank no later than six months after the closing date.

79. The management support consultants (MSC) shall be recruited for M&E of the Project impact, including the implementation and monitoring of the EMP, and the SAP/RAP. The M&E studies will evaluate the success in project implementation in terms of meeting the project's objectives, and assess its physical, hydrological, environmental, social, and economic impacts. The M&E activities will provide continuous feedback to the GoB the PSC and DPs on the project's performance, and on mitigation of negative impact under various components, so that corrective actions can be undertaken in a timely manner if necessary. Changes to the Project, if any, will be reflected in the implementation review aide memoires and or communicated through exchange of letters between the Bank and the Government. The Bank Team will place a Staff and/or a consultant in the country who will visit the project site on a regular basis (twice a week), particularly in first two years of the project, to monitor the project planning, implementation program for construction activities, communication strategy, and EMP and SAP/RAP activities.

C. Implementation Support and Governance and Accountability Framework (Annex 5)

80. **Strategy and Approach for Implementation Support.** The strategy for implementation support has been developed based on the nature and high risk profile of the proposed project. It will aim at making implementation support to the client more flexible and efficient, and focus on the implementation of the risk mitigation measures defined in the ORAF. Support would be provided in all aspects covering procurement, financial management, environment and social safeguards, anti-corruption, technical aspects including instituting an independent panel of experts, coordination among development partners and O&M of the bridge, institutional strengthening of BBA and other issues as they arise during the project.

81. The Bank Project Team consisting of multi-disciplinary members, will be based in the Bangladesh country office, some members would be in Washington and others in country offices in the region to ensure timely, efficient and effective implementation support to the client. Adequate budget would be allocated to oversee implementation of the project. Highly specialized consultants in Bridge Engineering and River Engineering have been recruited and would be maintained throughout the project implementation period. Additional consultants with specialized skills would be recruited as required. Timely monitoring and support to BBA will be mainly provided by the team members in the country offices of the region, as well as in the Washington office, especially for the first 18 months. Formal supervision and field trips will be carried out semiannually, and more frequently as needed in the first year of the Project. The supervision missions will be coordinated with other Development Partners (DPs) financing the project. To the extent possible, supervision missions will be undertaken jointly with the other DPs. The detailed are provided in Annex 5.

82. **Governance and Accountability Action Plan (GAAP)** The PMBP will be implemented in a high-risk environment, however, the Government of Bangladesh (GoB) is fully committed to the Project and its proper implementation because of its importance and transformative impact on the economy and on the development of Bangladesh as a whole and the Southwest Region (SWR) in particular. To mitigate and guard against governance, corruption and fraud risks and improve transparency and accountability in implementation of project activities a comprehensive Governance and Accountability Action Plan (GAAP) was prepared in consultation with INT and GoB and will be implemented by the BBA.

83. The key features of the GAPP are described below and described in detail in Annex 5.1 along with full risk analysis and measures incorporated in the project:

- (i) to strengthen the capacity of the implementing agency, recruitment of expert staff under the PMU responsible for dealing with the project, retention of independent, internationally-recruited consultants for design and construction supervision (CSC) and for monitoring and evaluation (MSC), and support by a number of NGOs and other institutions like CEGIS, and universities;
- (ii) to enhance internal accountability, establishment of a Project Steering Committee with both Government and NGO representation, establishment of a high-level Project Coordination Committee, chaired by the Minister of Finance or his designee. The most senior oversight entity will be a **Project Integrity Advisor** appointed by, and solely accountable to, the Prime Minister. The Project Integrity Advisor will have the authority to take decisions and report to the Prime Minister concerning project governance issues independent of staff and individuals engaged in project implementation. This individual will serve as a figure of institutional integrity for the project, and as such must be a person who is recognized within Bangladeshi society for integrity, independence, and concern for the public good. The Project Integrity Advisor will serve as the liaison to the World Bank and other co-financiers on all issues related to governance and corruption. Terms of reference for the Project Integrity Advisor will be developed in consultation with IDA.

The GoB will, by not later than March 15, 2011, issue an order, in form and substance satisfactory to IDA, which shall include inter alia: (a) the appointment of a Project Integrity advisor, with the Project Implementation Entity and concerned staff, satisfactory to IDA, and (b) the terms of reference of such Project Integrity Advisor.

- (iii) for proactive provision of information and enhanced transparency, designation of an information officer, regular reporting by MSC and PMU, establishment of a website with all procurement, contract and financial management information, complaints and resolution of complaints and implementation issues, implementation of a communication strategy, accountability meetings with NGOs, and media in the project area and Dhaka;
- (iv) to mitigate procurement risks, smart design of a small number of contracts, publication of mapping of the procurement process, ensuring multiple parties are legitimately involved at all stages of procurement, including public openings of bids in the presence of NGOs, establishment of complaint filing and reporting mechanisms, procurement information to be placed on the website;
- (v) to avoid potential for conflict of interest among participants in procurement, certification of no conflict of interest by project management, members of evaluation committee members and bidders, review of statement of financial interests encompassing key staff, requirements that bidders would declare their agents and other possible connections to the persons involved in procurement management; and
- (vi) to guard against improper targeting of beneficiaries and/or false delivery of benefits in case of SAP/RAP, implementation by NGOs with reputable track records, monitoring by MSC, disclosure of information and website etc, and enhanced two-tiered grievance redressal and complaint mechanisms.

D. Sustainability

84. The Padma Bridge Project is vital for accelerated economic growth of the country, in particular the SWR. The GoB is committed to the Project, and appreciates the importance of its sustainability which is crucial for the Project to continue to provide benefits. The Project is of national importance supported by all political parties and, most importantly by people of the area even, those affected by involuntary resettlement. As evidenced in the case of the Jamuna Bridge, operation and maintenance (O&M) have remained important since its inception. Ensuring sustainability would involve: (i) setting aside adequate funds for proper operation and maintenance each year from the toll revenue; (ii) satisfactory institutional arrangements and capacity for carrying out the O&M of infrastructure and facilities; (iii) appropriate regime for bridge safety review, assessment, designing solutions for remedial and mitigation measure and for their proper implementation; and (iii) adequate capacity and performance of the BBA to manage and monitor the O&M of both Jamuna and Padma Bridges.

85. BBA's financial objectives are to keep the toll level affordable to encourage use of the bridges and while raising enough funds from the users to meet the O&M costs and debts servicing obligations. Financial issues are discussed in more detail in the Financial Analysis section. In order to the keep toll affordable for the Padma Bridge, BBA will use a combined toll policy. Since Jamuna Bridge has lower and "mature" debt servicing requirements, the combined toll for Jamuna and Padma Bridges would be much more affordable than the toll required for the Padma Bridge alone.

86. As described in Section VI A (Financial Analysis) agreements have been reached with GoB regarding revision of the toll policies for Jamuna and Padma Bridges and an implementation plan, satisfactory to the Association, that would continue to ensure BBA's objectives of financial self sustainability.

87. For arrangements for O&M, it has been agreed that at completion of the Project, the BBA would: (a) enter into a five-year contract with a renowned O&M contractor based on international competitive bidding for monitoring and O&M of all project facilities, main bridge, RTWs, approach roads, toll plazas, and collection of toll, etc. as was done in case of the Jamuna Bridge; (b) the O&M contract would also cover carrying out of major repairs and their detailed design as guided by the bridge safety review panel; and (c) put in place new contract for O&M six months prior to expiry of the ongoing contract thus avoiding the risk of any time gap between the old and new contracts.

88. In addition, to ensure the bridge safety issues, avoid any backlog of repairs and timely implementation of major repairs, the BBA would institute a regular annual and three yearly more intensive bridge safety reviews by a panel of experts with appropriate skills consisting of national, international and expatriate experts. The panel would carry out the safety assessment, provide appropriate solutions, guidelines and methodology and will also play a advisory/supervisory role during implementation of major repairs. The panel's reports would be discussed at the BBA Board and shared with the Cabinet, public and the concerned stakeholders. BBA would ensure that first safety review of the Jamuna Bridge under this system would be carried out by October 31, 2011.

89. To enhance BBA capacity to monitor and manage the two bridges, and make it a more dynamic organization, an institutional reform program has been agreed. Its implementation has started in a modest way during the project preparation using Project Preparation Facility (PPF) resources. Capacity building of BBA would continue during the Project implementation period in a range of areas, including the O&M activities, and for that purpose sufficient funds have been allocated under Component E2 of the project.

V. KEY RISKS

90. The potential risks (and proposed mitigation) associated with the project are summarized below:

Risks	Risk Mitigation Measures	Risk Rating
Technical: Poor designs and engineering works, leading to catastrophic failure or poor performance	An internationally reputed company is responsible for designing the works. A checking engineer has been employed to review and check the designs according to standard practices for such projects. An independent panel of experts (IPOE) is involved throughout the project to provide the best technical advice regarding these designs and engineering issues. Additional expertise would be mobilized when required to review and check the technical issues.	Medium-I
Project Management: Overall government capacity to manage such a sizeable investment	An institutional study was carried out on the Bangladesh Bridge Authority. Under this study, a plan for capacity building of the organization was identified. This will be undertaken as a sub-component (i.e. strengthening of BBA) of this Project. The project will also provide a variety of support consultants to help with the overall management of the Project. Track record of Jamuna Bridge inspires confidence.	High
Coordination of Development Partners; conflict with differing preferences from individual financiers.	Different procurement, financial management and safeguard requirements by the development partners could become an issue in project implementation. Efforts have been made to harmonize the procedures to the extent possible. In the area of safeguards, the process is working well. In case of procurement the issues are being sorted out through discussion and meetings. The World Bank is Lead/Coordinating Development Partner and so far the coordination among donors has been working very well. An MOU is being negotiated defining coordination arrangements among the DPs that would be signed after signing of the Financing Agreement. While World Bank Guidelines would be followed in all aspects of the Project, efforts would be made to accommodate the requirements of all DPs as it has been done so far without any deviation from the Bank Guidelines. See details provided in the section on financing plan for more details.	Medium-I
Governance (procurement and financial management)	Project design has included several measures to bring more accountability and transparency to the overall procurement and Financial Management process. A proper system of procurement planning and tracking of various procurement actions, and monitoring of complaints will be implemented including provisions of experienced procurement consultant(s). A website will be maintained by the BBA to show up-to-date status of procurement. Only 3-4 large ICB contracts will be supervised by the international consultants to minimize these risks. Also a robust GAAP will be implemented to address potential governance issues.	High
Social and environmental risks during construction	The project involves significant resettlement and environmental issues at least during construction. Safeguard issues are always sensitive and could be the cause of controversy. These risks would be minimized thorough preparation, planning, review and monitoring of a variety of environmental and social management plans. The project will also design a communication strategy and a public consultation strategy to proactively disseminate project information and engage stakeholders in the project implementation BBA would establish a fund of US\$10 million equivalent to help address any outstanding environmental and social issues after project completion and closing of the loans.	High
Overestimate of economic benefits	The economic benefit calculations in large part are based on estimates of future traffic volume. The traffic estimates have been reviewed	Medium-L

Risks	Risk Mitigation Measures	Risk Rating
	carefully and conservative assumptions have been made to estimate project benefits. However, experience from Jamuna and other bridges in Bangladesh is that actual traffic is generally higher than what was estimated at the project planning stage. Moreover, early indication suggests that several multiplier benefits exist. Also the sensitivity analysis shows that the bridge is economically viable over a wide range of fluctuations in revenue and costs.	
Financial affordability and Financial Sustainability	Preliminary estimates show that with the current amount of concessional financing being made available for the project, and possible revenue from Jamuna and Padma tolls with appropriate tariff policies, the bridge would not be a financial burden on the GoB. Agreement has been reached with BBA (and GoB) on toll policies for the two bridges (Jamuna and Padma) and an implementation plan, satisfactory to the Association, that would continue to support BBA's objectives of financial self-sustainability. See Section IV A Financial Analysis for details.	High
Proper operations and maintenance of the bridge.	Adequate arrangements would be agreed as part of the project and BBA capacity would be strengthened. For monitoring and O&M of the bridge and related infrastructure and facilities, at the completion of the project BBA, would recruit an international contractor for a period of five years, and institute an enhanced system of bridge safety inspections. With financial sustainability ensured and O&M arrangements outlined above the risk of inadequate O&M that could lead to deterioration of the bridge would be minimized.	High
Overall Risk Rating:	Every effort has been made to learn from past experience and plan accordingly, including prior completion of detailed design of the construction works, implementation plans, construction plans and operational plans. The overall risk ratings at preparation and implementation are HIGH because of the following main factors: (i) the mere size of the Project; (ii) the large size of construction contracts on a very mighty river like the Padma river with meandering and unpredictable morphology; (iii) the number of people affected; (iv) the issues in construction due to unforeseen circumstances; (v) the possible coordination issues between DPs; and (vii) significant reputational risk to the Bank that may arise due to technical issues during construction, and safeguards aspects.	High

High: A risk with a high impact on the PDOs and a high likelihood that it will occur.

Medium-I (medium driven by impact): A risk that would have high impact if it took place but a low likelihood of it occurring.

Medium-L (medium driven by likelihood): A risk that would have low impact even if there is high likelihood that it would happen.

Low: A risk with a low impact if it does happen and a low likelihood of it occurring;

91. The major risky aspect of the project would be the implementation of the social/resettlement action plan, in which over 75,000 affected people are involved. Also the sheer scale of the project and nature of construction on a river like the Padma is challenging and the country has a weak governance environment. This is the reasoning behind rating risk as "high" for this operation.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analyses (Annex 9)

Economic Analysis

92. The Padma Multipurpose Bridge will provide a vital missing link in the national road network of Bangladesh particularly for the Southwest Region (SWR) of the country. A fixed crossing is essential to link SWR with the rest of the country. Continuing with transportation through ferries and boats is not an

option for the country, because without effective connectivity of the bridge, the SWR would continue to lag behind the rest of the economy and suffer from concentration of poverty.

93. The Padma Multipurpose Bridge Project (PMBP) is an important large scale infrastructure project of transformational nature with broad impact that would provide substantial benefits to all sectors of the economy. The analysis shows that the benefits of the Project would be equivalent to annual increase of at least 1.7 percent of SWR GDP value and of the 0.56 percent of annual increase of national GDP. The poverty reduction rate would increase by 1.0 percentage points in the SWR and by 0.8 the percentage points at the national level. The impacts are quite similar to the Jamuna Bridge (connecting Northwest Region to the country), which were estimated about five years after the opening of the bridge. This is quite similar to the estimated impact of the Jamuna Bridge measured in 2003, i.e. four years after opening of the bridge

94. **Estimation of Project Benefits.** The expected benefits of the Project can be divided into: (i) road users' benefits or transportation benefits directly realized by the operators of the vehicles, which were estimated using traffic models; (ii) other direct benefits such as land development, protection against river bank erosion and flooding around the bridge area as well as the cost avoided of separately providing for utility crossings such as gas pipeline, electric telecommunication lines and railway bridge, which were estimated by assessing the value of the land developed and alternative cost of construction; and (iii) wider economic benefits (WEB) with increased economic activity that would develop with reduced cost of transportation and generating a surplus for other economic activities, which were estimated using a Social Accounting Matrix (SAM) and Computable General Equilibrium (CGE) model.

95. The road users' benefits were estimated using the traffic projections and value of travel time and cost saved with the bridge. Traffic surveys were carried out for estimating the traffic projections, which is quite a challenging task in the absence of any existing fixed crossing of the Padma River. Similarly the estimates were prepared for value of time and cost of operation of vehicles. The assumptions and methodology are explained in detail in Annex 9.

96. The SAM model was used to assess the direct and indirect income effects of a particular exogenous impact (such as the opening of the Padma Bridge) that leads to different expenditure patterns. A SAM model is a square matrix with columns for expenditure and rows covering income accounts. It combines input-output data with national accounts data to reflect the circular flow of income at a particular point in time. In this context, its key use is to assess the direct and indirect income effects of a particular exogenous impact (such as the opening of the Padma Bridge) that leads to different expenditure patterns.

97. CGE analysis also allowed for the assessment of the impacts of exogenous shocks but within a constrained optimization framework (i.e. changes in quantity are restricted as supplies of primary factors are fixed – labor, capital and land). The SAM approach does not have capacity constraints, meaning that matching outputs are always supplied, resulting in higher factor incomes and household consumption expenditure. The CGE approach, working with constraints, does not generate extra income by employing additional factors of production—additional income would come from increased productivity in use of given factor of production and diversion of factors to more productive possibilities arising from a fall in transport costs because of the bridge. At the core of the model is a set of equations describing the behavior of various economic agents (such as industries and households) when faced with changes in relative prices.

98. The elimination of a major transport barrier and the significant improvement in accessibility to factor and product markets between Dhaka and the Southwest Region, where resources are not fully employed, means that the SAM approach (without any capacity constraints) can be considered suitable for modelling to quantify the income effects of the Padma Bridge. These income effects would be

additional to the value of travel time savings for passenger and freight vehicles and would come about by the bridge providing the link between consumers and producers in a wide range of markets.

99. **Estimation of Economic Rate of Return and Sensitivity Analysis.** The ERR for the base case is 19 percent, and the benefit-cost ratio is over 2.0. The Base Case reflects a conservative estimate, and ERR to be realized post project is likely to be higher than this. The base case includes benefits for the road users' based on conservative estimates of traffic forecasts, the value of the land developed (also a conservative estimate as river bank and flood protection benefits are not included), utility crossings (quite conservative in the case of the gas pipeline crossing) and wider economic benefits. The ERR would be 20%, if savings in ferry closings or the avoided cost of a railway bridge are included, and 21% if both are included. The NPV of the net benefits stream at the discount rate of 12% is US\$1.2 billion.

100. **Sensitivity Analysis.** The Project ERR is robust and not sensitive to variations in the project costs or benefits. Switching values have been computed to determine the effects of increase in costs and decrease in benefits. With increase in capital cost by 20% or reduction in benefits by 20% the ERR is 17% and it is 15% with a combination of two. The ERR would remain above 12%, which is considered as the opportunity cost of capital with a 90% increase in cost or a 40% reduction in benefits. The delay in completion of the project by two years would have no impact on the ERR. The sensitivity based on various risks that the project may face shows that it is highly unlikely that unfavorable developments would reduce the project ERR below the OCC.

101. The reasons that the ERR is so robust is that river crossing through ferry services only fulfils partial requirements of connectivity, passengers and goods perhaps to a limited scale, and even that at a very high cost as indicated by the reduction in travel times to various destinations in the SWR. Crossing of utilities such as gas and electricity and telecommunication are prohibitively expensive without a bridge. The scour depth of Padma River is over 60 meters. So for crossing a gas pipeline, for example, either gas line is to be supported by a foundation piers similar to Padma Bridge (over 130 meter deep) or pipeline is to be crossed under the river say at over 60 meters depth and both are extremely costly. Similar is the case for electrical and other utility crossings. The Project also develops a lot of land during construction which would be used for other economic activities. The land is Bangladesh raised above the flood level is extremely valuable that also adds to the robustness of ERR estimated. The details are provided in Annex 9.

Financial Analysis (Annex 9)

102. The Jamuna Multipurpose Bridge Authority (JMBA), the precursor to BBA, was created in 1985. Its ordinance envisaged it to be an Authority that would enjoy financial and organizational autonomy. Financial objectives of BBA are to (i) levy tolls at minimum levels so as not to discourage traffic from using the bridges and (ii) to raise enough funds from road users and other uses (such as power interconnector) to meet all operation and maintenance costs (including toll collection charges) and to meet debt servicing obligations.

103. Toward achieving these objectives, the Jamuna Bridge Project required JMBA to levy tolls and other user charges (such as the rent on land controlled by JMBA, and charges for carrying the power inter-connector) at a level sufficient to meet all maintenance and operation costs (including toll collection charges) and to meet debt servicing obligations. Indicative tolls were agreed at appraisal subject to confirmation in a toll study to be carried out by JMBA by June 30, 1997 of the level and structure of tolls. This study provided the basis for the tolls that were implemented at the time of the opening of the Jamuna Bridge.⁴

⁴ The current toll rates for Jamuna Bridge are: Taka 750, 1,000, 1,250 for small, medium and large trucks (US\$10.71, 14.29 and 17.86 equivalent respectively), Taka 550 and 800 for small and large bus (US\$7.14 and US\$11.4 equivalent respectively); Taka 400 and 30 for cars or light vehicles and motor cycles respectively (US\$5.71 and 4.3 equivalent respectively).

104. **Political Economy of Toll Increases.** Not only was the Jamuna Bridge the first mega scale investment in Bangladesh but it also carried a high level of uncertainty and anxiety about the unpredictable behavior of the river, that could have been detrimental to the project. Thus, the Government took extraordinary measures to ensure that the project would be completed and it could be maintained properly after its completion. All three credits for Jamuna Bridge (IDA, ADB, and Japan) required a buildup of a cash reserve for ensuring funds in case of any emergencies which may happen during and after the construction. The JMBA was headed by strong management, and it was given full autonomy to make decisions about the toll structure for the Jamuna Bridge. Using the 1997 study as a basis, JMBA decided the toll level, which was considered very high at that time. With a long grace period for loan repayments, very low O&M requirements (as both bridge and the river training works performed extremely well), growth in traffic resulting in a revenue surplus, and accumulated cash reserves, there was no immediate necessity to increase the toll.

105. With change in the exchange rate and inflation over time, the value of the toll decreased in real terms. With the debt service burden increasing and with the imposition of VAT and other taxes by the Government, BBA recently started experiencing negative cash flows. The mandate of BBA allows it to make toll adjustments without approval from the Government. Because of political and social implications such increases may have, in practice BBA is not able to make changes without prior approval from the Government. Two ideas might help in rationalizing the decision-making on tolls: (a) using a formula-based approach of linking toll levels to an appropriate indicator such as inflation; and (b) institutional changes which would allow BBA to have the level of autonomy envisaged in its mandate. Details of these aspects would be developed during the study proposed to be completed prior to opening of the bridge as described below.

106. **BBA's Past Finances.** Since the opening of the Jamuna Bridge in 1998, BBA has been in compliance with its financial objectives, and ostensibly generated a cumulative surplus of over Taka 8 billion (US\$114 million) by June 30, 2010, despite not having revised the tolls over the last 12 years. This is because all loans were on concessionary terms (IDA, ADB, and JICA), and had a grace period of 10 years. Thus, debt servicing was not a major burden on the BBA in the initial years of operation of the Jamuna Bridge, and the traffic growth rate was good over this period. BBA has not been spending adequately for O&M of the Jamuna Bridge, a deficiency that now needs to be rectified by carrying out major repairs over the next 4 to 5 years, thus consuming most of the surplus accumulated so far.

107. BBA's financial statements also show an operating deficit starting from 2007-08 (Taka 195 million, Taka 137 million and Taka 1,125 million in 2007-08, 2008-09 and 2009-10 respectively). This deficit will grow in coming years due to the increase in debt service burden in local currency terms, and with the repayment of IDA and ADB loans doubling from June 2014, BBA's net annual cash flow is expected to be negative. Financial projections at the current toll levels indicate that the Jamuna Bridge will have a deficit of about Tk 10,000 million in the 2010-2020 period, before reverting to surplus in 2021 when the debt service obligations would end. Thus, an increase in the Jamuna toll rate is required immediately to address deficits in the coming decade.

108. **BBA's Future Finances.** BBA is now embarking on the construction of Padma Bridge, and much of the funds required for construction of the Padma Bridge would be provided by the DPs and the GoB. Compared to the Jamuna Bridge, the Padma Bridge is more costly and the funds provided are less concessionary, thus, the future revenues of BBA depend on two main factors: the growth in traffic for both Jamuna and Padma Bridges, and the level of tolls. Other revenue from bridge usage fees from utilities and rent from land will be relatively insignificant. The main cost elements are debt servicing, the bridge O&M costs and BBA's administrative costs. A model was constructed to project BBA's future finances under different assumptions of traffic and toll charges.

109. **Padma Bridge Finances.** Projections show that at the current toll level of Jamuna Bridge, the Padma Bridge would generate deficits of Tk 22 billion in 2015-2020, Tk 45 billion in 2021-2025 and Tk 51 billion in 2026-2030. In order for the Padma Bridge to generate sufficient revenues to meet its debt service and other expenditure needs, toll rates would have to be about 350% of the current tolls at Jamuna Bridge. Such a large increase is untenable, both from the economic and the social points of view. Government subsidies would be possible, but not desirable, or in line with the financial mandate of BBA.

110. **Jamuna and Padma Bridge combined finances.** The best way to have BBA meet the financial obligations arising from the construction of Padma Bridge is to consider toll levels for both Jamuna Bridge and Padma Bridge as a package source of revenue. This would allow the “mature” Jamuna Bridge with lower (and after 2020 declining) debt service needs to cross-subsidize the Padma Bridge. Such a policy would also allow the tolls for the two bridges to be kept the same or proportionate to their size and cost, something that would be understandable to the users.

111. The financial model was run with a variety of toll scenarios that would both eliminate the anticipated deficit at Jamuna Bridge in 2011-2020 period, and generate sufficient funds for meeting obligations of the Padma Bridge. All of the scenarios show a need for a significant increase in toll rates for the Jamuna Bridge and a further increase at the Padma Bridge at opening. The various options are summarized below, and details are in Annex 9.

112. Keeping with the financial objectives of BBA, i.e. minimum level of tolls to encourage the use of bridge and raise sufficient funds to meet its financial obligations, the most optimal scenario seem to be to: (i) increase the Jamuna toll now by 40 percent which would be adequate to meet the financial obligations over the next few years till the opening of the Padma Bridge; and (ii) before opening of the Padma Bridge increase the toll of Jamuna Bridge by another 45 percent and set the tolls for Padma Bridge at the same level i.e. 103% of the current level. This would leave about Taka 5 billion deficit during 2011-2015 (less than the cash reserves of BBA) but overall BBA would be able to meet all its obligations for the two bridges. This is perhaps the most pragmatic option from the implementation point of view, particularly, if a differential toll is not considered desirable for the two bridges. While recent Jamuna data is available and very reliable, this assessment for the Padma Bridge is based on the data and traffic surveys carried out during the feasibility studies (before 2005), with updated information in 2009. Therefore, as explained below, a study has to be undertaken not more than one year prior to the opening of the Padma Bridge to determine more accurately the desired toll levels at the opening of the Padma Bridge.

113. **Need for a Toll Study Prior to Opening of the Padma Bridge.** The revenue collected from the bridge(s) depends upon the volume of traffic and the toll rates. The traffic in Bangladesh has been increasing about 8 percent per year. The growth rate is higher in the recent years, about 10-11% per year. Forecasting future traffic and in particular estimating opening traffic for the Padma Bridge is quite a challenging task due to several factors. The opening traffic for the Padma Bridge would depend upon: (a) current and growth in traffic over all the river crossings till the opening of the Padma Bridge. A lot of passenger movement across the river is on the speed boats and small launches which is difficult to capture in traffic surveys. Often buses operate on both sides of the river. The buses drop the passengers on one side and they cross the river through several way, ferry, boats, launches etc, and get the busses on the other side; (b) with the start of the construction of the bridge, there would be population moving into the zone of the bridge influence with greater economic impact, thus resulting in generated traffic which is very difficult to predict; and (c) diversion of traffic from other river crossings. Expected diversion from other crossings is more difficult to estimate as it depends on the savings in travel time, cost of the trips and speed of development of infrastructure and road network leading to the bridge. All these factors would influence the size of traffic, and the forecast will vary according to assumptions made about the likely nature and roles of the factors. For the purpose of economic analysis, a conservative estimate of traffic at opening was assumed.

114. In view of all the factors mentioned above, the approach to developing an appropriate toll strategy is:

- (i) To increase the Jamuna Bridge toll by 40% on average to ensure positive cash flow and avoid a major deficit from the Jamuna Bridge till the opening of the Padma Bridge. This would also provide a better basis for further increase in toll levels before opening of the Padma Bridge; and
- (ii) To carry out a detailed study, as it was done in case of Jamuna Bridge, one year before the opening of the bridge based on the actual and more realistic traffic data and information determine the toll levels required for financial sustainability of both bridges and of BBA. Then six months before opening of the Padma Bridge toll rates would be set for both bridges that would achieve the self-financing objectives of BBA. The study would also examine a formula-based approach perhaps linked to inflation or other appropriate indicators that would help make toll adjustments more automatic and less politically contentious, and institutional reforms that would let BBA practice autonomy in reality. The study would also develop legislative, legal or administrative instruments required for implementation of such a strategy.

115. Based on the above approach and in view of the importance of the toll increases for the future financial sustainability of BBA, and the risk of serious fiscal burden on GoB if the increases are not implemented, agreement has been reached with GoB on the approach and implementation plan for the toll policy that would continue to support the financial objectives of BBA. The agreements includes:

- (a) BBA shall, as soon as possible but before award of civil works contracts for the main bridge or river training works, or by such date agreed with the Association, raise the Jamuna Bridge toll rates applicable to various vehicle categories by an overall average of not less than 40% on the existing toll rates. BBA shall notify the Association of the increase once it is brought into effect;
- (b) BBA shall: (a) by December 31, 2012 complete a study in accordance with a methodology and terms of reference, satisfactory to the Association, on: the level and structure of tolls and other user charges to be levied on the Jamuna Bridge and Padma Bridge after its completion; and future tariff and financial policies for BBA; and (b) by June 30, 2013 propose to the Association for its review: (i) the level and structure of such tolls and user charges to be applied upon opening of the bridge for traffic, which shall generate an operating cash flow (net of operations and maintenance expenses) sufficient to cover debt service requirements of BBA; and (ii) future tariff, preferably use of a formula based approach linked with inflation or other appropriate indicators that would make tariff adjustments automatic and less controversial, and financial and institutional policies for BBA; and
- (c) BBA shall promptly thereafter increase the tolls and take all the proposed measures mentioned in paragraph (b) above, modified as needed to take into account the Association's comments thereon, in accordance with the schedule identified therein;

116. In addition, assurances have been obtained that:

- (i) The GoB's financial counterpart funding contribution towards the Project cost indicated in the project financing arrangements would be passed on to the BBA as a grant. Such contributions would be made at such intervals, satisfactory to the Association, as shall be necessary or required by BBA to carry out the Project in accordance with the project implementation program.
- (ii) GoB shall on-lend the proceeds of the Credit to BBA under a subsidiary agreement to be entered into between the GoB and BBA, under terms and conditions agreed with the Association, which shall include inter alia, that:
 - (a) The proceeds of the IDA Credit shall be relented to BBA at the same terms and conditions as of the Credit; and

- (b) The re-payment of each maturity by BBA to the GoB shall be made in Bangladeshi currency. The rate of exchange to be applied to the repayment in Bangladeshi currency of the amount payable by BBA to GoB shall be the rate of exchange applicable on the date of the repayment.

117. BBA shall:

- (a) not later than the start of the civil works for the main bridge or the river training works (parts A and B of the Project) open and maintain in a commercial bank, under terms and conditions satisfactory to the Association, a Padma Bridge Fund of at least US\$15 million equivalent which shall be used by BBA to finance expenditures of an emergency nature during construction of the Padma Bridge;
- (b) gradually increase the level of the emergency fund to US\$50 million equivalent after completion of the project; and
- (c) six months prior to completion of the Project, BBA would establish a fund of US\$10 million equivalent, under terms and conditions satisfactory to the Association to address any outstanding environmental and social/resettlement issues after completion and closing of the Project and loans/credits.

B. Technical

118. Technically the works are extensive, complex and challenging. It has been a challenge so far to construct fixed crossing across the Padma River (confluence of two of world longest rivers, Brahmaputra, 2,900 km and Ganges, 2,700 km) as the river is large with very dynamic morphology. However, significant experience has been gained through construction of Jamuna Bridge on the Brahmaputra/Jamuna River upstream from the proposed Padma Bridge. This experience has been fully utilized in designing of the bridge, river training works as well as in dealing with environmental and social issues. Due to geological conditions (deep alluvium deposits) and the deep scour depth estimated (more than 61 meters for 100 year return period about 46.7 general scour and 15 meter at the pier location) at the bridge location, designing of foundation of the bridge has been a challenging task. Similarly, the unpredictable behavior at the bridge site has resulted in extra-ordinary designs for river training works. Behavior of the river is rather unpredictable and varies between braiding, straight and meandering in cycles of about 20 years. Historically, the main channel can be located anywhere. At present time, it runs near to the North (left Mawa side) bank, but it is expected to move towards South channel (Janjira side). This has made the designing of river training works a daunting challenge.

119. The works for the bridge have been designed using the best possible expertise and experience available worldwide by a team of international consultants who have significant experience in designing such works. An Independent Panel of Experts (IPOE) with expertise in such works and in construction of Jamuna Bridge has been reviewing investigation programs, analysis and the designs and advising BBA and the detailed Design Consultants. A Checking Engineer was recruited to check, verify and certify all designs (main bridge and RTWs) and confirm security, safety and technical soundness of the proposed designs.

120. The works are packaged into large contracts and bidding would be carried out through a two staged bidding procedure to get competent contractors for construction of these works. This process would ensure that the nature of the works are understood by the contractors and allow for clarifications on technical aspects of the designs and construction techniques and methodology, etc.

121. As indicated in the environment section, climate change impact studies were undertaken to predict possible scenarios, and these findings have been incorporated in the project design. Also for each structure, bridge, RTWs, and approach roads, various alternatives were considered (as outlined above) and the best alternative has been selected for the Project.

122. To ensure that technical issues are addressed during implementation and that proper supervision is carried out, an international team of Construction Supervision Consultants (CSC) has been recruited who would be designated as the “engineers” for the civil works contract. BBA would have management support consultants (MSC) to provide support in implementation of this project and also in carrying out its role as “employer” under the civil works contracts. BBA would continue to use the services of technical advisors for reviewing project issues and help in managing this very challenging operation, including the day-to-day activities. The POE would continue to review the implementation of the project and advise BBA in crucial issues as they may arise. Sufficient resources are allocated under the project for BBA to carry out any specific studies or pilots and obtain advice and expertise to address any technical issues that may arise during the project implementation. As indicated above, extraordinary measures have been taken in proper planning, design and ensuring quality in implementation of the project to accommodate the “Substantial” risk rating of the technical aspects of the Project.

C. Financial Management (Annex 3)

123. The Financial Management (FM) established in the BBA is acceptable for the Project and meets the requirements of OP 10.02. However, due to the country environment, size of the operation and nature of transactions involved particularly in implementation of the RAP, the overall financial management risk for the project is assessed as ‘Substantial’.

124. The financial management would be carried out by BBA’s PMU. PMU’s financial unit will be responsible for financial, planning, management and day-to-day payments. In carrying out financial management, the PMU would be supported by qualified individual consultants, by Construction Supervision Consultants (CSC), and the Management Support Consultants (MSC). A qualified professional accountant with adequate experience on financial management of large infrastructure project would work in the PMU as the Senior Financial Management Specialist (SFMS) with terms of reference agreed with the Bank. Reporting to the Project Director, the SFMS will lead the FM functions of the project with the assistance of a Deputy Director (Finance), an Assistant Director (Finance) and a few other support staff. BBA would also maintain a Project Audit Committee to help in addressing the audit issues.

125. **On-Lending of Credit Funds and Disbursement.** The GoB would onlend the IDA Credit funds to BBA. GoB would authorize BBA to withdraw proceeds of the IDA Credit and proceeds withdrawn by BBA would be considered withdrawn by GoB. Most of the Project funds would be disbursed against large ICB contracts through direct payments by IDA and other development partners. Such payments would be certified by the CSC (the Engineer) of the civil works contracts. The internal control procedure and audit arrangements are described in more detail in Annex 3. The Project would use the IFR based method to access/withdraw the Bank funds. The advance and subsequent replenishment of funds would be deposited to the US dollar Designated Account. Detailed Disbursement arrangements are described in Annex 3.

126. **Retroactive Financing.** To meet the urgent project start-up needs, the IDA credit could be used to retroactively finance expenditures incurred during the period between December 1, 2010 and Credit signing of up to US\$60 million, provided that procurement procedures acceptable to the IDA are followed.

D. Procurement (Annex 3)

127. BBA has experience in similar IDA funded projects, most notably the Jamuna Bridge. However, the BBA's capacity is inadequate for procurement and contract management of such scale and complexity. The Procurement capacity will be strengthened by: (i) providing an advisor with international experience in carrying procurement and contract management; (ii) the design consultants (DCs) and the construction supervision consultants (CSC) internationally recruited will help in carrying out pre-qualification (PQ), preparation of the bidding documents, evaluation of the PQ submission and bids and the CSC will be designated as the "engineer" under the civil works contracts; and (iii) management support consultants (MSC) who would support BBA, among other things, in contract management and in carrying out the role of the employer.

128. Given the procurement environment in the country and nature of procurement in significantly large value contracts, the project is rated as "High-Risk" from procurement operation and contract administration viewpoint. Key risks include inadequacy in skilled and professional staff to handle significantly large contracts (in both value and scope). An international consultant will assist in procurement, as mentioned in the above paragraph. In addition, other measures to mitigate risks include: (i) establishment of procurement website; (ii) establishment of a credible procurement complaint handling system; and (iii) BBA would provide semi-annual report based on an agreed procurement risk mitigation plan (PRMP) covering about 10 key features for better procurement management related to internal control, bid openings, coercive practices, record keeping, publication of award of contracts etc, described in more detail in Annex 3.

E. Social (Annex 7)

129. The project will have significant social benefits in the project areas, the immediate neighboring areas, and the entire SWR of Bangladesh. Improved transportation linkages are anticipated to facilitate access to employment opportunities in Dhaka, as well as to lead to employment generation in the SWR as a whole. In addition, embankment works planned under the project will control erosion that negatively affects households close to the river banks.

130. The project will have major adverse impacts through land acquisition and involuntary resettlement. The project will affect 76,211 people in 13,578 households. This includes 47,637 people in 8,526 households who will lose farmland, 20,972 people in 3,886 households who will lose their residential houses and need relocation and 5,179 people in 960 households will suffer from loss of business. There are about 2,882 people whose jobs as daily wagers along the river will be affected. In addition, the project is expected to have impacts on public health and might have impacts on people living on *charlands* near the project sites. Field surveys and consultations have confirmed that there are no indigenous communities in the project areas.

131. The project will mitigate these adverse impacts through a carefully planned two-phased resettlement and rehabilitation program that will provide compensation payments and resettlement arrangements for households displaced during construction and implementation of the project, as well as a longer term livelihood restoration program that is anticipated to extend beyond the life of the project. The resettlement action plan will be implemented in phases to ensure that all households affected by continuous erosion of the river banks will be supported in their effort for livelihood restoration and improvement. It is worth noting that about one third of the displaced households are actually erosion-displaced households who are renting or squatting along the river. Most of them are moving to the resettlement sites where living conditions will be much better.

132. Resettlement planning has been going on over the past decade as part of project preparation. Major planning efforts started under separate technical assistance by JICA and ADB since 2005. Various surveys were conducted on socioeconomic conditions, impact inventory and census, impacts on physical

cultural resources, gender, public health and *charlands*. The planning process followed a participatory approach, involving extensive consultations and participation of the local communities, particularly over entitlement policies, relocation options, livelihood development approaches and packages. A series of action plans have been developed to address the adverse impacts. They include a three component Resettlement Action Plan (RAP), a Resettlement Policy Framework, a Gender Action Plan, a Public Consultation and Participation Plan, a Public Health Action Plan, a Charland Impact Monitoring and Management Framework. These action plans are consolidated in one project Social Action Plan (SAP). Key features of the SAP are summarized below.

133. **Resettlement and livelihood restoration.** Three RAPs have been prepared for the bridge, river training works and the development of four resettlement sites. The RAPs were prepared in compliance with relevant domestic and World Bank policies. They detail the socioeconomics in the project areas, resettlement planning efforts, project impacts, entitlement policies and packages, resettlement and rehabilitation approaches and action plans, implementation arrangements, institutional, monitoring and grievance redress mechanisms as well as cost and financing arrangements.

134. The resettlement approach proposed consists of group resettlement and self-resettlement options. This was adopted following the Jamuna Project experiences as well as extensive consultations with the affected communities. Four resettlement sites have been selected along the river and confirmed through participation of the affected population and technical assessment. The sites will be fully developed with infrastructure services. For households who prefer to relocate to places of their own choice, either as individual households or smaller groups, the project will assist them in identifying, securing and preparing their identified sites. The livelihood package has been developed consisting of cash compensation upfront and long-term livelihood assistance planned to last for a period of 10 years. The cash payment includes compensation at replacement cost to be determined through the Land Evaluation Committee and various other allowances. The long-term livelihood program will be developed in full at the household level during implementation through facilitation by an experienced implementing NGO and with participation of the local communities. This aims at helping the affected households to use their cash compensation productively for an improved livelihood. A Social Development Fund has been established and included in the budget to support the program.

135. **Gender Action Plan (GAP).** The GAP has been developed on the basis of a gender analysis. It aims to translate the gender concerns and social vulnerabilities identified into actions, with a focus on (i) increasing participation of women in the project implementation; (ii) maximizing women's access to project benefits; (iii) increasing women's skills, incomes and participation in decision making; and (iv) reducing women's social vulnerability, such as domestic violence against women, public sexual harassment, vulnerability to sexually transmitted infections (STI) including HIV/AIDS, human trafficking. The GAP will be implemented by the project NGOs. A national gender adviser will be engaged to guide and supervise its implementation.

136. **Public Health Action Plans (PHAP).** The PHAP has been prepared on the basis of an evaluation of project public health impacts and existing services in the project area as well as the additional requirements of health services during the project construction. The overall objective of the plan is to minimize and mitigate the risks on public health due to the construction activities and contribute to public health services in the project areas. The main target groups include (i) the relocating households; (ii) the general public in the project areas; and (iii) the construction workforce estimated at 5000 at peak. The plan is scheduled for a period of five years, with a total budget of US\$ 8.67 million. A BBA health team, in consultation with the Ministry of Public Health And Family Welfare, will be responsible for the PHAP implementation. This team will be strengthened with a program implementation NGO.

137. **Charland Impact Monitoring and Management Framework (CMMF).** Assessment from the Design Team indicates that the project would not have impacts on the *charlands* in the project areas. However, given the apprehension from the *charland* people, BBA has planned to continue monitoring the river behavior to assess any possible impacts on *charlands* due to the project, develop and implement any required mitigation measures. The CMMF is developed to guide such monitoring efforts and development of necessary mitigation measures.

138. **Information, Consultation and Communication.** Project preparation has followed a vigorous consultation process. Project design information has been shared with local communities at various stages of project preparation. The development of the resettlement entitlement policy, finalization of the resettlement sites and formulation of the livelihood restoration approach has all been achieved through consultations with local communities. This consultation process will continue through detailed planning and implementation of the SAP. Three Public Information Centres will be established in the project areas and managed by an NGO. An information booklet in Bangla has been developed and distributed among the affected people. A household entitlement card will be distributed each and every affected household, summarizing their household losses, entitlements and payments. Additionally, project information disclosure will continue through newspapers, radio, television, posters, community workshops, information brochures and village level meetings. BBA has been developing a communication strategy to systematically and regularly disseminate project progress information to the public and seek timely public feedback to improve project implementation.

