

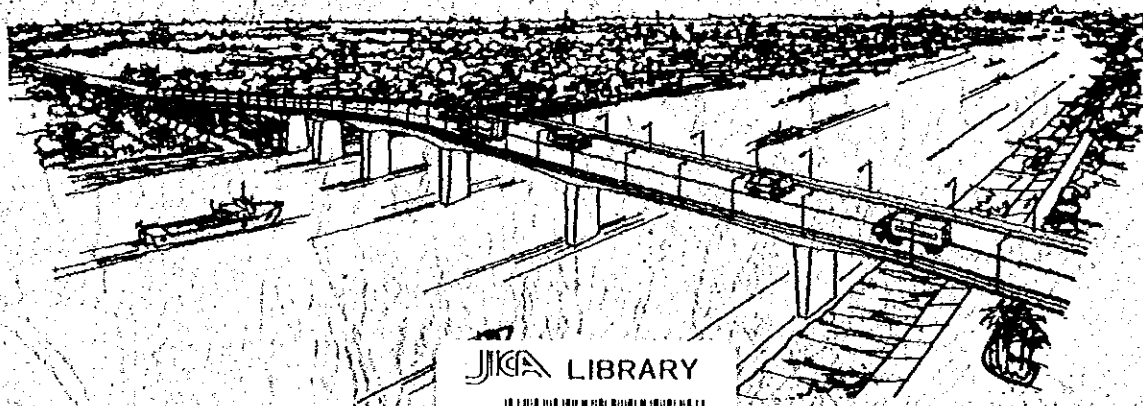
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF COMMUNICATIONS

THE GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

THE STUDY
ON
CONSTRUCTION OF THE BRIDGE OVER THE RIVER RUPSA
IN KHULNA
(Phase 2)

FINAL REPORT
SUMMARY



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MARCH 2000

PACIFIC CONSULTANTS INTERNATIONAL
JAPAN OVERSEAS CONSULTANTS

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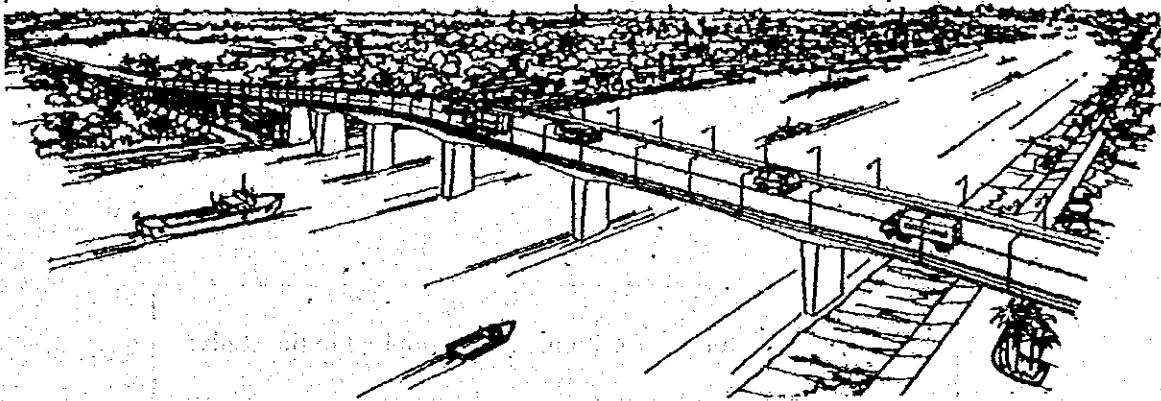
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The following foreign exchange rate is applied in the study:

US\$1.00 = 110.00 Yen = 48.60 Taka (as of August 1999)

PREFACE

In response to a request from the Government of the People's Republic of Bangladesh, the Government of Japan decided to conduct the Phase 2 study on the Construction of the Bridge over the River Rupsa and entrusted the study to the Japan International Cooperation Agency.

JICA selected and dispatched a study team headed by Mr. Kenji Maruoka of Pacific Consultants International, consisting of Pacific Consultants International and Japan Overseas Consultants, to Bangladesh three times between June 1999 and March 2000. In addition, JICA set up an advisory committee headed by Dr. Yuzo Akatsuka, Professor/Dean of Faculty of Regional Development Studies, Toyo University to examine the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Bangladesh and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Bangladesh for their close cooperation extended to the study team.

March 2000



Kimio Fujita
President

Japan International Cooperation Agency

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March 2000

Mr. Kimio Fujita
President
Japan International Cooperation Agency

Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the Final Report of "The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)" in the People's Republic of Bangladesh.

The report contains the results of study which was carried out by Pacific Consultants International in association with Japan Overseas Consultants between June 1999 and March 2000. The report consists of five volumes of Summary, Main Report, Appendix, Drawings and Draft Tender Documents.

The Summary briefly illustrates the findings of the whole study. The Main Report consists of 14 chapters and presents traffic demand forecast, engineering designs, environmental impact assessments, economic and financial analysis and conclusion and recommendations for the project implementation. It recommends that the institutional arrangement for project implementation should be taken as soon as possible.

The Draft Tender Documents comprise draft pre-qualification, draft tender documents and technical reports, and they are prepared based on the design at a detailed level.

We wish to express grateful acknowledgment to the personnel of your Agency, Ministry of Foreign Affairs, Advisory Committee, Ministry of Transport, Ministry of Construction and Embassy of Japan in Bangladesh, and also to officials of the Ministry of Communications, Government of Bangladesh for their assistance extended to the Study Team. The Study Team sincerely hopes that the results of the Study will contribute to the development of road network in Bangladesh.