139. **Grievance Redress Mechanism.** Project has a two-tier grievance redress mechanism. A project Grievance Redress Committee (GRC) will be established at local community level, with representations from BBA, implementation NGOs, local elected officials, representatives of affected people and women in the project area to allow voices of the affected communities to be heard and ensure a participatory decision-making process. A second tier GRC will be an independent three-member body comprising of a retired judge or a senior professor with legal background, a BBA representative and a representative from civil societies. The role of the BBA representative is to provide project background information, clarifying relevant project policies to facilitate the deliberation. Decisions of this independent body will be by two-thirds majority and are binding upon the project. GRC decisions will be publicized among the local communities. Where the complaining parties are not satisfied with the GRC decisions, they can always file their cases in court. The SAP describes in detail the GRC composition, complaint filing procedures, GRC operation principles and procedures, and timetable for grievance redress.

140. **Project Management.** BBA will be responsible for the SAP implementation. A Resettlement Unit has been established within the PMU. It has already opened two field offices and is completing its staff recruitment. BBA will be supported by other local institutions, including district administrations, five specialized NGOs to be contracted for implementation, the Ministry of Health And Family Welfare for the PHAP implementation, the Detail Design Consultant, Construction Supervision Consultant and an independent monitoring agency. The roles and responsibilities of various institutions involved are defined and elaborated in the SAP. One implementing NGO has already engaged for compensation payment. It has opened three field offices, with over 60 staff members in operation. The other four implementing NGOs are in recruitment and they are expected to be mobilized early 2011.

141. **Monitoring and Evaluation (M&E).** BBA has planned to set up an M&E system for SAP implementation. The M&E system consists of internal and external monitoring. The internal M&E system is part of BBA management setup, consisting of regular progress reporting and monitoring. For internal monitoring, BBA has started to develop a GIS-based Management Information System. This system will cover all component activities under the SAP. It will keep and maintain records of plot-wise and household-wise information on land and structure impacts, as well as household entitlements and payment progress. This will enable a transparent and updated record of all entitlements and compensation payments for every affected household. This will help control fraudulent claims and possible corrupt practices. Some parts of the system are already developed and in operation. The external M&E will be

conducted by an independent monitor to be recruited through a competitive process. The M&E will cover all aspects of SAP implementation, including detailed planning, physical progress, public consultation and participation, grievance mechanism and assessment of SAP performance on the progress information collected through the internal monitoring system. Its scope of work, methodology and M&E arrangements are detailed in the SAP. The total cost of the resettlement program is included in component C1 of the Project. The major cost is for the RAP and about US\$8 million are for implementation of PHAPs.

Environment (Annex 8)

142. The most important benefit of the Padma Bridge will be the establishment of an easy, safe and reliable communication link between the banks of the Padma River. Road connections with the Southwest will improve considerably and this will both have an accelerating effect on local as well as regional socio-economic development. A river crossing utility infrastructure will facilitate connection of the Southwest to the gas, electricity and telecommunication networks in the rest of the country and avoid expensive alternative construction. In the project area, new employment and business opportunities will be created and the improved connectivity will enhance access to healthcare, educational and recreational facilities. Air and noise pollution will be reduced and traffic congestion and long waiting times for ferries will disappear.

143. On the other hand, the Project involves large-scale construction on the Padma River covering a large area that will be affected. The Project is categorized as Environmental Category “A”. A full environmental assessment of the impacts has been carried out by BBA during project preparation to ensure that the impacts are identified, prioritized, and appropriately managed during all stages of the project. Since the project is also financed by ADB, JICA, and IDB, in addition to the World Bank, the co-financiers worked with the BBA for a common approach of environmental management in Padma Bridge preparation fulfilling the national requirement as well as the requirement of several development partners.

144. Extensive work has been done in carrying out the environmental assessment for this project. This is described in more detail in the Annex 8. The environmental assessment has also considered the previous work done between 2000 and 2007– Environmental Screening, Initial Environmental Examination, and preliminary EIA with several specialized studies on key aspects – such as *charlands*, ecology etc. One of the major outcomes of all these studies is finalization of the bridge alignment at Mawa – Janjira site after a study of various possible alignments at (i) Paturia-Goalundo site, (ii) Mawa-Janjira site, (iii) Dohar – Charbhadrasan site, and (iv) Chandpur – Bhedarganj site. The final EA/EMP report prepared by BBA with support from an independent team of consultants consisted of three volumes, and an Executive Summary summarizing all aspects of EA/EMP and SAP. The second volume provides more details of the EA/EMP, and the third volume summarizes the SAP. This is supported by several volumes of reports and field work carried out by the Design Consultants during the feasibility studies and updated by special consultants.

145. The EA considered an area that stretches 10 km (6 km on Mawa and 4 km on Janzira side) in direction perpendicular to the flow, 15 km upstream and 7 km downstream along the flow of the river. There are no notified wildlife protected havens within this area, however, several important features in the area were recognized as sensitive and management of impacts on these has been a key feature of the assessment. The river also serves as the migration route for the Hilsa fish, which goes upriver for breeding and pass the project site during the period from March to May. Other important species in the area include the Gangetic Dolphin, Otters, etc. The *charlands* serve as an important haven for several fauna species, including migratory birds. The pre-project levels of pollution are not very high except for bacteriological quality of surface water which makes it unsuitable for drinking without boiling, and presence of contamination in shallow tube wells on the Mawa side.

146. The EA identified impacts prior to construction of the bridge, during construction of the bridge and during operation of the bridge. During the design of the bridge, an associated works analysis of the alternatives was carried out and alternatives with minimum environmental and social impacts have been selected. One of the key decisions to keep the RTW on the Janjira side along the bank has resulted in keeping the south channel open. Potential environmental and social impacts associated with project design, construction and operation were evaluated. Based on this evaluation, an EMP has been proposed for the Project, designed to mitigate, minimize, and compensate any negative effects and to enhance the ecological benefits of the Project (summary of EIA and EMP is provided in Annex 8).

147. The assessment of impacts prior to construction of the bridge covers: (i) social impacts including land acquisition, loss of income and livelihood, shifting of ferry ghats, etc (these aspects are discussed in more detail in the social section); and (ii) environmental impacts including land clearing (about 200,000 trees would be cut), loss of agriculture land (about 650 ha), loss of fish pond (about 12 ha of fish ponds with annual production level of about 2,000 kg/ha), and loss of *charland* with high biodiversity.

148. In addition, during construction of such massive infrastructure, several impacts can have the potential to cause large environmental damage if proper care is not taken. These include: (i) impact on the natural drainage; (ii) impacts on local flora and fauna as well as land from dredge material use, storage, and disposal; (iii) impacts of piling and vibration under water that can hamper movement/migration and can cause disturbance to aquatic fauna; (iv) risks to the health and safety of personnel working in risky situations; and (v) temporary increases in air, soil, water pollution during transport of very large quantities of material – steel, stone, sand, etc. - over land and water. The assessment of impacts during operation includes, in addition to the social impacts, increased traffic, contribution to greenhouse gas emission and increased accident risks.

149. **Environmental Management Plan.** The EMP prepared as part of the EA describes in detail the measures needed to minimize, mitigate or compensate for expected environmental impacts from the proposed works. The EMP prepared for the project including details for implementation, including specifications for contractors, detailed description of activities, necessary arrangements and costs for all mitigation measures. The Environmental Management Plan (EMP) includes various categories of mitigating measures. These are potential impacts or risks that could be either prevented or mitigated or compensated by adopting appropriate measures. These include: (i) measures that can be included in design and contract documents; (ii) stand-alone mitigation measures; and (iii) proactive compensatory measures, e.g. measures to preserve specific habitats.

150. Much of the construction stage EMP activities would be included in the civil works contracts. It requires the contractors to: (i) prepare a dredge management plan – covering the use, storage and disposal of excess material to be removed from the river; (ii) prepare a plan to ensure that piling does not cause hindrance/damage to the migrating aquatic life (in order to safeguard fish migration, piling in water will be discontinued during March-May in areas deeper than 7 meters); (iii) preserve top-soil; and (iv) follow guidelines in the form of Environmental Codes of Practice that cover the important aspects of the Contractors work including safety, labor camps, transport of material, etc. Training and capacity building for the contractor, consultant and BBA staff are included in the EMP.

151. While most parts of the EMP are being suitably incorporated into the contracts to be monitored by the Supervision Consultant, there are several measures that require implementation by BBA without the contractor being involved. These include: (i) plantation of trees under in about 400,000 trees will be planted to compensate for loss of trees on land to be acquired by the project; (ii) distribution of around 720,000 bamboo and banana saplings to the people of the host villages at the ratio of bamboo and banana 60:40 in lieu of the about 360,000 of these trees; (iii) development of protected wetland area (500 ha

charland and 500 ha river sanctuary⁵ and *charlands* visitor centre; and (iv) community environmental management plan for resettlement sites and an emergency response plan. The costs of these activities have been included in Component C2 of the project.

152. GoB has agreed to establish an Environmental Enhancement Fund to finance sustained environmental development and protection of the project area during the O&M stage and to address any outstanding social and environmental issues during operation of the Project. The level of this fund will be not less than US\$10 million equivalent.

153. **Monitoring Plan.** The environmental monitoring program has been designed (i) to monitor the contractor's work during project implementation in order to check contractual compliance with specified mitigation measures, and subsequently (ii) to assess the actual environmental impacts of the project over the years following completion of the various project components. The first type of monitoring will be the done by the construction supervision consultant (CSC). The second type of monitoring will be commissioned out by local organizations/consultants with sufficient experience in hydrological and ecological monitoring. Result of monitoring of impacts will have to be reviewed and evaluated from time to time by the M&E/MSO consultants. Findings might be used to revise the operational rules of the project. Details of the institutional responsibilities have been described in implementation arrangement.

154. **Implementation Arrangements.** The institutional arrangements for project implementation take cognizance of the various tasks involved and envisage a multi-layered supervision and monitoring arrangement. BBA has already constituted an Environment Management Committee and appointed Panel of Experts to provide specific guidance on project design, implementation and monitoring. The Project Management Unit has established a separate Safeguard (Environment and Resettlement) unit to be responsible for overall coordination, management and monitoring of safeguard issues in the projects. BBA will establish a Safeguard Division later on and the staff working in the Safeguard Unit of the PIU will be integrated into the Safeguard Division. The environmental management system at BBA will also be certified to ISO 14001 during the project duration. The implementation responsibility of EMP will mainly rest on the different contractors and NGOs assigned by the BBA. The PIU will employ a construction supervision consultant (CSC) for supervision of civil works, including supervision of implementation of portions of the EMP to be implemented by the Contractor responsible for the bridge and RTW. Environmental specialists of CSC, in coordination with environmental specialists in the Safeguards Unit, will ensure the implementation of environmental management practices at each stage of the project activities. The CSC will also be responsible for updating the EMP, if required. BBA will also contract specialist expertise for the delineation of the sanctuary and the development of the visitor centre. In addition, the PMU will engage independent M&E consultants to undertake monitoring of EMP and RAP. The PMU will work together with, relevant Ministries and some national organizations and training institutes like Centre for Environmental and Geographic Information Services (CEGIS), Bangladesh University of Engineering and Technology, etc. which will act as 'twinning institutions' to build the capacity of its own staff. These institutions will support the PMU through providing their laboratories for analyses and other technical facilities. An organogram describing the relationships between the various actors is in Annex 8.

155. **Consultation and Disclosure:** The process of public consultation and participation has been an integral part of all project preparations since 2003. During the prefeasibility and feasibility study a series of consultations were organized and these were stepped up during detailed design. These consultations were held as proposed in the Public Consultation and Participation Plan with formal and informal meetings, village level workshops and disclosures of project impacts to the affected households and communities. The views, needs and aspirations of the affected people as expressed during these consultations have been incorporated in the project design and the proposed mitigating measures with the

⁵ Establishment of a protected char area (the first in the country), including a fisheries sanctuary will have a positive effect on the country's natural resources.

objective to maximize benefits and minimize adverse social and environmental effects. Focus group discussions were held with groups of affected persons covering the issues like anticipated impacts, possible solutions, etc. Formal consultations at three locations involving about 350 participants representing affected persons, union and *upazila* leaders, NGOs, and national and local government representatives were also held. The recommendations from the public consultations have been incorporated in the engineering design and the resettlement and compensation plan for the affected communities. In addition, consultations with experts were held during the detailed design phase to share information on the project and to obtain feedback on important social and environmental aspects. Guidance and expert advice on the social and environmental studies was also received from the Panel of Experts appointed by BBA consisting of 10 national and international experts charged with periodic review of procedures and progress of the PMBP.

156. **Five consultation meetings** to disclose the results of the environmental and social assessment and the EMP and SAP were held in the project area March 16 – 19, 2010. A national workshop was held October 23, 2010. After completion of the Environmental Impact and Social Assessment, a summary in Bengali has been prepared and distributed to local authorities and relevant stakeholders. The draft Summary and the EIA and EMP have been published on the website of BBA and placed in various places in the Project area and Dhaka. The hard copies of these documents will also be available at the BBA office, project site offices and deputy commissioner offices for general public access. The EA/EMP and SAP/RAP were approved by the Department of Environment on September 6, 2010. The reports were submitted to the bank Info Shop on September 8, 2010. The reports have been disclosed on ADB and JICA websites.

157. **Climate Change Impact on Bridge Design.** A special study was carried out as part of the EA to quantify the potential effects of climate change. Based on the results of the climate change studies the following extreme situations were taken into consideration in the design of the Padma Bridge, a maximum: (i) extra water-level increase at the bridge site of 0.4 m, which is the combined impact of sea level rise (extreme scenario) and increased rainfall in the catchment area leading to a maximum water level of 7.8m PWD for 100 year flood and 8.2 for check flood of 500 year ; (ii) temperature of 46.6 °C and a minimum temperature of 9.3 °C; (iii) rainfall of 372 mm in 1-day period and 514 mm in a 2-day period; (iv) discharge of 151,100 m³/sec and a lowest flow of 7,345 m³/sec; and (v) wind speed of 126 km/h.

Annex 1: Results Framework and Monitoring
BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

Project Development Objective (PDO): The PDO is connect the south-western region to the rest of the country in order to stimulate economic growth by facilitating inter-regional, cross-river transport of passengers and freight, and transmission of natural gas, telecommunication and electricity in a cost effective manner.												
PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				2011	2012	2013	2014	2015				
Indicator One: The south-west region is connected to the rest of the country	<input type="checkbox"/>	Percentage completion of bridge, river training and related works	0	5%	20%	50%	90%	100%	Quarterly	Consultants Report (CSCs, MSCs, and NGO)	BBA, CSC, MSC	Padma Bridge constructed in phases (rail ready bridge, allows transmission of gas pipeline, fiber optic cable and power; 12 km of approach roads; two toll plazas and bridge end facilities; River training works).
Indicator Two: Quantum of freight and passenger crossing over the bridge and transmission of gas and electricity.	<input type="checkbox"/>	Average annual daily Traffic (AADT)	No passengers or freight passing over the bridge	0	0	0	0	AADT of at least 3000 with 70% trucks	Quarter	BBA, MSC reports	BBA, CSC, MSC	Number of vehicles of various size and nature passing over the bridge
Indicator Three: Number of Ha protected against river bank erosion and floods	<input type="checkbox"/>	Ha	0	0	0	0	0	5000 ha protected against river bank erosion and floods	Quarter	BBA, MSC	BBA, MSC	River training works would also provide protection to the area against river bank erosion and floods.
Indicator Four: Number of people directly benefiting from the bridge.	<input checked="" type="checkbox"/>	Number of People	0	0	0	0	0	About 7 million People	Quarter	BBA, MSC	BBA, MSC	People in the vicinity of bridge who would take part in construction, whose land values would be increased and whose business would and who would cross the bridge on a regular basis.
Indicator Five: Reduction in travel time to Khulna and Jessor	<input type="checkbox"/>	Hours	Current travel time is 12 hours 45 minutes to travel to Khulna and 12 hours 55 minutes to travel to Jessore	0	0	0	0	Travel time would reduce to 3 hours and 30 minutes o Khulna and 3 hours 20 minutes to Jessore.	Quarter	BBA, MSC	BBA, MSC	Travel time to reach two major cities in South West Region (reduction in travel times in particular by tucks).

INTERMEDIATE RESULTS												
Component one: Main Bridge and Approach Roads												
One: Construction of 6.15 km bridge	<input type="checkbox"/>	Percentage completion of the bridge works	0	10%	20%	50%	90%	100%	Quarterly	BBA, CSC Reports	BBA	Two level rail ready road bridge (four lane highway at upper level, and provision for single track on the lower deck); bridge to allow passing of gas pipeline and fiber optic cable, and crossing of power transmission.
Two: Construction of Bridge Approach Roads, toll plazas and service areas	<input type="checkbox"/>	Percentage of completion	0	5%	10%	60%	90%	100%	Quarterly	BBA, CSC Reports	BBA	12 km bridge approach roads including small bridges, culverts and underpasses, on both sides of the river including toll plaza and bridge end facilities will be constructed
Component 2: River Training Works (RTW)												
One: Completion of RTWs	<input type="checkbox"/>	Percentage completion	0	5%	10%	20%	60%	100%	Quarterly	Consultants Report	BBA	About 35 million (OR 50 million CUM?, para 99 annex 2) cum of dredging
Component 3: Implementation of Social Action and Environmental Management Plans												
One: Implementation of SAP and RAP	<input type="checkbox"/>	Percentage completion	0	30%	60%	100%			Quarterly	BBA, reports of NGO, MSC	BBA	Land acquisition in phases before the contractor is on site
Two: Livelihood Restoration of Affected People	<input type="checkbox"/>	Percentage completion	0	20%	40%	50%	60%	90% would continue after the project closure	Quarterly	BBA, reports of NGO, MSC	BBA	PAPs will be resettled on sites developed under the project as per the Social Action Plan (SAP)
Four: Environmental Mitigation Action Plan		percent		20%	50%	70%	100%	Monitoring would continue throughout and after the project period	Quarterly	BBA, Consultant's report , CSC and MSC consultants	BBA	EMAP will be closely monitored by MSC consultant; much of EMP activities included in construction contracts.

Component 4: Construction Supervision and Monitoring and Evaluation of the Project, and Social and Environmental Management Plans												
One: Construction Supervision and Implementation Support (CSC Consultants)	<input type="checkbox"/>		Constant support and supervision by the CSC	Constant support and supervision by the CSC	Constant support and supervision by the CSC	Constant support and supervision by the CSC	Constant support and supervision by the CSC	Constant support and supervision by the CSC	Quarterly	BBA, reports of CSC and of MSC	BBA, CSC and MSC	CSC will act as Engineer of the project and will ensure timely completion and quality of work.
Two: Independent M&E of Project Impact and of SAP and EMAP	<input type="checkbox"/>		Regular support and monitoring	Regular support and monitoring	Regular support and monitoring	Regular support and monitoring	Regular support and monitoring	Regular support and monitoring	Quarterly	BBA, MSC, NGO	BBA	MSC will independently monitor project implementation, performance and impact, and supervise/monitor implementation of the SAP and EMAP
Component 5: Project Management Support, Capacity Building of BBA, Technical Assistance and Training												
One: Effectiveness of PMU operations			Recruitment of CSC and MSC on time and awards of works contracts	Minimum issues with safeguard aspect	Minimum problems in works contracts implementation, few variations	Monitoring of implementation		Completion of project on time, smooth transition to O&M arrangements	Quarterly	CSC and MSC reports, MTR	BBA	Satisfactory project implementation
Two: Capacity Building of BBA			BBA has limited capacity for PMBP's implementation & O&M of Jamuna and Padma bridges. Consultants prepared a plan for BBA's restructuring & to enhance its capacity. Oversight committee formed to oversee restructuring	-Key positions (to be agreed) filled through external recruitment. - Satisfactory implementation of agreed TA and training program (incl on the job training)	All key positions recommended by Institutional Development consultants filled. - Satisfactory project implementation on progress. - Satisfactory implementation of agreed TA and training program (incl on the job training)	- Satisfactory project implementation progress. - Satisfactory implementation of agreed TA and training program (incl on the job training)	- Satisfactory project implementation progress. - Satisfactory implementation of agreed TA and training program (incl on the job training)	Project completed without any major outstanding implementation issues. BBA has satisfactory asset management plans.	Quarterly	BBA, Independent assessment by consultants for MTR, Bank Implementation support missions, annual reports by PMO, reports of the MSC.	BBA	Annual work program will include agreed activities for BBA capacity building.

Annex 2: Detailed Project Description

BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

Background

158. **The Padma Multipurpose Bridge Project (PMBP)** aims to remove the last major physical barrier in the road connection between Dhaka and the Southwest and South Central regions of Bangladesh, home to about one quarter of the Bangladesh population. Currently there is a rather unreliable ferry connection over the Padma River with limited capacity and long waiting times. Ferry services are sometimes interrupted for days during fog and high floods. The construction of the Padma Bridge will replace the unreliable and unsafe ferry connection with a reliable and safe fixed river crossing. The bridge will shorten the distance from the Southwest to Dhaka by 100 km and travelling time will be considerably reduced, by about two hours for cars and more than ten hours for trucks. When completed, a reliable highway connection will be established⁶ between Dhaka and the land port of Benapole, the seaport of Mongla and the district headquarter of Khulna and Barisal. The provisions for a railway line on the Padma Bridge will make it possible to construct a new railway connection between Dhaka and the Southwest within the framework of the Trans Asian Railway network. Padma Bridge will also include options for major utility connections to the Southwest including gas, power transmission, and communication lines.

159. **The project area** is located 40 km southwest of Dhaka (Map IBRD 28235). The bridge will be constructed between a site near the village of Mawa, lying north of the Padma River and Janjira on the south side. Components of the project such as approach roads and bridge end facilities will affect an area of 6 km inland on the Mawa side and four kilometers (km) inland on the Janjira side; bridge and river training works may even affect a corridor 15 km upstream and seven km downstream in the river. The 250 km² project area comprises areas located in three separate administrative districts: Munshiganj district on the Mawa side (north bank) and Shariatpur and Madaripur districts on the south side. Lauhaujong and Sreenagar upazilla (sub-district) lie on the north bank and Janjira and Shibchar *upazila* lie along the south bank.

160. The new bridge, which will be over 6 km long, will form an integral part of the realization of the Transnational Asian Highway network (Asian Highway no1), whose construction program was ratified by the Government of Bangladesh (GoB) in 2004. The Road Masterplan for Bangladesh prepared in 2007, earmarks the development of this highway (also called National Highway no 8), the Padma Bridge and the two missing links as high-priority projects. The highway is of national importance since it will link Dhaka to the Southwest of the country as well as to two major ports of the country. GoB has approved this plan and earmarked the project as a national priority project for early implementation. The completion of this project opens the way for accelerated socio-economic development of the SWR, which is currently a relatively isolated and underdeveloped area. The incidence of poverty in the SWR is higher than in the rest of the country. The Gross Regional Product (GRP) of the SWR (Khulna and Barisal divisions) is only 17.4 % of the GDP compared to 38 % in Dhaka division. The Padma Bridge will help to stimulate economic activity in the SWR by providing a reliable and rapid transport connection.

161. **Morphology of Padma River.** The Padma is the third largest river in the world in terms of mean average annual discharge and the second largest in terms of sediment transport. The Padma River is fundamentally different from its two tributaries Ganges and Brahmaputra. While the Ganges is a more predictably meandering river, in places contained by natural nodal points, the Brahmaputra is one of the largest braided sand-bed rivers in the world, characterized by short temporal bursts of erosion and deposition. The combined flow forms the young Padma River. While it flows mostly as single thread channel at the bridge area, there have been periods when multiple channels occur. At present the Padma is

⁶ Currently there are still two sections between Dhaka and Banapole which are not up to standard

in a stage of transforming again from a straight channel planform at the bridge site into a meandering one. This means the existing south bank upstream of the bridge will likely experience major erosion again. Historically, the bridge location has not been stable and major parts of the south bank approach road are situated on young deposits of old major channels. Since 2005 river has eroded about 0.5 Km of this bank. However, this location is better than the alternatives available. The north (Mawa) bank on the other hand is characterized by very slow erosion processes and can be termed as quite stable. For more information on the river morphology and hydraulics see Annex 2.1.

162. Plans for Development of Railway in the Region. Bangladesh Railway (BR) is a large Government undertaking and employs 37,000 staff. Its network comprises 2,835 km of railway track. In FY 2008, BR carried 53.8 million passengers and 3.3 million tons of freight. In the SWR, BR is currently running 134 passenger trains and 20 freight trains daily. Because of a missing link between Dhaka and Southwest, regional movement of passenger and freight by railway suffered. Once the Padma Bridge is built and the railway connection restored, there will be manifold increase in the movement of passenger and goods between Dhaka and South west. Once the link is established through the Padma Bridge, movement of freight between Dhaka-Mongla port and Chittagong port to Mongla port will reduce congestion at the Chittagong port. The Bangladesh Railway has taken up a scheme of four projects (Dhaka-Mawaa-Bhanga-Janjira link, Faridpur-Pakuria link, Bhanga-Jessore link, and Bhanga-Barisal link) of constructing new railway lines to connect Dhaka to the Padma Bridge and southwest region (308 km of new railway track) with an estimated cost of US\$ 1.5 billion. A plan has been prepared for these works, however their implementation could take as much as another decade to get underway. The railway on Padma Bridge will form part of the Trans Asian railway, provision of DFC (Indian Dedicated Freight Corridor) loading has been kept on the bridge. This would be rail ready bridge, and track will be put in place when the link between Dhaka and SWR is established. For the Jamuna Bridge, the railway line was also established a few years after the opening of the bridge. During September 2010, GoB negotiated a TA loan of US\$23 million with ADB (Transport Project Preparatory Facility Loan for the Ministry of Communication) out of which US\$12 million will be used by BR to carry out a feasibility study of the Dhaka-Bhanga railway link and a feasibility study and design of the Khulna-Mongla railway bridge.

163. Climate Change Impact on the Design of the Project. Climate change may result in the rise of future sea levels, higher temperatures, wind speeds and increased cyclone intensities and rainfall patterns, which are all factors that may affect the design of the Padma Bridge. A study was carried out as part of the EIA into the potential effects of climate change. Findings of this study are summarized in Annex 8.

164. Impacts on bridge design. Based on the results of the climate change studies the following extreme situations were taken into consideration in the design of the Padma Bridge:

- A maximum extra water-level increase at the bridge site of 0.4 m, which is the combined impact of sea level rise (extreme scenario) and increased rainfall in the catchment area leading to a maximum water level of 7.8m PWD for 100 year flood and 8.2 m for the check flood of 500 years;
- A maximum temperature of 46.6 °C and a minimum temperature of 9.3 °C;
- A maximum rainfall of 372 mm in 1-day period and 514 mm in a 2-day period;
- A predicted maximum peak discharge of 151,100 m³/sec and a lowest flow of 7,345 m³/sec and associated scour depth and river bank erosion consideration;
- Maximum wind speed of 126 km/hour.

Project Components

165. The Project is designed to support the development objectives. The layout of the project (in plan form) is given in the Figure 1 below. The Project has following the following components:

166. **Component A: Main Bridge and Approach Roads (US\$1,626.2 million).** This component will include construction of the foundation, substructure and superstructure of the main bridge and services on the bridge, road viaducts, approach roads, toll plazas and various bridge end facilities.

167. **Sub-component A1.1: Main Bridge and viaducts (US\$1,339.8 million).** This would be a “rail ready” road bridge. The main bridge would be about 6.15 km long consisting of a two-level steel truss bridge with a concrete top deck slab. It would accommodate four lane divided highway on the top (about 22.5 meter wide) and would have provision for a single track on the lower deck. It would allow the passing of a high pressure gas pipeline, and fibre optic cable. The crossing for power transmission would be installed about 500 meters downstream from the main bridge using piers similar to the bridge.

168. The bridge would consist of 41 spans (42 piers) with a span length of 150 meters found to be most cost effective. The bridge piers would be placed on a foundation cap supported by six piles each about 120 meters deep. Every fifth pier would be V shaped. The road viaducts linking the main bridge with the approach roads would be about 2 km on each side with a gradient of about 4%. The span length of road viaduct is 30 meters. Rail viaducts would be extended about 250 meters from the main bridge on both sides that would allow appropriate connection with the rail viaduct to be constructed in the future when the railway line is constructed in the region. About 4.8 km length of the bridge would allow sufficient clearance for navigation (vertical clearance of 18.3 meters and horizontal clearance of 76.2 meters) of the river traffic passing through the Padma Bridge site. A general river bed scour depth of 46.7 meters for 100 year scour is used for the design with provision of 15 meters additional scour at the pier location.

169. The structural design is based on the assumption that an earthquake and the maximum scour depth would occur at the same time. An earthquake with peak ground acceleration (PGA) with a 475 year return interval is used for Padma Bridge.⁷ As indicated above, impacts from climate change are considered in the design of the bridge facilities. Future changes include expected large scale climate change impacts and smaller scale changes in the catchment area. Recognizing the highly speculative nature of the assumptions, the river discharges have been increased to account for increased rainfall and runoff and the river water level has been increased by 0.4 meters to account for higher discharges and bed level rises due to morphological changes.

170. In an effort to optimize the bridge span and other factors of construction, the steel truss type of bridge came to be the most efficient/economic solution with two levels. With this type of bridge it was estimated that the incremental cost of accommodating a rail track is negligible. Therefore, given the uncertainty of railway development in the future it is prudent to make a provision for railway loading on the bridge that would be installed in the future. The rail loading provision was also made in accordance with the Indian Dedicated Freight Corridor (DFC) standard (32.5 tons per axel instead of 25 tons Bangladesh Railway standard) since the bridge is expected to cater to regional transport. The bridge would have capacity to install rail track that would be laid in future.

171. Provision of electricity transmission lines downstream of the bridge instead of on the lower deck of the bridge is a better solution. Based on the generation capacity installed and plans in the near future, a 400 KV transmission line is required in Bangladesh instead of 220 KV which was installed on the Jamuna Bridge. A special study carried out for the installation of a power line on the bridge showed that it

⁷ **Intensity** of an earthquake is usually measured using the Modified Mercalli Intensity Scale (no mathematical basis) and is based on observed damage and perception/ **Magnitude** of an earthquake is measured using the Richter Scale and usually relates to the energy release; **Peak ground acceleration** (pga) is measurable and is used in the design (for Padma 475 year return interval PGA of 0.144g). The pga will decrease as the distance from the epicentre increases. Approximate relationship is that for a PGA of about 0.15g, the Mercalli intensity is approximately VI to VII and corresponding Richter value would be say 6.0.

was very costly and complex to install the power transmission line on the lower deck (over US\$300 million). Instead, passing the power line from around 1 to 2 Km downstream from the bridge on a pile foundation, similar the bridge would be a better and cheaper solution. Approximately six towers would be required to cross the power line. It would be very economical to install these piers under the Main Bridge contract.

172. **Sub-component A1.2. Development of Construction Yards (US\$57.5 million).** This would include preparation of construction yards for the main bridge contract covering some 147 ha on both sides of the river. The cost is for raising the land to above flood level and river protection. This would be done prior to the award of the main bridge contract. The cost for installation of equipment etc. in the construction yard is included in component A1 of the project.

173. **Sub-component A2: Approach Roads and Bridge end Facilities (US\$228.9 million).** This component would support construction of approach roads connecting the existing road work to the bridge and Bridge end facilities and would include the following two sub-components:

174. **Subcomponent A2.1: Approach Road and Bridge end Facilities on Mawa side (US\$35 million).** On the left bank side (Mawa side) only a limited stretch of road, 1,5 km needs to be constructed. One culvert would be rehabilitated. In addition this would include construction of a Toll Plaza and Service Area 1 (SA1). Service Area (SA-1, about 27 ha) would house the consultants for construction supervision (CSC) and management support consultants (MSC) on site with all basic amenities (office, dormitory, mess, residences etc.).

175. **Subcomponent A2.2 Approach Road and Bridge end Facilities on Janjira Side (US\$193.9 million).** The approach road on the right bank (Janjira side) is approximately 10.5 km, which includes 5 small bridges (total length 270m), 20 culverts and 8 underpasses. In addition, there is provision for about 10 km of local service roads, access roads, roundabout, etc. The width of the approach roads on both sides of the river will be 23.6 meters. They will consist of two lanes on both sides with a lane width of 3.65 m and two meters of hard shoulders. The roads are designed with a four meter central median with a 30 cm up-stand to prevent vehicles from crossing this central reserve. Along the road there is sufficient space on both sides for a service road and for plantation of trees. The roads would be raised above the maximum flood level.

176. The component would provide financing for the toll plaza along with the equipment and facilities for collection of toll. Toll plazas on Mawa and Janjira side would be identical. Both sides would have ancillary facilities and a weighbridge.

177. Of the two Service Areas in Janjira side, Service Area 2 (SA2 about 56 ha) will house the main construction supervision office in Janjira with residences, offices, hostels and mess. The SA 2 will also house the “bridge experience” consisting of a resort-type area, museum, offices, and associated facilities. The Service Area 3 (SA 3 about 6 ha) has provision for office and lab for BBA staff/engineers, residences/dormitory, indoor sports, parking etc. The Janira site would also have an emergency response station, including trauma facilities to ensure proper handling of traffic accidents and as a stand-by in case of any other emergencies or accidents on the bridge. Both service areas will be designated to accommodate during operation a police station, restaurants, food courts, shops, mosque, visitor centre, and sufficient parking for visitor and staff. Approach road on Janira side along with all bridges, SA3 and Toll Plaza 2 would be financed by an IDB loan through a separate contract. SA2 and any remaining works on Janjira side that are or cannot be financed under the IDB contract would be financed by IDA.

178. **Component B: River Training Works (U\$799.9 million).** The geo-morphologically young Padma River is the third largest river in the world in terms of average annual discharge with an alluvial bed and a complex rapidly changing morphology, flowing mostly as single thread channel in the reach at the bridge. The river has a tendency to switch from straight to meandering and widens overall. The main

considerations in selecting river training options are the bridge length and low-risk alternatives for stabilizing the river in the vicinity of the bridge. The river training works (RTW) are designed to meet this challenge.

179. The left bank (Mawa) is relatively high and stable. The river training works at the Mawa side are about 1.5 km long with about 1 km upstream of the bridge tying into the low erodible, existing clay layer that extends for some length into upstream direction. The right (Janjira) bank is characterized by periodic river attacks from a meandering planform. Presently the river is straight and the last meandering channel from the mid 1990s is silted up. However it is expected that the meandering channel will be active several times during the lifetime of the bridge. In addition to the bridge abutment and end facilities the upstream approach road requires protection due to its vicinity to the riverbank. On the Janjira side the length of the river training works is about 10.5 km.

180. The river training works would involve substantial dredging (up to about 30 meters below workable low water levels). The slopes above low water would be covered with concrete block, while the slope under water would be covered with rock and alternatively geo-textile bags depending upon the location (and the outcome of ongoing testing). The work is secured at the toe by a wide apron, designed to launch in steps to the design scour depth. The slope of RTWs is in general 1V:6H, with local adaptations. The total amount of dredging involved is estimated about 50 million m³ with about 10 million m³ on the Mawa side. About 4.5 million tons of rock would be used in construction of the RTWs.

181. **Component C: Implementation of Social Action and Environmental Management Plans (US\$291.9 million).** The PMBP is a large, complex and challenging project involving a variety of issues ranging from land acquisition, physical and economic displacement, impacts on vulnerable groups and other unanticipated impacts. This necessitates proper attention to the social and environmental issues with focus on consultation, participation, gender, livelihoods, public health upstream and downstream impacts on the *charland* settlements, ecology, and aquatic life during construction and operation of the project. This component would support implementation of Social Action Plan including the Resettlement Action Plans (RAP), public health action, gender action, *charland* monitoring and public consultation plans and the environmental management plan (EMP).

182. The component would cover the cost of land acquisition, payments for houses, trees, and other assets, development of resettlement sites, relocation, reconstruction and transfer grants and special assistance to the households headed by females, disabled and vulnerable and various measures for income restoration. The public health action plan, aimed at minimizing risks and possible harmful effect on health due to construction of the bridge, would support establishing and operation of health facilities and implementation of preventive, and curative activities.

183. Many of the EMP activities have been included with the construction contracts under other components. However, some like tree plantations, establishment of protected area on *charland*, community environment management plan etc. would be funded under this component.

184. **Component D: Construction Supervision, Monitoring and Evaluation of the Project Impact and Social and Environmental Management Plans (US\$72.0 million).**

185. **Sub-component D1: Construction Supervision and Implementation Support (US\$65.0 million).** This component will cover the cost of consulting and other services for project implementation, including construction supervision and project management support. It will also cover implementation of all activities under the project: procurement, contract administration, quality control, certification of payments, financial management, preparation of any additional designs, and bidding documents, etc.

186. **Sub-Component D2: Monitoring and Evaluation of the Project Impact and Social and Environmental Management Plans (US\$7 million).** The monitoring and evaluation (M&E) activities

would provide continuous feedback to the Government of Bangladesh (GoB), Project Coordination Committee (PCC), Project Steering Committee (PSC), BBA and the project cofinanciers/development partners (DPs) on the project's performance and impact of its various components, so that corrective actions could be undertaken in a timely manner. The monitoring will be carried out by an independent M&E consultants. They will also supervise implementation of the overall social and environmental management plans and provide independent monitoring of various activities, assess positive and negative impacts and propose alternatives to address any long-term or, during construction, social and environmental issues. These consultants, namely the Management Support Consultants (MSC) would also provide management support thus enhancing the capacity of BBA in project implementation and in contract management, and help in playing the role of employer effectively.

187. The M&E activities are likely to cover, but not be limited to: (i) the impact of the project during and after completion on the communities at various levels; (ii) impact on various productive activities, including, industrial, manufacturing sectors, crops, livestock, fisheries, commerce, and trade; (iii) environmental impact of construction activities in the project area, particularly on any ecologically important sites; (iv) acquisition of public and private land and assets, agreements reached and arrangements made for acquisition of assets; (v) socio-economic impacts and the impact on the level of employment, livelihood and household incomes in the project area; and (vi) evaluation of the SAP and EMP implementation at completion; and (vii) estimation of the project's overall benefits and economic rate of return at completion and prepare Borrowers ICR, etc.

188. **Component E: Project Management Support, Capacity Building of BBA, Technical Assistance and Training (US\$26.0 million).** This component will support the BBA implementing the project by coordinating all project related activities. It will include support for: (i) the operation of the PIU including procurement and tendering of contracts, contract management, implementation of social and environmental management plan, managing operation of the site, river systems, communication strategy, project audits, liaison with stakeholders, civil administration, local and central Government and the DPs etc; (ii) building the capacity of the BBA to effectively implement the project, O&M of the bridges it manages and carrying out its full functions as defined in its mandate. In particular its capacity would be enhanced in planning and programming, engineering section and O&M of the bridges, financial management, procurement, and management of the environment and social issues; (iii) technical assistance and training in such areas as designing of bridges, river training works, approach road, hydraulics; detailed designs of structures; contract administration and construction supervision; procurement; operations and management planning; asset management plans; financial management; legal issues. This will include on the job training, post graduate programs, seminars, workshops, and study tours, etc; (iv) an independent panel of experts for design and construction quality and safety enhancement or any other issues that may have to be addressed during project implementation; and (v) strategic studies, audits, mitigation measures and pilot projects, that may be identified during the project implementation. This component would finance provision of consulting services, goods, minor works, and incremental operating expenditures.

Project Cost and Financing

189. The project cost is estimated to be about US\$2,915 million. Cost by component, including and excluding contingencies and estimates of IDC is given in Table 1. Project cost by component including contingencies and category of expenditures is given in Table 2.

190. Project financing has been secured and at this stage there is no major financing gap. The part to be financed by GoB is not so extraordinary that it would strain the public expenditure program of the Government. With appropriate toll policies, it can be financed with revenue surplus generated by the Jamuna Bridge during the construction period of the Project. Also the amount to be financed by GoB is not much more than the tax receipts from the investment.

191. The agreed financing arrangements are that JICA, ADB, IDA and GoB would finance the main bridge contract. IDA, ADB and GoB would finance the RTWs. IDB would solely finance a clearly identified approach road contract on the Janjira side. Other works and activities would be financed by the IDA. IDA Credit would finance 100% of cost of implementation of EA/EMP (Component C1) and bulk of the SAP/RAP related cost (Component C2).

Table 1: Project Cost by Component (US\$ Millions)

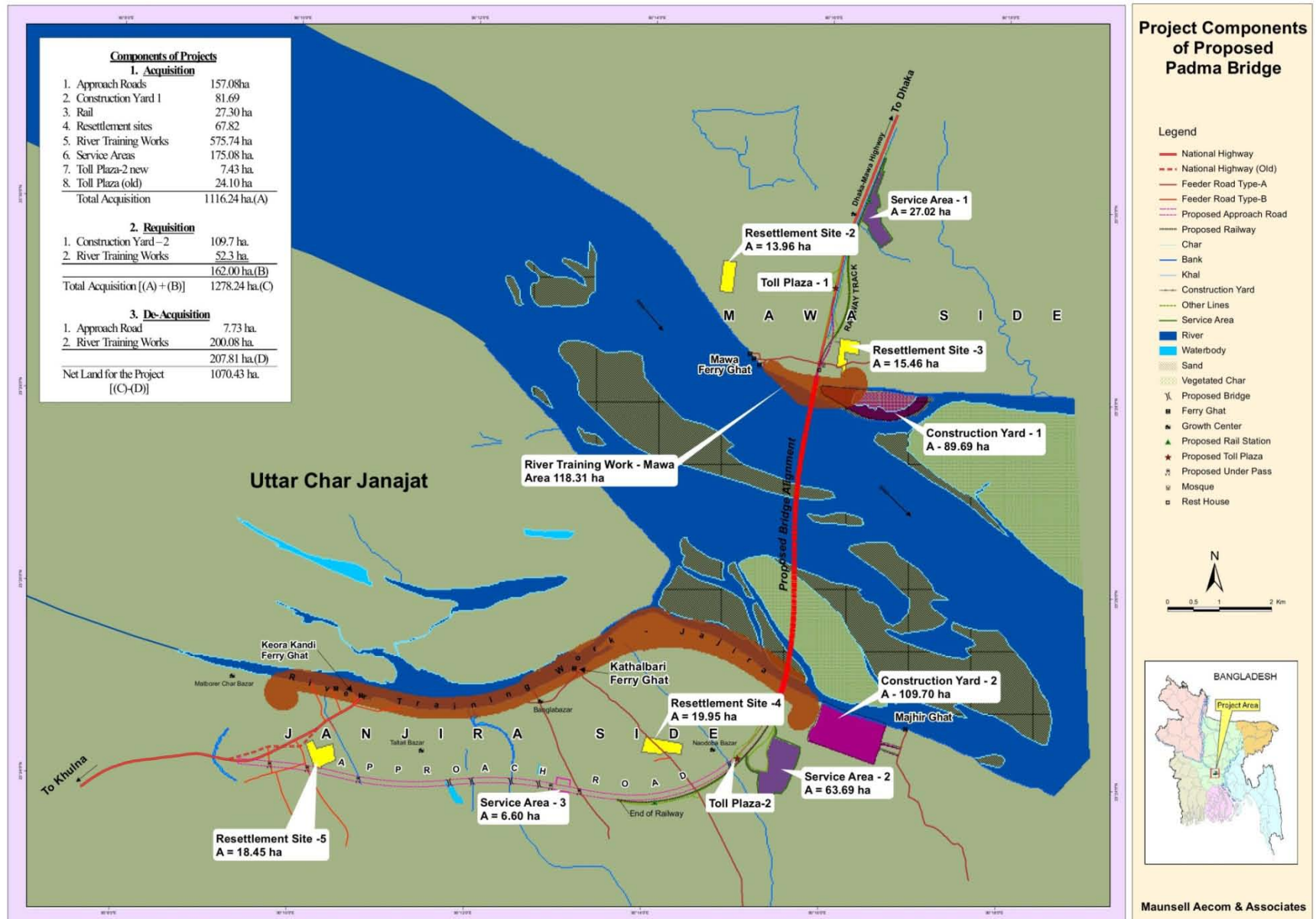
	Total Cost Incl. Contingencies	Base Cost and Contingencies
A. Main Bridge		
A1.1 Main Bridge Facilities and Viaducts	1,339.8	1,204.5
A1.2 Construction Yards	57.5	52.8
A2 Approach Roads and Facilities		
A2.1 Mawa Side	35.0	31.5
A2.2 Janjira Side	193.9	174.3
Sub-total A	1,626.2	1,463.1
B. River Training Works	799.9	685.4
C. Implementaton of SAP and EMP		
C1. Social Action Plan (SAP)	273.2	230.0
C2. Environmental Management Plan (EMP)	18.7	15.8
Sub-Total C	291.9	245.8
D. Consultancies for Supervision		
D1 Construction supervision and PM support	65.0	60.0
D2 M&E and supervision of EMP and SDAP	7.0	6.0
Sub-total D	72.0	66.0
E. Project Management, TA, Training		
E1 PM support and audits	7.0	7.0
E2 BBA strength, TA, POE, training	14.0	14.0
E3 Strategic studies	5.0	5.0
Sub-total E	26.0	26.0
Base Cost	2,816.0	2,486.2
Physical Contingencies	0.0	155.5
Price Contingencies	0.0	174.3
Fees and IDC	96.0	96.0
Refinancing of PPF	3.0	3.0
Total Project Cost	2,915.0	2,915.0
Tax contents 19.5%	549.1	

192. The IDA Credit is for SDR 779.3 million (US\$1,200 million equivalent), ADB Credit and Loan US\$615 million and JICA US\$400 million. With these commitments the Project is fully financed by the DPs and the GoB and there is no financing gap. However, additional availability of concessional funds for the Project would reduce pressure on the GoB's development budget thus allowing reallocation of scarce development funds to other programs which cannot be funded by entities like BBA through generation of their own resources.

Table 2: Project Cost by component and Expenditure Category (US\$ millions)

	Works	Goods	Consulting Services	Incremental Operating Costs	Training	Property and benefits	Total
A. Main Bridge							
A1.1 Main Bridge Facilities and Viaducts	1339.8						1339.8
A1.2 Construction Yards	57.5						57.5
A2 Approach roads and facilities	228.9						228.9
Subtotal A	1626.2						1626.2
B. River Training Works	799.9						799.9
C. Resettlement Cost							
C1. Social Action Plan	30.0		10.0			233.2	273.2
C2. Environmental Management Plan	13.0	2.0	2.0	1.0	0.7		18.7
Subtotal C	43.0	2.0	12.0	1.0	0.7	233.2	291.9
D. Consultancies for supervision							
D1 Construction supervision and PM support			65.0				65.0
D2 M&E and supervision of EMP and SDAP			7.0				7.0
Subtotal D			72.0				72.0
E. Project Management, TA, training							
E1 Project Management Support and audits		1.0	1.5	4.5			7.0
E2 TA, POE, training		1.0	5.0	5.0	3.0		14.0
E3 Strategic studies			4.0	1.0			5.0
Subtotal E		2.0	10.5	10.5	3.0	0	26.0
Sub-Total	2,469.1	4.0	94.5	11.5	3.7	233.2	2,816.0
Fees and Interest	96.0						
PPF	3.0						
Total	2,568.1	4.0	94.5	11.5	3.7	233.2	2,915.0

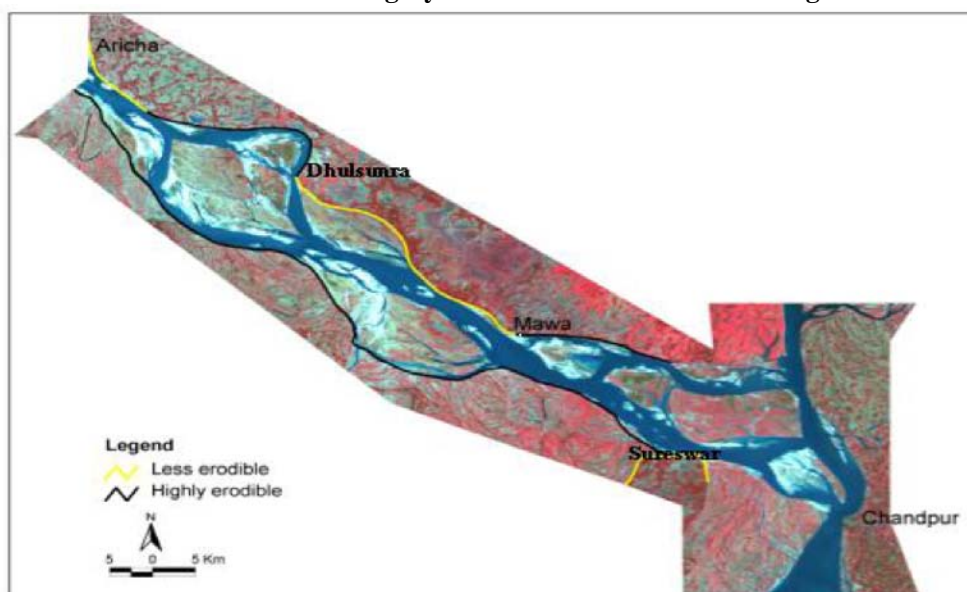
Figure 1: Project Layout



Annex 2.1 Padma River Physical Characteristic – Morphology and Hydraulics

193. **Geology and Soils.** The left-bank floodplain of the Padma River has been formed by relatively old (5000 years Before Present) alluvial sediments, a patch of which is also present at the right bank of the Padma River close to the confluence with the Meghna River. This material is considered to be more resistant to erosion than the recent alluvial deposits. Most of the floodplain along the right bank of the Padma River is formed by recent courses of the Ganges/Padma River and a patch of older and more erosion-resistant sediment is located approximately 20 km downstream of the crossing site. Consequently, most of the right bank (south side) of the river is relatively easily eroded alluvial sediments consisting of very fine sand and silt, whereas much of the left bank (north side) consists of older, more erosion-resistant materials. The different types of materials are illustrated on Figure 1.

Figure 1: Location and extent of highly erodible bank materials along the Padma River

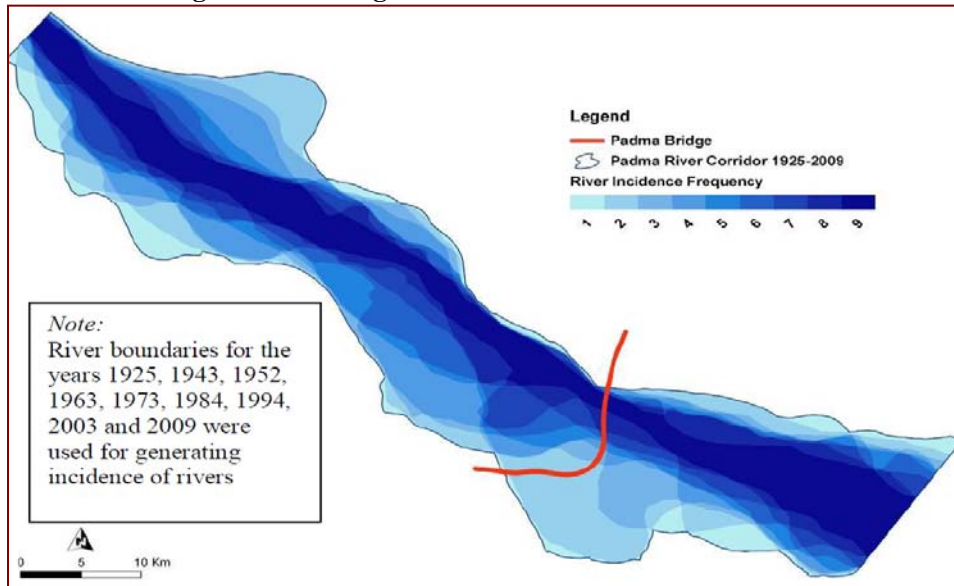


194. **Historical Development.** The Padma River has undergone major changes in its alignment over the last 230 years. Up until 1779 the Padma River was simply the downstream continuation of the Ganges River. Between 1779 and 1826 the Brahmaputra started to occupy the Jamuna river course in present day Bangladesh, flowing south along its present path to meet the Ganges near Aricha, more than doubling its discharge. At that time, the Padma entered the Bay of Bengal approximately along the present course of the Arial Khan. In response, the Padma widened and increased its braiding intensity, although it initially maintained its course along the line of the Arial Khan. As more water of the Brahmaputra River was diverted through the Jamuna River, the Padma River became wider. Over time the river shifted towards the northwest direction by cutting through the Tippera and Arai-gur Surfaces sediments. After 1826 the combined flow of the Ganges and the Jamuna Rivers was flowing through the Padma River. Consequently the Padma River channel is exceptionally young in comparison to any other major river in the world. Since the time-scales for morphological processes on large alluvial rivers are commonly measured in decades or even centuries, it is likely that the influence of these developments has affected the morphology and hydraulic characteristics of the river throughout its recent history.

195. **Channel Stability.** Overlaying the channel boundaries from each year produces a map of channel incidence (See Figure 2). At the bridge location and also along a 15 km long reach upstream of

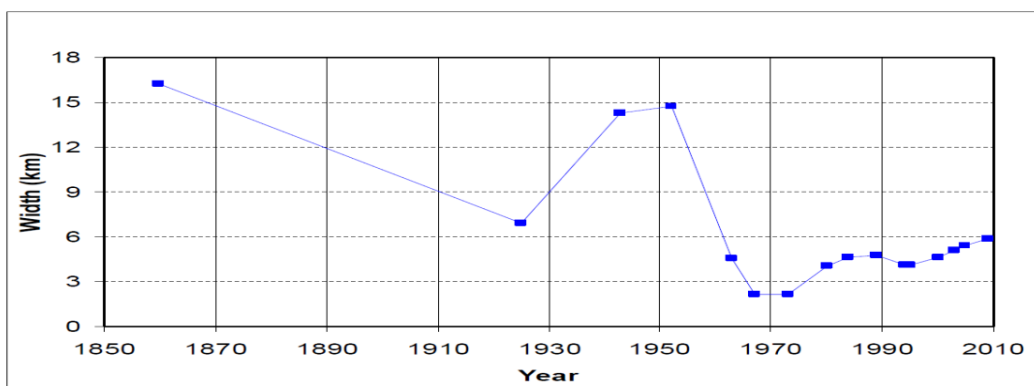
Mawa, there was always some form of channel running along the left bank (channel incidence was 100%). However, the northern approach road is beyond the limit of historic channel incidence. Within the bridge span, the channel incidence varies from 100% to 50%. On the right (south) bank the new approach road falls within the historic river channel corridor, with the channel incidence ranging between 20% to 50%. Previous investigation, which did not have access to the long historic record available for this study, concluded that the bridge crossing is situated at a stable nodal point. However, based on the more comprehensive data set that has been compiled, it is evident that nodal points on the Padma River are rather transient and will periodically disappear and re-form. It is conceivable that the river could shift back to its configuration in 1942 to 1952 if river training works are not installed.

Figure 2: Shifting of the river boundaries over time



196. The variation of the river width along the alignment of the Padma Bridge crossing was very erratic. In 1860, it was about 16.2 km (See Figure 3), due to the presence of multiple channels. The width reduced to 6.9 km in 1925 but rapidly increased to 15 km due to the appearance of multiple channels. In the following decades the river width reduced drastically to about 2 km at the end of 1960s and early 1970s. Since 1980, the width of the river section became relatively stable and river width variation from 4 to 6 km range. During the last one and half decades the river width at this section has been showing a persistently widening trend.

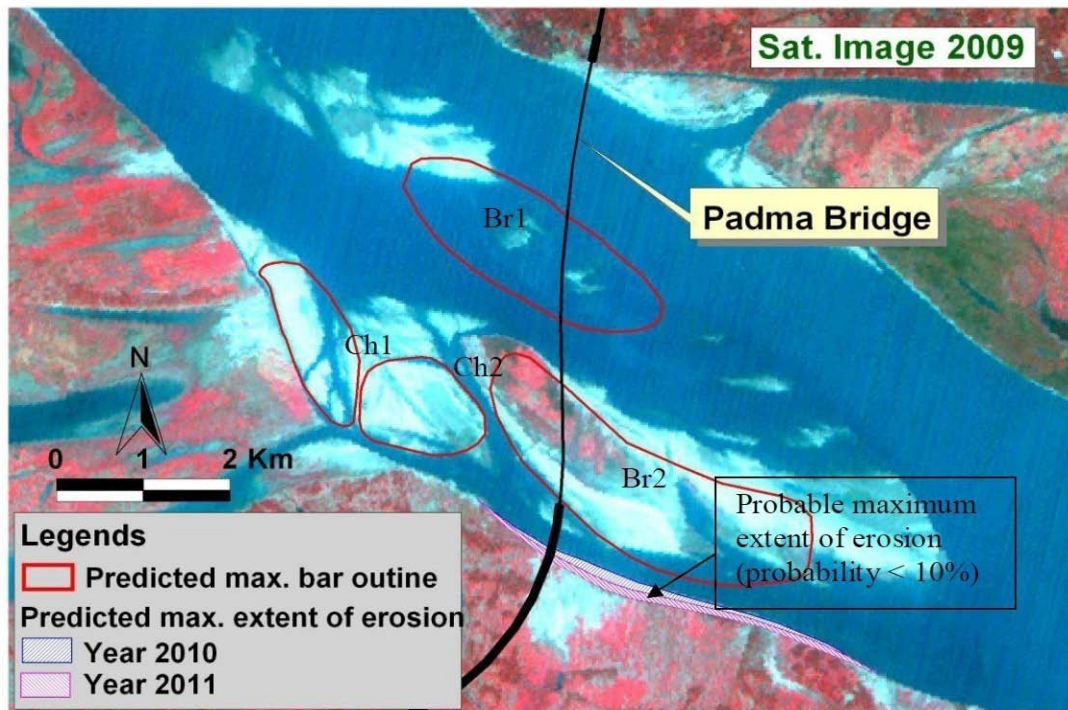
Figure 3: Changes in width of the river at bridge location



197. Recent research has shown that during the second half of twentieth century there were huge changes in the width and braiding intensity of the Jamuna, Padma and Lower Meghna Rivers. It concluded that these changes were due to the propagation of a sediment wave generated by the Assam earthquake of 1950. The sediment wave took several decades to propagate through the Brahmaputra-Jamuna-Padma-Lower Meghna river system and finally to reached into the Bay of Bengal. A conceptual model was developed to illustrate the processes of the sediment wave and the subsequent morphological changes. The conceptual model for the Padma River is shown in Figure 7. In addition to the earthquake-induced effects, the rapid morphological changes during the last few decades are probably affected by several other factors such as the long-term northeast migration of the river courses and its interaction of the cohesive bank along the left bank.

198. **Short-term Prediction of Future Channel Changes.** Predictions of the short-term planform changes at the bridge site were based on (i) an analysis of char development and migration, (ii) review of historic meander bend movement and (iii) assessment of bathymetric surveys from 2008 and 2009. It should be noted that the predictions involve considerable judgement and are tentative, subject to receipt of additional monitoring surveys and other model results. A planform prediction for the year 2011 is presented in Figure 4.

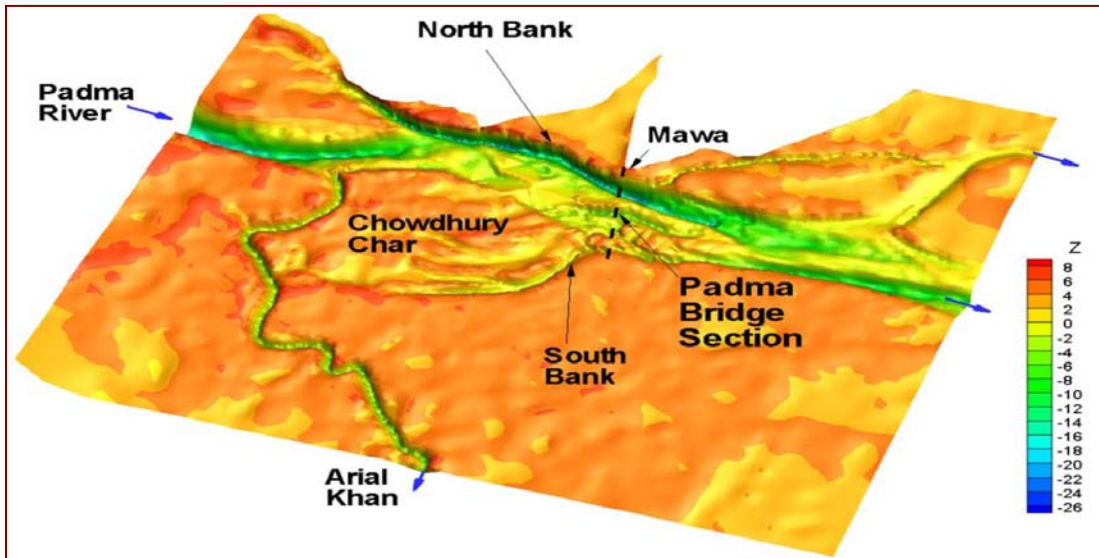
Figure 4: Padma River at bridge crossing (Prediction for 2011)



199. Bathymetry surveys and satellite images indicate that the probability that Ch2 will develop further and enlarge is less than 25%. The maximum probable extent of bank erosion along the right bank at the bridge crossing is expected to be 80 m (probability 20%). As it is expected that the river at Mawa is going to evolve to a single-thread channel, the overall trend is for channels Ch1 and Ch2. to decline in 2011. There is only a 5 to 10% probability that Channel Ch2 or Ch1 will increase further. In such a case, the maximum extent of bank erosion at bridge crossing would be 150 m from the present position (probability < 10%). Bar Br1 is expected to move further downstream and reach the bridge crossing. It is likely that the right flanking channel at the bridge crossing will be silted up. In such case bar Br2 would become an attached char.

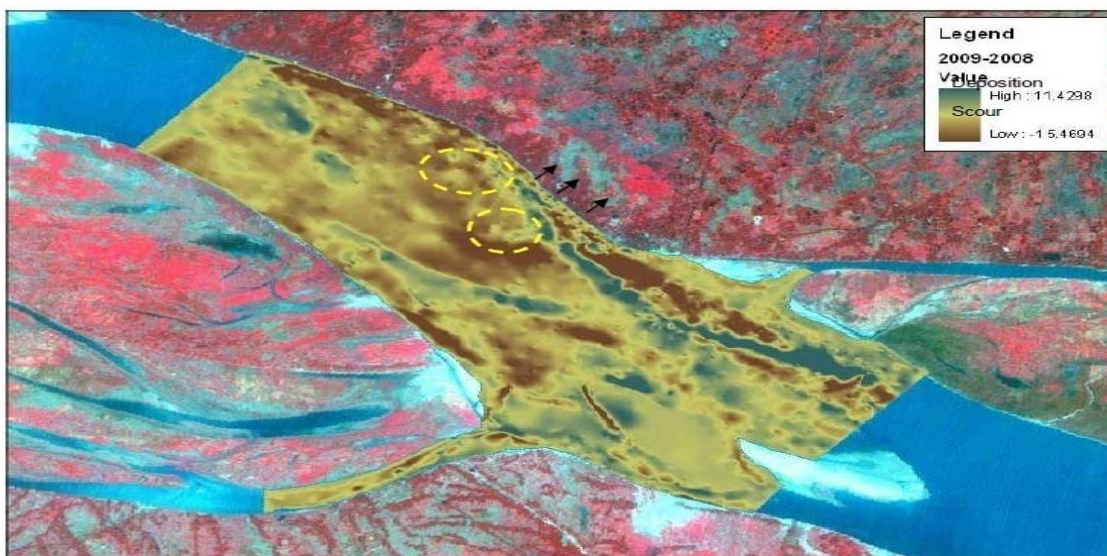
200. **Hydraulic Properties.** Figure 5 shows a three dimensional rendering of the Padma channel based on the 2008-2009 bathymetry. The Padma River has a deep meandering thalweg that shifts from the left (south) bank upstream from the Arial Khan offtake, to the opposite right (north) bank downstream from it. Although the channel width at bankfull level is about 5 km wide, it is constricted in most parts by large bars, especially at the bridge section. Contraction scour caused by these bars during low flows, plus meandering flow impinging against the inerodible north bank, might help explain the deep channel located near the north bank at the proposed bridge crossing. The lowest bed elevations reached values of El. -28.7 m PWD. It is interesting to note that despite the relative straight alignment of the river, the 2008 bed elevation at cross section closest to the bridge crossing is the lowest observed in the past two decades.

Figure 5: Padma River and adjacent south floodplain (near bridge location)



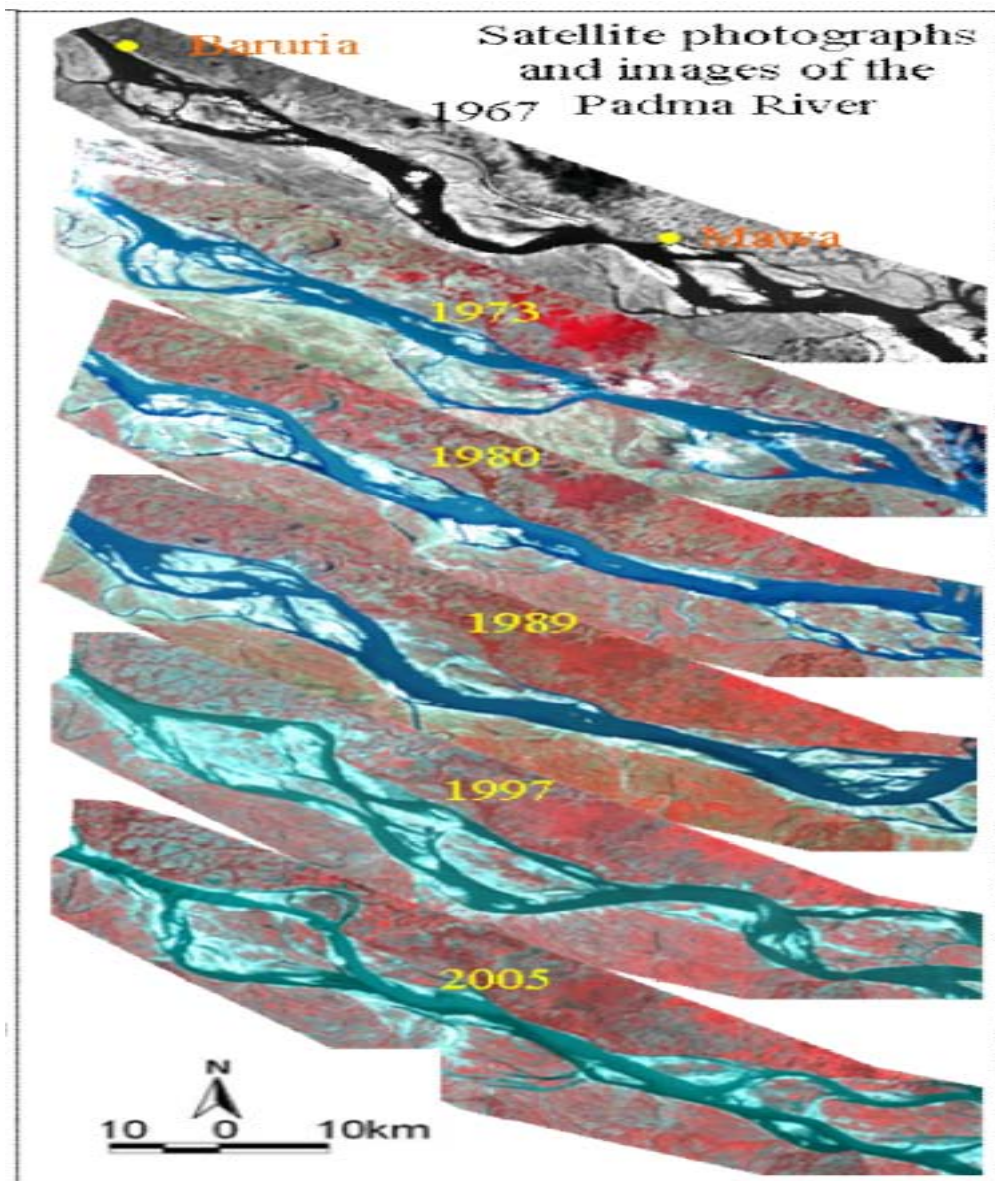
201. A difference in 2008 and 2009 bed elevation plot near Mawa (Figure 6) shows that substantial morphological changes can occur over a single flood season. The 2008 thalweg was partially filled in 2009 and migrated north by means of erosion. At the same time, large shallow bars present in 2008 were significantly eroded.

Figure 6: Changes between 2008 and 2009 close near Bridge Site



202. On August 29, 2009, NHC measured flow velocity and discharge at eight transects on the Padma River near Mawa using an Aquatic Doppler Current Profiler (ADCP). Water levels during the ADCP survey were about 5.7 m at Mawa, while discharges were around 76,000 m³/s, which is the approximate bankfull discharge and dominant discharge in the river. For a transect (101418) located upstream of the proposed bridge crossing (See Figure 6) the average depth and velocity at this section are 9.7 m and 1.5 m/s respectively. However, depth varies between 6 and 25 m, while velocity peaked at 2.7 m/s (70% larger than the mean). A deep channel is located in the first 1000 m from the left (north) bank, where unit discharge (the product of depth and velocity) clearly shows values that are significantly higher than in the rest of the channel. At this particular section, about half of the total discharge is concentrated in only one quarter of the channel width. A large shallow bar (where depth is about 5 m) occupies about half of the entire channel width, but it only conveys about 20% of the total flow discharge. Other ADCP transects also show similar uneven flow distributions.

Figure 7. Changes of the morphological parameters and planform of the Padma River



Annex 3: Implementation Arrangements
BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

1. Project Institutional and Implementations Arrangements

Project Administration Mechanisms.

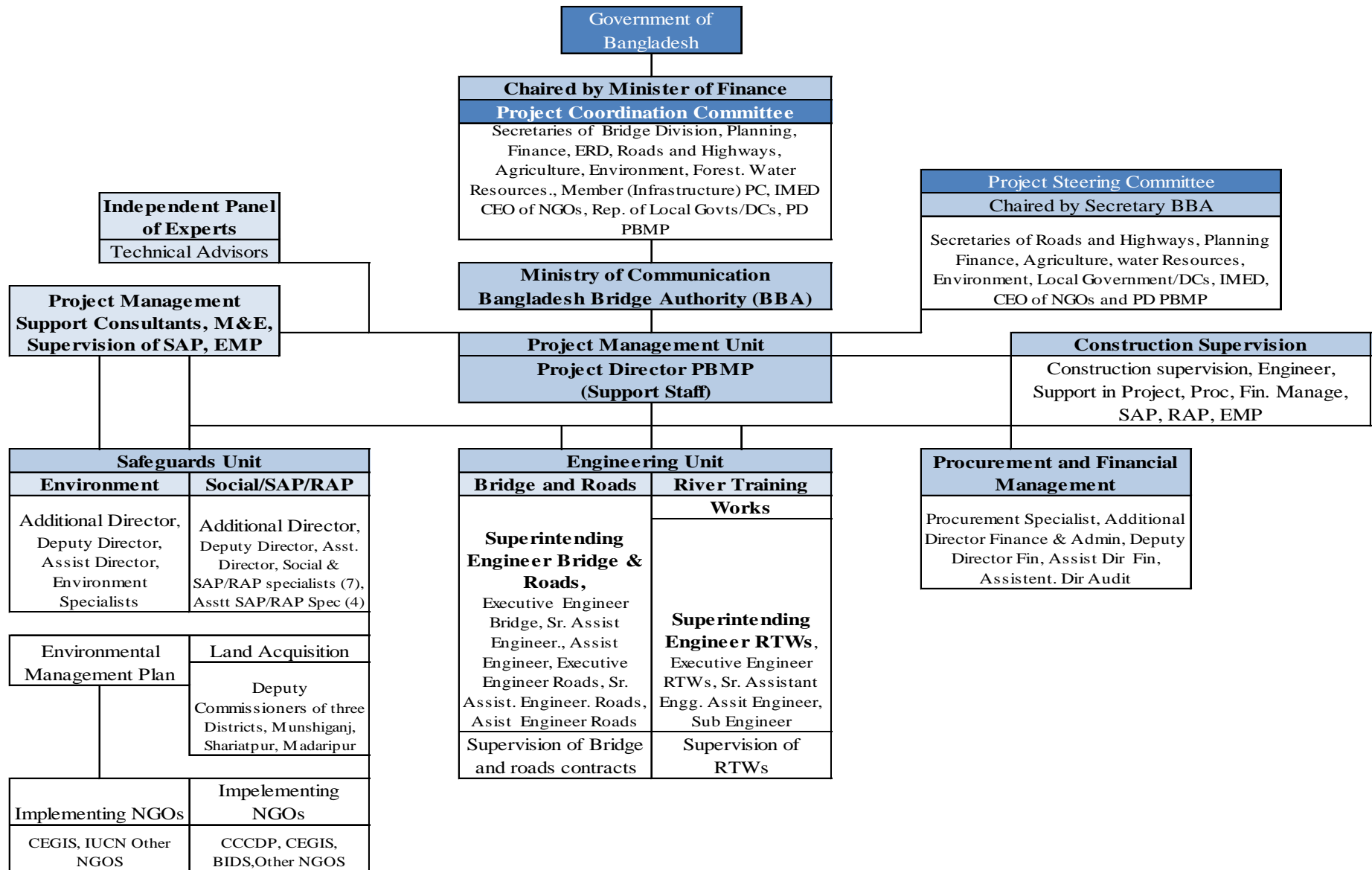
203. The Bangladesh Bridge Authority (BBA) under the Bridges Division of the Ministry of Communication of the Government of Bangladesh shall be responsible for the execution and implementation of the Project. The BBA was established in 1985 through an Ordinance establishing the Jamuna Multipurpose Bridge Authority (JMBA) to implement the Jamuna Bridge Project. The authority constructed the Jamuna Bridge during 1993 to 1998 and has been maintaining it since then. Its mandate was amended and broadened in 1998 to develop bridges greater than 1.5 km length. Through a Presidential Order in 2007, its name was changed from JMBA to BBA. Since completion of the Jamuna Bridge, BBA has completed the Mukhtepur Bridge in February 2008 with financing from China.

204. **Project Management Unit (PMU).** BBA has established a PMU that would be primarily responsible for carrying out day-to-day project implementation activities. The implementation arrangements are shown in the Chart I. The PMU has been strengthened by providing additional staff. It would be supported by consultants, advisors and appropriate Non-Governmental Organization (NGO) for implementation of the Project. The PMU would be responsible for all aspects of project implementation. The PMU will be headed by a Project Director with four units: (i) Finance Unit; (ii) Procurement Unit; (iii) Engineering Unit; and (iv) Environment and Sociology (Safeguard) Unit. Key specialists have been recruited and the units have largely been staffed with qualified personnel. The PMU would be supported by two sets of consultants, Construction Supervision Consultants (CSCs) who would help in construction supervision, contract management, and management aspects of the project. An NGO would support PMU in implementation of RAP and SAP, already selected and operating in the field. For civil works contracts, the Project Director will serve as the *Employer representative*, and the CSCs supervising consultant will serve as the *Engineer* for construction supervision. At the site, *Resident Engineers*, appointed by the CSCs, with a team of specialists and inspectors will supervise the Contractor. The Management Support Consultants (MSCs) would provide management support and in carrying out the role of the employer. The MSC would also supervise the implementation of SAP and EMP, and carry out independent M&E for the project activities and implementation. For implementation of communication strategy and management of information and public awareness PMU would be support by qualified communication officers.

205. The PMU would supervise the implementation of **Components A and B** through its Engineering unit, that would be supported by the CSC, also designated as the “Engineer” for the civil works contracts and MSC who would provide management support and help it in the role of the “employer” under the civil works contracts

206. For implementation of **SAP and EMP (Component C)** of the Project, BBA/PMU has engaged specialized NGOs (and will engage additional NGOs) and agencies to implement the safeguard plans developed under the SAP and EMP. BBA through its Safeguard/RAP unit coordinates the property acquisition with respective DCs and with the help of NGOs, regarding compensation according to the land acquisition act and according to the World Bank Guidelines. BBA is assisted in its task by the DCs of Munshiganj, Shariatpur and Madaripur districts for acquisition of land for the project and relevant Ministries of Land, Environment, Agriculture, Forest livestock etc.. The Centre for Environmental and Geographic Information Services (CEGIS) has been engaged to computerize land acquisition data with GPS reference. The Bangladesh Institute of Development Studies (BIDS) has been engaged to undertake surveys and verify field data for preparation of RAPs.

Chart I. Implementation Arrangements for the Project.



An experienced NGO (Christian Commission for Development in Bangladesh) has already been mobilized for implementation of the three RAPs at field level. The implementation/monitoring of EMP is likely to be supported by IUCN under a suitable institutional and contractual agreement.

207. From previous experience it is now widely recognized that the task of successfully implementing resettlement programs requires the typical experience, attitude and skills of NGOs working at grassroots level. Most of the components of the SAP will therefore be implemented with the help of such organizations. In total it is expected that five NGOs will be hired to implement RAP I, II and III, the Public Health Action Plan, the Gender Action Plan and the *Charland* Impact Monitoring and Development Framework. Also the development of a nature conservation reserve and the establishment and management of a *Charland* Visitors Centre could best be carried in consultation with an NGO like IUCN. The bidding document for Works Contracts will provide the guidance to prospective contractors, based on the EMP, to prepare their own Construction Environmental Action Plan (CEAP), which will be reviewed and approved for the successful bidder. The supervision by the CSC will also cover the CEAP. A separate Management Support Consultant to be hired by BBA, will provide regular M&E support to the PIU. Certain elements of the EMP, not implemented by Contractors, would be implemented through NGOs.

208. The PMU would also be responsible for **Components D and E** related to recruitment of consulting services, and project management, BBA strengthening, strategic studies, audits and panel of experts, etc.

209. **Project Coordination Committee (PCC).** A Project Coordination Committee (PCC) has been constituted to oversee the Project, provide policy-level guidance and inter-agency coordination for the project. The PCC is chaired by the Minister of Finance, or another person acting on his/her behalf with Secretaries of Planning, Economic Relations Division, Finance, Bridge Division, Agriculture, Forest, Water Resources, Roads and Railway, Environment, Local Government, Implementation Monitoring and Evaluation Division (IMED), Member (Physical Infrastructure) Planning Commission, Chief Executive Officer of the selected NGOs, representatives of the local/district administration as its members and the Project Director (PD) of PMBP. The PD PMBP would be the secretary of the PCC.

210. **Project Steering Committee (PSC).** The PSC would help resolve project management issues and address day-to-day implementation problems. It would be chaired by the Secretary and Executive Director of BBA, and Secretaries of Planning, Economic Relations Division, Finance, Environment, Roads and Highways, Local Governments, Agriculture, Water Resources, Forest, IMED, Member (Physical Infrastructure) Planning Commission, Chief Executive Officer of the selected NGOs, Project Director and representatives of and the consultants (CSCs, and MSCs) will be members. The Project Director of PMBP would be the secretary of the PCC.

Financial Management, Disbursements and Procurement

Financial Management

211. The financial management would be carried out by BBA's PMU. The PMU's financial unit will be responsible for financial, planning, management and day-to-day payments. In carrying out financial management, the PMU would be supported by qualified individual consultants, by Construction Supervision Consultants (CSC), and the Management Support Consultants (MSC).

212. A qualified professional accountant with adequate experience on financial management of large infrastructure project is working with as the Senior Financial Management Specialist (SFMS). Reporting to the Project Director, the SFMS will lead the FM functions of the project with the assistance of a Deputy Director (Finance), an Assistant Director (Finance) and a few other support staff.

213. **Accounting and Financial Reporting.** The Project accounting would be a subset of the BBA entity accounting system that would be maintained under accrual basis meeting International Accounting Standards and International Financial Reporting standards. A computerized accounting system would be required to record accounting data and produce financial reports and statements on a timely and reliable basis. BBA would develop this with support from the consultants. The chart of accounts will be designed to capture project financial transactions in terms of different dimensions such as project components, disbursement category and economic classifications. Until a computerized accounting system is fully operational, books of accounts will be maintained manually using spread sheets for analysis and reporting. Manual/excel based registers will be used to adequately record acquisition and use of all projects' fixed assets. Physical inventory at the end of each financial year will ensure updated status on usability condition and safe custody of the assets. Fixed assets such as vehicles, office furniture and equipment, computers etc. that would be supplied under different works and services contracts will be identified and recorded in the Asset Register.

214. Until such time as a computerized accounting system for the project is fully operational, an excel-based consolidated statement will be used for generation of quarterly IFRs as well as the annual financial statements. The Project will follow the GoB Project Accounting Manual in maintaining books of accounts and in complying with monthly, quarterly and annual financial reporting requirements of various government agencies and also of IDA and other development partners. The project will produce Interim Unaudited Financial Reports (IUFs) on a quarterly basis showing project progress on all components and sources and uses of funds from all stakeholders on a user friendly harmonized format and submit the same to IDA and other stakeholders within 45 days from the end of each quarter. The contents and the formats of the draft Interim Unaudited Financial Reports (IUFs) have been developed in discussion with the BBA and the partners. IUFs would include realistic expenditures forecasts based on the procurement plan, updated implementation plan, and an analysis of payment obligations arising out of contracts having regard to contractual progress milestones.

215. **Nature of Transactions.** The project would be implemented through a few large sized ICB contracts in which case most of the payments would be made to the contractors perhaps directly by IDA. The payments to the contractors would be certified by Construction Supervision Consultants (CSC) would be designated as the "engineer" for the works contracts. These arrangements would reduce the financial management issues. The number of transactions would be higher in case of resettlement action plan where several thousand beneficiaries would be paid compensation payments. For this purpose the BBA would be supported by an NGO. Also the CSC would help to develop a financial management system to ensure adequate control on and proper accounting of these small payments. All such payments under Resettlement Action Plans (RAP) will be made through bank transfer to the bank accounts of the beneficiaries. The FM unit of the PMU will undertake the independent pre-payment checking of such payments. Having regard to the irregularities on implementation of RAP in Jamuna Bridge Project as indicated in its ICR, Pre-audit by the project auditor of all payments under RAPs would minimize the fiduciary risk on this. IDA's FM supervision would also include review of controls in place on such payments.

216. **Internal Control.** Internal control on the separation and segregation of various functions under financial management of the project will be applied as far as practicable. The bank account(s) will be reconciled monthly by an Accountant and such reconciliation will be verified by the AD(F)/ DD(F) and all identified unusual differences will be investigated expeditiously. The SFMS will oversee the monthly bank reconciliation, countersign the cash book every month end and scrutinize before payment all bills of contractors, consultants and other providers of goods and services. All bills of works contracts will be certified for payment by the CSC. To facilitate cross checking of the invoices by the FM section of the Project, the soft copy of all invoices should be submitted in addition to hard copy in original by the contractor/ construction supervision consultant. All payments shall be approved by the Project Director. Check signing arrangements will follow the two panel system.

217. **Internal Audit.** BBA does not have an adequately functional internal audit unit that can be used for performing the internal audit function of the project. Therefore, internal audit functions of the Project will be conducted by hiring a chartered accountant firm with international affiliation, on the basis of a Terms of Reference (TOR) agreed with IDA, by June 30, 2011. The firm will be selected through appropriate competitive process to be prior reviewed by IDA. The internal audit report would be submitted to the Executive Director, BBA with a copy to the Chair, Project Audit Committee and the Project Director.

218. **External Audit.** In addition to the annual entity audit by a firm of Chartered Accountants, the Directorate of Commercial Audit under C&AG would audit the BBA accounts as per their constitutional mandate. The entity audit would continue throughout the project implementation period.

219. The Foreign Aided Project Audit Directorate under C&AG would undertake the annual project audit in line with the country system on audit of development projects with external financing. Considering the magnitude of the Project, BBA would agree with C&AG on FAPAD assigning one dedicated audit team under one Deputy Director for continuous audit of the Project throughout the project period and report on a semi-annual basis with a copy to IDA. In all future audits during the project period, audit TORs for the entity audit will be shared with IDA. FAPAD under C&AG will audit the annual project financial statements. A Statement of Audit Needs (SAN) will be prepared by the BBA and agreed with the C&AG. BBA will submit to IDA the audited financial statements for the project not later than December 31 each year. The SAN will include audit focus on testing the efficacy of internal control arrangements at various agencies and transaction testing for detection of fraud and corruption.

220. BBA is currently implementing a PPF for the Project, there is no outstanding audit report or ineligible expenditures. However, a large number of audit observations on the Bank financed Jamuna Bridge Project (ended in December 1999) implemented by the same agency is still outstanding though there is no declared ineligible expenditures. Though BBA has made some progress recently, the pace of settlement of the objections is very slow. BBA is preparing an Action Plan to resolve the outstanding audit issues. The following audit reports will be monitored in the Audit Report Compliance System:

Implementing Agency	Audit Type	Auditor	Report Submission Deadline
BBA	BBA Entity Financial Statement reflecting receipt and use of project funds	A Chartered Accountants Firm with international affiliations.	December 31
BBA	Audit of Project's Annual Financial Statements –Conforming with FMR submitted to IDA	Foreign Aided Project Audit Directorate (FAPAD) under Comptroller & Auditor General	December 31

221. **Project Audit Committee:** To ensure that the audit reports generated by the external, internal and operational audits of the project have met the TORs, the reports are reviewed and audit recommendations are followed up, BBA will set up a Project Audit Committee (PAC) with a composition acceptable to IDA by June 30, 2011. The PAC will conduct its business as per Audit Committee Charter (TOR) prepared by BBA and shared with IDA. The PAC would meet at least twice a year

222. **Supervision Plan.** The initial supervision will focus on compliance with all agreed actions, terms, and conditions including Project FM staff being assigned and on board, identifying any FM or disbursement issues in project implementation and agreeing on redressing measures. Padma Bridge Project's readiness for access to Project funds, use of computerized entity accounting system for Project

financial management, production of first Interim Unaudited Financial Report (IUFMR) on time, and use of internal controls on FM functions will be closely reviewed by IDA's FM unit both on the desk and at site as deemed appropriate for fulfilment of fiduciary objectives. In addition, supervision efforts will focus on testing transactions, reviewing payment processes against the defined control framework, and monitoring the progress of institutional preparedness and strengthening. The task team will also keep a watch on the progress of main stream FM reforms through implementation.

223. **Risk Analysis and Mitigation.** The overall project FM risk is rated as “High” in consideration of the country level high inherent risks, FM capacity at entity level, inherent project level high risks due to the large size with multiple financing agencies and substantial control risks on internal control, flow of funds and audit assurance.

224. **Financial Management Action Plan.** The following action plan has been prepared to address the weaknesses identified in the FM assessment. This has been discussed and will be finally agreed with BBA during appraisal:

Padma Bridge Project - Financial Management Agreed Action Plan

#	Issues	Actions Required	Completion date	Responsibility	Condition
1	An appropriate Computerized Accounting System to be in place for project FM functions.	<ul style="list-style-type: none"> ▪ SFMS on joining test the BAA computer software adequacy to apply for the project immediately on joining. ▪ On any inadequacy a tested locally available software to procure for the project along with maintenance agreement. ▪ A manual cash and bank book and excel sheet summarization table to apply during interim period for the preparation of IUFMR . 	On an inadequacy in current software tested software to procure within 90 days of project effectiveness	BBA	During implementation
2	FAPAD Audit. Considering the depth and dimension of a mega project/s fiduciary objectives, a dedicated FAPAD audit team would be required to be assigned to the project for more in depth audit and semiannual interim reporting	<p>Agree on a Statement of Audit Needs including agreement on:</p> <ul style="list-style-type: none"> • Deployment of a dedicated audit team • Submission of an interim audit report semiannually • A larger sample size of transactions to be covered under audit • Scope of audit of contractor and consultants operations covering inventory management and test of work quality and certification process. • Review of control framework 	June 30, 2011	BBA	During implementation
3	BBA Entity Audit over the Project duration Appoint audit firm with international affiliation under a TOR to be agreed	<ul style="list-style-type: none"> • Agree TOR with the Bank. • Ensure adequate budget for audit fees commensurate to value added audit objectives. 	31 Jan 2011 31 Mar 2011	BBA	During Project

	with the Bank	<ul style="list-style-type: none"> • Appoint Auditors for FY 2010-11 and 2011-12 . • Submission of audited financial statements FY11 • Submission of audited financial statements FY12 	31 Dec 2011		
			31 Dec 2012		
4	Outstanding audit objection on Jamuna Bridge Project	Resolution of the audit objections with FAPAD. An Action Plan to be prepared by BBA will be reviewed by IDA	December 2011	BBA BBA/IDA	During Project Implementation
5	Financial disputes and Litigation with BBA	List to prepared to draw an action plan to strengthen internal control and risk management framework	December 2011	BBA	
6	Internal Audit	BBA Audit team will continue as internal auditor under a program to be made available to the bank.. Appointment of a chartered accountant firm for internal audit on the basis of a TOR to be agreed with the Bank	Each year	BBA	Covenant

Disbursements

225. **Financing Plan.** The Project would be financed by an IDA credit SDR 779.3 million (US\$1,200 million equivalent), and ADB credit of US\$76 million and a loan of US\$539 million, a JICA credit of US\$400 million, Islamic Development Bank (IDB) financing of US\$140 million and the Government of Bangladesh (about US\$560 million).

226. As indicated in the procurement section, the main bridge would be financed by IDA, JICA and ADB. The River Training Works would be financed by IDA and ADB. Part of the approach road on the Janjira side (one the right bank of the river) would be solely financed by the IDB. Any remaining works on Janjira side that are not funded under the IDB financed contract would be funded by IDA. IDA would also fund the Component D (consulting services), Component E (Project Management, TA and Training) and implementation of EMP (Component C2) and part of the Component C1 (implementation of SAP).

227. **On-lending to BBA.** The IDA credit proceeds would be re-lent by GoB to BBA at the original terms. GoB would authorize BBA to withdraw the proceeds of the IDA credit and proceeds withdrawn by BBA would be considered withdrawn by GoB.

228. **Flow of Funds and Designated Account (DA).** Based on the onlending arrangements mentioned above, funds from IDA credit proceeds would be passed to BBA. BBA will open a Designated Account with such branch of any commercial bank as having adequate experience (in maintaining such accounts), acceptable to IDA. BBA would be managing the Designated Account. In addition to DA, the funds will also flow through Special Commitments and Direct Payments to the contractors and suppliers of works, goods and services.

229. IDA funds will flow to a Designated Account on the basis of six month forecasts through quarterly Interim Unaudited Financial reports (IUFRRs). Such expenditures forecast would be realistic based on the procurement plan, updated implementation schedule, and an analysis of payment obligations arising out of contracts regarding contractual progress milestones. The minimum application size for reimbursement, and direct payment would be 20% of the advances to the Designated Account and will be reflected in the additional instructions.

230. **Categories of Expenditures and Disbursement rate.** The disbursement schedule is provided in the Table 1 below. Part of the IDA credit for each component is allocated to the unallocated category so there would not be an exact match between the project cost/financing table figures and the IDA credit allocated to the expenditures categories --the difference is in the unallocated category. IDA would also finance Category 3 covering SAP/RAP related expenditures covering purchase of properties, compensation of assets for livelihood restoration etc, 100% up to US\$206.3 million and any expenditures above this amount would be financed by the GoB. Approval for the financing has been granted by the Land Committee.

231. Works for the Main Bridge procured as one contract are cofinanced by the ADB Loan, JICA Loan, IDA Credit and GoB. Similarly, works as one contract for river training works would be financed by the ADB Loan, GoB and IDA Credit, both would be financed from expenditure Category 1. An agreement has been reached with ADB and JICA that the disbursements for these works (Category 1) would be made sequentially by each development partner by the GoB/BBA. Based on advanced consultations during project implementation, the Borrower (GoB/BBA) would submit specific invoices/payment requests to a specific development partner against which the development partner would make full payment up to its total allocation for the category. Such payment requests by BBA would include an update of disbursement position indicating the cumulative disbursement made by each co financier against the amount committed and the balance remaining. Based on this procedure IDA financing rate of works category is shown as 100%. The actual financing share is shown in the table for financing plan.

Table 1 Allocation of Credit Proceeds (US\$ millions)

Expenditure Category	Total Amount	IDA c/ Amount	Financing Percentage
1. Works, Goods, and non-consulting services except under part A2.2 of the project	2,223.4	800.0	100% a/
(iii) Consulting Services	84.5	80.0	100%
3. Purchase of Land Property and other assistance as required under SAP/RAP (Component C1)	273.2	200	100% b/
4. Incremental Operating costs	15.2	10.0	100%
5. Refund of Project Preparation Advance	3.0	3.0	Amount payable pursuant to Section 2.07 of the General Conditions
6. Service and Commitment Charges etc during project construction/ implementation period	29.0	29.0	According to section 2.03 of the Financing Agreement
7. Unallocated	-	78.0	
Financed by other DPs without any cofinancing by IDA (IDB=162.2 M; ADB IDC=67 M; GoB- Construction Yards= 57.5)	286.7		
Total	2,915.0	1,200	

a/ The main bridge works and river training works each contracted through a single ICB contract would be and financed by IDA, JICA and ADB, and IDA and ADB respectively, and using GoB contributions. Based on the agreements reached various bills/invoices of the contract would be 100% financed by a specific cofinancier.

b/ SAP/RAP cost under component C1 of project cover purchase of properties, and compensation for assets assistance to the affected people and , and provision of related goods, works and services. IDA would disburse 100% of such costs up to US\$206.3 million and remaining expenditures are to be met by GoB.

c/ Part of the IDA credit for each component is allocated to the unallocated category so there would not be an exact match between the project cost/financing table figures and the IDA credit allocated to the expenditures categories --the difference is in the unallocated category.

232. **Operating Costs.** These costs will include incremental operating costs for office utilities, office supplies and stationeries, operation and maintenance of equipment and vehicles, hiring of vehicles, fuel, office rent, events, bank charges, advertising costs, and incremental staff salaries and contractual allowances of contracted staff but excluding salaries of Government officials.

Procurement

233. Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004, Revised October 2006 and May 2010 (Procurement Guidelines); and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, Revised October 2006 and May 2010 (Consultant Guidelines)) and the provisions stipulated in the Financing Agreement.

234. All expected major procurement of works and consultants' services has been announced in the General Procurement Notice (GPN), published in the dgMarket and United Nations Development Business (UNDB).

235. **Procurement Responsibility.** The overall responsibility of project implementation would be with the BBA under the Bridge Division of the Ministry of communication. The BBA would be responsible for carrying out all procurement under the project.

236. **Procurement of Works.** The project would have a few high value works contracts as described below that would be procured through international competitive bidding (ICB) following Bank's Procurement Guidelines and using the Bank's Standard Prequalification and Bidding Documents:

- (i) **Main Bridge Contract**, consisting of construction of main bridge, road viaducts, minimum required length of rail viaducts, services on the bridge, including minimum requirements for the installation of rail track in future, and separate facility for passing a power line. The contract is being procured using international competitive bidding (ICB) method, with pre-qualification (PQ) of the bidders, followed by two stage bidding procedure with alternate options for few parameters;
- (ii) **River Training Works**, the river training works contract for both sides (estimated to cost over US\$799.9 million) is being procured through ICB procedure using PQ and two stage method;
- (iii) **Approach Roads and Bridge end Facilities on Mawa side** would be an ICB contract (estimated to cost around US\$35 million) could be procured using PQ, followed by bidding. This would cover approach roads, Toll Plaza 1 and Service area 1;
- (iv) **Janjira Side Service Area 2** with office and other facilities estimated to cost around US\$31.7 million (and possibly approach road works that are not financed by IDB) would be procured through an ICB contract using PQ, followed by bidding.

237. In addition to the above four contracts, there will be another ICB contract for Approach Roads and Bridge end Facilities on Janjira side with an estimated cost of US\$162 to be financed by IDB following its Guidelines.

238. The works contracts estimated to cost less than US\$5 million for development of resettlement sites may be procured through National Competitive Bidding (NCB). NCB would be carried out under Bank Procurement Guidelines following the procedures for "Open Tendering Method" of the People's Republic of Bangladesh (Public Procurement Act 2006, Public Procurement Act (1st Amendment) 2009, and Public Procurement Rules 2008 (as amended in August 2009)- collectively referenced as PPA) with

the modifications outlined in the paragraph below and using standard bidding documents satisfactory to IDA.

239. For the purpose of National Competitive Bidding (goods and works), the following shall apply:
- (a) post bidding negotiations shall not be allowed with the lowest evaluated or any other bidder;
 - (b) bids should be submitted and opened in public in one location immediately after the deadline for submission;
 - (c) rebidding shall not be carried out, except with the Association's prior agreement;
 - (d) lottery in award of contracts shall not be allowed;
 - (e) bidders' qualification / experience requirement shall be mandatory;
 - (f) bids shall not be invited on the basis of percentage above or below the estimated cost and contract award shall be based on the lowest evaluated bid price of compliant bid from eligible and qualified bidder; and
 - (g) single stage two envelope procurement system shall not be allowed.

240. **Procurement of Goods.** Procurement of goods would be carried out using the Bank's standard bidding documents (SBD) for all ICB. Goods contracts estimated to cost less than US\$500,000 may be procured through NCB. NCB would be carried out under Bank Procurement Guidelines following the procedures for "Open Tendering Method" of the People's Republic of Bangladesh (Public Procurement Act 2006, Public Procurement Act (1st Amendment) 2009, and Public Procurement Rules 2008 (as amended in August 2009)- collectively referenced as PPA) with modifications as outlined in above paragraph and using standard bidding documents satisfactory to IDA.

241. **Works.** Contracts estimated to cost less than US\$100,000 and goods contracts estimated to cost US\$50,000 may be procured through Shopping. The Request for Quotation" under PPA is acceptable to IDA as a form of shopping.

242. **Procurement of non-consulting services:** Procurement of non-consulting services estimated to cost up to US\$2.0 million equivalent will follow NCB and contracts estimated to cost US\$50,000 or less will follow Shopping. Depending on the nature of procurement, BBA will carry out such procurement using Bank Guidelines.

243. **Selection of Consultants.** Selection of consultants will follow the Consultant Guidelines. There will be two high value consultancy firm contract using Quality and Cost Based Selection (QCBS) method. These two services are (i) construction supervision consultancy and (ii) management service consultancy. Besides, for RAP implementation and monitoring, audit, etc. the following methods will apply: Quality-based selection, Fixed Budget Selection (FBS), Consultants' Qualification (CQ), Least Cost Selection (LCS), and Single Source Selection (SSS). Selection of individual consultants will follow Section V of the Consultant Guidelines. The Procurement Plan will specify the circumstances and threshold under which specific methods will be applicable.

244. Shortlist of consultants for services estimated to cost less than US\$200,000 equivalent per contract may be composed entirely of national consultants. For the selection of these national consultants, the request for proposal prepared on the basis of PPA and acceptable to the Bank may be used.

245. **Operating Costs.** These costs will include incremental operating costs for office utilities, office supplies and stationeries, operation and maintenance of equipment and vehicles, hiring of vehicles, fuel, office rent, souvenirs, events, bank charges, advertising costs, and salaries and contractual allowances of contracted staff but excluding salaries of Government officials.

Assessment of the Agency's Capacity to Implement Procurement

246. **Procurement Environment.** Bangladesh has a nodal procurement policy agency and a Public Procurement Act (PPA) 2006 with associated Public Procurement Rules 2008 (PPR) and bidding documents. It created a critical mass of about 25 procurement professionals and, as of now, provided training to over 3200 staff of about 300 organizations. To sustain the reform, with Bank's assistance, the Government has been implementing a second procurement reform project since late 2007, focusing largely on the implementation and monitoring of PPA including introduction of e-government procurement at key sectoral agencies.

247. Notwithstanding the above, progress over the past years in reshaping the procurement environment through procurement reform that include harmonized procedures, recently the new Government made few amendments to the PPA that were found to be inconsistent with the Bank's Guidelines and good procurement practices. The Bank as well as other key development partners raised concern over those. The Bank for its projects did not accept those provisions for NCB as provided in the sections above.

248. **Procurement Capacity and Risk Assessment.** The procurement capacity assessment was carried out in BBA with web based Procurement Risk Assessment Management System (P-RAM S). The assessment covered legislative framework, procurement planning, procurement processing, organizational functions and staffing, internal control and support system, record keeping, and contract administration. A detailed capacity assessment report is available in the file. The agency lacks adequate procurement staff to manage such significantly high value procurements under this project. BBA had experience in a similar IDA funded project (i.e. Jamuna Bridge Project), but that project was completed in 1998. The staff that managed and implemented that project are no longer available in BBA. In addition to that, given the country environment, BBA is not immune to systematic issues affecting procurement efficiency and performance. Key weaknesses identified are: inadequacy in skilled procurement staff especially to deal with bidding documents and evaluations of significantly large value contracts; inadequate capacity in administering large and complex contracts; weak process of handling complaints; possible inappropriate and/or collusive bidding practice; vested interests and political intervention. In addition, the following areas need improvement: information dissemination, delivery follow up, and payments. Considering all the facts and the nature of large value contracts, the project is rated as "High-Risk"(High Impact/ High Likelihood) from procurement operation and contract administration viewpoint. Several measures to mitigate the risks are either in place or being put in place and have been described below

249. **Measures for Improving Governance in Procurement.** In order to minimize procurement associated risks, the following measures have been agreed with the Government, part of which are already in place while the remaining will be implemented as the project preparation moves and the project is implemented. . Additional procurement associated governance risks and measures are described in Annex 5.1.

- i) A panel of experts with high reputation in the associated fields has been advising BBA on management issues including commenting on the PQ documents;
- ii) A design consultant (firm) has been assisting BBA in preparing the pre-qualification and bidding documents for the main bridge and river training works. As part of the advance procurement actions, both of these contracts are currently at the prequalification stage; the consultant will also assist BBA in evaluations;
- iii) A checking engineer is reviewing the designs and technical aspects of the bidding documents including commenting upon them;
- iv) A short-term international consultant has been assisting BBA in the selection of a construction supervision consultant (CSC) and management consultants including short-listing, request for proposals, and evaluations;

- v) BBA will hire *by January 31, 2011* an individual national procurement consultant with sound knowledge of both local and international procurement;
- vi) BBA will establish a functional webpage as mentioned below with procurement related information accessible to public by December 31, 2011;
- vii) BBA will establish a system for handling complaints as described below and a database for recording, monitoring and follow up those complaints under the project by June 30, 2011; and
- viii) BBA will provide semi-annual report based on an agreed procurement risk mitigation plan (PRMP) with a set of features as mentioned below.

250. **Establish a system for handling complaints.** A credible system for handling complaints will be put in place in BBA. The database of BBA should also record, monitor and follow up the procurement activities under this project. The salient features of the system will be an oversight of a complaint database including provisions of ascertaining by a bidder from the implementing agency the grounds for rejection of its bid, a standard protocol with appropriate triggers for carrying out investigations, and actions taken against involved parties. The system will be developed and managed by the implementing agencies.

251. The Procurement Risk Mitigation plan (PRMP) will have following features:

- 1) **Alert bidders in pre-bid meeting.** BBA through a notification will alert bidders during pre-bid meeting on consequences of corrupt practices (fraud and corruption, collusion, coercion, etc.). The alert message, among others, will include that if bidders are found to have adopted such practices, there may be remedial actions including debarment from bidding processes in conformity with the Bank's Guidelines. For national competitive bidding, national bidders be barred, if any, under the PPA will not be able to participate. In addition, in the pre-bid meeting, the bidders will be clarified for preparation of bids correctly.
- 2) **Alert internal officers/staff.** BBA will issue alert letter(s) notifying about the fraud and corruption indicators and the possible consequences of corrupt and similar behavior in procurement practices and actions to be taken against the official staff if they get involved in such practices. Moreover, BBA will highlight that in case of noncompliance or material deviation from IDA's Procurement Guidelines, IDA may take remedial actions (i.e., withdrawal of funds, declaration of misprocurement) for concerned contracts.
- 3) **Multiple dropping.** Multiple dropping of bids (bids submitted in more than one location and opened in one location) will not be permissible for any procurement under this project.
- 4) **Bid opening committee (BOC) & Bid evaluation committee (BEC).** A formal structured BOC will be constituted for each contract package. The BEC will have at least five members with two experts from outside the procuring entity with proven track record of experience in procurement; depending on the type of procurement such experts shall be either from public offices and/or from professional bodies/ individuals of known probity. Formation of such BEC shall be in conformity with the Bank's Guidelines and be acceptable to the Bank. Individual consultants and / or representative of the consulting firm may participate as a member of the BEC.
- 5) **Bid opening minutes.** During the same day of bid opening, photocopies of the Bid Opening Minutes (BOM) with readout bid prices of participating bidders will be submitted by BBA for circulation to all concerned. For prior review packages, such BOM will be shared with IDA.
- 6) **Low competition among bidders and high price of bids.** The case(s) of low competition (not solely based on number of bidders) in ICB and NCB cases coupled with high priced bids will be inquired into and further reviewed by BBA. The review and decision in this regard would be in the context of qualification criteria, the contract size (too small or too large), location and accessibility of the site, capacity of the contractors, etc.

- 7) **Measures to reduce coercive practices.** Upon receiving allegations of coercive practices resulting in low competition, BBA will look into the matter and take appropriate measures. For prior review contracts, observations of BBA will be shared with IDA, along with the evaluation reports. BBA may seek assistance from law enforcing agencies to provide adequate security for bidders during bid submission. For ICB contracts, provision for bid submission through international/national courier services will be allowed and confirmation of the receipt of the bid will be informed to the bidders through e-mail.
- 8) **Rebidding.** In case of re-bidding, BBA will inquire into the matter, record and highlight the grounds of re-bidding (i.e. corruption or similar, high bid prices etc.) along with recommended actions to be taken. For prior review cases, all such detailed reports will be sent to IDA.
- 9) **Filing and record-keeping.** BBA will preserve records and all documents regarding their public procurement in accordance with provisions of the PPA, and these records will be made readily available on request for audit/investigation/review by the Development Partners and the Government.
- 10) **Publication of award of contract.** BBA will publish contract award information within two weeks of contract award in its website, dgMarket/ UNDB online, and CPTU's websites with the following information: identity of contract package, date of advertisement, number of bids sold, number of submitted bids along with names, bid prices as read out at bid opening, name and evaluated price of each bid, number of responsive bids along with name of bidder, name of bidders whose bids were rejected and brief reasons for rejection of bids, name of the winning bidder and the price it offered, proposed completion date of contract as well as brief description of the contract awarded.

252. **Procurement Plan.** A draft procurement plan covering all major procurement packages in ICB has been prepared for the entire duration of the project. This plan will be finally agreed between the Borrower and the Project Team prior to negotiations. It will also be available in the project's database and in IDA's external website for this project. The Procurement Plan will be updated in agreement with BBA at least annually to reflect the actual project implementation needs and adjustments thereof.

253. **Detailed Procurement Arrangements.**

Works

Ref No.	Contract Description	Estimated Cost (Million US\$)	Method a/	Review by Bank	Expected Date of			Financier
					Bid Opening	Evaluation	Award	
W1	Padma - Main Bridge Construction	1,339.8	ICB	Yes	Jul-11	Aug-11	Oct-11	IDA, ADB, and JICA
W2	River Training Works	799.9	ICB	Yes	Jun-11	Jul-11	Oct-11	IDA, & ADB
W3	Janjira Approach Road and bridge end facilities	162.2	ICB	Yes	Apr-10	May-10	Jun-11	IDB
W4	Mawa Approach Road and Bridge End Facilities	35	ICB	Yes	Jul11	Sep-11	Nov-11	IDA

W5	Janjira Side SA 2 and possibly app. road works not financed by IDB.	31.7	ICB	Yes	Jul-11	Sep-11	Nov-11	IDA
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Note a/ : All ICB contracts are subject to prequalification and with provisions of domestic preference.

Services

Ref No.	Contract Description	Estimated Cost (Million US\$)	Selection Method	Review By Bank (Prior/Post)	Expected Date			Financie rs
					Proposal Submission	Evaluati on	Award	
S1	Construction Supervision	65.00	QCBS	Yes	June-10	Dec-10	Apr-11	IDA
S2	Management Services	7.00	QCBS	Yes	Nov-10	Mar-11	Jun-11	IDA
S3	Project Audit	2.00	QCBS	Yes	Dec-11	Feb-12	Apr-12	IDA

254. **Review by IDA of Procurement Decisions.** The review by IDA of procurement decisions and selection of consultants will be governed by Appendix 1 of the Bank's Guidelines. For each contract to be financed by the Credit, threshold for prior review requirements and post review contracts will be identified in the Procurement Plan. During the first 18 months of the project, IDA will carry out prior review of the following contracts; this prior review threshold will be updated annually based on the performance of BBA:

- (i) **For Goods.** All the ICB contracts and Direct Contracts irrespective of estimated cost. The NCB Contracts estimated cost equivalent or more than US\$500,000.
- (ii) **For Works.** All the ICB contracts and Direct Contract irrespective of estimated cost. First NCB contract regardless of value and thereafter contracts estimated to cost equivalent US\$5,000,000 or more.
- (iii) **For Consultant's Services.** Prior review will be required for consultants' services contracts estimated to cost US\$ 200,000 equivalent or more for firms and US\$ 50,000 equivalent or more for individuals. All single-source contracts will be subject to prior review by and in agreement with IDA. All Terms of references of the consultants are subject to the IDA's prior review; and

255. **Frequency of Procurement Supervision.** In addition to the prior review supervision to be carried out by IDA, the capacity assessment of the Implementing Agency has recommended semi-annual supervision missions to visit the field to carry out post review of procurement action

Resettlement Action Plan (RAP) Costs.

256. The RAP related costs i.e. contracts for purchase of land and property and for other social costs would be based on the procedures agreed in the RAP and negotiated by the implementing agencies following Bangladesh law and guidelines for land/property acquisition and providing compensation to the project-affected people. The RAP costs would cover, purchase of land and properties, compensation of assets, assistance in moving and making such arrangements, consulting services, goods, works and any other related costs. Payments for purchase of properties and other compensation made by the Deputy Commissioners over US\$40,000 equivalent and by BBA above US\$100,000 equivalent for each

beneficiary would be subject to prior review by IDA and other payments would be subject to post review. The prior review threshold level would be reviewed after one year and adjusted as appropriately.

Monitoring and evaluation of outcomes/results

257. The BBA will submit quarterly reports in an appropriate format to the GoB, PSC, and PCC and the Bank no later than 45 days after the end of each quarter. The quarterly report would cover the progress and expected completion dates for civil works and equipment supply contracts, progress on institutional components, implementation of SAP and EMP, training and studies, and activities of the BBA/PMUs engineering, M&E, procurement and financial consultants. The reports would cover financial and procurement information, including: (a) comparison of actual physical and financial outputs with forecasts, and updated six-months project forecasts; (b) project financial statements, including sources and application of funds, expenditures by category statement, and special accounts reconciliation statement; and (c) a procurement management report, showing status and contract commitments.

258. The PMO will also prepare annual reports by no later than September 30 of each year of project implementation. The report will cover: (a) the progress of each component, implementation of key features of the environmental management plan, key performance indicators, operation of project facilities, and financial statements; and (b) the Annual Work Plan for implementation, annual funds required for implementation with breakdown by each co-financier, an updated disbursement profile, planned actions for mitigating negative effects during construction, and target indicators for the coming year. A mid-term review of the Project would be undertaken by October 31, 2013. An Implementation Completion Report (ICR) would be submitted to the Bank no later than six months after the closing date

259. A group of consultants shall be recruited for M&E of the Project impact, including the implementation and monitoring of the EMP, and the RAP. The M&E studies will evaluate the success in project implementation in terms of meeting the project's objectives, and assess its physical, hydrological, environmental, social, and economic impacts. The M&E activities will provide continuous feedback to the GoB and the PSC on the project's performance, in mitigating its impact on the various components, so that corrective actions can be undertaken in a timely manner. Changes in the PAD or the Project, if any, will be reflected in the implementation review aide memoires and or communicated through exchange of letters between the Bank and the Government. The Bank team would place an individual consultant in the country who would visit the project site on a regular basis (twice a week), particularly in first two years of the project, to monitor the project planning, implementation program for construction activities, communication strategy, and EMP and SDAP activities.

Role of Partners

260. The Project would also be financed by the ADB, JICA and IDB. The financing plan and mode of financing is described in the PAD already. The World Bank is Lead/Coordinator Donor for this Project. A memorandum of understanding (MOU) will be signed among the cofinanciers of the Project outlining the coordination arrangements and modalities for project implementation, application of procedures etc. Overall, the World Bank operations policies and guidelines would be applied to the Project. However, it is has been agreed that cofinanciers would use their best reasonable endeavours to harmonize and accommodate the procedures and guidelines of other cofinanciers. The MOU outlines that for:

- a. **Safeguards requirements.** Cofinanciers recognize the importance of environmental and social safeguards compliance requirements under the Project and agree to cooperate in implementation and monitoring of each safeguard document all of which have been are prepared for the Project and endorsed by each Cofinancier.
- b. **Coordination.** To ensure smooth operation an efficient implementation and monitoring of the Project implementation, cofinanciers coordination committee (CCC) composed of representatives of each cofinancier is put in place.

- c. **Procurement.** For contracts financed jointly, World Bank Standard bidding documents would be used and all cofinanciers would follow the requirements of World Bank Guidelines and the same would be specified in the bidding documents;
- d. The ADB would make adjustments to their procedures as needed to allow joint cofinancing of the contract with the World Bank, these may include participation of contractors from the non-ADB member countries, etc. The World Bank would make best efforts to ensure that the contractors, suppliers or individuals debarred by the ADB are not eligible for financing under contracts jointly financed by IDA and ADB.
- e. **Disbursements.** For contracts finance jointly, the Borrower may approach any of the cofinanciers to disburse entire amount of disbursement applications, subject to any retention conditions and upper limit of cofinancier's contribution.
- f. Cofinanciers also agree that **changes in the safeguard and procurement documents (or any project documents)** and other safeguard and procurement decisions would be subject to written agreement of each Cofinancier. The safeguard compliance review would be conducted jointly with a view to reach mutually agreed decisions. However, if a mutually agreed decision cannot be reached with 30 days then views of the Lead Cofinancier would prevail. If the cofinancier is unable to accept the Lead Cofinancier's view then such cofinancier will have a right to take actions as it reasonably considers necessary.

ANNEX 4. Operational Risk Assessment Framework (ORAF)

BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

Project Development Objective(s)

The PDO is to connect the south-western region to the rest of the country so as to stimulate economic growth by facilitating inter-regional, cross-river transport of passengers and freight, and transmission of natural gas, telecommunication and electricity in a cost effective manner.

PDO Level Results Indicators:	1. The south-west region is connected to the rest of the country.
	2. Quantum of freight and passenger crossing over the bridge, and transmission of natural gas and telecommunication systems over the bridge.
	3. Number of hectares protected against river bank erosion and floods.
	4. Number of people directly benefitting from the bridge.
	5. Reduction in travel time to Khulna and Jessore.

Risk Category	Risk Rating	Risk Description	Proposed Mitigation Measures
1. Project Stakeholder Risks			
Stakeholder Risks	High	<p>The risk that significant delays in completing the bridge, and problems in implementation of the social safeguards action plan may affect government's relationship with the donors.</p> <p>The project has to cope with a dynamic natural phenomenon (river flow). There is risk of controversy in implementation of the</p>	<p>As a result of the extensive preparation and consultations during planning and project preparation, there is broad agreement on the need for such transformational and regional connection project with the donors and other stakeholders.</p> <p>The project will provide extensive technical assistance to BBA through CSC, MSC and NGO for implementation, and POE will remain available to GoB to provide the best technical advice on issues as they may arise. PCC and PSC will closely monitor implementation progress and help ensure inter-agency coordination and address issues.</p> <p>Vigorous consultation process with the local communities during project preparation and design was followed and has informed the preparation of a comprehensive Social Action Plan (SAP). The POE provided expert advice on the social and environmental studies. The project will follow similar consultative process during implementation of the SAP (e.g., three Public Information centers managed by an NGO, preparation of an information booklet, extensive disclosure of information).</p>

		<p>environment and social safeguards plans, particularly involving major resettlement of people affected by the project.</p>	<p>NGOs will continue to support BBA in implementation of RAP and SAP. An independent consulting firm (MSC) will monitor implementation of SAP and EMP.</p> <p>The project will support BBA in implementation of a proactive communication plan, a public consultation strategy and a grievance redress mechanism.</p>
<p>Implementing Agency Risks</p>	<p>High</p>	<p>Limited capacity in BBA for project implementation, for O&M of the bridges, and to carry out its full functions is a serious implementation issue. As a division of the MOC, BBA's decision making may be subject to delays because of the government's tendency for centralized decision making on important matters.</p> <p>Lack of effective coordination among different BBA units could result in delays in the procurement process and contract management including in vetting the contract variance orders and payments to contractors. Corruption is a general concern in the implementation of large infrastructure projects. There is also a risk of fraudulent compensation payments to several thousand beneficiaries under the resettlement action plan.</p>	<p>The project will: (i) provide extensive support to BBA for a phased implementation of its capacity building program; (ii) provide a variety of support consultants (e.g., CSC, MSC, NGOs, procurement, FM) to help in overall project management including independent monitoring; (iii) set up and support a PMU/PMO in BBA, and PSC and PCC. The PCC and PSC will help resolve implementation issues, provide policy guidance and facilitate inter-agency coordination; (iv) develop and implement a communication strategy and a public consultation strategy to systematically and regularly disseminate project progress information to the public and seek timely public feedback to improve implementation; and (v) establish a grievance redress system. Six months before completion of bridge facilities, BBA will recruit an experienced O&M contactor on a five year term contract for monitoring and O&M of the bridge and associated infrastructure.</p> <p>The project will: (i) continue to support BBA through specialized consultants in the preparation of prequalification and bidding documents for the main bridge and RTW, bid evaluations, and in the selection of CSW and MSC; and (ii) establish a functional webpage for procurement information accessible to the public and a system for handling complaints.</p> <p>The bidders will be required to fully disclose any agents used by them during the procurement process, along with the terms on which those agents were hired, to declare any direct or indirect relationships with government officials in relation to the subject tender, and to certify that a bidder does not have any such conflict of interest. The contracts will contain robust audit clauses to permit access to company documents related to procurement and contract implementation, and to any documents generated during those processes. The audit clause will also apply to companies that bid but did not win. The pre-qualification panel and bid evaluation committee members will be required to declare any potential conflict of interest including relationships with government officials and bidders.</p> <p>CSC, as engineer for construction supervision, will supervise large works contracts and certify all bills of works contracts for payment. A qualified professional accountant with experience in large infrastructure projects would work as Senior</p>

			<p>FMS in BBA's PMU.</p> <p>An NGO would support BBA in implementation of the resettlement plans and MSC will provide independent monitoring. Large payments would be subject to prior review.</p> <p>The BBA will recruit, by June 2011, a chartered accountant firm with international affiliation for conducting internal audits of the project. On external audits, the annual entity audits will be by a firm of Chartered Accountants, and the Directorate of Commercial Audit of C&AG would conduct annual project audits by a dedicated audit team for continuous audit throughout the project period. The TORs for the audits would also cover special examination of the controls and compliance with the agreed-upon procurement procedures.</p> <p>During regular implementation support missions, the team will monitor progress of payment processing, financial reporting and implementation of the overall governance and accountability framework.</p>
Project Risks			
Design	Medium-I	<p>The risk of a catastrophic failure or poor performance due to poor designs and engineering works.</p> <p>BBA itself does not have adequate capacity for proper supervision and for addressing technical issues during implementation.</p>	<p>An internationally reputed company has designed the works, and a checking engineer has reviewed and checked the designs according to standard practices for such projects. POE has advised the government on the designs and engineering issues, and will continue to advise BBA on crucial technical issues.</p> <p>Feedback from the extensive consultations with the local communities throughout project preparation has also informed the project design.</p> <p>CSC and MSC are being recruited to support BBA to carry out the roles of the "engineer" for civil works contracts and of the "employer" under the civil works contracts, respectively.</p> <p>Additional expertise would be mobilized when required to review and check the technical issues.</p> <p>Not later than the start of civil works for the main bridge or RTWs, BBA will open and maintain a Padma Bridge Fund of at least \$20 million to finance expenditures of an emergency nature during construction of the Padma Bridge and gradually increase the Fund to \$50 million after completion of the project.</p>
Social & Environmental	High	Project involves resettlement of 76,211 people in 13,578	The project will provide specialized NGOs for implementation of the different programs under the SAP.

		<p>households that may be affected by the project, and is expected to impact on public health and may have impacts on people living on <i>charlands</i> near the project sites. Large scale construction on the Padma river covering a large area will have significant environmental impacts. Safeguards and environment management issues are always sensitive, and there is risk that appropriate risk mitigation measures are not applied properly.</p>	<p>The detail design consultant (DDC) and CSC will hire resettlement specialists to assist and advise BBA's PMU in implementing the SAP.</p> <p>The project will provide for MSC to independently monitor and evaluate the SAP implementation.</p> <p>BBA will recruit a specialist to assess training needs of the various offices and institutions involved in SAP implementation, and implement the training program to improve its capacity.</p> <p>The project will support BBA in designing a communication strategy and a public consultation strategy to proactively disseminate project information and engage stakeholders in project implementation.</p> <p>BBA will establish a Grievance Redress Mechanism with representation to allow voices of the affected communities to be heard and ensure a participatory decision making process.</p> <p>The Bank will carefully supervise implementation of the Bank approved environmental management and social safeguards action plans.</p> <p>Six months prior to completion of the project BBA would establish an environmental and social fund of US\$10 million to address any outstanding environmental and social/resettlement issues after completion of the Project.</p>
<p>Program and Donor</p>	<p>Medium-I</p>	<p>The project will be financed by three other donors (Asian Development Bank, JICA and the Islamic Development Bank). There is risk that different procurement, financial management, and environment and social safeguards requirements of the DPs, particularly procurement requirements, could become an issue in project design and implementation.</p>	<p>The Bank will continue to work throughout implementation with BBA and the DPs to achieve harmonization of the procedures. An MOU has been agreed defining coordination arrangements among the DPs that would be signed after signing of the Financing Agreement.</p> <p>While World Bank guidelines will be followed in all aspects of the project, efforts would be made to accommodate the requirements of all DPs as it has been possible so far without any deviation from the Bank Guidelines.</p> <p>At this stage it is not possible to foresee circumstances or issues on which conflicting guidelines or disagreement in application of the guidelines would lead to problems in implementation of the Project. If such a situation was to arise and a pragmatic/justifiable solution would require a waiver of the World Bank Guidelines, the staff would seek appropriate waiver from the Board.</p>

<p>Delivery Quality</p>	<p>High</p>	<p>There is risk that BBA may not have adequate capacity to manage and maintain the Padma bridge and RTWs upon completion in addition to the Jamuna bridge.</p> <p>Toll rates for Jamuna bridge have not changed since its inception (1998) and are now less than half in real terms. RTWs for the Jamuna bridge need repairs and the main Jamuna bridge now requires resources to maintain it properly. There is risk that the GoB may not implement adequate toll charges for both the Jamuna and Padma bridges at levels to enable the BBA to cover from its revenues the (i) proper O&M of the bridges and RTWs to sustain the physical assets, (ii) administrative costs, and (iii) debt service payments, required for BBA's financial sustainability, and that without adequate toll rates, the Padma bridge could become a financial burden on the GoB.</p> <p>There is risk that actual traffic volumes may be lower than those assumed for the analysis, further affecting BBA's financial viability.</p>	<p>BBA would institute and enhanced system of safety review of the infrastructure owned by it. BBA would institute a regular annual and three more intensive bridge safety reviews by a panel of experts with appropriate skills consisting of national, international and expatriate experts. The panel would carry out the safety assessment provide appropriate solutions, guidelines and methodology and will also play a advisory/supervisory role during implementation of major repairs. The panel's reports would be discussed at the BBA Board and shared with the Cabinet, civil society and the concerned stakeholders. BBA would ensure that first safety review of the Jamuna Bridge under this system would be carried out by October 31, 2011.</p> <p>Six months prior to completion of the Padma bridge, BBA will recruit an experienced O&M contractor for monitoring and O&M of all project facilities (i.e., main bridge, RTWs, approach roads, toll plazas and collection of tolls) under a five-year contract.</p> <p>A toll policy and a time-bound implementation plan that are satisfactory to IDA, for the Jamuna and Padma bridges have been agreed with GoB. In case of lower traffic volumes, the Bank will further discuss with GoB toll levels and elimination of subsidies in ferry operations.</p> <p>The project will provide support to BBA in project implementation and monitoring through specialized consultants particularly the CSC and MSC, and NGOs in SAP implementation.</p>
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		BBA's capacity to accurately monitor implementation of the project, and manage large complex contracts is limited.	
Other: Economic benefits	Medium-I	There is risk that actual traffic volumes may be smaller than those assumed for the economic analysis of the project.	If such a risk is realized then dialogue would be undertaken with GoB to adjust toll levels, and eliminate subsidies in ferry operations.

Overall Risk Rating at Preparation	Overall Risk Rating at Implementation	Comments
High	High	Although every effort has been made to learn from the past experience in implementing the Jamuna bridge and other large Bank financed infrastructure projects, and design the project and implementation arrangements accordingly, including prior completion of the detailed design of the construction works, extensive attention over the past decade to the assessment and management of the environmental and social safeguards aspects, and the implementation, construction and operational plans, the risks during preparation and for implementation are rated High in view of the (i) mere size of this transformational project, (ii) complexity of the large construction contracts on a river with unpredictable morphology, (iii) significant socio-environmental impacts, (iv) construction issues that may arise due to unforeseen circumstances, (v) potential issues that may arise in harmonizing the requirements of the donors in particular on procurement, (vi) risks that the GoB may not implement the agreed toll strategy, (vii) significant reputational risks to the Bank that may arise due to technical and engineering issues during construction and in implementation of the environment and social safeguards aspects of the project, and (viii) risks related to BBA's capacity, procurement, coordination and fraud and corruption.

Annex 5: Implementation Support Plan
BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

Strategy and approach for Implementation Support⁸

261. The strategy for implementation support (IS) has been developed based on nature and “High” risk profiles of the proposed project. It will aim at making the support to the client for implementation more flexible and efficient and focus on the implementation of the risk mitigation measures defined in the ORAF.

- **Procurement:** There are two very large ICB contracts, Main Bridge (US\$1.4 billion) and RTWs (US\$800 million), three medium size contracts for approach roads. Several small contracts for development of RAP sites etc. The Bank team have been providing and continue to provide implementation support by: (a) technical, management and procurement expertise funded from the ongoing PPF; (b) training to members of the procurement committee and related staff in the regional project offices, as well as the project management consultant; (b) reviewing procurement documents and providing timely feedback to the procurement committee; (c) providing detailed guidance on the Bank’s procurement guidelines to the procurement committee; and (d) monitoring procurement progress against the detailed procurement plan developed by BBA.
- **Financial management:** Supervision will review the project’s financial management system, including but not limited to accounting, reporting and internal controls. Supervision will also cover sub- projects on a random sample basis. The Bank team will also work with the project management consultant to assist BBA in improving coordination among different departments and units for financial management and reporting.
- **Environmental and social safeguards:** The Bank team will supervise and provide supports to BBA for the implementation of the agreed Environmental Management Plan and the Simplified Resettlement Action Plan.
- **Anti Corruption:** the Bank team will supervise the implementation of the agreed Governance and Accountability Action Plan.
- **Technical Aspects/Independent Panel of Experts:** The Bank credit would support an independent panel of experts consisting of internationally renowned experts in the fields of Bridge, river, and structural engineering, geotechnical and foundations expertise, structural construction technology, environmental and social, and institutional and livelihood restoration aspects.
- **Coordination with the Development Partners.** Bank team would help Government in coordination among the Development Partners, help in addressing project management, procurement, disbursement, financial management as well as the safeguard issues.
- **Other issues:** Some issues like toll strategy, O&M of the bridges, strengthening of BBA, etc. will not be addressed just at the Project level but through Bank’s policy dialogue with the GoB, Ministry of Finance, and BBA.

⁸ This is an indicative and flexible instrument which will be revised during implementation as part of the ISR and adjusted based on what is happening on the ground. The implementation plan should be consistent with the design and riskiness of the operation, and should be adequately resourced.

Implementation Support Plan

262. Most of the Bank team members will be based in the Bangladesh country office, some would be in Washington and others in country offices in the region to ensure timely, efficient and effective implementation support to the client. Timely monitoring and support to BBA will be mainly provided by the team members in the country offices of the region, especially for the first 18 months. Formal supervision and field trips will be carried out semiannually. The supervision mission would be coordinated with the other Development Partners (DPs) jointly financing the project. To the extent most almost all supervision missions would be undertaken jointly with other DPs.

263. Detailed inputs from the Bank team are outlined below:

- **Technical inputs.** Bridge engineering and river engineering inputs are required to review of bidding documents to ensure fair competition through proper technical specifications in the bidding documents and fair assessment of the technical aspects of the bids. The task team has contracted with individual consultants for these skills. Specialist and high level procurement skills are required for review of the major works contracts as well as the two consulting services CSC and MSC. During construction and commissioning, technical supervision is required to ensure contractual obligations are met on technical grounds. Field visits by the team's Bridge and River Engineers will be conducted on a semiannual basis throughout project implementation.
- **Fiduciary requirements and inputs.** Training will be provided by the Bank's financial management specialist and procurement specialist. The team will also help BBA identify capacity building needs to strengthen its financial management capacity and to improve procurement management efficiency. Both financial management and procurement specialists will be based in the country office to provide timely support. Formal supervision of financial management will be carried out semi-annually, while procurement supervision will be carried out on a timely basis as required by the client. The BBA would be provided by the consulting services in this area and assistance by CSC and MSC. In addition under component E of the project funds are available to the BBA for recruitment of specialized skills as needed. Bank can help in identifying the consultants needed for these required skills.
- **Safeguards.** Inputs from an environment and a social specialist are required, though the project's social and environmental impacts are limited and the client capacity is generally adequate. Training is required on environment monitoring and reporting. On the social side, the supervision will focus on the implementation of the agreed land acquisition and resettlement plan. Field visits are required on a semi-annual basis. Both social and environmental specialists are country office based. The MSC would help in independent monitoring of the safeguard issues and highlighting to the Bank team any issues, possible alternative solutions in a timely manner.
- **Institutional Review of BBA and capacity building.** Input would be required from highly qualified institutional specialist to support and monitor BBA in capacity building component of the Project.
- **Financial review of BBA corporate finance.** Input is required from a highly skilled financial specialist for regular review of BBA financial status to verify compliance of financial covenants.
- **Operation.** An operations officer based in the country office will provide day to day supervision of all operational aspects and coordination with the client and among Bank team members.

The main focus of implementation support is summarized below:

Time	Focus	Resource Estimate	Partner Role
First Year of the Project	Technical Review, procurement review, site review, bidding documents	Bridge Engineer (with Proc exp.) 4 SWs River Engineer (with Proc ex.) 3 SWs Procurement Specialist 5-6 SWs	Skills shared with DPS
Or 18 months	Procurement Training, FM Trainings and	Procurement and FM Species 5 SWS	NA
	SAP/RAP Implementation, Land Acquisition	Social Specialist/ RAP Specialist 6 SWs	May be shared with DPs
	Environmental supervision	Environmental Specialist 6 SWs	May be shared with DPs
	Institutional and capacity building of BBA, Financial and toll strategies etc	Institutional Specialist 4 SWs Financial Sp, 4 Sws	
	Transport systems, approach roads	Transport specialist 3 Sws	
	Team Leader	TTL 8 SWs	
Year 2-5 of the Project Sws per year	Project construction	Bridge Engineer 4 SWs RTWs Engineer 3 SWS Procurement and Contract management 4 Sws	NA
	Environmental and social monitoring	Environmental Sp. 4 Sws Social/RAP Sp. 6 Sws	NA
	Financial Management, disbursement and reporting	FM Specialist, Disbursement Sp. 4 Sws	
	Institutional arrangements, capacity building of BBA, financial strategy for BBA	Institutional Sp. 3 Sws	NA
	Task leader Ship	TTL 8 Sws	NA

The staff skills mix required is summarized below

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Bridge Engineer	4 SWs annually	Fields trips as required.	International
River Engineer	3 SWs annually	Field Trips as required	International
Procurement	4/5 SWs annually	Fields trips as required.	Country office based
Procurement Specialist	2 SWs Annually		International
Social specialist (national)	8 SWs annually	Fields trips as required.	Country office based
Social Specialists (intern.)	5 SWS Annually	Field trips as required	International/Regiona 1

Environment specialist	3 SWs annually	Fields trips as required.	Country office based
Environmental Sp.	3 SWs Annually	Field trips as required	International
Financial management specialist	3 SWs annually	Fields trips as required.	Country office based
Institutional Specialist	4 SWs annually	Field trips as required	International
Task Team leader	6 SWs annually	Fields trips as required	International/Country based

ANNEX 5.1: GOVERNANCE AND ACCOUNTABILITY ACTION PLAN (GAAP)

BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

264. The Governance and Accountability Action Plan (GAAP) for the Padma Multipurpose Bridge Project (PMBP) is designed to reflect the specific responsibilities of the implementing agency, the Bangladesh Bridge Authority (BBA), and the World Bank to facilitate effective and appropriate use of the funds for the project, preclude the incidence of corruption and enhance good governance. This plan is based on an assessment of the governance risks, particularly fraud and corruption, the context for addressing Governance and Anti-Corruption (GAC) issues in Bangladesh and specifically for the entities involved with the PMBP. It also is based on Bank experience in addressing governance and anti-corruption issues, and, in particular, the Bank's experience in having financed the earlier Jamuna Bridge project. The GAAP will be adjusted as necessary during implementation to reflect governance issues which may emerge and/or to strengthen or add actions. It will be monitored regularly through indicators and reflected in monthly progress reports by the implementing agency, as well as in World Bank implementation supervision reports and aide memoires for supervision missions.

Country Context and Background Analysis.

265. Bangladesh is a high risk environment. It scores poorly on international corruption monitoring indices although there have been some improvements in recent years. Its efforts to bolster its legal framework to counter corruption, including the empowerment of an Anti-Corruption Commission, passage of an Anti-Money Laundering Act, a soon-to-be adopted law protecting whistle-blowers, and joining the UN Convention against corruption have not yet yielded substantial gains. Institutions of accountability are weak and country systems to deter corruption such as asset statements or prosecution of corruption cases are spottily enforced. These capacity and governance shortcomings in the public sector, combined with the susceptibility of large civil works projects worldwide to fraud and corruption, underline the importance of an action plan that utilizes a robust range of tools to mitigate corruption and poor governance risks. This GAAP seeks to achieve these objectives, and will be adjusted as is necessary to new circumstances and to challenges and risks throughout project implementation.

266. The PMBP is an extremely high-profile project, which in itself has important implications for governance. On the one hand, the people of Bangladesh, the majority of civil society, and especially the people of the Southwest Region and the project area support the project. They are keen to ensure that it is implemented properly and on time. It is the signature project of this Government, whose current political mandate expires in 2013. Prominence invites scrutiny: media are constantly examining the status of the project, tracking various activities such as prequalification, procurement, contracting land acquisition, compensation, etc. Moreover, the size of the works involved are so large that they will be observed by major organizations and governments of contractors' countries of origin, other contractors internationally, professional and engineering societies and the international press. For this reason, strong latent demand for good governance exists.

267. The project's prominence is also significant for potentially providing a model for good governance and sound institutional arrangements, thereby generating positive demand-side pressures on other institutions in the public sector. Several GAC measures and robust arrangements have been introduced in this project to provide additional checks which are somewhat unique to this megaproject, and may be less transferrable in terms of institutional development to public sector performance as a whole. However, some good practices contributing to successful implementation, such as extensive *suo motto* disclosure as per Bangladesh's Right to Information Act or third party monitoring of procurement practices will serve as a valuable example for other public sector bodies and development projects.

268. The Bank's strategy for improving governance in Bangladesh, laid out in its 2011-2014 Country Assistance Strategy, focuses on developing accountability mechanisms in public sector operations, especially through increased transparency. The Bank seeks to align with Government priorities in developing the means of accountability, especially strengthening of public financial management, support for local government, use of information and communication technology (ICT) and the adoption of a Right to Information (RTI) regime. In particular, the Bank is working with the Government to improve budgeting practices among line agencies in conjunction with enhanced accountability mechanisms. It is working to increase the role and quality of oversight of public finances by the Parliamentary Accounts Committee, improve capacity of the Comptroller and Auditor General's Office, and promote greater public understanding of public financial management to build more informed demand and ability to hold Government accountable. The Bank's strategy also focuses on improving public service delivery, a key component of which is fostering greater accountability to recipients of services including through a strengthened role for local government. The Bank supports the Government's efforts to establish functioning RTI regime, including building capacity in all agencies to provide information more fully and efficiently. The Bank also continues to emphasize the importance of building demand for good governance among civil society, which in turn requires facilitation of avenues for civil society to engage with, and monitor the performance of, the public sector.

269. The Bank maintains a strong policy against corruption, and presses for sanctions on those who engage in it. Similarly, the Bank recognizes the importance of strengthening country systems to prevent corruption from occurring. Given the heightened integrity risks for this project, the GAAP is based on ensuring that every action in the project is identified in detail and subject to heightened multi-party scrutiny. Complementing this GAAP is the Bank's regular system of investigation and potential sanctions for fraud and corruption operated by its Integrity (INT) Vice Presidency (including cross-debarment provisions with other multilateral development banks). INT's preventive services unit was consulted in defining this project's GAAP.

270. The Jamuna Bridge Project and experience with other large infrastructure projects offer lessons for addressing GAC concerns which have been internalized in the PMBP. These include: (i) designing a procurement plan that allows for extensive scrutiny and obtains the best construction expertise available; (ii) engaging in comprehensive prior consultations and designing an effective communications strategy during construction; and (iii) ensuring multiple, robust monitoring mechanisms. The Project Monitoring will involve dedicated staff in the Project Management Unit (PMU) for engineering, construction supervision by internationally recruited Construction Supervision Consultants (CSC) who would be the "engineer" for the civil works contracts, consultant support for environment and social aspects and an independent M&E consultancy (internationally recruited Management Support Consultants) to monitor progress and supervise the Environmental Management Plan (EMP) and Social Action Plan (SAP) activities. It will also involve enhanced Bank supervision, including an in-country consultant who would visit the project site on a regular basis in the first two years of the project, when construction will be taking place, to keep the Bank and the project coordination committee and project steering committee informed of issues arising in project implementation.

271. However, audit observations on the Bank-financed Jamuna Bridge Project (ended in December 1999) implemented by the same agency are still outstanding, though no ineligible expenditures were declared. Though BBA has made some progress recently, the pace of settlement of the objections is slow. BBA has prepared an action plan to resolve the outstanding audit issues, which will be reviewed by the task team.

272. Institutional arrangements for implementation were determined through analysis of the relevant institutions and lessons learned from the past. The BBA, an entity under the Bridges Division of the Ministry of Communication, was *a priori* the appropriate institution given its mandate. It is the successor

entity to the Jamuna Bridge Authority, the special purpose entity which successfully implemented (on time and on budget) the previously largest bridge project in Bangladesh. The BBA has demonstrated a good track record of on time and on-budget implementation of large infrastructure projects in Bangladesh. Contrary to the Roads and Highway Department, the BBA has a stronger record of performance and a higher degree of transparency, accountability, and integrity. For these reasons, the BBA has been entrusted with the implementation of the PMBP in conjunction with robust monitoring measures.

273. The BBA underwent an external institutional review in two phases in late 2009 in anticipation of its role as implementing agency under PMBP. The review found that the BBA had a small range of functions related to the maintenance of several large bridges despite the broader, if vaguely worded, mandate set forth in the Act which created it. The review noted that, in part because of the low volume of work, the agency had a top-heavy structure with weak technical capacity with the partial exception of the Engineering Department. It also suffered from low morale and a bureaucratic culture that was not results-oriented. Key staff from the Jamuna Bridge project were no longer at BBA. These findings informed a capacity building plan involving the establishment of a robust Project Management Unit in recognition of the one-off nature of intensive work during the tendering and construction for this major bridge, expected to be the last such megaproject for the foreseeable future.

274. BBA also underwent a review of its procurement and financial management systems. This included a procurement capacity assessment with the web-based Procurement Risk Assessment Management System (P-RAM S). The assessment covered the legislative framework, procurement planning, procurement processing, organizational functions and staffing, internal control and support system, record keeping, and contract administration. Capacity in all these areas was found to be in need of strengthening. In addition, a review of financial management systems was conducted and identified significant accounting and internal audit weaknesses that will need to be addressed under the project. On this basis, Government prepared a capacity enhancement plan for BBA in 2010, the implementation of which has been incorporated in this GAAP. The capacity building and strengthening of BBA is supported through ongoing Project Preparation Facility (PPF of US\$3 million), and ADB support technical assistance loan and substantial resources are incorporated in the project (component E2 about US\$14 million) to continue enhancing BBA's institutional capacity.

Governance and Corruption Risks

275. Four areas of GAC risk have been identified under the PMBP: institutional and organizational weaknesses in the implementing agency; specific procurement risks; contract management and execution risks; and fraud and corruption in implementing the SAP/RAP.

276. **Institutional Risks.** The BBA suffers from systemic issues involving the civil service which affect procurement efficiency and performance, including a need for greater accountability. Stronger accountability for performance and internal controls to counter fraud and corruption are needed. Systems for provision of information to the public and handling complaints or feedback from third parties on performance are nascent. As noted above, assessments of capacity for procurement and financial management have been identified areas for strengthening.

277. **Procurement risks.** Possible risks include fraud, corruption, collusion, and coercion amongst parties involved in the procurement process. For example: collusion among the bidders; corruption involving bidders and government officials; fraudulent documents; corruption between the bidder and the engineer; and corruption between the winning bidder and the approving authority. Conflicts of interest may present a serious problem, most notably through relationships with government officials, whether direct or indirect, including through companies and/or relatives of officials.

278. **Contract execution and project management risks.** Collusion is also possible between the contractor and the PMU, including but not limited to aspects related to quality assurance, extension of time, variations to contract and price adjustment. Collusion can also involve the independent Construction Supervision Consultant (CSC) retained to serve as engineer on the contracts and oversee technical implementation. However, this would be a substantial reputational risk for the internationally recruited consultants, also the Bank Standard Bidding Documents modeled on the FIDIC documents have provision to deal with possibility of such collusion.

279. **Risks in delivery of benefits under the Social/Resettlement Action Plan (SAP/RAP).** Fraud is possible in the identification of recipients by either delivery agents or individuals seeking benefits, as well as in inflating numbers of benefits recipients with false or 'ghost' entries.

Actions to Mitigate GAC Risks

280. GAC concerns will be addressed through a combination of project design and special measures to reflect three basic principles: maximum transparency and provision of information about every step or action undertaken including the individuals or entities involved; ensuring that multiple parties are in place to provide external assessment of the actions that are undertaken in order to have a robust system of scrutiny and checks; and enhanced use of mechanisms for feedback from individuals outside the implementation of the project, particularly through use of ICT. Below is a summary of the actions to be undertaken followed by a matrix summarizing the actions, responsible entities, timelines, and warning signs to trigger additional review through Bank supervision and/or investigation. It is important to stress that these measures are not meant to be exhaustive. Depending upon emerging risks highlighted by more intense project monitoring, additional measures may be necessary

281. Institutional risks. BBA is provided with (using PPF Funds) more skilled and professional staff to deal with bidding documents and evaluations of large value contracts, and to administer large and complex contracts. To strengthen financial management systems with enhanced internal controls, including a more robust internal audit capacity additional staff have also been recruited. BBA will also adopt a code of ethics for its staff's conduct in order to emphasize the need for propriety and to strengthen internal controls.

282. The Project Management Unit has been strengthened with externally-hired staff to be responsible for day-to-day implementation within the BBA (a detailed description of administrative and project oversight arrangements is in Annex 3). Specifically, there will be dedicated staff in the Project Management Unit for engineering construction supervision by an internationally recruited Construction Supervision Consultants who would be the "engineer" for the civil works contracts, consultant support for environment and social aspects, and an independent M&E consultancy (internationally recruited Management Support Consultants) to monitor progress and supervise the Environmental Management Plan (EMP) and Social Action Plan (SAP) activities.

283. The BBA will also designate as per the Right to Information Act an information officer dedicated to PMBP as well as an internal appellate authority (having jurisdiction to hear appeals and review decision) for requests for information. The information officer and appellate officer will be provided with sufficient training on the Right to Information regime and adequate staff and administrative support to carry out an expansive communications program of proactive disclosure (described below)

284. Multiple oversight entities will scrutinize BBA's performance, particularly on governance and countering corruption. First, the BBA's performance will be overseen by a Project Coordination Committee chaired by the Minister of Finance or his/her designee. Second, the Management Support Consultants (MSC), which reports to the Bridges Division and the Project Steering Committee, will also

commission an additional outside party to carry out monitoring and evaluation of project performance, including of financial management. Third, the project will continue to have an Independent Panel of Experts (IPOE) consisting of an equal number of eminent Bangladeshi and expatriate experts to review the designs for the project. The IPOE primarily provides technical review but also will ensure additional scrutiny to guard against corruption. With individuals of professional competence and well-regarded reputations, it has unique technical capacity to recognize misconduct in performance of works that others might miss. It is anticipated that some individuals on the panel may be substituted as the project goes to the construction phase, but the principle of a mixed Bangladeshi-expatriate grouping will remain.

285. The most senior oversight entity will be a *Project Integrity Advisor* appointed by, and solely accountable to, the Prime Minister. The Project Integrity Advisor will have the authority to take decisions and report to the Prime Minister concerning project governance issues independent of staff and individuals engaged in project implementation. This individual will serve as a figure of institutional integrity for the project, and as such must be a person who is recognized within Bangladeshi society for integrity, independence, and concern for the public good. The position will be endowed with powers to require provision of information and documents from all project-related entities and individuals which, if there is cause, may be subject to further investigation and legal action. The Project Integrity Advisor will serve as the liaison to the World Bank and other co-financiers on all issues related to governance and corruption. The creation of this institutional arrangement will signal the commitment of the Government to ensure the highest standards of integrity in carrying out the project. Terms of reference for the Project Integrity Advisor will be developed in consultation with IDA. The GoB will not later than March 15, 2011 issue an order, in form and substance satisfactory to IDA, which shall include inter alia: (a) the appointment of a Project Integrity advisor, with independence from Project implementation satisfactory to IDA, and (b) the terms of reference of such Project Integrity Advisor.

286. The project will provide extensive access to a broad range of civil society organizations and media regarding all aspects of project performance as part of its communications strategy. This will entail regular Accountability meetings with civil society organizations (CSOs) operating near the project site and in Dhaka as well as visits at BBA offices and the project site to demonstrate project progress and allow for questions. CSOs will be expressly informed that they are free to ask any questions and receive any information about the project.

287. A qualified professional accountant with appropriate experience in financial management of large infrastructure project will work in the PMU as the Senior Financial Management Specialist (SFMS), reporting to the Project Director, with terms of reference agreed with the Bank. Because BBA's internal audit unit requires enhancement, these functions (including capacity building) will be conducted by hiring a local chartered accountant firm with international affiliation, selected through appropriate competitive process subject to prior review by the Bank. Another firm of chartered accountants with international affiliation will carry out the external audit throughout the project implementation period. Given the magnitude of the project, BBA would agree with the Comptroller & Auditor General's Foreign Aided Project Audit Directorate to assign one audit team for continuous audit of the Project throughout the project period and report on a semi-annual basis with a copy to IDA and co-financiers.

288. **Procurement Risks.** These risks are addressed through the overall design of the project and through enhanced transparency, in addition to following Bank ICB guidelines with its requirements for firm timelines, transparency, and other mechanisms to guard against corruption. Works, goods, and services procured under the project have been grouped into five large contracts (four of which involve IDA financing) to be carried out at one site. This concentration of contracts allows for extensive scrutiny and special arrangements for each procurement and subsequent management of execution. In order to avoid undue influence on procurements, a detailed mapping of each step in the procurement process with a designation of a finite list of persons with access to specified documents and associated information will

be put in place and shared with the World Bank and monitored/verified through Bank supervision. The mapping will be reviewed by the Bank in order to ensure appropriate access to sensitive documents on a need-to-know basis and maximum publication of other documents. Technical Evaluation Committee (TEC) for each of the contracts will have a mixed composition to provide for system of checks and monitoring to guard against collusion. The TEC for evaluation of bids will include eminent external representatives (such as well recognized staff from technical universities), representatives from other government agencies outside of the Ministry of Communications, as well as one or more internationally selected expatriate experts.

289. All officials of the Ministry of Communications, its Bridges Division, and the BBA who are involved with the process of procurement for the PMBP, including issuance of recommendations for contract awards, as well as TEC members, shall be required to submit declarations of no conflict of interest in these procurements. These declarations shall specify that there is no conflict of interest between bidding organizations and their personnel and (a) TEC members or their close relatives, or (b) other officials of the Ministry of Communications, Bridges Division, and the BBA involved with the procurement process or their close relatives. The declarations will be submitted prior to the commencement of evaluation of bids. The BBA will maintain these declarations on file as well as provide them to the Bank. If during the procurement process a TEC member is found by any Project oversight entity or by the Bank to have concealed a conflict of interest, that individual shall be immediately replaced on the TEC. The GoB is aware that if such information is revealed following the conclusion of the procurement process the Bank will consider appropriate remedies.

290. All senior personnel of BBA, including the Executive Director, Project Director, and heads of departments in the PMU as well as any other BBA staff participating on a TEC, will be required to submit a statement of his/her financial interests and affiliations at present and in the preceding year as well the analogous affiliations and interests for the same period for his/her spouse⁹. These statements will be filed on an annual basis. A standard format for reporting financial interests/affiliations will be agreed in advance with the Bank. These statements will be shared with the World Bank and an ethics subcommittee for the project consisting of three members of the Project Coordination Committee, as well as the appointed Project Integrity Advisor. The BBA will maintain a register of financial interest statements. If during the procurement process BBA personnel on a TEC is found by the Project Coordination Committee or by the Bank to have falsified the listing of his/her relatives, his/her own financial interests, or his/her spouse's financial interests, that individual shall be immediately replaced on the TEC. The GoB is aware that if such information is revealed following the conclusion of the procurement process the Bank will consider appropriate remedies.

291. Bidding documents including the Request for Proposal, instructions to bidders/consultants, and model contracts would include measures to mitigate misconduct. For instance, bidders would be required to: disclose in full any agents used by the bidders during the procurement process, along with the terms on which those agents were hired (both scope of work and remuneration); and certify any conflict of interest most notably relationships with government officials, whether direct or indirect (e.g., via direct relationships with the officials related to the subject tender, or via companies and/or relatives of officials). These documents would also define the scope of the Bank's audit rights.

292. Transparency of the procurement process will be enhanced through a package of measures. The designated information officer will develop and implement a detailed plan of *suo motto* disclosure by the project. This will include disclosure of all relevant documentation and plans related to the procurement process with the goal of providing access to information to the wider community beyond interested bidders and supporting design, management, and construction consultants. Part of this plan will include a

⁹ TEC members who are not personnel of BBA shall not be required to submit a statement of financial interests.

website in Bengali and English dedicated to the PMBP prominently identified on the BBA's website with a dedicated page for summaries of procurement actions, the procurement plan and any updates, and all documentation related to the procurements themselves (outside of the proposals themselves). These documents will be placed on the website within one week of their issuance to the public domain (including after a Bank no objection, in cases where this is required). This documentation will include:

- Pre-qualification documents for ICB contracts more than US\$10 million;
- All Invitations to Bid;
- Bidding documents and drawings;
- Clarification of bids;
- Bid opening minutes;
- Information on contract award;
- Information about short-lists including a narrative statement regarding the reasons for inclusion or exclusion of the bidders in the shortlist.

293. The BBA will implement a broader communications strategy that will include information about procurement. Procurement information will be summarized in a quarterly newsletter in Bengali and English produced by BBA and distributed widely to civil society organizations in the project region and in Dhaka, as well as local government officials in the region who will be instructed to make the newsletters available in their communities. The BBA will promote the availability of all procurement information except information protected by confidentiality requirements of the procurement process on its website and in its newsletters as part of a program of periodic updates on the progress of the project via SMS messaging with major cell phone operators. This information will also note that the BBA will make available to any member of the public promptly upon request hard copies of such documents related to the project, subject to payment of a reasonable fee to cover the cost of printing and delivery.

294. Public scrutiny of procurement will be facilitated. Representatives of civil society and the media will be invited to attend public bid openings as observers and encouraged to provide feedback on the openings.

295. An enhanced complaints receipt and response unit will be established in BBA to operate throughout the life of the PMBP, including during the procurement stage. The BBA's website and newsletters will state clearly how to file complaints through the following text to be displayed prominently. The BBA will maintain a log of complaints which will track the status of response or follow-up. Depending on the nature of the complaint, the unit will assign the review of complaints to internal auditors or third party auditors, or may transfer the investigation of complaints to other appropriate investigative bodies such as the police or the Anti-Corruption Commission. All complaints received shall be responded to within five days of receipt, with a copy to the PSC and the World Bank. Recording and appropriate referral of all incoming complaints will be undertaken by the BBA, with each case generating an automatic, standard format report including the full text of the original complaint to the Bank. In addition a monthly report tracking the status of complaints and measures taken will be provided to the Project Steering Committee, the Project Coordination Committee, and the Bank. The Project Coordination Committee will designate one of its members with specific responsibility to ensure that the complaints receipt and response unit is functioning properly as well as report to the Committee on the substance of the complaints which are received. Reports summarizing complaint cases which have been resolved will be published on the website. At all times and in all documents the anonymity of the complainant will be maintained.

296. The Project Integrity Advisor would be provide the log of complaints and his office would review the follow up by the PMU, BBA and PCC, and investigate as necessary the complaints depending upon their nature and severity outcome of the follow by BBA and the PCC.

297. The BBA's website and newsletters will state clearly how to file complaints through the following text to be displayed prominently:

"The contact point for complaints related to the Padma Multipurpose Bridge Project (PMBP) is:

To:

Secretary, Bridges Division
Ministry of Communications
and
Executive Director
Bangladesh Bridge Authority
Government of the People's Republic of Bangladesh
Dhaka.

Tel:

Fax:

e-mail:

To: the World Bank Fraud and Corruption unit

Email: investigationshotline@worldbank.org

Website: <http://www.worldbank.org/integrity>

If you prefer to remain anonymous, you may wish to make use of a free email service (such as Hotmail or Yahoo) to create an email account using a pseudonym. This way, we could correspond with you as necessary, to seek clarification or additional information. This would be helpful for us in pursuing your allegation. You may also contact us through a Fraud and Corruption Hotline hired by INT for this purpose: (24 hours/day; translation services are available)

Toll-free: 1-800-83 1-0463

Collect Calls: 704-556-7046

Mail:

PMB 3767, 13950 Ballantyne Corporate Place
Charlotte, NC 28277, United States"

298. **Contract execution and project management risks.** The transparency and enhanced complaints mechanisms put in place for procurement will also apply post-procurement during contract execution. The website would contain monthly updated information about project activities including, *inter alia*, the current estimate of the progress of implementation (e.g., gross estimate of completion as a percentage of works to be carried out, other project related activities such as workshops, and data concerning complaints and remedial actions. In addition regular accountability meetings organized by the implementing NGOs in conjunction with BBA will be held quarterly with CSOs in the region and in the capital will be held to share information. These meetings will be attended by PMU, CSC, and CMC staff as well as third party entities involved in monitoring execution.

299. **Numerous separate entities will be involved with execution of contracts** and therefore will also provide a check against misrepresentation. In the execution of the civil works contracts, the Project Director's will serve as the *Employer's representative*, while the CSCs supervising consultant will serve as the *Engineer* for construction supervision. At the site, *Resident Engineers*, appointed by the CSCs, with a team of specialists and inspectors will supervise the Contractor. The Management Support Consultants (MSCs) would provide management support in carrying out the role of the employer. The MSC would also carry out M&E for the project activities and implementation.

300. Third-party monitoring of the technical aspects involved with the civil works would be carried out by the IPOE. Each of these will provide a report to the PCC, the Project Integrity Advisor, and the Bank on a quarterly basis on its assessment of progress of the project, quality of works and other construction and design issues. Technical audit can be initiated when found necessary to assess through appropriate mechanisms.

301. The contracts would have robust audit clauses that permit access to company documents related to both the procurement and contract implementation, and to any documents generated by the company during those processes (not just financial records). The latest Guidelines for audit clause language, which extend to companies that bid for contracts but did not win them, also apply to procurements under this project.

302. **Risks in delivery of benefits under the SAP/RAP.** The proactive information disclosure measures involving the website, newsletter, SMS-messaging services and the enhanced complaints mechanism will be utilized for the implementation of the SAP/RAP as well. In addition, as noted in Annex 3, implementation will be through external NGOs with experience and skills to carry out the benefits program. MSC would conduct monitoring to include a survey on the effectiveness of the SAP/RAP among the population in the targeted areas. MSC will recruit a group of NGOs to conduct its monitoring efforts. The NGOs responsible for SAP/RAP delivery will hold public hearings at least once a quarter on the implementation of the plans. Accountability meetings will be held with the public and Civil Society Organizations (CSOs) in the region and in the capital (given the national interest in the project and the presence of strong, interested NGOs and academic institutions in Dhaka) to explain the SAP/RAP.

303. Management of payments will be based on written documents and contracts properly agreed and registered in the presence of resettlement NGOs. Such records would be maintained for audit and post review by the co-financiers and selected representative of the NGOs. Payments for purchase of properties and other compensation made by the Deputy Commissioners over US\$40,000 equivalent and by BBA above US\$100,000 equivalent for each beneficiary would be subject to prior review by IDA and other payments would be subject to post review. The prior review threshold level would be reviewed after one year and adjusted appropriately.

Remedies and Sanctions

304. The BBA independently, or at the direction of the Bangladeshi oversight entities in the form of the Project Coordination Committee and the Project Integrity Advisor, will undertake disciplinary action up to dismissal of staff deemed to have violated financial management or other procedures. Any of the three entities will, if it is determined that there is credible evidence to launch an inquiry into possible criminal actions (including for corruption), refer such cases for investigation to the Anti-Corruption Commission or police.

305. The Bank will apply sanctions as per its guidelines if it determines incidences of fraud, corruption, collusion, coercive, and obstructive practices. Information on the Bank's sanction process can be found at the website www.worldbank.org/sanctions. In addition, the Bank will coordinate with its project co-financiers in the event of misconduct issues.

306. The Bank will apply sanctions as per its guidelines if it determines incidences of fraud, corruption, collusion and coercive practices. These sanctions may include fines, blacklisting, suspension of disbursements, or ultimately cancellation with respect to that contract. The Bank will seek first to remedy cases of corruption through cooperation with the implementing agency and its oversight entities.

Any entity that is found to have misused funds may be excluded from subsequent funding. Information regarding such cases, where lessons are learned and funds are retrieved, will be widely disseminated.

GAAP Monitoring Arrangements

307. The PMU with support from MSC will be responsible for monitoring and reporting on this GAAP on a quarterly basis. Monitoring shall include both quantitative measures of implementation of actions (e.g. numbers of complaints received, followed up and resolved, numbers of persons at accountability meetings), recording of benchmarks (e.g. training of designated Information Officer, establishment of third party monitoring), as well as qualitative reporting on the efficacy of measures and instances where problems were corrected through these mechanisms. Its reports shall be submitted to the Project Coordination Committee, the Project Steering Committee, and the World Bank simultaneously. Upon clearance by the Project Steering Committee, summaries of the reports indicating complaints, investigations, and their outcome, without specific personalized information regarding shortcomings resolved internally, will also be disclosed to Development Partners and the public through placement on the project website. The Project Integrity Advisor will issue special reports on concerning his/her independent reviews of significant cases and their outcomes as is necessary.

Bank Supervision and Surveillance

308. Supervision arrangements for this project, particularly for procurement and financial management, are extensive. Prior review thresholds would apply to almost all contracts in this case as the contacts are large. The first contract in all categories (goods, consultancy, works, etc.) will be subject to prior review regardless of its value in order to start good-practice procurement and contract management. Post procurement reviews will be carried out by qualified Bank staff in procurement and contract management, and will be done quarterly for the first 18 months. Bank supervision missions will be more frequent at the start of the project and would involve qualified staff in all disciplines, including procurement, contract management, and financial management. The Bank will also conduct regular monitoring between supervision missions, including an in-country consultant who would visit the project site on a regular basis in the first two years of the project, when construction will be taking place, to keep the Bank and the Project Coordination Committee informed of issues arising in project implementation. The Bank will conduct a mid-term review of the project after two years. Detailed plans for supervision by the Bank are given in Annex 5.

309. In addition, the Project Management Unit, the Construction Supervisory Consultants, and the Management Support Consultants would carry out extensive oversight of the implementation of contracts. An independent team of M&E consultants would review overall progress in implementation and report on contract implementation issues to the Project Coordination Committee, the Project Steering Committee, and the Bank.

310. In terms of monitoring progress on the GAAP, the Bank will conduct six-month reviews for the first 18 months and then successive annual reviews of GAAP implementation. The review will assess progress, gauge the efficacy of measures, agree among all parties on areas for improvement, and make adjustments as appropriate. The Bank will update its assessment of GAC risks on an ongoing basis, and anticipates that adjustments to the GAAP will be likely to reflect what will be most effective in the context of the project.

Matrix of Actions
Padma Multipurpose Bridge Project Governance and Accountability Action Plan

Issues/Risks/ Objective	Actions	Agency responsible	Timeline	Early Warning Indicators to Trigger Additional Action
Institutional Risks				
Need to strengthen capacity to handle large volume procurement, financial management, contract management, communications, and monitoring functions	<p>Establish PMU with externally hired staff and consultants.</p> <p>Retain independent consultants for design, construction supervision (CSC), and management support (MSC).</p> <p>Contract out M&E functions through Management Consultant</p> <p>Increase frequency of full Bank supervision missions to review operations, including more intensive supervision early in the project.</p>	<p>BBA</p> <p>BBA</p> <p>Management Support Consultant</p> <p>Task team/IDA</p>	<p>Key staff recruited prior to start Ongoing</p> <p>Contracted in 1st year; quarterly reports</p>	Delays in conduct of procurement, execution of contracts, processing of payments, filing reports
Need to/provide improve internal accountability mechanisms in the BBA	<p>Establish a Project Steering Committee composed of Secretaries from other agencies and heads of leading NGOs</p> <p>Establish a Project Coordination Committee chaired by the Advisor to the Prime Minister with multi-sectoral and NGO representation to provide overall guidance</p> <p>Appoint Project Integrity Advisor endowed with powers to require provision of information and documents from all project-related entities</p>	<p>GoB</p> <p>GoB</p> <p>Office of Prime Minister</p>	<p>Established and ongoing</p> <p>Established and ongoing</p> <p>March 15, 2011</p>	Abrupt and/or large-scale changes in membership of PCC or PSC, or office of Project Integrity Advisor
Need for proactive	Designate Information Officer and appellate	BBA	By March 2011.	Lack of information

<p>provision of information and enhanced transparency</p>	<p>authority and provision of support</p> <p>Undertake regular reporting by PMU on implementation</p> <p>Maintain website on implementation issues</p> <p>Produce quarterly newsletter.</p> <p>Hold accountability meetings for CSOs/NGOs/media in region and Dhaka on the SAP/RAP</p> <p>Adopt and implement a communications strategy</p>	<p>BBA</p> <p>BBA</p> <p>BBA</p> <p>BBA</p> <p>BBA</p>	<p>Ongoing</p> <p>Regularly updated, at least once a month, all documents w/in one week of their issuance</p> <p>Quarterly</p> <p>Biannually</p> <p>Adopt by first 6 months., implementation ongoing</p>	<p>officer or frequent replacement</p> <p>Delays in provision of information on website</p> <p>Delays in implementation of communication strategy</p>
<p>Procurement Risks</p>				
<p>Reduce risk of corruption in procurement.</p>	<p>Retain smart design of few contracts processed in one location to enhance scrutiny</p> <p>Publish/agree detailed mapping of procurement processes, including finite list of who has access to documents when in the process</p> <p>Ensure multiple parties are legitimately involved at all stages in procurements: CSCs, MSCs, NGO representation on the TECs</p> <p>Enforce ICB procurement guidelines for documentation, timelines, and transparency</p>	<p>BBA, MSC</p> <p>BBA</p> <p>BBA, Bank</p> <p>BBA</p>	<p>March 2011</p> <p>Ongoing</p> <p>Ongoing</p> <p>Designate March 2011;</p>	<p>Procurement red flags in ex ante and ex post review</p> <p>Inconsistencies with ‘need to know’ principles in procurement mapping, evidence of unauthorized access to information</p> <p>Delays in suo motto</p>

	<p>Designate Information Officer and implement plan for <i>suo motto</i> disclosure of information</p> <p>Establish and maintain website, newsletters</p> <p>Enhance complaints mechanism with reporting established and follow up guidelines.</p>	<p>BBA</p> <p>BBA, PCC, Project Integrity Advisor, Bank (reviewing)</p>	<p>Website by Dec 2011</p> <p>Complaints unit in place by March 2011</p>	<p>disclosure plan issuance/implementation</p> <p>Website and newsletter are delayed or not updated.</p> <p>Nature and frequency of complaints</p>
<p>Potential for or reduce risks of conflict of interest among participants in procurement</p>	<p>Declarations of no conflict of interest by BBA personnel, including members of TECs, and bidders</p> <p>Review statements of financial interests encompassing key project staff</p> <p>Require bidders' statements concerning agents and other possible connections to persons involved with procurement.</p>	<p>BBA</p> <p>BBA, PCC</p> <p>BBA</p>	<p>BBA personnel by effectiveness; bidders at submission</p> <p>Within one month of submission</p> <p>At bidding stage</p>	
Contract Execution and Project Management Risks				
<p>Potential for collusion of parties involved</p>	<p>Involve independent CSC and MSC involved with transactions, approving works and disbursement.</p> <p>Require financial interest statements of key senior PMU staff</p> <p>Ensure third Party monitoring by Independent Panel of Experts as well as MSC performing oversight function.</p>	<p>CSC, MSC</p> <p>BBA, WB</p> <p>IPOE, MSC</p>	<p>Ongoing</p> <p>By June 2011 updated every year</p> <p>Ongoing upon appointment</p>	<p>Monitoring reports identify anomalies</p>

Need for greater capacity in PMU to exercise oversight	Disseminate information dissemination measures (website, newsletters,) Establish enhanced complaints mechanism, including ICT Ensure third Party monitoring and reports	BBA BBA, Project Integrity Advisor MSC, IPOE	Launched within 3 meetings. of effectiveness Dec 2011 Ongoing	
Fraud and Corruption in Delivery of SAP/RAP Benefits				
Need to improve implementation capacity of BBA	Contract out implementation to experienced NGOs, with oversight by BBA	BBA, NGOs	Contracts being implemented using preparation funds	
Potential for improper targeting of beneficiaries and/or false delivery	Engage experienced NGOs with reputable track record for similar programs for implementation Ensure third party monitoring by the MSC Conduct survey among beneficiaries Enhance complaints mechanism, including use of ICT Suo motto disclosure of information	BBA, NGOs MSC MSC BBA, Project Integrity Advisor/, WB supervise BBA	Contracts in place Occur upon selection of the MSC Unit in place by effectiveness or before Designated office in place by effectiveness, begin implementing expanded disclosure plan three months after effectiveness	Reviewers (BBA, Project Integrity Advisor, WB) receive plausible complaints borne out by frequency or other corroboration Survey results identify improprieties

Annex 6: Team Composition

BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

World Bank staff and consultants who worked on the project:

Name	Title	Unit
Masood Ahmad	Lead Water Resources Specialist	SASDA
Mohi Uz Zaman Quazi	Transport Specialist	SASDT
Ishtiaque Ahmed	Transport Specialist	SASDT
Reefat Sultana	Project Analyst	SASDT
Shakil Ahmed Ferdausi	Environmental Specialist	SASDI
Burhanuddin Ahmed	Sr. Fin. Management Specialist	SARFM
Furqan Salim Ahmad	Sr. FM Specialist	AFTFM
Zafrul Islam	Lead Procurement Specialist	SARPS
Tanvir Hossain	Senior Procurement Specialist	SARPS
Chaohua Zhang	Sr. Social Sector Specialist	SASDS
Gaurav D. Joshi	Environmental Specialist	SASDI
Chao-Ching Shen	Sr. Finance Officer	CTRFC
Marta Elena Molaes-Halberg	Lead Counsel	LEGES
Winston Yu	Water Specialist	SASDA
Rashid Faruqee	Economist (Consultant)	SASDT
Inder Sud	Institutional & Financial (Consultant)	SASDT
Clell Harral	Transport Specialist/Economist	SASDT
Thomas Buckley	Sr. Country Officer	SASPK
Surendra K. Agarwal	Consultant (ORAF)	SARDE
Charles Undeland	Senior Governance Specialist	SASGP
Anna O'Donnell	Social Specialist	SASDS
Rajesh Bahadur Singh Dongol	Program Assistant	SASSDO
Md.Tafazzal Hossain	Program Assistant	SACDO
Peer Reviewers		
Henry Kerali	Sector Manager	ECSS5
Jacques Bure	Senior Highway Engineer	ECSS5
Alessandro Palmieri	Lead Dams Specialist	OPCQC
Devesh Mishra	Regional Procurement Advisor	ECSC2
Ismael Mubarak	Consultant	ECSS5
Maninder Gill	Sector Manager	LCSSO
Andreas Kopp	Lead Transport Economist	ETWTR
Frederick Edmund Brusberg	Lead Social Development	ECSS4

Annex 7: Summary of Social Action Plan

BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

Background

311. Preparation of Padma Bridge Project has been going on for the past decade. A pre-feasibility study¹⁰ was carried out in 1999, followed by a feasibility study (FS)¹¹ in 2005. The FS recommended construction of the Padma Multipurpose Bridge Project (the Project) at Mawa point (on the north bank), about 35km southwest of Dhaka, to Janjira (on the South bank). In 2006, based on the FS, the Bangladesh Bridge Authority (BBA) – the executing agency (EA) of the Project – prepared a Land Acquisition Plan (LAP)¹² and a Resettlement Action Plan (RAP)¹³. The RAP was later updated into a Land Acquisition and Resettlement Plan (LARP)¹⁴ under ADB Project Preparation Technical Assistance. In 2009, ADB provided the GoB with a TA Loan to carry out the detailed design. During 2009-2010, on the advice from the development partners (DPs), the Detailed Design Consultants (Consultants) updated early surveys and undertook further field surveys on impact inventory, gender and public health as well as broad local consultations to prepare the project for DPs' financing.. A project Social Action Plan was developed to include the updated LARP and additional action plans.

Project Area

312. The project area is located 35 km southwest of Dhaka. The bridge will be constructed between a site near Mawa ferry ghat, lying north of the Padma River and Janjira on the south side. Components of the project such as approach roads and bridge end facilities will affect an area of 6 km inland on the Mawa side and 4 km inland on the Janjira side; bridge and river training works may even affect a corridor 15 km upstream and 7 km downstream in the river. The 250 km² project area comprises areas located in 3 separate administrative districts: Munshiganj district on the Mawa side (north bank) and Shariatpur and Madaripur districts on the south side. Louhajang and Srinagar upazila (sub-district) lie on the north bank and Janjira and Shibchar upazila lie along the south bank.

313. The project districts are predominantly rural. Its urban population was about 11% according to the last census in 2001, with sharp increases in the past few years. Project socioeconomic survey indicates that about 30% of the households in the project areas are below the poverty line, with a higher poverty ratio on the Janjira side. The Janjira side to the south of the river has a strong agricultural character and most people earn their living by farming and horticultural. Farms are generally small and cropping intensity is high. Mawa area to the north of the river has a high percentage of retail trade, services and transportation. Both sides are subject to severe annual flooding and erosion.

Project Impact Identification

314. The Project covers three administrative districts – Munshiganj (Mawa/North bank) and Shariatpur and Madaripur (Janjira/South bank). It will have significant social impacts in the project areas, the immediate neighbouring areas and the entire Southwest region of Bangladesh. For the project areas, the local communities will benefit greatly from the improved transport conditions that will provide them with faster and more efficient access to employment opportunities in Dhaka, as well as the embankment works

¹⁰ *Padma Bridge Study: Pre-Feasibility Report* (Vol. VI Resettlement Policy and Data), RPT/ Nedeco/BCL, 1999.

¹¹ *Feasibility Study of Padma Bridge in Bangladesh – Final Report* (Vol. VII- Environmental and Social/Resettlement Studies, Nippon Koei Co. Ltd, 2005.

¹² *Land Acquisition Plan*, Bangladesh Consultants Ltd, 2006

¹³ *Resettlement Action Plan*, Bangladesh Consultants Ltd, 2006

¹⁴ *Land Acquisition and Resettlement Plan*, ADB PPTA No. 4652-BAN: Preparing the Padma Multipurpose Bridge Project, Jan 2007.

that will control erosion that has been devouring their land and houses along the river. The resettlement and rehabilitation program itself is designed not only to restore, but also improve livelihoods for those affected. It is worth noting that about one third of the displaced households are actually erosion-displaced households who are renting or “squatting” on private and public lands along the river. Most of them are moving to the resettlement sites where living conditions will be much better.

315. The project will also incur significant adverse social impacts. They are expected to occur in several zones, including the bridge construction area, embankment areas for river training works, the access road area, areas for construction operations, the *charland* areas, four resettlement sites and river activities. The following categories of impacts have been identified:

- (i) Land and structure acquisition and household relocation
- (ii) Business and job losses
- (iii) Possible *charland* impacts
- (iv) Impacts on physical cultural resources, such as mosques
- (v) Public health impacts
- (vi) Possible impact on fishery
- (vii) Gender impacts

316. Major impact under the project is land acquisition and household relocation. The total area of land to be acquired is expected to be 1039 ha of largely agricultural areas. The project will affect a total of 76,211 people in about 13,578 households. The population affected through agricultural land acquisition is 46,637 in 8,526 households. The project would also require relocation of 20,972 people in 3,886 households, including 60 households who will lose their family business along with their residences. There are about 960 households of 5,179 people whose business will be affected, and about 2,882 whose jobs as wage earners are likely to be affected due to the construction of the project. It should be noted that, among the affected population, the landless and squatting population (including affected households displaced by river erosion in past years), is over 30% of the total affected households. Detailed breakdown of land acquisition by project components and impacts of land acquisition are presented in Tables 1 & 2.

Table 1 – Land Acquisition for Padma Bridge Project

Components	Land Acquisition (in ha) by District			Total
	Munshiganj	Shariatpur	Madaripur	
A. Acquisition				
Approach Road	30.80	78.90	66.40	176.10
Service Area	27.03	148.50	-	175.53
River Training Work	114.70	190.50	203.50	508.70
Toll Plaza	17.50	4.80	6.60	28.90
Resettlement sites	30.30	19.90	18.50	68.70
Construction yard (Mawa side)	81.00	-	-	81.00
Subtotal – Acquisition	301.30	442.70	294.90	1038.90
B. Requisition				
Construction Yard (Janjira side)		146.40		146.40
TOTAL	301.30	589.10	294.90	1185.30

317. The project is expected to have other impacts as well. The project is expecting an influx of construction workers over the project implementation period by about 5,000 during the peak period. It is expected that large numbers of service providers will be attracted to the project areas as well. The influx of population will increase public health risks, HIV and STD diseases in particular, to both the

construction workers and the local population. The relocating households would also be vulnerable to health impacts during the relocation process.

Table 2 – Summary of Affected Population (All 3 RAPs)

Types of losses	Affected households (AHs)				Affected Persons (APs)			
	RAP-I	RAP-II	RAP-III	Total	RAP-I	RAP-II	RAP-III	Total
Agricultural land	436	6,072	2,018	8,526	2,385	33,214	11,038	46,637
Households losing residence	30	1,262	2,534	3,826	172	6,444	13,870	20,486
Household losing business	0	204	756	960		1,042	4,137	5,179
Households losing both business and residence	1	59	0	60	5	301	0	306
Households losing auxiliary structures	3	17	112	129	19	87	615	721
Sub-total	470	7,614	5,420	13,501	2,581	41,088	29,660	73,329
Other economic impacts (wage earners and others)	0	0	0	0	98	1007	1,777	2,882
Common property resources	1	12	63	76				
Total	471	7,626	5,483	13,578	2,679	42,095	31,437	76,211

318. Based on the Jamuna Project experience, much consideration and analysis was given in the project design over possible impacts over *charlands* near the bridge. The initial assessment indicates that the current project design is not expected to induce impacts on the *charlands*. This assessment indicates that there would be no fishery impacts under the project, except some disturbances to migrating fishes during the construction period. Construction activities could interfere in fishing activities for local communities. There is a gender dimension in all the impacts identified. Women, particularly poor and female-headed households, would be more vulnerable under these project impacts. These have been identified and assessed through the consultative planning process.

Project Safeguard Policies

319. The project has conducted an analysis of the policy gaps between GoB legal framework and the DPs' policies on involuntary resettlement. On the basis of this analysis, BBA has tried to introduce provisions to bridge the policy gaps and develop a project-specific resettlement policy to address the project safeguard impacts in compliance with both GoB and DPs' resettlement policies. The basic principles adopted are as follows,

- (i) Avoid or minimize impact as much as possible through alternative design options;
- (ii) Consult affected people and communities adequately;
- (iii) Make resettlement plans and other related documents available at the project sites; full disclosure will be ensured through distribution of a summary RP in Bangladesh to the affected households and other stakeholders;
- (iv) Determine replacement cost of assets acquired and compensate at full replacement costs determined by property valuation committee;
- (v) Resettlement assistance will be provided to all APs irrespective of titles to land;

- (vi) Establish grievances redress committees at the local level for speedy resolutions of disputes;
- (vii) Provide additional assistance to poor women and vulnerable groups
- (viii) Provide income restoration assistance through alternative income sources and restoration of livelihoods for assisting affected people to restore and/or improve upon their pre-project levels or standards; and
- (ix) Carryout internal monitoring by EA and third party monitoring independent external experts/agency to assess resettlement operations and evaluate outcomes.

320. All affected households and persons, as per the project policy, are eligible for compensation and assistance to be provided by the Project. The Project Entitlement Matrix covers all types of direct, indirect, customary rights of occupancy and titles, based on inventory of losses established during the inventory survey as part of project preparation, with the exception of RAP III whose inventory of impacts will be updated during implementation when the section of engineering designs finalizes the section of alignment for embankment works. The full details of the entitlement matrix are available in the Resettlement Policy Framework.

Project Social Action Plan

321. The project preparation has witnessed a continuous process of planning as part of the project design to address social impacts under the project. Planning activities include socioeconomic surveys, impact census and inventory surveys, poverty and gender assessment, assessment of local public health institutions and service delivery, etc. They were carried out at different times of the project preparation and updated along the engineering design progress. The planning followed a participatory process through information sharing and continuous consultation with local communities over impact identification, compensation and resettlement policies, options for relocation and resettlement, approach for livelihood development as well as their views and recommendations for the project. This program is broadly endorsed and supported by local communities.

322. The planning efforts have delivered the following action plans and frameworks that are packaged into the Padma Project Social Action Plan (SAP). The SAP includes the following,

- Vol. 1 SAP Executive Summary
- Vol. 2 Socio-economic Profiles and Analysis
- Vol. 3 Resettlement Action Plan for Resettlement Sites Development (RAP I)
- Vol. 4 Resettlement Action Plan for Main Bridge and Approach Roads* (RAP II)
- Vol. 5 Resettlement Action Plan for River Training Works (RAP III)*
- Vol. 6 Padma Project Resettlement Policy Framework
- Vol. 7 Public Consultation and Participation Plan
- Vol. 8 Gender Action Plan
- Vol. 9 Public Health Action Plan
- Vol.10 Charland Monitoring and Management Framework
- Vol.11 Institutional and Implementation Arrangements

*Including physical cultural resources actions

Resettlement Action Plans (RAPs)

323. Land acquisition and involuntary resettlement is the major impact under the Project. Three RAPs have been prepared for three different packages of civil works following different arrangement for engineering designs. The RAPs detail the socioeconomics in the Project areas, resettlement planning

activities, Project impacts, entitlement policies and packages, resettlement and rehabilitation approaches and action plans, implementation arrangements, institutional, monitoring and grievance redress mechanisms, cost and financing arrangements. Key elements and features are summarized below.

- **Policy framework.** All three RAPs follow the same set of objectives and principles established under the Project Resettlement Policy Framework. This framework is developed in compliance with relevant GoB and DPs' safeguard policies. A detailed entitlement policy is contained in the framework, outlining entitlements for different impacts on different groups of affected population, including people whose properties, business and employment are affected under the project.
- **Resettlement approach and arrangements.** The approach adopted combines group resettlement with self-resettlement options. This arrangement was tested as successful in the Jamuna Bridge Project and is endorsed broadly by the relocating households, following intense consultations and visits to the Jamuna Project resettlement sites. Both options would be open to any relocating households. The final decisions of the households are expected through consultations in the detailed planning during implementation. Four resettlement sites have been selected along the river. These sites are identified and confirmed through participation of the affected population and technical assessment. The sites will be fully developed with infrastructure services. The site development plan, household plot allocation and relocation arrangements are described in the three RAPs. For households who prefer to relocate to places of their own choice, either as individual households or smaller groups, the project office would assist in identifying, securing and preparing their identified sites.
- **Livelihood restoration approach and arrangements.** A package of assistance has been developed to assist the affected households in their livelihood restoration and improvement. The packages consist of cash compensation upfront and long-term livelihood assistance planned to last for a period of 10 years. The cash compensation package has two parts. The first part is Cash Compensation under the Law (CCL), which will be determined and delivered through the government revenue system. The second part will be the bridging amount between CCL package and replacement cost as determined through the Property Evaluation Committee already established under the Project. The committee composition, responsibilities and working methodology are detailed in the RAPs. This part of the compensation payment will be delivered to the affected households by BBA. The livelihood assistance program will focus on household income-generation. The SAP provides a general outline of the program based on expert experiences and consultations held so far with the communities. The livelihood program will be developed at the household level, together with the individual households, on the basis of their needs, capabilities, preferences as well as opportunities to be created under the project and available in local areas. This will be carried out during project implementation in a highly participatory approach. An experienced implementing NGO is being recruited to facilitate this participatory planning and implementation process. The livelihood program will aim to assist the affected households in using their land compensation money more productively. At the same time, a Social Development Fund has been established and included in the SAP budget to facilitate and contribute to the livelihood planning and restoration process.
- **Institutional and monitoring arrangements.** BBA will be responsible for the implementation of the SAP and it has established an institutional setup for the implementation of the SAP. It consists of a Social Environment Unit within BBA at both headquarter and in the field, an implementation advisory TA team, a national gender advisor, district administrations and five implementing NGOs for different component activities under the SAP. BBA has already recruited five consultant environmental and social experts for its Social Environment Unit. Two BBA field offices have also been established with staff assignment. The district administrations will play a major role in the SAP implementation process. They have established a team of district officers from different departments to work along BBA field offices. The project will

continue the traditional practice in Bangladesh engaging NGOs for rural development operations. They will play a major role in community mobilization, detailed programming and actual implementation. One NGO has already been engaged to facilitate RAP 1 implementation. It has established three field offices with over 60 staff members recruited and working at community level. The recruitment process has started for the other five NGOs. A separate health team will be mobilized from a reputed NGO to implement the Public Health Program. An independent monitor will be recruited for the implementation of the SAP. (Please see below for details).

- **Implementation approach.** The DPs have reviewed and cleared the SAP for compliance with their safeguard policies. The three RAPs are following different schedules. Considering that development of the resettlement sites is in the “critical path” of the project, RAP I implementation has started. . Payments of compensation funds to the affected households have been completed and site development is in progress, construction of public infrastructure, and civic facilities. RAP II has also completed the detailed planning and is ready for implementation. Compensation fund payment has started.. Given the continuous flood erosion and timeframe for implementation, the detailed design for RTW will be carried out on a section-by-section basis during implementation. Consequently, the alignment for the entire embankment can only be determined when all section designs are all completed. The engineering design is in progress and the impact inventory is being updated with the latest section designs. RAP III will be updated with the latest impact data and costing for implementation. .

Gender Action Plan (GAP)

324. The GAP is developed on the basis of a gender analysis. It aims to translate the gender concerns and social vulnerabilities identified into actions, with the following focus and key interventions.

- **Increasing participation of women.** The project will encourage women participation in all community meetings and continue to consult them in separate focus group discussions over their preferences, experiences and needs. Women will be fully informed about entitlements, timetable of compensation delivery and relocation activities. The monitoring NGO will engage local women members to engage in community-led monitoring. Focus group discussions will be held with women each quarter in each resettlement area, including female construction workers and women living on the char.
- **Maximizing women’s access to project benefits.** Local women will be encouraged to take up construction employment. This will be done through raising awareness about the types of jobs available, timeframes and pay rates, how to apply for work, and issue of ID cards to give them preference for project work. BBA and NGOs will assist contractors to form female work groups to take on discrete construction tasks. Occupation training will be tailored for local women in construction jobs and R&R programs. NGOs providing livelihood development services will target women for skills training for employment opportunities under the Project.
- **Increase women’s skills, incomes and participation in decision-making.** Women’s corners will be constructed in each resettlement site. They will serve as physical spaces where women can network, learn, support each other, and undertake group and individual income earning activities. Implementation NGOs will assist in the training and support for small income earning activities. Exposure trips to successful women’s businesses will be facilitated. Linkages with micro-credit providers and more empowering finance modalities should also be explored. Under RAP I, Female Local Contractor Societies have been established already to facilitate employment of women in the resettlement site development activities.
- **Reducing women’s social vulnerability.** Social vulnerabilities in the context of this project may include domestic violence against women, public sexual harassment, vulnerability to sexually transmitted infections (STI) including HIV/AIDS, human trafficking. Information campaign will

be conducted to disseminate materials on STI and HIV/AIDS, raising awareness about public health services in the area and against human trafficking. Women's corner operators will receive training from NGOs in gender issues and women's protection. Contractors will be asked to implement a zero tolerance policy against sexual harassment.

325. The GAP will be implemented by the project implementing NGOs. A national gender adviser will be engaged to guide and supervise its implementation. The GAP measures and budget are mainstreamed into each action plan for implementation. The GAP contains monitoring indicators and monitoring protocol.

Public Health Action Plans (PHAP)

326. The PHAP is prepared on the basis of an evaluation of project public health impacts and current services in the project area as well as the additional requirements of health services during the project construction. The overall objective of the plan is to minimize and mitigate the risks on public health due to the construction activities and contribute to public health services in the Project areas. The plan is scheduled for a period of five years, with a total budget of 8.67 million USD. The main target groups include: (i) the relocating households; (ii) the general public in the project areas; and (iii) the construction workforce estimated at around 5000 people at peak time.

- **Activities for safeguarding health of PAPs and host communities.** During the pre-construction phase public health activities will mainly focus on safeguarding the health conditions of the relocating families. Health facilities and services will be set up at the sites, focusing on information, education and communication over household and personal hygiene, vaccinations and detection of childhood illnesses and prevention of malaria and STI/HIV/AIDS.
- **Activities to safeguard general public health in the area.** During the pre-construction phase a baseline study will be carried out to determine key criteria and characteristics of the target group. The findings will help with the design of an information, education and communication program for those who will interact with the influx of workers during construction. During the construction phase activities will be expanded to minimize adverse effects on the health of people migrating to or resident in the project surroundings. Activities will focus on reproductive health and prevention of STI and HIV/AIDS.
- **Activities to safeguard the health of the construction workforce.** The activities in the plan will be focused on keeping the construction workforce safe from occupational hazards and health risks from living together in compounds. Health facilities will be established in the service areas. Other measures include introduction and implementation of occupational health safety measures, education campaigns on HIV/AIDS and STI and regular check-ups.

327. A BBA health team staffed with qualified medical professionals will be responsible, in consultation with the Ministry of Public Health And Family Welfare, for the implementation of the PHAP. This team will be strengthened with a program implementation NGO. The total cost of PHAP is estimated around US\$8.67 million.

Charland Monitoring and Management Framework (CMMF)

328. In view of experiences in the Jamuna Project, the BBA has given extra attention to possible erosion or flooding impacts on the charlands due to the construction of the project. A hydrological assessment framework indicates that, with the current design, the project would not have erosion impacts on the charlands. However, given the apprehension from the charland people, BBA has planned to establish a monitoring system over possible impacts on the charlands during the project construction, as well as an approach to address any such impacts once they are identified.

329. This framework (CMMF) has been prepared to guide the impact monitoring and any required mitigation efforts. A multidisciplinary team will be formed including representatives of the social safeguard team, the district administration, the land survey and technical specialists from the Ministry of Water Resources and the Bureau of Disaster Management. The project will monitor the river behaviour to assess the impacts on the charlands situated within the defined project boundary (15-km upstream and 7-km downstream from the bridge). In case of any impacts such as induced floods or bank erosion due to the construction of the bridge, the impacts will be assessed and mitigation measures will be undertaken to address the losses. The team will develop a guideline for detailed assessment, screening and eligibility for assistance in the case of induced impact.

Institutional Setup and Implementation Arrangements

330. BBA under the Bridge Division of the Ministry of Communications (MOC) as the Executing Agency for the SAP implementation. BBA has established a Project Management Unit (PMU) for execution of the PMBP. A Resettlement Unit has been established to implement the SAP. The roles and responsibilities of various institutions involved are elaborated in RAPs (I, II, & III). BBA is in the process of staff recruitment. It has already opened field offices in the Project areas.

331. The PMU will be assisted by the following agencies in the implementation of various programs under the SAP.

- District administrations will assign dedicated staff members to collaborate with the PMO over the SAP implementation. Local government institutions, such as Upazila Parishad and Union Parishad, will work with PMU;
- Five specialized NGOs will be employed for implementation of different programs under the SAP, such as health program, gender strategy, and livelihood program. One NGO-Christian Commission Development Bangladesh has already been engaged for a five-year period for implementation of RAPs in the project.
- The Ministry of Health And Family Welfare and its local agencies will advise and support the implementation of the Public Health Program;
- The Detail Design Consultant (DDC) and Construction Supervision Consultant (CSC) Team will hire resettlement specialists to assist and advise the PMU in the SAP implementation.
- Independent monitoring agency/consultants will be recruited to monitor and evaluate the SAP implementation.
- A communication team to be recruited will manage public communications for the Project.

332. BBA recognizes the need for capacity building within the institutional setup for SAP implementation. It plans to recruit a specialist to undertake the training needs assessment of the various offices and institutions involved in the SAP implementation. An annual training plan will be developed and implemented to improve its capacity for SAP implementation.

Information, Consultation, Participation and Communication

333. The project preparation process has followed a vigorous consultation process. Project design information has been shared with local communities at different stage of the project preparation. This was done mainly through community meetings and workshops. The development of the resettlement entitlement policy, finalization of the resettlement sites and formulation of the livelihood restoration approach has all been achieved through consultations with local communities. The SAP details, including final inventory data, the survey approach for RAP III, entitlement policies, information and planning of the resettlement sites, have all been shared with the local population. This consultation process will continue through detailed planning and implementation of the SAP.

334. BBA will establish three Public Information Centres (PICs) in the project area. The centres will be managed by an NGO whose staff will interact with local communities. A summary of these documents has already been translated into *Bangla* and distributed in the project areas. An information booklet has been designed for distribution among the affected persons as the primary tool for disclosure. For illiterate people, other suitable communication methods will be used. These materials will also be available in the union *parishad*, *upazilas* and district offices in the project area. Additionally, project information disclosure will be continued through newspapers, radio, television, posters, community workshops, information brochures and village level meetings. The affected persons will be represented in the Grievances Redress Committees to review and resolve disputes or claims over resettlement entitlements and benefits. An identification card will be issued to every affected household. A household entitlement summary, covering impacts, compensation payments and various allowances will be distributed to every affected household.

335. BBA has engaged a professional team to develop a communication strategy for the project. The strategy will be completed end 2010, along with recommendations to organize and carry out communication work for BBA. It aims to systematically and regularly disseminate project progress information to the public and seek timely public feedback to improve project implementation. A communication expert team will be recruited to implement the communication strategy.

Grievance Redress Mechanism

336. A two-tier grievance redress mechanism has been designed for Padma Bridge Project. A Grievances Redress Committee (GRC) is established at local community level, with representations from BBA, implementation NGOs, local elected officials, representatives of affected people and women in the project area to allow voices of the affected communities to be heard and ensure a participatory decision-making process. GRC decisions will be on a majority basis and will be publicized among the local communities. The second-tier is an independent body consisting of a local retired judge, a representative from civil society and a member from the BBA. The SAP describes in detail the GRC composition, complaint filing procedures, GRC operation principles and procedures, and timetable for grievance redress. Where the complaining parties are not satisfied with the GRC decisions, they can always file their cases in court.

337. The project implementing NGOs operating at the community level will assist any members of local communities who have grievances to document, submit and follow up on the grievances. A register will be maintained at each of the PICs to register queries, suggestions and grievances of the project communities and PAPs. All queries, suggestions and grievances recorded at the PICs will be forwarded by the INGO to the Resettlement Unit (RU).

Monitoring and Evaluation (M&E)

338. BBA has designed an M&E system for SAP implementation. The M&E system consists of internal and external monitoring. The internal M&E system is part of BBA management setup, consisting of regular progress reporting and monitoring. BBA has started to develop a Management Information System, covering all components of the SAP. A master MIS data system will be maintained at BBA in Dhaka with access to field offices. A GIS-based system has been developed to record and maintain all plot-wise and household-wise information on land and structure impacts as well as compensation payments. The implementing NGO already engaged and in operation, Christian Commission for Development in Bangladesh, has developed a compensation payment information system. This system records all impacts, entitlements and compensation payments at household level. This enables a transparent and updated record of all entitlements and compensation payments for every affected household. This system is already in operation for RAP I. These systems will be merged into a project

MIS system. These will help monitor and control fraudulent claims and prevent possible corrupt practices in the compensation payment process.

339. The external M&E will be conducted by an independent monitoring team/agency (EMA) to be recruited through a competitive process. The EMA will carry out quarterly, annual, mid-term and final evaluation of SAP implementation. The M&E will cover all aspects of SAP implementation, including detailed planning, physical progress, public consultation and participation, grievance mechanism and assessment of SAP performance. Its scope of work, methodology and M&E arrangements are detailed in the SAP and also in the terms of reference of the MSC. The EMA recruitment is ongoing and the EMA is expected to mobilize early 2011.

Cost and Financing

340. The total cost of the SAP is estimated at BDT 19,133.53 million, equivalent to US\$273.2 million USD. The key cost categories include compensation for lost household properties, various household allowances, resettlement site development, livelihood restoration support, common resources lost, public health interventions and NGO engagements for SAP implementation, monitoring and management cost. The household compensation rates to be adopted will be replacement costs recommended by the property valuation committee (PVAC). The resettlement site development cost is estimated on the basis of the engineering feasibility study. Various allowances are per the project resettlement policy and are also included in the SAP cost estimates. Given the dynamic nature of resettlement planning, particularly the inventory and cost to be updated for RAP III, the SAP cost is expected to increase. The total cost includes a contingency of 10%. Financing of the SAP/RAP costs would be according to the project financing plan given in Section III B2.

Annex 8: Summary of Environmental Assessment and Environmental Management Plan
BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

Introduction

341. The project is classified as an Environmental Category 'A' project, due to the extent of the project and complexity of environmental issues associated with construction of the main bridge, river training works and resettlement sites development. Four Bank safeguard policies are triggered: (a) OP/BP 4.01 Environmental Assessment; (b) OP/BP 4.04 Natural Habitats; (c) OP/BP 4.11 Physical Cultural Resources; and (d) OP/BP 4.12 Involuntary Resettlement.

342. A pre-feasibility study for the Padma Multipurpose Bridge Project was carried out in 2000. It investigated a number of potential alignments for the proposed bridge. On the basis of the outcome of that study, a feasibility study (FS) carried out in 2002-2004 by Japan International Cooperation Agency (JICA) concluded that the most feasible bridge site is at Mawa-Janjira point. The selection of this site was subsequently approved by GoB. The FS included, among others, a preliminary technical design, economic and financial evaluation, Initial Environmental Examination (IEE), and an Environmental Impact Assessment (EIA). The Government carried out another study to update the previous EIA and to prepare an Environmental Management Plan (EMP), a Land Acquisition Plan (LAP) and a Resettlement Action Plan (RAP) in 2006. The Asian Development Bank (ADB) also conducted a FS including an EIA in 2007. These studies formed the basis for the decision of GoB to proceed with the current effort, which includes the detailed engineering design and implementation of the Project. The Project will have considerable environmental impacts, which are summarized in this annex.

Project Area

343. The bridge site is located 35 km southwest of Dhaka, near the village of Mawa, lying north of the Padma River and Janjira on the south side. Components of the Project such as approach roads and bridge end facilities will affect an area of 6 km inland on the Mawa side and 4 km inland on the Janjira side; bridge and river training works may even affect a corridor 15 km upstream and 7 km downstream in the river. The 250 km² project area comprises areas located in 3 separate administrative districts: Munshigansj district on the Mawa side (north bank) and Shariatpur and Madaripur districts on the south side. Lauhaujong and Sreenagar upazilla (sub-district) lie on the north bank and Janjira and Shibchar upazilla lie along the south bank.

Project Components

344. Detailed description of the project components is given in Annex 2.

Environmental Policies/Rules

Government of Bangladesh

345. The Environmental Conservation Rules (1997) of the Government stipulate that the construction of a bridge of over 100 m length falls under the Red Category of projects requiring the implementation and approval of a full-scale EIA in order to obtain environmental clearance from Department of Environment (DOE), the technical arm of the Ministry of Environment and Forest (MOEF) and the regulatory body and enforcement agency of all environmental related activities. DOE has approved the TOR of this study and provided a number of additional conditions and suggestions to be incorporated in it.

World Bank Safeguard policies

346. **OP 4.01 – Environmental Assessment:** The World Bank requires an Environmental Assessment (EA) for all projects proposed for Bank financing to ensure that these projects are environmentally sound and sustainable. The PMBP was classified Category A, because of the scope of the expected impacts from construction and operation, the impacts of land acquisition, the resettlement, and the expected impacts on the natural environment.

347. **OP 4.04 – Natural Habitats:** There are no designated conservation areas or nature reserves in the project area. However OP 4.04 does apply since part of the area consists of semi-natural charlands in the active Ganges/Brahmaputra floodplain, with typical floodplain habitats and breeding grounds that might be affected by the project.

348. **OP 4.11 – Physical and Cultural Resources:** This policy is triggered for any project that requires an EA. The project involves large-scale earth moving along both embankments and dredging activities in the Padma River. The policy requires a proper management plan for unexpected chance finds during implementation of the project.

349. **OP/BP 4.12 - Involuntary Resettlement:** Some 26,000 people will have to be resettled. Separate social studies have been carried out and resettlement action plans (RAP) prepared. These aim to minimize resettlement while offering adequate compensation or settlement alternatives in conformity with World Bank policies and Bangladesh law.

350. **Project Safeguard Policies:** In view of the different requirements of GoB and the potential co-financiers of the PMBP, a harmonized environmental safeguard framework was developed to conduct the EIA. This framework was used to prepare the TOR for the EIA, which has been reviewed and approved by the BBA, DOE and the potential co-financiers of the project.

Analysis of Alternatives

351. **Without project scenario:** The without project scenario is not acceptable since this will continue to limit the potential for socio-economic development in the entire Southwest region, where about one quarter of the Bangladesh population lives. Current risky and unreliable ferry services will remain in service, often resulting in long waiting times for trucks (10 hours and more) and cars (2 hours). Noise, oil pollution and hindrance of commercial navigation caused by the fleet of ferries, launches and speedboats crossing the river on daily basis will continue.

352. **Bridge location:** The 2005 feasibility study reviewed and compared four different locations for the bridge. Out of two preferred options the Mawa-Janjira site was finally selected as the best option, mainly on the basis of factors such as travel time/distance to Mongla seaport and the cost of associated works. The evaluation also considered environmental and social impacts (more or less comparable in the two options) into account.

353. **Alternative bridge designs:** In the detailed design phase four possible bridge design options were studied, including three options with a bridge superstructure consisting of two levels (road on upper deck and railway below), including a two-level steel truss bridge. After comparison with the proposed option the one-level concrete bridge from the feasibility study it was concluded that concrete bridges are generally more expensive as compared to a steel truss bridge. Another major advantage of the last is that the construction of a steel truss is relatively easy and does not need a long time to construct. Thus, finally a detailed evaluation was made between the single level concrete extra-dosed bridge and the double level steel truss bridge on basis of the following factors: technical robustness, constructability, maintenance,

cost, social aspects, environmental impacts and proven previous use. In October 2009 a decision was taken to go ahead with the design of the steel truss bridge, mainly on the basis of the factor of construction time, which is only three years, while the concrete bridge would take double this time. Environmental impacts on river hydrology and aquatic life in the selected option are also lower in view of the restricted construction time and lower number of piers required. The present bridge design is based on a bridge length of 6.15 km, since considerable bank erosion has recently taken place on the unprotected original landing site on the Southern side, near Janjira. Various options for the electricity line with the Bridge structure were also explored. It was concluded that the costs of the solid insulated cable supported within the bridge structure would be excessively more than 3 times the suspension tower cost. The option of constructing the 6 platforms 1-2 km downstream has been chosen.

354. **Alternative transition structures:** To minimize the length of the viaduct structures two options were studied to separate road and rail alignments at the end of the approach road. In the first option the four-lane road from the bridge is divided into two carriage ways of which one passes under the railway viaduct. In the second option the whole road passes over the railway viaduct. The first option has been selected in view of lower cost, better aesthetics and technical advantages. The preferred option requires about 7 ha more land.

355. **Alternative river training works designs:** Since the feasibility study an area of 500 m land inwards has been eroded on the Janjira side; this process can be seen on satellite observations. The optimal type of river training works has been the subject of detailed hydrological and model studies, and consultations between experts. Also physical and numerical hydraulic model studies were applied to determine the effect of various options of bank protection. Two major alternative designs for river training works (RTW) were identified:

356. Alternative 1 consisted of a 12 km continuous revetment bund along the south bank and the bank of the channel to protect all project components on this side of the river. A 6 km section of this revetment bund near the bridge will be raised above flood level to prevent overtopping or outflanking from floodplain flows; the remainder will be constructed slightly above bank level. Alternative 1 will both adequately protect major project components from erosion and have fewer environmental impacts on river ecology and *charlands*. It involves less dredging but it needs 190 ha of land on the floodplain. The south channel will remain open (requested by the char people) and the *charlands* will not be affected. Alternative 2 consisted of a guide bund to protect the landing site of the bridge and two hard points on the bank of the south side channel to protect the approach road, which is only situated a few kilometres inland and runs parallel to the bank of the south channel. This alternative was later modified by shifting the two hard points across the channel on the *charland*. This Alternative 2-modified was believed to give better hydraulic performance and would not require the purchase of too much land on the populated channel bank, where there are also two ferry *ghats*. A detailed comparison of both alternatives revealed that Alternative 2-modified requires less agricultural and residential area but a considerable *charland* area (200 ha) will disappear. Moreover, the south channel will be closed in this alternative. A detailed comparison of the two alternatives concluded that Alternative 1 is preferred.

Description of Environment

Physical environment

357. **Climate:** The climate in the project area is a typical monsoon climate with three main seasons: summer (March to May), monsoon (June to October) and winter (November to February). The summer is warm and humid with average monthly temperature of 28 °C with occasional moderate to heavy rainfall. The monsoon period is generally humid with 80 % of total annual rainfall. Total annual rainfall varies between 1750 and 2500 mm, with most rain from May to October with a usual peak in July (300- 700

mm). The winters are dry and relatively cool with few rains and an average monthly temperature of 18°C. Wind mainly comes from two directions: a northerly light wind mainly blows in the winter season, while winds from the south and south-east dominate in summer and monsoon seasons.

358. **Geomorphology and landscape:** The north bank is part of the Lower Ganges/Brahmaputra River floodplain, which is characterized by a relatively stable and elevated river levee (elevation +7.5 to 8m) with medium textured soils, which have been silted up to a level that is slightly above annual flood level. The area is densely populated; most occupation and trees are on the high river levee while rice cultivation is in the lower lying areas.

359. The south bank near Janjira is located on a north-south oriented meander belt complex, consisting of parallel sandy ridges and lower lying medium textured depressions often with some form of natural drainage towards the main channel. Homestead development and trees are found on the higher ridges and on the embankment of the channel a wide variety of crops is grown in winter and in summer, including rice. There is also livestock holding and a few fishponds in the area.

360. The third unit consists of Char Janajat, which is a complex of aggregated chars. Char Janajat was formed in the last 20 years by the braiding and meandering Padma River. The area consists mainly of vegetated and often cultivated *charlands*, which are slightly raised above the average river level (elevation + 2.5 to 4m).

361. **Soils:** Soils in the area are of alluvial origin. Soils usually have good physical and chemical properties and have a pH of 7.5 – 8.0. They are moderately fertile and suitable for a broad range of crops. At some distance from the river finer textured grey colored clayey material has been deposited in the lower basins and depressions. These soils can be characterized as gley soils. These soils are very suitable for rice cultivation. The soils of the *charlands* consist mainly of very fine sand or silt loam.

362. **Land use:** Both banks of the Padma River can be characterized as rural areas with agriculture being the predominant land use. However, there is more urban and commercial influence on the northern Mawa side. The presence of the capital is reflected in the lower share of agricultural land as compared to the other side of the river. On the northern side of the river only 65 % of the land is occupied by farms, whereas 86 % of the land is farmland on the south side. Residential development on the north bank is considerably higher (31 %) than on the south bank (12 %). Land use on the chars is completely different. Most people are fishermen and about 34 % of the *charlands* is used for agriculture. A considerable area (43 %) is classified as fallow land (bare, semi-natural grassland, or wetlands covered with sedges and reeds) and partly used for grazing cattle. Only 3 % of *charland* is occupied by housing and settlement.

363. **Padma River:** The width of the Padma at the project site has varied from 2 to 6 km in the period 1976 to present. The behavior of the river at Mawa is fairly unpredictable and varies between braiding, straight and meandering in cycles of about 20 years. Historically the main channel can be located anywhere. At present it runs near the north bank, but it is expected to move towards the south channel. Maximum discharge of the Padma River at Mawa measured during the 1998 flood was 115,000 m³/sec. The average water level slope of the Padma is about 5 cm/km.

364. **Other surface water bodies:** The Arial Khan is a distributary from the Padma River that takes off about 15 km upstream from Janjira. The South channel is another relatively short river channel near Janjira, separating the southern bank of Padma River and Char Janajat. Other surface waters in the area include *khals* (natural drainage canals), *beels* (natural depressions), *baors* (oxbow lakes) and a number of fishponds.

365. **Bank erosion:** The embankment near Janjira is rather low and has been subject to heavy erosion during the past few years. This is also why the bridge will be longer (6.15 km) than anticipated in the 2005 feasibility study (5.6 km). Structural measures through river training works are necessary to reinforce and protect the embankment. The north bank is fairly stable and there is hardly any erosion from the river.

Natural environment

366. **Ecosystems:** The deltaic plain where the project is situated consists of a number of ecological zones, each with their associated flora and fauna. The variability is mainly determined by the hydrological conditions (seasonal variations in water levels and seasonal connections between river and floodplain) and the composition of soils. Typical ecosystems are partly natural and partly manmade. The natural systems are: (i) Padma River and its tributaries, and (ii) the *charlands* within the river. The manmade ecosystems are located in the older parts of the floodplain and comprise: (iii) homesteads and settlements, (iv) agricultural fields, (v) tree ecosystems, and (vi) permanent and seasonal wetlands.

367. **River ecosystem:** The river's ecosystem is significant as habitat for numerous species of vertebrates and invertebrates. Most are also found elsewhere in the delta, but for some species the project area is of special importance, namely the highly threatened Gangetic Dolphin and two other species. This part of the Padma River is known for their regular presence and breeding. The project area is also of special importance for a few reptiles and amphibians as well as three endangered turtle species. Also the presence of the nearly extinct Gangetic Gharial has been confirmed in the area. There are 158 species of channel migratory fish species known in Padma River including major carps and floodplain resident species. Some species of fish are confined to the river water, some migrate from the floodplain to the river mostly for breeding, and others migrate to the upper reaches during the monsoon season. The major migratory fish of the Padma is Hilsa. Hilsa migrates from the Bay of Bengal via the Padma River to spawn in the upper reaches of the river. They pass the project construction site during March–May, together with catfishes and major carps that migrate in the same period. Janjira is considered one of the main fish breeding grounds, but a number of smaller spawning and nursing grounds are found to the SE (Naria) and NW of the project site.

368. **Charland ecosystem:** *Charlands* are newly accreted lands from river deposits. In the direct surrounding of the project site there are three significant complexes of *charlands*: (i) Char Janajat, upstream (NW) of the proposed bridge, (ii) a young complex of Char Tarapasa and Majhir Char situated directly under and near the bridge alignment, (iii) a *charland* complex downstream (E) Char Teotia consisting of Chandra Bari Char, Char Lauhajong and the more developed Char Korhati. The ecological significance of the *charlands* is considerable. They provide the typical biotope for the endangered Fishing Cat and the critically endangered Indian Crested Porcupine. Large numbers of footprints of the first species were actually seen in the project area. The submerged areas of the chars are favorable microhabitats for fishes and since fish is the main food for dolphins, the chars and sandbanks in the middle of the river are important biotopes for the dolphins. Majhir Char (under the bridge) is considered a major staging ground for migratory birds in winter. Thirteen amphibian species were observed in the project area of which two are endangered and three vulnerable; six different turtle species, including some endangered and very rare species and two different Monitors both categorized as endangered in the IUCN Red List. Ten species of snakes were found of which three are on the Red List.

369. **Terrestrial ecosystem:** These include homesteads and settlements, agricultural fields and semi-forested areas. These ecosystems provide living opportunities to the rural population, but also support floral and faunal biodiversity, albeit that most species are common and found all over the country. The significance is the ecological corridor function and the availability of trees supporting a fauna that

otherwise would not be available in the area. About 92 terrestrial bird species were observed including one listed in the IUCN Red Data Book: the Brown Fish Owl.

370. **Wetland ecosystem:** Temporary wetlands are agricultural lands flooded during the monsoon period. Their ecological significance is major and could be compared to that of the submerged areas around the chars. They are important breeding and especially nursing biotopes for fish and crustacean species, including Hilsa, major carps and catfishes. Permanent wetlands are the manmade ponds, the oxbow lakes, depressions (*beels*) and channels. They are important for aquaculture. About 65 aquatic bird species were observed in these areas including some Red-listed species.

371. **Physical and cultural resources:** There are no designated historical, archaeological or cultural resources within the project area. However, Lauhajang on the north bank has a rich cultural and historical heritage with some beautiful mosques and tall minarets. Idrakpur Fort, the earliest Muslim architecture, is a popular tourist place. These monuments will not be affected by the project. Some locally important cultural or community assets may be impacted and these are handled in line with local needs.

Existing Pollution levels

372. **Air quality:** The major sources of air pollution in the project area are ferry traffic, vehicular traffic and dust and emissions from brick fields. At the three ferry *ghats* there are heavy traffic congestions of waiting trucks, buses and cars resulting in extensive exhaust emissions. Also emissions from the numerous, often poorly maintained ferries, launches and speedboats crossing the river contribute to air pollution.

373. **Noise:** The major sources of noise in the project area are the ferry *ghats* and the traffic on road and river. Vibration also occurs at ferry *ghats* during uploading and offloading of heavy vehicles. Highest noise levels of 77 dBA were recorded at the Mawa during the day and 73 dBA during the night., which is above the standard set by the Bangladesh Environment Conservation Rules of 1997 (60 dBA for commercial and mixed areas).

374. **Surface water quality:** Surface water quality of the Padma River, the Naodoba Channel and other surface streams and ponds was measured during the monsoon and dry period. Compared to irrigation water standards the water quality is satisfactory, with the exception of the high amounts of total and faecal coliforms. Without boiling this water is definitely unsafe for use as drinking water.

375. **Groundwater quality:** Groundwater at the Mawa side is not always safe, especially from the more shallow tubewells. In some shallow tubewells (<90 m) on the Mawa side, high values of arsenic have been recorded and these tubewells should not be used for potable water. Arsenic values in deep tubewells (>90 m) are below the national standards and they can be considered safe. Iron and manganese content in some tubewells is slightly higher than the national standards for drinking water. This may result in a bad taste and problems of clogging and flocculation of iron and manganese oxides in pipes.

376. **Riverbed sediment quality:** Analyses of riverbed sediments of the Padma River show that there are no major concentrations of heavy metals in the silty material from the riverbed. Mercury (Hg) was slightly higher than standards in two samples of a series, which was analysed in Dhaka. This was not confirmed by other samples, which were analyzed for heavy metals and toxic organics in Singapore. The results of these tests indicate that there are no harmful concentrations in any of the samples. More monitoring is required, especially of the deeper sediment layers, which will be exposed by dredging.

Significant Impacts and Their Mitigation

Overall impacts of the PMBP

377. The most important impact of the Padma Bridge will be the establishment of an easy, safe and reliable communication link between the banks of Padma River. Road and railway connections with the Southwest will improve considerably and this will both have an accelerating effect on local as well as regional socio-economic development. A river crossing utility infrastructure will facilitate connection of the Southwest to the gas, electricity and telecommunication networks in the rest of the country and avoids expensive alternative constructions. In the project area new employment and business opportunities will be created and the improved connectivity will enhance access to healthcare, educational and recreational facilities. Air and noise pollution will be reduced and traffic congestion and long waiting times for ferries will disappear.

Impacts during pre-construction stage

378. **Development of resettlement sites:** The development of four resettlement sites, two on each bank of the river, will require the acquisition of 68 ha of land at an early stage of project preparation. The relocation of the basic and religious services has been discussed with the communities and it has been widely accepted that relocation of most facilities (as far as possible) within the resettlement area would be preferred. The detailed plans and budgets for these facilities have been included in RAP I. A separate EIA has been prepared for the development of the resettlement sites.

379. **Impact of land clearing:** Land clearing and removal of trees and other vegetation will have a major impact on landscape and wildlife. All vegetation and trees in the road and railway alignments right-of way and on other project sites will be removed, before infertile fine sandy dredge material is used to raise the level of these areas with an average 5 meters to elevations above maximum flood level. The terrestrial ecosystem of these areas will be changed permanently. It has been estimated that more than 200,000 trees on the project land will be cut during site clearance. Owners of trees will receive compensation under the RAPs and are also allowed to sell their own trees and take the wood free of cost to be used for timber or firewood. To compensate most of the negative impacts a tree plantation and green belt development plan has been drafted, which includes the planting of more than 400,000 trees. Trees will be planted in strips along road and railway alignments to mitigate noise, to form green belts around construction yards and resettlement sites, and alongside slopes and behind guide bunds of river training works (about 100 ha). In addition, total quantities of affected banana and bamboo have been estimated at around 360,000. Around 720,000 bamboo and banana saplings will be distributed to the people of the host villages at the ratio of bamboo and banana 60:40.

380. **Loss of agricultural land:** An estimated 640 ha of agricultural land will be lost in the project area. This loss will impact 8,525 farmer families, who will receive compensation in cash. It is not considered realistic to expect that the loss of production can be covered by boosting the production in the remaining neighboring areas of the project. Those affected by the project will receive cash compensation for land and other assets at full replacement cost as per market price at the time of dispossession. Besides this, the households are eligible for additional support in the Income and Livelihood Restoration Plan which includes also an Agricultural Development Program. Under the program, a number of agricultural extension workers will assist and train farmers in close cooperation with the Department of Agricultural Extension.

381. **Loss of fishponds:** An estimated 12 ha of fish ponds will be lost due to project activities. With a common production level of 2,000 kg/ha, some 24,000 kg of fish will be lost yearly. In addition, food fish production from 724 ha of floodplain (at least 150,000 kg) will be lost. The following compensation

measures are identified: (i) Provision of an equal pond area in the resettlement areas. (ii) Establishment of fish (reproduction) sanctuaries in the Padma River.

382. **Construction of yards on charlands with high biodiversity:** Especially reed lands on Char Janajat and Char Chandra Bari (Teotia) are important wildlife areas, which should not be subject of any project building activity. Construction of yards should be restricted to old lands and developed *charlands*. Use of Janajat and Char Chandra Bari for vegetation clearance and construction yards is ecologically unacceptable. Barring these two main *charlands* for yard construction also excludes their use for transportation activities and for replacement of ferry *ghats*.

Impacts during construction stage

383. **Construction related impacts:** In a project of this magnitude and complexity there are many impacts and risks, which potentially could affect air, soil, and water quality, and which, could cause hindrance (noise, dust, traffic) or pose safety hazards (health and safety). Most of these impacts are less significant and could be avoided, prevented or mitigated by adopting good operational practices and environmental management guidelines and by permanent monitoring and inspection. Most impacts could be prevented or mitigated by including generic Environmental Code of Practices and Environmental Management Guidelines in contract documents. The less significant impacts are not included in this annex.

384. **Transport of materials over land and river:** Large quantities of concrete, steel and rock, and other building materials will be transported both on water and by road during mobilization and construction will cause traffic congestions and hindrance on roads and during navigation in the river. There are also associated safety hazards to be considered. Especially local roads are not designed for carrying heavy traffic and this may result in considerable damage to local roads. Prevention and mitigation can be achieved by constructing temporary bypass roads in order to maintain uninterrupted traffic flows to ferries and urban centres. Damaged roads should be repaired. Movement of vessels, barges and dredgers will be constricted to designated areas to reduce risks of collisions and accidents.

385. **Impacts of dredging:** Dredging will be carried out during the dry season when currents are not strong; increased turbidity may cause increased turbidity in the water for longer periods. Dredging also destroys the benthic communities, which are especially abundant in the shallower parts of the river and form the nursing and feeding grounds for fish. There are no toxic substances to be expected in view of the good quality of riverbed sediments (fine silty sand). The following significant adverse impacts are expected from dredging:

- Water quality deterioration during dredging (high turbidity) will affect aquatic fauna and to some extent also the use of river water (bathing/washing) by the population;
- Dredging of *charlands* and submerged embankments will result in loss of wildlife habitat and aquatic fauna will be forced out of their preferred habitat. It is estimated that about 500 ha of vegetated char and about 500 ha of submerged embankments will be permanently lost;
- Deep dredging in main gully during March – May will stop Hilsa migration;
- Disposal of dredge material on *charlands* will severely impact flora and fauna on the *chars*, whereas disposal of dredge material in the river in the dry season will create negative impacts on aquatic life.

386. **Mitigation of adverse impacts of dredging.** A dredging material management plan is to be prepared in order to reduce permanent damage to breeding and nursing biotopes for numerous fish, crustacean species, and feeding grounds for dolphins.

387. This plan should be based on the following principles:
- use of anti-turbidity technology during dredging
 - constant monitoring of cutter head turbidity, especially TSS and TDS values
 - dredging operations in upstream direction to prevent concentration of silt and other suspended materials (clay, waste)
 - avoid dredging of vegetated *charlands*
 - suspension of dredging during the main Hilsa migration period (March to May) in the main channel on the North side of the river. In the other parts of the river dredging may continue.

388. The loss of wildlife habitat in the submerged embankments and the *charlands* should be compensated by the establishment of around 1,200 ha protected wetland area (600 ha char and 600 ha river) or sanctuary for *charland* wildlife.

389. **Impacts of piling:** Piling takes place during the construction of the bridge substructure for an estimated period of 2.5 years. Impacts will therefore mainly have a temporary character, but effects are significant and lasting. Impacts are twofold:

390. **Vibrations disturb fish migration routes:** For most commercially important species (Hilsa, carps, catfish) migration is indispensable to reach the breeding areas close to or upstream of the project site. Hilsa fish migrate upstream for feeding and breeding during March-May. Vibrations caused by piling will chase fish away from the wider area, resulting in loss of recruitment. Although these disturbances will only take place during two years, the effect on especially Hilsa will be long-lasting: interruption of its migration from the sea to the upstream breeding areas will result in the absence of two year-classes born upstream of the project site, and those year-classes will subsequently not use the same migration route when they are adults. This will virtually eliminate the breeding opportunities for this important food fish in the traditional Padma breeding areas upstream of the project site.

391. **Noise pollution disturbs behavior of aquatic fauna.** Dolphins as well as fish have very sensitive acoustic organs, and thus are sensitive to noise and vibration. Gangetic River Dolphins are present within the project site; they are likely to avoid the area during the construction period and especially during the calving period (mainly March-May). Both dolphins and fish use sounds for communication; strong vibrations might well disturb their common behavior patterns, potentially resulting in loss of reproduction capacity. The combination of these effects with the loss of breeding and nursing biotopes for fish and feeding ground for dolphins will have a major project impact. There might also be impacts on the endangered aquatic turtles using the *charlands* near the project site as their nesting site. It is expected that bird species will avoid the area close to the project site during construction activities, but that they can return to the *charlands* immediately thereafter.

392. **Mitigation of impacts of piling**

- In order to safeguard fish (Hilsa) migration, piling in water should be discontinued during March-May in areas deeper than 7 meters. Piling on land and in water shallower than 7m could continue during March-May, provided that vibration measurements and Hilsa observations indicate uninterrupted migration; if monitoring results point at severe interruption of Hilsa migration the acceptable piling depth should be reduced.
- The piling system with lowest sound generation should be selected in order to reduce disturbances;
- In order to prevent impacts on reproduction of the Gangetic Dolphin, noise should be kept as low as possible during the main calving period, which is March to May. Since this is also the Hilsa migration period, for which piling should be discontinued, additional mitigating measures are not required.

393. **River Training Works:** Impacts of RTW on floodplain and river ecology are in principle long lasting or permanent. Both impacts are highly significant in view of the large footprint of the RTW, which is estimated at 328 ha on land and 292 ha in the river.

394. **Impacts on the floodplain:** The main impact in the floodplain will be a decline of seasonal wetlands, which are the agricultural lands flooded during the monsoon periods. Their ecological significance is more or less comparable to that of the submerged areas around the chars; decrease of these temporary wetlands will result in a loss of feeding and nursing biotope of all fish and crustacean species.

395. **Impacts on river ecology:** The impact on the river ecology is the destruction of important feeding and breeding biotopes for virtually all aquatic fauna in the submerged parts of the embankment that will be replaced by a smooth sloping revetment bund consisting of dredge spoil material covered with artificial material, which will be used as protection for the riverbank. Protected stable riverbanks with underwater slope coverage have the positive impact of providing more shelter to fish and other aquatic life compared with present embankments, but shelter is substantially less important than other habitat functions. There is no direct mitigation of impacts possible, but the impacts highlight the need for the compensation in the form of a wildlife reserve or sanctuary in the riverine zone.

396. **Impacts on charlands:** Given the limited availability of uninhabited lands in Bangladesh and their high natural biodiversity, it is essential to keep as many as possible *charlands* untouched. The selected alternative has the advantage that it is expected to adequately protect approach road and landing sites of the bridge from erosion. It also leaves the *charlands* largely untouched. Despite this, dredging, filling and reshaping 14.5 km of embankments will result in considerable loss of wildlife habitat. It is estimated that about 44 million m³ of dredge materials will be generated over two seasons due to the construction of RTW alone. River dredging will force aquatic fauna away from their preferred habitat.

397. **Impacts on Hilsa migration:** The longitudinal character of dredging for river training works will have an additional impact on Hilsa migration, especially along the northern embankment. Dredging for river training works should be suspended during the main Hilsa migration period (March-May), especially along the northern shore. Dredging along the south-western side stream may continue.

398. **Impacts on natural drainage system:** The RTW and the raised alignments of the approach road will obstruct the natural drainage flow in the area. This may lead to water logging problems and stagnation of floodwaters after floods retreat. For mitigation and prevention of these problems it is important to keep the existing natural drainage system functioning and to improve the system where the natural flow is blocked, hampered or changed in direction. A number of bridges and culverts have been designed to overcome these problems, but water logging may still create local problems in residential and agriculture areas. It is important to monitor the natural flow system during the monsoon and flood period for a number of years. It is expected that improvements to the drainage systems might be required at a number of localized places. Special attention should be given to the outflow of the natural drains, streams and gullies collecting flood/rainwater from the areas behind the RTW.

Environmental Impacts during operation and maintenance stage

399. **Impacts of increased traffic:** A considerable increase in traffic passing the bridge is expected from 4,000 vehicles per day in 2014 to 45,000 in 2044. Without measures such as proper settlement planning, traffic management and noise reduction the quality of living will decline considerably and safety hazards and accidents will increase.

400. **Contribution to Green House Gas emissions:** It is expected that a significant number of vehicles will cross Padma River daily in the year 2036 contributing GHG emissions of 334,203 ton CO₂

equivalents/year. Total project GHG emission contribution as compared to the national total and world emission is insignificant. With the introduction of new techniques and new sources of fuel this figure is likely to decrease. Also the suspension of regular ferry services will contribute to a reduction of GHG emissions.

401. **Increased accident risks:** The most common emergency event will be road traffic accidents. However, there are several other emergencies that could have impacts on the operation of the bridge. These include flooding of land areas near the bridge, railway accidents, spill or leakage of hazardous materials (oil, chemicals) on land and in the river, civil disturbances, terrorist attacks, gas leaks and explosions. An Emergency Response Plan has been prepared, which covers all aspects of emergency management including prevention, preparation, response and follow-up of emergencies. An Emergency Response Team and an Emergency Response Centre with trained staff and equipment will be established to deal with such events.

Other Relevant Issues

402. **Climate change and its impact on bridge design:** Climate change may result in the rise of future sea levels, higher temperatures, and wind speeds and increased cyclone intensities and rainfall, which are all factors that may affect the design of the Padma Bridge. A study was carried out as part of the EIA into the potential effects of climate change. Based on the results of the climate change studies the following extreme situations were taken into consideration in the design of the Padma Bridge:

- Extra water-level increases at the bridge site of 0.4 m, which is the combined impact of sea level rise (extreme scenario) and increased rainfall in the catchment area leading to a maximum water level of 7.8m PWD for 100 year flood and 8.2 for check flood of 500 year;
- A maximum temperature of 46.6 °C and a minimum temperature of 9.3 °C;
- A maximum rainfall of 372 mm in 1-day period and 514 mm in a 2-day period;
- A predicted maximum peak discharge of 151,100 m³/sec and a lowest flow of 7,345 m³/sec;
- Maximum wind speed of 126 km/h.

403. **Natural bank erosion:** Erosion of river banks and of *charlands* is a common phenomenon in the active Padma River system. During the last two years, Char Janajat has been exposed to increased erosion and it is expected that the *charlands* upstream of the Arial Khan off take also may experience some massive erosion, especially on Char Badrashan. The affected area lies more than 15-20 km upstream of the bridge and studies with numerical and physical models concluded that the expected backwater effect from the bridge would not be more than 2 km upstream. It is not very likely that the bridge will have much influence on this erosion process. Further protection of the *charlands* at the present time would fall beyond the scope of the present project.

404. **Possible impacts on charlands:** Though the project is not anticipated to create any impacts on the *charlands*, the char dwellers could attribute the natural erosion to the construction of the bridge and raise compensation claims against BBA. For this reason a *Charland* Impact Management Framework (CIMP) has been prepared which gives guidelines for identifying potential impacts and risks for the *charland* communities given the uncertainty of erosion and accretion processes in the recent floodplain of the Padma River.

Environmental Management Plan

405. **Measures in design and contract documents:** Most of the construction related impacts and some of the operation related impacts can be prevented, minimized, mitigated or compensated by following environmentally friendly design options and by including special conditions in the respective construction bid documents. The EIA process was instrumental in improving some of the earlier design options (in river training works, resettlement sites, approach roads etc). The engineering consultant has incorporated general and specific environmental protection measures into the contract documents. During construction the supervising consultant responsible for supervision of EMP and RAP will supervise civil works contractors and verify that they implement the works in accordance with the measures mentioned in the construction bid documents. They will also raise environmental sensitivity and awareness of the personnel of contractors and sub-contractors working on the project.

406. **Dredging Material Management Plan:** Dredging works will be carried out during the entire construction period. These operations generate an enormous quantity of dredge spoil part of which will be needed at a later stage of the project. Large quantities of spoil are needed for earth filling activities of the various project sites to levels above maximum flood level, although at different moments during construction, requiring stockpiling of dredge spoil for some time in temporary basins. A Dredging Material Management Plan has been prepared in order to optimize operations and meanwhile minimize damage to *charlands* and wildlife habitats. This plan describes the method of dredging operations and type of equipment to be used, the designated dredging areas and method and conditions, and methods for temporary or permanent disposal.

407. **Preservation of topsoil:** The topsoil of the areas to be filled with dredge spoil should be preserved, since this material represents the most fertile part of the soils in the project area containing humus and clay. Therefore it is important that a layer of 0.25- 0.50 m of topsoil (depending on later land use) is stripped off and put aside and stored for later application as covering layer on top of the sandy dredge spoil.

408. **Tree replanting plan:** More than 400,000 trees will be planted to compensate for the loss of trees on the 100 ha to be acquired by the project. The trees will be planted in strips along the approach roads and railway line, along internal roads and in green belts around resettlement sites, construction sites, public places and behind river training guide bunds. Species selected include 50% trees for timber, 30% fruit trees, 10% medicinal tree species and 10% trees suitable as fuel wood. Settlers will receive a number of saplings to be planted around their houses. In addition, around 432,000 bamboo and 288,000 banana samplings will be distributed to the host villages to compensate the banana and bamboo trees lost.

409. **Community Environmental Management Plan:** A community environmental management committee is established for each resettlement site to assist the project authorities in providing infrastructural facilities such as water supply, sanitation, schools, mosques, health centres and other services. The committee will assist in implementing mitigating measures for each site as described in the Community Environmental Management Plan. The activities will also include environmental monitoring and organizing awareness campaigns.

410. **Protected area and charlands visitor centre:** A protected area or reserve for *charland* wildlife will be established on part of Char Janajat or elsewhere. The protected area on the char must acquire official status and will contain a core area and a buffer zone. Rangers will have to be trained to monitor and protect the area. A *Charland* Visitors Centre will be established to improve local and national knowledge about *charlands* and their biodiversity. A suitable location would be in Mawa, from where tourists and day trippers from Dhaka can travel by electric boat to the reserve to make a guided walk along an eco-trail in the nature reserve and watch the reed lands and its flora and fauna.

411. **Emergency Response Plan:** An Emergency Response Plan has been prepared for unexpected events and accidents such as extreme flooding, traffic accidents (road and rail), leakage or spill of hazardous materials, civil disturbance/riot, terrorist attacks/threats and gas leaks or explosions. The plan aims at applying effective prevention techniques to avert an emergency event from ever taking place. It further includes measures for a rapid and effective emergency response; the provision of assistance to emergency and security services; the implementation of an evacuation plan if required, and the establishment of good communications with persons/institutions involved in transport and emergency services.

412. **Monitoring Plan:** The monitoring program has a dual purpose. It is designed (i) to monitor the contractor's work during project implementation in order to check contractual compliance with specified mitigation measures, and subsequently (ii) to assess the actual environmental impacts of the project over the years following completion of the various project components. The first type of monitoring will be implemented by the contractor and supervised by the M&E consultants of CSC. The second type of monitoring will be commissioned and carried out by local organizations/consultants with sufficient experience in hydrological and ecological monitoring. Monitoring will be continued for a period of five years. Result of monitoring of impacts will have to be reviewed and evaluated from time to time by the M&E consultants. Findings might be used to revise the operational rules of the project.

413. **Environmental Enhancement Fund:** This fund will be created in order to finance sustained environmental development and protection of the project area during the O&M stage and to address any outstanding social and environmental issues during operation of the Project. The level of this fund will be US\$10 million equivalent.

414. **Cost of EMP:** Much of the EMP activities would be implemented through other components and construction contracts. The stand alone activities that are not included in such components and contract are costed separately and provided under the component C2. These are summarized below:

Summary of costs of EMP and monitoring (US\$ 000)

Nr	ITEM	FUNDING	Subtotal	Total
	During project preparation (2010-1011)			
1	Baseline ecology and biodiversity (external agency)	MSC/IUCN		365
	During Construction (3 years)			
2	DREDGING MATERIAL MANAGEMENT PLAN	Contractor		*
3	ENVIRONMENTAL MITIGATION PLAN	Contractor		5,016
4	ENVIRONMENTAL COMPENSATION PLAN	BBA/PMU		
	- Tree planting and reforestation		1,769	
	- Establishment protected area on charland		2,700	
	- Charlands visitors center at Mawa		430	
	- Agricultural Development Plan (in livelihood program)		-	
	- Community Environmental Management Plan		500	
	TOTAL COMPENSATION PLAN (phase I)			5,399
5	EMERGENCY RESPONSE PLAN (phase I)	BBA		1,228
6	CAPACITY BUILDING	BBA/PMU		5,262
7	MONITORING PLAN			
	- Monitoring ecology, fishery, biodiversity (4 years)	MSC/IUCN	65	
	- Environmental quality monitoring,	MSC	464	529

During Operation and Maintenance (5 years)				
8	ENVIRONMENTAL COMPENSATION PLAN - Maintenance tree plantation (2 years) - Operational Cost Protected area (5 years) - Operation Cost Charlands Visitors Center (5 years) TOTAL COMPENSATION PLAN (Phase II)	BBA/PMU	72 163 849	1,085
9	CHARLAND IMPACT MANAGEMENT FRAMEWORK			p.m.
	Total Cost EMP			18,883

*Dredging material management plan is included in civil work amounting around USD 1,900,000.

Implementation Arrangements

415. **Project Implementation Unit:** A Project Management Unit (PMU) headed by a project director has been established by BBA to implement the PMBP. The PMU consists of separate units responsible for: (i) Bridge; ii) Bridge End facilities and Roads, (iii) River Training Works, and (iv) Safeguard (Environment and Resettlement). The PMU will have the responsibility of overall project coordination and management of the project. At present a program of institutional strengthening is being developed and new staff is being recruited. A Panel of Experts, appointed by BBA with national and international experts to provide guidance and periodic review of procedures and the work of the DCs is also in place. An Environment Management Committee has also been constituted to help PIU on environmental aspects during preparation and implementation of the project. The environmental unit is currently being strengthened to be fully operational during the construction of the PMBP. The unit will consist of 3 senior resettlement specialists and 3 senior environmental specialists. In order to build capacity of this unit, twinning arrangements have been agreed with academic and practitioner institutes like, BUET, CEGIS, etc. BBA has established a Safeguard Division with separate environmental and resettlement staff for the period after construction of the Padma Bridge. This division will eventually be charged with the management of environmental and resettlement aspects of all present and future projects implemented by BBA.

416. **Construction Supervision Consultant:** PMU will employ a construction supervision consultant (CSC) for supervision of civil works, including supervision of implementation of portions of the EMP to be implemented by the Contractor responsible for the bridge and RTW. The CSC team will have an environmental unit– including Occupational Health and Safety expert. Environmental specialists of CSC, in coordination with EU staff, will ensure the implementation of environmental management practices at each stage of the project activities. The CSC will also be responsible for updating the EMP, if required.

417. **Implementation of key non-construction EMP:** BBA will engage specialized NGOs and agencies to implement the safeguard plans developed under the SAP and EMP. Also the establishment of a nature conservation reserve and the establishment and management of a Charland Visitors Centre could best be carried out by a national or international NGO like IUCN. Certain elements of the EMP could be implemented by the contractor(s) under supervision of the environmental unit and M&E consultants.

418. **Supervision, and monitoring and evaluation:** Independent M&E consultants will be engaged to undertake monitoring of RAP and non- RAP components and of the EMP implemented through contractors, as well as specialist NGOs.

Public Consultation and Disclosure

419. **During project preparation and design:** The process of public consultation and participation has been an integral part of all project preparations since 2003. During the pre-feasibility and feasibility study, a series of consultations were organized and these were stepped up during detailed design. These

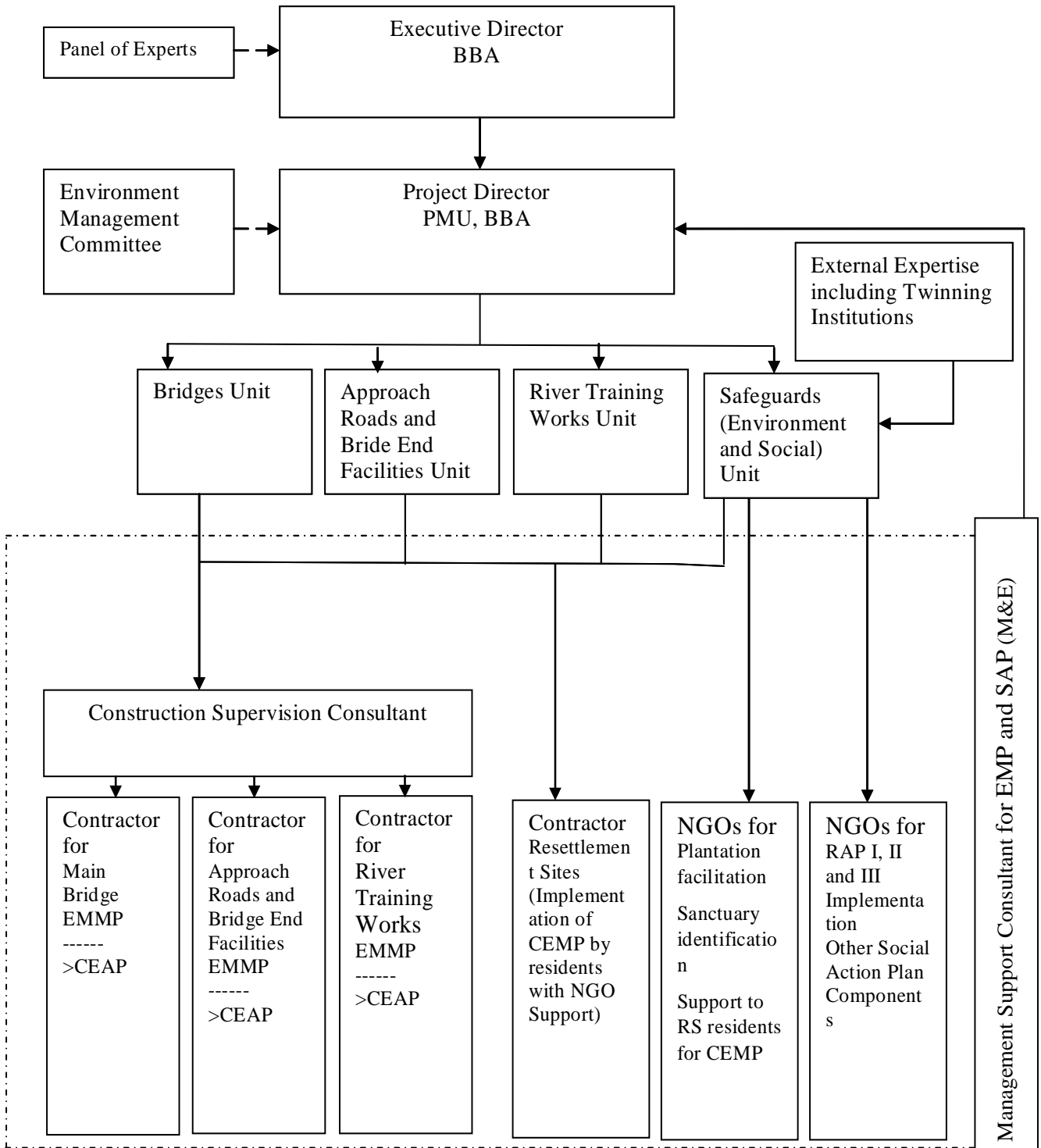
consultations were held as proposed in the Public Consultation and Participation Plan with formal and informal meetings, village level workshops and disclosures of project impacts to the affected households and communities. The views, needs and aspirations of the affected people as expressed during these consultations have been incorporated in the project design and the proposed mitigating measures with the objective to maximize benefits and minimize adverse social and environmental effects.

420. **Focus group discussions:** There were different types of consultations. A very important role was played by the Focus group discussions, where discussions were held with affected groups of persons focusing on specific subjects. At the beginning of such meetings the anticipated impacts were disclosed and followed by discussions on possible solutions to prevent or mitigate such impacts. Major issues discussed in such meetings typically included: (i) land acquisition and possible alternatives; (ii) hydrology, drainage and river erosion; (iii) fisheries and wildlife; (iv) health hazards, (v) tree cutting and impacts on local ecosystems; (vi) community severance; (vii) employment/job opportunities and occupational changes; (viii) traffic congestion; (ix) cultural resources and infrastructure; (x) impacts on char lands; and (xi) relocation and resettlement. Participants actively joined in discussions and contributed very useful suggestions and ideas, which were recorded for follow up.

421. **Public consultation meetings:** Formal public consultations meetings were held at three locations involving about 350 participants representing affected persons, union and *upazilla* leaders, NGOs, and national and local government representatives. The recommendations from the public consultations have been incorporated in the engineering design and the resettlement and compensation plan for the affected communities.

422. **Expert consultations:** Consultations with various groups of experts were held during the detailed design. The objective was to share information on the project and to obtain feedback on important social and environmental issues to be considered in the Social Assessment and Environmental Impact Assessment. Guidance and expert advice on the social and environmental studies was also received from the Panel of Experts appointed by BBA consisting of 10 national and international experts charged with periodic review of procedures and progress of the PMBP.

423. **Disclosure:** Five consultation meetings to disclose the results of the environmental and social assessment and the EMP and SAP were held in the project area March 16 – 19, 2010. A national workshop was held on October 23, 2010. The EA/EMP was approved by Department of Environment on September 6, 2010. The Summary Report was submitted to Bank's Info Shop on September 8, 2010. These reports have also been placed on the websites of ADB and JICA. After completion of the English version of the Environmental Impact and Social Assessment a summary in Bangla is prepared and distributed to local authorities and relevant stakeholders. The draft Summary and the EIA and EMP are published on the website of BBA. The hard copies of these documents are available at the BBA office, project site offices and deputy commissioner offices for general public access and they have been distributed widely.



Annex 9: Economic and Financial Analysis

BANGLADESH: PADMA MULTIPURPOSE BRIDGE PROJECT

424. The Padma Multipurpose Bridge will provide a vital missing link in the national road network of Bangladesh particularly for the Southwest Region (SWR) of the country. A fixed crossing is essential to link SWR with the rest of the country. Continuing with transportation through ferries and boats is not an option for the country, particularly for the SWR because without effective connectivity of the bridge, the region would continue to lag behind the rest of the economy and suffer from high concentrations of poverty.

425. The Padma Multipurpose Bridge Project (PMBP) is an important large-scale infrastructure project of transformational nature with broad impact that would provide substantial benefits to all sectors of the economy. The analysis shows that the benefits of the Project would be equivalent to annual increase of at least 1.7 percent of SWR GDP in value and of the 0.56 percent of annual increase of national GDP. The poverty reduction rate would increase by 1.0 percentage points in the SWR and by 0.8 the percentage points at the national level. The impacts are quite similar to the Jamuna Bridge (connecting Northwest Region to the country), which were estimated about five years after the opening of the bridge.

426. The Padma Bridge is expected to: (i) provide significant travel time savings to drivers, particularly between the Dhaka Division to the south-west of Bangladesh and possibly onto India (saving travel time by about 2 hours for cars to more than 10 hours for trucks); (ii) result in change in transport costs that will result in significant economic structural change of the SWR (changing the relative prices of factors of production, goods and services and resulting in relocation of economic activities, generation of new activities or changes in the way that current economic activities are performed); and (iii) result in increased economic activity and consumption expenditure leading to poverty alleviation in Khulna and Barisal Divisions of the SWR.

Estimation of Project Benefits.

427. The expected benefits of the Project can be divided into: (i) road users' benefits or transportation benefits directly realized by the operators of the vehicles, which were estimated using the traffic models; (ii) other direct benefits such as land development, protection against river bank erosion and flooding around the bridge area and avoided cost of separately providing for utility crossings such as gas pipeline, electric telecommunication lines and railway bridge, which were estimated by assessing value of the land developed and alternative cost of construction; and (iii) wider economic benefits (WEB) with increased economic activity that would develop with reduced cost of transportation and generating surplus for other economic activities. The WEB effects of the bridge were estimated using Social Accounting Matrix (SAM) and Computable General Equilibrium (CGE) models. These are described in more detail in Annex 9.1.

Transportation or Road Users Benefits.

428. The Design Consultants (Maunsell/AECOM) carried out detailed traffic studies and developed traffic models to prepare the estimates of the direct transport benefits (report July 2009 and August 31, 2010). The direct transport benefits are estimated by the transport modeling, which required the following steps:

- Building base and future year networks;
- Determining base year crossing demand from an origin-destination survey undertaken in May 2009 and calibrating it to current conditions of road traffic;

- Determining future demand on the basis of (a) growth in car ownership and (b) changes in socio-demographics, including population and employment;
- Based on the relative costs of each mode, calculating how mode choice would change for future year demand;
- Assessing freight movements; and
- Assigning the motorized traffic to specified points in the road network.

Traffic Estimates and Forecast.

429. Based on detailed information on the socio-economic situation and travel patterns, The Design Consultant used a transport model to forecast traffic volumes on and revenues from the Padma Bridge. The model takes into account four primary socioeconomic influences on the traffic demand: (i) population; (ii) number of households and average household size (iii) employment by main sector of the economy; (iv) GDP by main sectors of the economy and GDP per capita and (v) vehicle ownership. Each of these influence traffic demand and further assumptions about parameters were made and these are noted below.

430. **Population and households.** The projection of total urban and rural population were made based on BBS data and it was assumed that certain areas directly served by the bridge would get a boost in population growth primarily through migration. Similarly the size of households was projected on the basis of past trend and observed status in other countries. For the purpose of traffic demand projection, the total number of households was then derived by dividing the population forecasts by average number of people per households.

431. **GDP growth** assumptions were based on IMF series. The key assumptions in the traffic model about GDP and per capita GDP are noted in Table 1. Regression analysis was used to forecast sectoral composition of GDP.

Table 1: Adopted Forecasts of real GDP and GDPPC

	Real GDP	Real GDPPC
2009-2014	5.9%	4.0%
2015-2024	5.5%	4.2%
2025-2034	5.3%	4.2%
2035-2044	4.8%	4.1%

432. **Vehicle Ownership.** Car ownership is low in Bangladesh—estimated to be 0.64 per 1000 population and motorcycle ownership is 2.58 per 1000 population. Car ownership is concentrated in Dhaka area, but motorcycle ownership is, more evenly distributed. In forecasting vehicle ownership levels for Bangladesh initial figures were used from BBS source and projection of ownership was made using a standard model (GOMPERTZ). Vehicle ownership for cars and motorcycles was calculated separately for the Dhaka Zila, SWR and the remainder of Bangladesh. Given the change in GDP forecasts due to the effect on the economy of Padma Bridge, the rate of vehicle ownership is also expected to increase. The model generated a 10% per annum, long-term growth rate of vehicle ownership.

433. Other assumptions were made and estimates used with regard to trips in base year and future years, and about parameters of the traffic model.

434. **Base Year Trips and Traffic Forecast.** Base year demand in the model was based on all potential trips that could possibly use the Padma Bridge. This was derived from origin-destination surveys covering all vehicular and person traffic crossing, three ferry crossings (Mawa, Paturia, Shariatpur) and two existing bridges (Jamuna and Paksey). In addition, a live origin-destination survey of current traffic

was conducted in the first half of May 2009 at nine points (four river crossing, Dhaka port, and four road junctions) netting altogether more than 18,000 survey respondents and counts in excess of 325,000 passengers and 22,000 vehicles. This substantial body of O-D traffic count information was joined with socio-economic data at the Zila level (disaggregated for Dhaka to the Upazila level), a network mapping of rail, water, and road routes (incorporating IRI measures of road condition and locally validated operating costs and volume/ capacity relationships), all of which were entered into the standard Cube Voyager transport model suit. The model was then used to calculate trip generation, origin-destination distributions, mode split (including passenger cars versus buses as competing modes), and, ultimately, route assignments, including the predicted volume for four vehicle classes (trucks, buses, cars, motorcycles) at the Mawa crossing/Padma Bridge site for both 'with' and 'without' Padma Bridge cases.

435. **Historic Traffic Pattern over Padma.** Table 2 and 3 show past traffic crossing on over Padma River at key crossing points ferries (Mawa, Paturia and Chandpur) and Jamuna Bridge from where the traffic for Padma Bridge crossing would come. The annual growth rate for traffic at Mawa is higher than Paturia crossing with overall growth rate of about 10 percent.

Table 2: Traffic over Padma River at key Ferry Crossings (AADT) and Annual Growth Rate

	Mawa	Paturia	Chandpur	Total
1994-95	182	920		1,102
1995-96	219	1,120		1,339
1996-97	297	1,148		1,445
1997-98	390	1,139		1,529
1998-99	312	1,287		1,599
1999-00	469	1,402		1,871
2000-01	611	1,571	2	2,184
2001-02	663	1,811	31	2,505
2002-03	461	2,474	49	2,984
2003-04	494	2,230	42	2,766
2004-05	424	2,636	28	3,088
2005-06	765	2,589	25	3,379
2006-07	910	2,743	36	3,689
2007-08	1,034	2,892	18	3,944

Annual Growth Rate in AADT Percent

Period	Mawa	Paturia	Total
Five Year Growth Rate 1994-95 to 1999-00	21.0	7.0	11.0
Five Year Growth Rate 2002-03 to 2007-08	17.5	3.16	5.9
Ten Year Growth Rate 1997-98 to 2007-08	10.3	9.5	9.5
Ten Year Growth Rate 1994-95 to 2004-05	8.7	11.1	9.7
Thirteen Year Growth Rate 1994-95 to 2007-08	14.3	9.2	10.3

Table 3. Jamuna Bridge Traffic (AADT) Since Opening and Growth Rates

	Trucks	Bus	Leight Vehicles	Motor Cycles	Total
1998-1999	876	807	614	223	2,520
1999-2000	960	901	576	113	2,550
2000-2001	1,249	1,118	569	106	3,041
2001-2002	1,430	1,251	569	100	3,350
2002-2003	1,685	1,386	610	87	3,767
2003-2004	2,138	1,567	671	96	4,472
2004-2005	2,542	1,778	719	102	5,141
2005-2006	2,570	1,893	850	134	5,447
2006-2007	2,930	2,002	916	104	5,952
2007-2008	3,533	2,216	1,097	112	6,957
2008-2009	3,778	2,289	1,332	140	7,539
2009-2010	4,306	2,487	1,679	178	8,650
Annual Growth Rate					
for 10 years 1998-99 to 2009-09			11.6%		
for 5 years 1998-99 to 2004-05			12.1%		
for 5 yrs 2003-04 to 2008-09			11.0%		
for 11 yrs 1998-99 to 2009-10			11.9%		

Valuation of Traffic Benefits

440. Besides assumptions and estimates made to forecast traffic, certain assumptions and estimates were made to generate estimates of traffic benefits. Travel time and cost saved were converted into common value in taka. Table 5 records the values used in the model. It is also assumed that value of time will grow with time. The DCs assume that value of time would grow at 50% of the rate of real income growth.

Table 5: Assignment Parameters (in 2009 Taka)

	Truck	Bus	Car	Motorcycle
VOT (Taka per vehicle per hour)	107	555	145	40
VOC (Taka/Km)				
Good road condition	17	18	13	2
Fair road condition	19	20	14	3
Bad road condition	24	26	19	3

Source: “Road User Cost Annual Report for 2004-05”, Roads and Highways Department and “Household Income and Expenditure Survey, 2005”. BBS

441. The quantified benefits of the bridge investment are measured as the difference between the ‘without project’ and ‘with project’ cases. In estimating benefits for each of the items, certain assumptions were made and some available estimates were used. Vehicle operating cost (VOC) is used to provide economic value in distance savings covering various factors such as fuel, tires and maintenance etc. This is a major part of total benefits. For the economic evaluation, unit VOC was derived from the “Road User Cost Report, 2004-05”, RHD. Total VOC was disaggregated into fuel and non-fuel components, which were then escalated to 2009 values by the increase in Average Petroleum Spot Price (IMF, 2009b) and the Consumer Price Index (BBS, 2009a).

442. A measure of Value of Time (VOT) is used to convert travel time savings into a monetary value. Savings in travel time costs account for 23% of total benefits estimated by Design Consultant. Unit travel time costs for passengers and crew were sourced from RHD (2005) and for freight in transit from STUP (2007). These were then escalated to 2009 prices by estimated increase in General Wage Rate Index from BBS (2008) and ADB (2009). The above VOT for the different vehicle classes was then weighted using the vehicle proportions observed during Traffic Survey (May 2009) to determine VOT for truck, bus and light vehicles.

443. Additionally it was also assumed that VOT would increase with uncertainty and delay, Wait Time in the economic evaluation was valued 1.5 times in-vehicle time. Research shows that valuation of wait time can be between 1.5 to 3.5 times of in-vehicle time.

444. **Travel Time Savings.** Table 6 presents the travel time savings likely to be experienced by users of the Padma Bridge for a selection of typical trips from Dhaka in 2014. These travel time savings include wait time at ferry *ghats* weighted by vehicle class, which add further 2 to 10+ hours to travel times. Due to long ferry wait, it is expected that large number of traffic will be diverted from ferry to bridge.

Table 6. Travel Time Savings

Destination	Padma Bridge	Paturia Ferry	Savings	Mawa Ferry	Savings
Khulna					
Time	3 hr 30 min	7 hr 50 min	4 hr 20 Min	12 hr 45 Min	9 hr 15 min
Distance	170 km	240 Km	170 Km	170 Km	-
Jessore					
Time	3 hr 20 min	7 hr 00	4 hr 40 min	12 hr 55 min	9 hr 35 min
Distance	160 km	210 Km	50 km	160 km	

Revised Traffic Estimates Used

445. The World Bank, ADB and JICA Teams undertook two missions (May 2010 and August 2010) to the project area to assess the traffic and assumptions made for the traffic forecast and in valuation of the traffic benefits. Based on this review several adjustments were made to the traffic model developed by the consultants. The major difference is in the traffic forecast for the Padma Bridge. The Project Teams' (WB, ADB and JICA) estimate of traffic used in this economic and financial evaluation is more conservative. These are provided in the Table 7. In particular, the Project Teams considered the assumption about strong induced traffic generation and diverted truck and bus traffic away from ferry services at Paturia and other locations to the bridge and ultimate traffic (of over 70,000) by the DCs too optimistic.

446. The Project Team assumed an opening traffic of 4,300 AADT, growing to 12,831 by the year 2020, 36,597 by 2030 and ultimate traffic of about 45,000 in 2040. In making the revised estimate of traffic growth, a growth rate of 9% prior to bridge opening was taken into account. Also it was assumed that about 70% of the traffic crossing Paturia would be diverted in four years after opening of the bridge. During this time currently planned improvements in road network on western side of Dhaka would be completed. Construction on four lane expressway on the west side of Dhaka (Western bypass) should be highest priority complementary investment (of about US\$50 million) to direct the traffic from the north and south of Dhaka going to the SWR towards the proposed bridge with added advantage of reducing traffic congestion in Dhaka city.

447. A growth rate of 14% for about eleven years after opening the bridge starting from 2015 to 2025 was assumed. The growth rate of about 8% was assumed for the period from 2026-2030 and 2% and 1% respectively for 2030-2040 and 2040-2050 and capping the traffic to 45,000 AADT. The composition of the traffic is taken similar i.e. initially light cars are small proportion and their proportion grows over time.

Year Ending June	Truck	Bus	Car	Motor Cycle	Total
2015	1,868	1,533	825	75	4,300
2016	2,685	2,191	1,193	107	6,176
2017	3,802	3,088	1,697	151	8,738
2018	4,334	3,490	1,952	172	9,948
2019	4,941	3,943	2,245	197	11,325
2020	5,633	4,259	2,716	224	12,831
2021	6,421	4,599	3,286	256	14,562
2025	10,845	6,257	7,044	432	24,578
2029	14,755	7,320	11,084	587	33,747
2030	15,935	7,613	12,415	634	36,597
2035	17,594	8,201	14,046	700	40,541
2038	18,671	8,576	15,126	743	43,116
2039	19,044	8,705	15,504	758	44,011
2040	19,425	8,835	15,892	773	44,925
2044	19,425	8,835	15,892	773	44,925
2045	19,425	8,835	15,892	773	44,925
2050	19,425	8,835	15,892	773	44,925

Project Benefits

448. The benefits of the bridge investment are measured incremental to the ‘without bridge’ case i.e. they are measured as the difference between the ‘without project’ and ‘with project case’. The benefits are (i) road users benefits; (ii) other direct benefits; and (iii) wider economy benefits (WEB) and indirect benefits

449. **Road Users benefits.** Road users benefits, estimated based on the saving on vehicle operation costs (VOC) and savings in travel time cost (TTC). These constitute a major part of the quantified benefits. The revised traffic forecast described above was used and VOC and TTC benefits estimated were adjusted for this traffic forecast;

450. **Land Development.** There would essentially be two kinds of land related benefits from the bridge – land developed in the vicinity of the bridge and protection to land from erosion and flood in the area. The estimated capitalized value of land is taken into account. This covers:

- 240ha of land will be created from reclamation and protection by the river training works (60 ha on the north side of the river, 180 ha on the south side)
- 112 ha of service area land will be available for commercial development (85ha at Janjira and 27ha at Mawa);
- About 147 ha of land would be developed for construction yards on both sides of the river, Mawa and Janjira side.
- Value of land for commercial use is based on acquisition cost of land and ratio of developed land value to undeveloped land value of 4:1;
- Annual rental return (which is applied to land value) is the same as the economic opportunity cost of capital (12%).

451. **River Bank and Flood Protection.** Land is very is valuable in Bangladesh. The bridge will also provide protection to land from riverbank erosion and flooding. Annually more than 9,000 ha of land are eroded by rivers, primarily by the Jamuna/Padma River. The GoB has a large investment program for stabilization of the Jamuna/Padma River based on the Flood Action Program 1 (FAP 1) studies. For

example, the cost of two hard points constructed at Sirjganj and Mathrupara (for the Brahmaputra Right Bank Embankment) about ten years ago was more than US\$120 million. For Jamuna/Brahmapura river stabilization the GoB has an investment plan of about US\$400 million to construct hard points to stabilize the river over the next five years. The value of land protected against erosion and flooding is estimated around US\$ 2,263 per hectare and value of peri-urban land is about US\$ 32,587 per ha.

452. The river training works (an investment of about US\$800 million) to be constructed under the Project would provide a very strong hard point. This would help in managing the river bankline, and consistent with overall program of GoB for riverbank protection along the Padma River and perhaps it is justified solely on its own, based on the benefits from protection against riverbank erosion and flood protection. The river training works and approach roads would provide protection to large tracts of land on both sides of the river. In particular on the Janjira where more than 0.5 km of bank has been eroded over the last five years since completion of the feasibility studies for the Project. The approach of about 13 km of land on the Janjira side and the land behind it would be protected against the 100-year flood. The rough estimate is that more than 9,000 ha of land would be protected against river erosion and flooding. The value of land saved would be at least US\$156 million. These benefits are not included as the project benefits.

453. **Utility Crossings.** The savings in construction of a gas pipeline crossing of over the Padma River would be prohibitively expensive. The crossing has to be below scour depth of the Padma River i.e. more than 55 meters below the bed level. Also construction of the foundation for an independent crossing of power transmission without the bridge is estimated to cost more the US\$63 million equivalent. The combined savings in utility crossings for electrical line, fiber optic cables and gas pipeline is taken as US\$271 million.

454. **Railway Bridge.** The Padma Bridge is a rail-ready bridge on which railway tracks could be built to connect with the railway network when constructed in the region. The construction cost of a separate bridge would be about US\$900 million and perhaps it would be constructed in the year 2022 and 2023. The avoided cost of the railway bridge is considered a project benefit. However, in the base case for this evaluation these savings are not included.

455. **Savings in Ferry Operating Costs.** The Government subsidizes operation of ferries by about 50%. The estimates of cost savings mentioned above are based on the actual tariff charged to the vehicles users. With closure and/or reduction in operation of ferries there would be additional savings that would be realized to the economy. The DCs have estimated these savings (the NPV at 12%) of which is about US\$400 million equivalent. However, the Project Team has not taken these as project benefits (in base case scenarios);

456. **Wider Economy Wide Benefits.** As explained in detail in the Annex 9.1, the literature as well as an ex post analysis of the Jamuna bridge show that major infrastructure like the Padma Bridge would bring a structural change and the impacts are generally more pronounced than what is anticipated at the appraisal time by a travel model only. In short, the conventional approach always undermines the increase in traffic that would occur from opening a major link like the Padma Bridge. For this purpose Social Accounting Matrix (SAM) and Computable General Equilibrium (CGE) models were developed and used to prepare an estimate of wider economic benefits (WEB). These benefits build slowly and start about two three years after the completion of the bridge as the cost and time savings are realized and used to induce additional economic activities. The benefits plateau around the year 2030. This analysis is discussed in more detailed in the attached Annex 9.1.

Economic Costs

457. The economic capital cost of the project is estimated by taking out the price contingencies, taxes and duties and using a standard conversion factor (SCF) of 0.9. The economic costs come to about US\$1,884 million. The estimated cost of O&M of the infrastructure is also included in the estimates.

Estimation of Economic Rate of Return and Sensitivity Analysis

458. The ERR for base case is about 19%. The benefit cost ratio is over 2.0. The base case reflects a very conservative estimate and the ERR realized is likely to be higher than this. The base case includes, benefits for the road users' based on very conservative estimates of traffic forecast, value of the land developed (also a very conservative estimate as riverbank and flood protection benefits are not included), utility crossings (quite conservative in the case of the gas pipeline crossing) and wider economy wide benefits. The ERR would be 20%, if savings in ferry closings or avoided cost of railway bridge are excluded and 21% if both are included. The NPV of the net benefits stream at the discount rate of 12% is US\$1.2 billion and NPV of the cost and benefit is US\$1.3 and US\$2.6 billion respectively. The ERR analysis is given in Table 8 below.

459. Table 9 shows the results of the ERR estimates and sensitivity analysis. The Project ERR is robust and not very sensitive to variations in the project costs or benefits. Switching values have been computed to determine the effects of increase in costs and decrease in benefits. With increase in capital cost by 20% or reduction in benefits by 20% the ERR is 17% and it is 15% with a combination of two. The ERR would remain above 12% considered as opportunity cost of capital with 90% increase in cost or 40% reduction in benefits. The delay in completion of the project by two years would have no impact on ERR. The sensitivity based on various risks that the project may face shows that it is highly unlikely that unfavorable developments would reduce the project ERR below the OCC.

Table 8. ERR Analysis

Year End June	Cost			Project Benefits							Net	
	Capital	O&M	Total	Road User Benefits			Non Road User Benefits				Total	Economic
	Cost	O&M	Cost	VOC	TTC	Sub-total	Ferry	Land	Utilities	WEB	Benefits	Benefits
2011	60		60			0					0	-60
2012	500		500			0					0	-500
2013	500		500			0					0	-500
2014	500		500			0					0	-500
2015	324	0	324	19	31	50	0	384	271	0	705	381
2016		13	13	37	50	88	0			0	88	75
2017		25	25	61	75	137	0			25	162	137
2018		25	25	74	87	161	0			43	204	179
2019		25	25	84	97	182	0			68	249	224
2020		25	25	93	106	199	0			79	278	253
2021		25	25	111	124	235	0			90	325	300
2022		25	25	131	145	276	0		0	98	374	349
2023		15	15	153	168	321	0		0	116	437	422
2024		15	15	176	193	369	0			136	505	490
2025		15	15	202	221	423	0			158	581	566
2026		15	15	231	243	473	0			182	656	641
2027		15	15	260	266	526	0			209	735	720
2028		15	15	290	291	581	0			234	815	800
2029		15	15	322	316	637	0			260	897	882
2030		15	15	354	342	696	0			287	983	968
2031		15	15	370	351	721	0			312	1033	1018
2032		15	15	386	360	746	0			312	1058	1043
2033		15	15	401	370	771	0			312	1083	1068
2034		15	15	417	378	795	0			312	1107	1092
2035		15	15	431	388	820	0			312	1132	1117
2036		15	15	447	397	844	0			312	1156	1141
2037		15	15	462	407	869	0			312	1181	1166
2038		15	15	477	417	895	0			312	1207	1192
2039		15	15	493	427	919	0			312	1231	1216
2040		15	15	508	437	945	0			312	1257	1242
2041		15	15	513	438	951	0			312	1263	1248
2042		15	15	518	439	957	0			312	1269	1254
2043		15	15	521	440	962	0			312	1274	1259
2044		15	15	525	441	966	0			312	1278	1263
2045		15	15	542	455	997	0			312	1309	1294
Total	1,884							384	271			
NPV(12%)	\$1,310	\$139	\$1,398	\$1,291	\$1,321	\$1,660	\$0	\$343	\$242	\$919	\$2,615	\$1,217
											ERR	19%
											NPV	\$1,217
											B/C	2.00

Table 9. ERR Estimate and Sensitivity Analysis

Scenario	Toll (Taka)
Base case	19
Cost increase by 20%	17
Benefits decrease by 20%	17
Cost increase by 20% and benefit decrease by 20%	15
Cost increase by 90%	12
Benefits Decrease by 50%	12

460. The reasons that the ERR is so robust is that river crossing through ferry services only fulfils partial requirements of connectivity, passengers and goods perhaps to a limited scale, and even that at a very high cost as indicated by the reduction in travel times to various destinations in the SWR. Crossing of utilities such as gas and electricity and telecommunication are prohibitively expensive without a bridge. The scour depth of Padma River is over 60 meters. So for crossing a gas pipeline, for example, either gas line is to be supported by a foundation piers similar to Padma Bridge (over 130 meter deep) or

pipeline is to be crossed under the river say at over 60 meters depth and both are extremely costly. Similar is the case for electrical and other utility crossings. The Project also develops a lot of land during construction which would be used for other economic activities. The land in Bangladesh raised above the flood level is extremely valuable that also adds to the robustness of ERR estimated. The details are provided in Annex 9.

Financial Analysis

461. The Jamuna Multipurpose Bridge Authority (JMBA), the precursor to Bangladesh Bridge Authority (BBA), was created in 1985, its ordinance envisaged it to be an Authority that would enjoy financial and organizational autonomy to be able to build the large (\$1.0 billion) Jamuna Bridge Project. JMBA is now called Bangladesh Bridge Authority..

462. **Financial Objectives of BBA** are to: (i) levy tolls at minimum levels so as not to discourage traffic from using the bridges and (ii) to raise enough funds from road users and other uses (such as power interconnectors) to meet all operation and maintenance costs (including toll collection charges) and to meet debt servicing obligations.

463. The agreements under the IDA Credit for the Jamuna Bridge Project included JMBA to levy tolls and other user charges (such as the rent on land controlled by JMBA, and charges for carrying the power inter-connector) at a level sufficient to meet all maintenance and operation costs (including toll collection charges) and to meet debt servicing obligations. Indicative tolls were agreed at appraisal subject to confirmation in a toll study to be carried out by JMBA by June 30, 1997 of the level and structure of tolls. This study provided the basis for the tolls that were implemented at the time of the opening of the Jamuna Bridge.

464. **Political Economy of Toll Increases.** Not only was the Jamuna Bridge the first mega scale investment in Bangladesh but it also carried a high level of uncertainty and anxiety about the unpredictable behavior of the river, that could have been detrimental to the project. Thus, the Government was taking extraordinary measures to ensure that the project would be completed and it could be maintained properly after its completion. All three credits for Jamuna Bridge (IDA, ADB, and by Japan) also required a buildup of a cash reserve for ensuring funds in case of any emergencies which may happen during and after the construction. The JMBA was headed by strong management and it was given full autonomy without any political pressures to make decisions about the toll structure for the Jamuna Bridge. Using the 1997 study as a basis, and a careful approach, JMBA decided the toll level which was considered very high at that time (the car toll was set at US\$10 which was more than the estimates in the staff appraisal report). With a long grace period for loan repayments, O&M requirement being very low (as both bridge and the river training works performed extremely well), growth in traffic resulting in a revenue surplus, and accumulated cash reserves, there was no immediate necessity to increase the toll. Therefore, BBA (the successor of JMBA) and the government were not compelled to take politically difficult decisions of upward adjustments of the toll.

465. With change in exchange rate over time and the debt servicing burden increasing, the value of the toll is decreasing in real terms and with the imposition of VAT and other taxes by the Government on BBA, it is only recently that BBA is expected to see negative cash flows. The mandate of BBA allows it to make toll adjustments without any approval from the Government. However, because of political implications such increases may have, in practice BBA is not able to make changes in the toll without prior approval of the Government. Two aspects would help in rationalizing the decision making in this regard. These are possibly: (a) using a formula-based approach of linking the toll levels to an appropriate indicator such as inflation; and (b) institutional changes which would allow BBA to have the level of

autonomy, in reality, as envisaged in its mandate. Details of these aspects would be developed during the study proposed to be completed prior to opening of the bridge as described below

BBA Past Finances.

466. Since the opening of the Jamuna Bridge (JB) in 1998, BBA has been in compliance with these financial objectives and had ostensibly generated by June 30, 2010 a cumulative surplus of Tk 8000 million (US\$114 million), despite not having revised the tolls over the last 12 years. This is because all loans were on concessionary terms (IDA, ADB, and JICA) had a grace period of 10 years thus debt servicing was not a major burden on BBA in the initial years of operation of the Jamuna Bridge and a good traffic growth rate occurred over this period. However, even this surplus is subject to some further qualifications. In the past, BBA has not been making an adequate provision for operations and maintenance of the Jamuna Bridge, a deficiency that now needs to be rectified by allocating an estimated \$100-150 million for major maintenance over the next 4 to 5 years. This would more than absorb all the cumulative surplus to-date.

467. BBA's financial statements also show that a deficit starting from 2007-08 (Taka 195 million, Taka 137 million and Taka 1,125 million in 2007-08, 2008-09 and 2009-10 respectively). This deficit would further grow in future due to increase in debt service burden in local currency terms, and repayment of IDA and ADB loans doubling starting from June 2014 BBA's net annual cash flow is expected to be negative. Therefore, increase in Jamuna Toll rates immediately is unavoidable.

BBA Future Finances

468. BBA is embarking on construction of the Padma Bridge (PB) and many of the funds required for construction of the bridge would be provided by the Development Partners of Bangladesh as loans and credits and the Government of Bangladesh as a grant to BBA (about US\$560 million equivalent). BBA also owns another bridge constructed by the Chinese Government namely the Muktapur Bridge. BBA is reported not having any debt obligation for the Muktapur Bridge. The toll collection from the Muktapur Bridge is very nominal. Thus for financial projections and BBA financial position the two bridges, Jamuna Bridge which is in operation and the Padma Bridge which is likely to start its operation in 2014-15 are of significance.

469. The future revenues of BBA depend on two main factors: the growth in traffic for both Jamuna Bridge and Padma Bridge, and the level of tolls. Other revenue from bridge usage fees from utilities, and rent from land used during construction that reverts back to BBA after the completion of the bridge, are relatively insignificant. The main cost elements are the bridge O&M costs and BBA's administrative costs. A model was constructed to project BBA's future finances under different assumptions of traffic and toll charges. Other assumptions used in the model are as follows:

Revenue	
Elasticity of traffic with toll increase	-0.10
Service area revenue per annum	Tk 38 million per annum for JB and Tk441 million for PB
Utility Charges	Tk 12 million per annum
Expenses	
Annual routine O&M cost of the bridge	0.33% of capital cost
Major O&M for bridge	1.2% in year 25
O&M cost of RTW	2.0% of RTW construction cost
BBA administrative cost	Extrapolated from 1999-2010

Domestic inflation applied to costs	5% per annum
VAT on toll revenue	15%

470. The toll rates at Jamuna bridge since 1998 are as follows:

Vehicle Type	Economic Rate of Return (%)
Small Truck	750
Medium Truck	1,000
Large Truck	1,250
Large Bus	800
Small Bus	550
Car and light vehicles	400
Motor Cycle	30

471. As mentioned above, despite these tolls not having been revised since 1998, BBA has still managed to generate a small cumulative surplus. There are two reasons for this: (i) all of the financing for the JB has been on concessional terms from the donors, and (ii) traffic at JB has been growing around 11% per year. However, financial projections at the current toll levels indicate that the JB will have a deficit of about Tk 10,000 million in the 2010-2020, before once again turning into surplus in 2021 as the debt service obligations would end. These points to the need for an immediate adjustment in the tolls for JB.

472. **Padma Bridge Finances.** The construction of the PB will add a much larger additional financial burden of BBA because of its high cost (over \$2.9 billion) and significantly harder financing terms (\$755 million from ADB and IsDB on non-concessional terms). GoB has already committed to finance the counterpart funding requirements (about \$657 million) of the project from its budget since it considers the project to be of the highest national priority, and the expectation that this funding would be offset by the additional taxes from the bridge contractors. Projections show that at the current toll level, PB would generate deficits of Tk 22 billion in 2015-2020, Tk 45 billion in 2021-2025 and Tk 51 billion in 2026-2030. This level of burden is well beyond the capacity of GoB to fund.

473. In order for PB to generate sufficient revenues to meet its debt service needs, toll rates will have to be raised by 350% over the current tolls at JB. Such a large increase would not be tenable either from the economic or social point of view. Yet, given the already constrained fiscal situation of GoB, it would not be prudent to require subsidy subventions to meet the deficits.

474. **Jamuna and Padma Bridge Combined Finances.** The only possible way to have BBA meet the financial obligations arising from PB construction is to consider toll levels for both JB and PB as a package. This would allow for the possibility of a cross-subsidy from the “mature” JB with a lower (and declining after 2020) debt service needs to cross-subsidize the deficits from PB. Such a policy would also allow the tolls for the two bridges to be kept proportionate to their size and cost, something that would be understandable to the users.

475. The financial model was run with a variety of toll scenarios that would both wipe out the anticipated deficit at JB in 2011-2020 period, and generate sufficient cross subsidy for PB. All of the scenarios show a need for a significant immediate increase in toll rates for JB and a further increase at PB at opening in 2015. The various options are summarized below.

476. *Option 1: 75% increase now in JB Toll and PB Toll set at 125% of JB at opening.* While there are many possible combinations of tolls that can be considered, the optimal case would be to increase tolls at JB by 75% now and set the opening year toll rates for PB at 125% of the current toll rates. Although still leaving an overall deficit of about Tk 5,100 million in 2011-2025, overall it would allow BBA to meet all its debt service obligations from internally generated resources as summarized in Table 10 below, and the resultant average toll rates are given in Table 11.

477. The differences in toll levels at JB and PB would roughly be in proportion to the length of the bridges (about 25%) and thus justifiable from the point of view of users.

478. *Option 2: 40% increase now in JB toll and annual adjustments with inflation and the set PB toll 25% higher than JB.* It is generally preferable for tariff to be adjusted regularly in small increments rather than having to make a major adjustment at any one time. Had the JB tolls been adjusted to keep pace with inflation every year, there would have not only been adequate tariffs to meet future debt service needs but also to make a contribution to the construction of PB. An alternative policy that would also largely meet BBA's financial viability requirements would be to increase JB tolls now by 40% now and allow annual automatic adjustments linked with inflation, and tolls for PB set at 25% higher than PB. See Table 1 and 2 for internally generated resources and toll rates.

479. *Option 3: 40% increase in JB toll now and another 45% before opening of PB.* A third option would be to have a smaller increase (40%) in the JB toll rates now and another 45% (or 103% above the current level) before opening of PB applicable to both JB and PB. While meeting overall financing needs of BBA, this would still leave a Tk 5,000 million deficit in 2011-2015 period that will have to be financed by BBA (see below).

480. Keeping with the financial objectives of BBA, i.e. minimum level of tolls to encourage the use of bridge and raise sufficient funds to meet its financial obligations, the most optimal scenario seems to be to: (i) increase the Jamuna toll now by 40 percent which would be adequate to meet the financial obligations over the next few years till the opening of the Padma Bridge; and (b) before opening of the Padma Bridge increase the toll of Jamuna Bridge by another 45 percent and set the tolls for Padma Bridge at the same level i.e. 103% of the current level. This would leave about Taka 5 billion deficit during 2011-2015 (less than the cash reserves of BBA) but overall BBA would be able to meet all its obligations for the two bridges. This is perhaps the most pragmatic option from the implementation point of view, particularly, if a differential toll is not considered desirable for the two bridges. While recent Jamuna data is available and very reliable, this assessment for Padma Bridge is based on the data and traffic surveys carried out during feasibility studies (before 2005) with updated information in 2009. Therefore, as explained further below a study has to be undertaken not more than one year prior to the opening of the Padma Bridge to determine more accurately the desired toll levels in future and in particular at the opening of the Padma Bridge.

481. **Need for a Toll Study Prior to Opening of the Padma Bridge.** The revenue collected from the bridge(s) depends upon the volume of traffic and the toll rates. The traffic in Bangladesh has been increasing about 8 percent however the growth rate is higher in the recent years, about 10-11%. Forecasting future traffic and in particular estimating opening traffic for the Padma Bridge is quite challenging task due to several factors. For the purpose of economic analysis quite a conservative estimate was used.

Table 10: Net Surplus/(Deficit) with various Toll Options (Taka Millions)

	Year Ending			
	2011-15	2016-20	2021-25	2026-30
Option 1: 75% increase in JB toll now and PB toll set at 125% at opening				
Padma Bridge	-	(10,898)	(23,715)	(16,905)
Jamuna Bridge	(1,389)	10,879	19,996	39,902
Total	(1,389)	(19)	(3,719)	22,997
Option 2: 40% increase in JB toll now and annual adjustments with inflation and PB toll to be set at 25% higher of JB toll.				
Padma Bridge	-	(12,883)	(21,550)	241
Jamuna Bridge	(3,582.00)	11,841	27,956	65,128
Total	(3,582.00)	(1,042)	6,406	65,369
Option 3: 40% increase in JB toll and another 45% before opening of PB				
Padma Bridge	-	(12,633)	(27,017)	(22,127)
Jamuna Bridge	(5,005)	15,420	26,339	48,954
Total	(5,005)	2,787	(678)	26,827

Table 11: Toll Rates for various options (Taka per vehicle)

	Jamuna Bridge				Padma Bridge			
	Truck	Bus	Car	MC	Truck	Bus	Car	MC
Current	960	780	400	30				
Option 1: 75% Increase in JB Toll and PB Toll 125% at opening								
Revised 2010/11	1,680	1,365	700	53				
Before opening of Padma (2014-15)	1,680	1,365	700	53	2,160	1,755	900	68
2020	1,680	1,365	700	53	2,160	1,755	900	68
Option 2: 40% Increase now in JB Toll annual adjustemnt for inflation and PB toll 25% higher than JB								
Revised 2010/11	1,344	1,092	560	42				
Before opening of Padma (2014-15)	1,572	1,277	655	49	1,728	1,404	720	58
2020	1,839	1,494	766	57	2,022	1,642	842	68
Option 3: 40% Increase now in JB Toll and 45% before opening of PB (103% above currennt)								
Revised 2010/11	1,344	1,092	560	42				
Before opening of Padma (2014-15)	1,949	1,583	812	61	1,949	1,583	812	44
2020	1,949	1,583	812	61	1,949	1,583	812	44

MC - Motorcycle

482. The opening traffic for the Padma Bridge would depends upon: (a) current and growth in traffic over all the river crossings till the opening of the Padma Bridge. A lot of passenger movement across the river is over the speed boats and small launches which is difficult to capture in traffic surveys. Often buses operate on both sides of the river. The buses drop the passengers on one side and they cross the river through several way, ferry, boats, launches etc, and get the busses on the other side; (b) with start of

construction of the bridge (bridge is in planning for decades thus some doubt that it would be realized) there would be population moving into the zone of bridge influence with greater economic impact thus resulting in generated traffic which is very difficult to predict; and (c) diversion of traffic from other river crossings. Expected diversion from other crossings is more difficult to estimate as it depends on the savings in travel time, cost of the trips and speed of development of infrastructure and road network leading to the bridge. All these factors would influence the size of traffic and the forecast will vary according to assumptions made about the likely nature and roles of the factors. For the purpose of economic analysis, a conservative estimate of traffic at opening was assumed.

483. **Affordability of Tolls.** The economic benefits of use of the bridge are much higher than the toll rates. The proposed toll rates are affordable and willingness to pay can be observed from considerable savings and that the current toll rate paid at ferry crossing is higher than the Jamuna Bridge toll rates (toll for medium truck at Paturia Ferry crossing is Taka 1600). Nevertheless, the public always resists toll increases, particularly when they are increased in large increments. There will be a need for an extensive public outreach to explain the rationale for the tolls to the people.

Annex 9.1: Estimation of Wider Economic Benefits

Using Social Accounting Matrix and Computable General Equilibrium Models

Background and Rationale

484. The Padma Bridge is expected to: (i) provide significant travel time savings to drivers in the corridor, particularly between the Dhaka Division to the south-west of Bangladesh and possibly onto India; (ii) result in change in transport costs that will result in significant economic structural change of the Southwest region. Changes in the relative prices of factors of production, goods and services will result in relocation of economic activities, generation of new activities or changes in the way that current economic activities are performed; and (iii) result in increased economic activity and consumption expenditure leading to poverty alleviation in Khulna and Barisal Divisions of south-west region.

485. **Economic Impact of Large Infrastructure Projects.** The economic evaluation of a large infrastructure project like the Padma Bridge shows broadly two types of benefits—road (and bridge) user benefits and non-road user benefits. Users benefit from the bulk of the projected benefits and consist of two items: (i) vehicle operating cost savings and (ii) travel time cost savings. These savings are at the core of traditional benefit analysis of road and bridge projects, but several methodological papers, some of them published recently, show that this traditional analysis invariably underestimate benefits in developing country contexts. A study by Ahmed and Hossain (1990) in the Bangladesh context argued that the conventional approach to estimation of benefits of infrastructure projects would not give the complete picture in a situation, where resources are not fully employed. A major infrastructure project like the Padma Bridge would bring a structural change and the impacts are generally more pronounced than what is anticipated at the appraisal time by a travel model only. In short, the conventional approach always undermines the increase in traffic and its impact on the economy that would occur from opening a major link like the Padma Bridge.

486. **Ex-Post Evaluation of the Jamuna Bridge Project.** The findings of *ex-post* analysis of Jamuna Bridge confirm that improved connectivity did create economic opportunities for economic growth and poverty reduction in the north-west region, the effects of which were much more significant than the benefits estimated by the conventional approach of time and cost savings from the bridge. This happened through reduction of transportation costs as well as costs in consumption and production of goods and services. With easier access because of the bridge, farm and non-farm production had a boost as a result of increased availability of inputs and lower input costs. The bridge provided connectivity that would yielded multi-sectoral productivity gains through structural change in the economy.

487. The report on Padma Bridge prepared by Design Consultants notes that its traffic model could not model changes in land use patterns (population and employment) and the level of economic activity from the improved accessibility to wide range of markets provided by the bridge. Here also the findings of the *ex-post* impact analysis of Jamuna Bridge are applicable to Padma Bridge. The 2007 impact study of Jamuna Bridge carried out a careful study of project villages (which were most affected by outcomes of the bridge) and control villages (not benefiting by the bridge) concluded that per capita income of project villages rose by 3 percent per annum; in contrast, the income in control villages increased at less than one percent per annum during the same period. Project villages experienced greater decline both in head count and extreme poverty compared to control villages. The decline in extreme poverty in project villages was 2.5 more than that of control villages. The study found clear evidence (as expected) that in post-Jamuna periods, areas under perishable but high value products like vegetables, onion, spices and oilseeds, increased in project areas by about 10 percent while the same declined in control villages by about 18 percent. The study had similar findings for cash crops in these two types of villages. Again, as expected, average prices for in project villages rose faster than in control villages.

488. The results of the 2007 impact study clearly establishes that Jamuna bridge had far reaching impacts on the north-west region even much more pronounced than what was estimated through cost and time saving analysis at the time of appraisal of the bridge. Similarly the economic opportunities, which the Padma Bridge will particularly open up for the Southwest region, will be enormous and far-reaching and will not be fully reflected in the benefits estimated for the bridge by the consultants using the conventional approach of the traffic model.

489. Given this serious limitation of the conventional approach, Computable General Equilibrium (CGE) models were used, in addition to the traffic model. The use of these models made it possible to estimate wider benefits of the bridge including its secondary benefits. The Padma Bridge has the added advantage that these models were used both as *ex-ante* and *ex-post* methods of estimating wide benefits of Jamuna Bridge. Use of these models for Jamuna Bridge gives us a useful benchmark as well as a tested approach for estimating full benefits of the Padma Bridge.

Approach and Methodology

490. The economic benefit of the bridge is estimated by taking into account both the direct benefits in terms of cost and time savings of travel time and the indirect benefits in the form of structural impact on the economy in the south-west and the rest of the economy from improved connectivity of the Southwest Region with the central and eastern parts of the country. To estimate the direct travel benefits, a traffic model was used. And to estimate indirect and secondary benefits of the bridge two economy wide macro models were used.

491. The traffic benefits are noted in another annex; so this annex only incorporates the secondary or economy wide benefits of Padma Bridge generated by CGE models—benefits accruing from a structural transformation of the economy and creating benefits beyond just cost and time saving in travel. The two macro-economic models used were Social Accounting Matrix (SAM) and Computable General Equilibrium (CGE) models.

492. **Social Accounting Matrix (SAM).** The use of the SAM model was to assess the direct and indirect income effects of a particular exogenous impact (such as the opening of the Padma Bridge) that leads to different expenditure patterns. A SAM model is a square matrix with columns for expenditure and rows covering income accounts. It combines input-output data with national accounts data to reflect the circular flow of income at a particular point in time. In this context, its key use is to assess the direct and indirect income effects of a particular exogenous impact (such as the opening of the Padma Bridge) that leads to different expenditure patterns. For the national SAM exercise, the impact of the Padma Bridge is represented in two alternative ways: (i) injection of \$2.1 billion into the economy (taking into account that part of the total cost of the bridge that will be injected into the economy) via construction sector (\$1.4 billion) and via services, utility, trade, transportation and food sectors (\$0.7 billion) and (ii) an increase in the demand for high-value crops, electricity, and transport services. The magnitudes of the initial increases are derived from the results of the micro-level sector and factor impacts.

493. The findings of the national SAM exercise would show that all the socio-economic groups benefit from the bridge-initiated initial changes estimated for use in the simulation. One of the limitations of the SAM model discussed above is that it assumes fixed prices and excess capacity to meet increases in demand generated by the lower transport costs due to the Padma Bridge. However, in an increasingly efficient market-oriented economy, the variations in prices may also be important sources of reallocation of resources among competing activities. This then may alter the factor-level income distribution and hence personal income distribution. Changes in personal income distribution of household groups and

consumer price indices may have different implications for the welfare and poverty situations of the household groups.

494. **Computable General Equilibrium (CGE).** CGE analysis also allowed for the assessment of the impacts of exogenous shocks but within a constrained optimization framework (i.e. changes in quantity are restricted as supplies of primary factors are fixed – labor, capital and land). The SAM approach does not have capacity constraints, meaning that matching outputs are always supplied, resulting in higher factor incomes and household consumption expenditure. The CGE approach, working with constraints, does not generate extra income by employing additional factors of production—additional income would come from increased productivity in use of given factor of production and diversion of factors to more productive possibilities arising from a fall in transport costs because of the bridge. At the core of the model is a set of equations describing the behavior of various economic agents (such as industries and households) when faced with changes in relative prices.

495. The elimination of a major transport barrier and the significant improvement in accessibility to factor and product markets between Dhaka and the Southwest Region, where resources are not fully employed, means that the SAM approach (without any capacity constraints) can be considered suitable for modeling to quantify the income effects of the Padma Bridge. These income effects would be additional to the value of travel time savings for passenger and freight vehicles and would come about by the bridge providing the link between consumers and producers in a wide range of markets.

496. Although in most cases, new infrastructure would not immediately bring a major boost in economic activities, in the medium to longer run, reductions in the generalized costs of transport will: (i) increase the profitability of local firms which will lead to higher retained profits, encouraging investment in capacity expansion and increased output - economic activity in the region; (ii) result in local firms having reduced costs and lead to a lowering of prices and an increase in output; (iii) encourage financial institutions to expand lending to firms in the Southwest Region, as the costs of doing business for the institutions would be lowered from the improved communications; (iv) induce the establishment of new firms in the region through the improved competitiveness of the region as a business location, and the need to service the increased movement of passenger buses to/from Dhaka and of trucks carrying goods to/from India; (v) firms may also relocate to the region in response to the reduction in transport costs to avoid the negative agglomeration effects (congestion, pollution) of locating in a place like Dhaka.

497. It is asserted sometimes that after opening of Jamuna Bridge, the assumption of unconstrained supply may not be as strongly applicable for Padma Bridge, as it was for Jamuna. So, in addition to SAM model, a CGE model was used to estimate the economy wide benefits of the bridge estimated under a constrained maximization framework. In estimating secondary (or total) benefits, the results of both models are presented.

498. The macro-economic models thus captured the flow of economic effects that are beyond the reduction in travel costs. Firms respond to the costs reduction in a variety of ways, such as increasing production, shifting to higher value-added production and expanding marketing areas. The lower transport costs and increased accessibility to a wider range of markets and services also affect household income and expenditure.

Simulation Design

499. Two different simulations were conducted under these two different approaches. The results of the simulations are different under these two approaches. In the SAM approach, the impact of the Padma Bridge was explored either through injection of initial investment of injection of US\$2.1billion into the economy via mainly construction sector and also via services, utility, trade, transportation and food

sectors or through an increase in the demand for high-value crops, electricity, and transport services as evident in Jamuna *ex-post* analysis. Since there are no capacity constraints, matching outputs are always supplied (as a result of demand interventions), which resulted in higher factorial incomes and household consumption expenditure. Both simulations using national SAM produced similar benefit streams. The simulation set-ups for the National and the Regional SAM models through increase in demand are provided in Table 1 below.

Table 1: Simulation set-up for the SAM Models

Sectors	Percentage Increase in Demand	
	National	Regional
Other crops	10	20
Fisheries (including Shrimp)	10	20
Utility (Electricity)	5	10
Transport	20	50

500. Under the CGE framework, the simulation was performed by reducing the transport margin for the sectors in the model. As a result of the reduction in transport margins, the incentive structure in the economy changed which changed the relative price situation in the economy. This led to the reallocation of resources to various producing activities. The gains are obtained by reducing existing distortions and hence they are small. Since supplies of primary factors were fixed there is no scope of generating extra income by employing additional factors (as was the case in the SAM approach). Furthermore, the results of the model simulations were fed into a poverty module to estimate the impact of the bridge investment on national as well as regional poverty levels.

Result of Macro-economic Models

501. **Wider Economic Benefits (WEB).** Non-road users' benefits are derived from the simulated outcome of national SAM model exercise. The result of this model indicates that total increase in national GDP would be estimated at US\$6,000 million considering a 31-year period (i.e. between 2015 and 2045) with an NPV at 12% of about US\$900 million. The annualized non-user or wider economic benefits would build up slowly and would peak at an annual return of about US\$300 million a year by 2032.

502. To obtain more realistic results a constraint maximization framework, a CGE model was used to trace the impact of the bridge on national and regional GDP. The results of the use of CGE model suggest that in general, resources would move out of some manufacturing leading to the positive value added growth in agriculture and manufacturing. It also appears that all households would experience a decrease in poverty indices.

503. **Impact on Gross Output.** SAM simulation shows that gross output would increase by more than 10% compared to the base case. Among 5 major activities [agriculture, manufacturing, construction, transport and services], largest increase of 29 percent is found for construction sector output followed by agriculture (9.5%). Increase in other 3 categories of activities will be around 8%. Compared to national impact, impact on the gross output of south west region would be more pronounced. For example, gross output in agriculture in south-west would increase more than 50 percent over 31 years projected in the regional SAM model. Table 2 presents the expected annual increase in agriculture output in south-west.

Table 2: Annual Impact of Padma Bridge on Agriculture (output regional SAM)

Endogenous SAM Accounts (Intermediate Classification)	Base Value	Simulation	% Change
Cereal Crops	82,010	1,591	1.94
Commercial Crops	43,145	748	1.73
Livestock-Poultry-fishing	193,480	2,198	1.14
Forestry	36,272	1,257	3.47
Other Agriculture	26,870	525	1.95
Agriculture Total	381,477	6,319	1.66

504. **Poverty Impact.** Both exercises, SAM and CGE models, show a reduction in poverty in Bangladesh after the opening of the Padma Bridge. However, the results suggest a higher magnitude of poverty reduction under the SAM approach than the CGE approach. The reasons for obtaining different magnitudes of poverty reduction under the two approaches lie in the fact that the impact of the Padma Bridge intervention is explained differently by the two approaches. The SAM approach simulates impacts entirely through changes in quantities, while the CGE, as it stands now, does the same based strictly on changes in price. Since the ability to increase supply to Bangladeshi markets could be restricted by some capacity constraints, the actual poverty impact of the bridge will most likely be smaller than that projected by the SAM exercise, which assumes no capacity constraints. Conversely, the result of the CGE exercise most likely substantially under-represent the indirect and induced effects of the Padma Bridge. Particularly, the CGE model assumes that the Bangladeshi economy is currently functioning at full capacity, which most likely is not the case. As such, the results of the CGE model do not take into account that certain segments of the national economy have most likely become more productive as a result of the Padma Bridge. The overall rate of yearly CGE are as follows:

**Table 3: Additional Reduction in Poverty because of Padma Bridge
(% change from base value)**

	National Level	Regional Level
SAM based approach	-0.8	-1.0
CGE based approach	-0.08	No Regional CGE was used

505. The result in Table 3 indicates that SAM based approach yields the outcome of Padma Bridge at the national level would be to reach 1.9% per year reduction in poverty instead of 1.1%, as the present long term trend shows. At the regional level (for the Southwest Region) the expected reduction rate would be 2.0% per year instead of 1.0%, which is the long-term trend of reduction of poverty, according to results of SAM.







506. The corresponding figures from the CGE model, which accounts only for the price effect of exogenous change, show lower impact on poverty reduction rates. The impact of the CGE model seems to underestimate the actual impact because of underlying assumption of the CGE model about full employment of all factors in the economy. As illustrated in *ex-post* impact analysis of Jamuna Bridge, the actual impact of the bridge was closer to SAM model results. The poverty impact on different groups, based on national SAM model, would be different and outlined in Table 4.

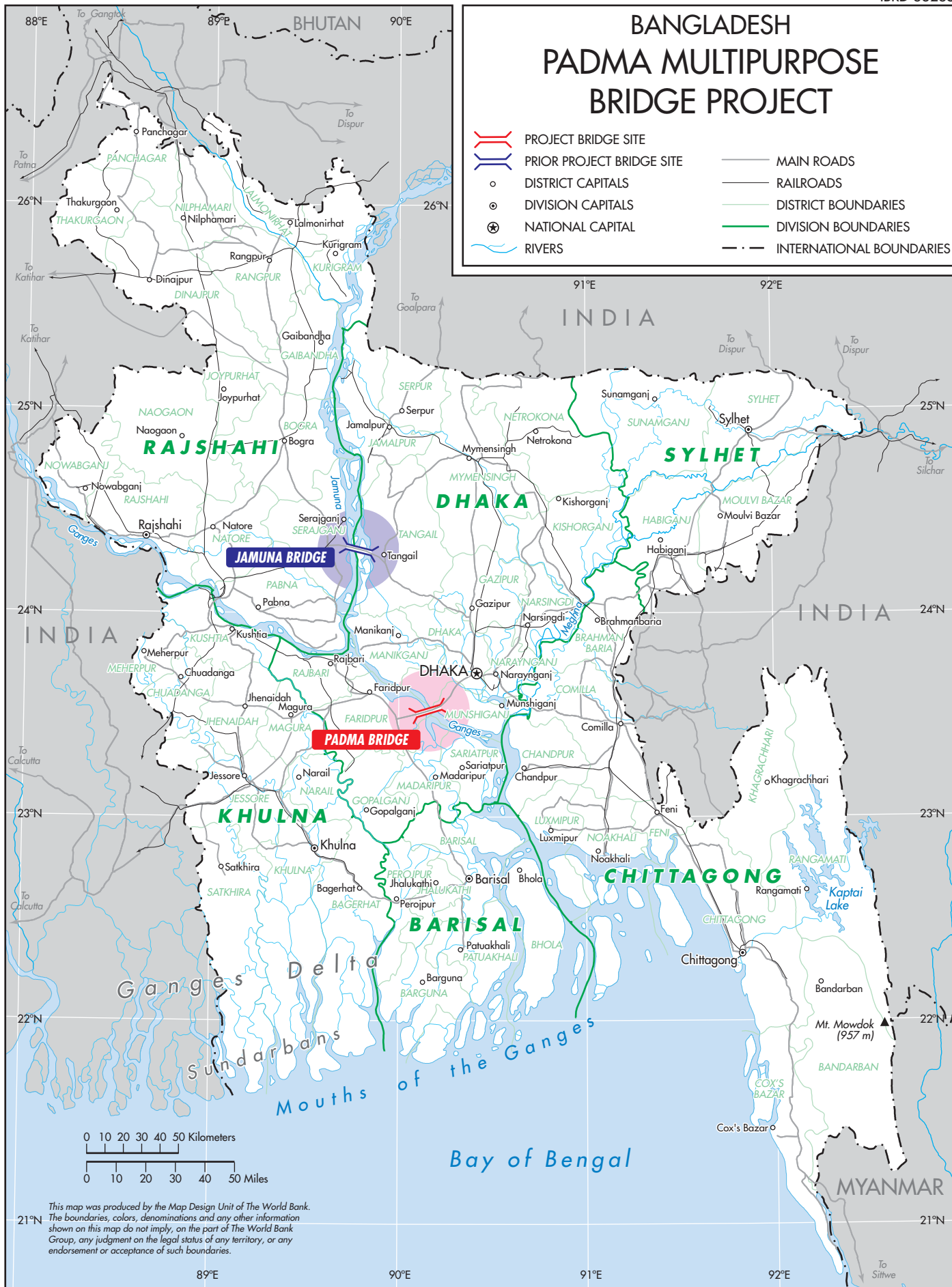
Table 4: Impact on Head-count Poverty (Based on National SAM Model))
 (% change from base value)

Households	Head-count (P0)	Poverty gap (P1)	Squared poverty gap (P2)
Landless	-0.99	-1.21	-1.38
Marginal farmers	-0.86	-1.13	-1.19
Small farmers	-1.06	-1.33	-1.38
Large farmers	-0.43	-0.51	-0.64
Rural non-farm	-0.43	-0.51	-0.64
Urban low education	-0.95	-1.22	-1.38
Urban high education	-0.66	-0.91	-0.73
National	-0.84	-0.99	-1.10

507. **Impact on Labor and Employment.** The experience after Jamuna Bridge was that the labor mobility across the river went down indicating increased economic activities within the local economy of the Southwest Region. Increased farm activities—especially the increase in vegetable production—would produce that effect. This is also expected to happen in the areas opened up by the Padma Bridge. One simulated effect of the bridge derived by use of the national SAM was 10.2% increase in total employment over the base level. This result was consistent with what was found as likely impact of the bridge on national gross output.

BANGLADESH PADMA MULTIPURPOSE BRIDGE PROJECT

-  PROJECT BRIDGE SITE
-  PRIOR PROJECT BRIDGE SITE
-  DISTRICT CAPITALS
-  DIVISION CAPITALS
-  NATIONAL CAPITAL
-  RIVERS
-  MAIN ROADS
-  RAILROADS
-  DISTRICT BOUNDARIES
-  DIVISION BOUNDARIES
-  INTERNATIONAL BOUNDARIES



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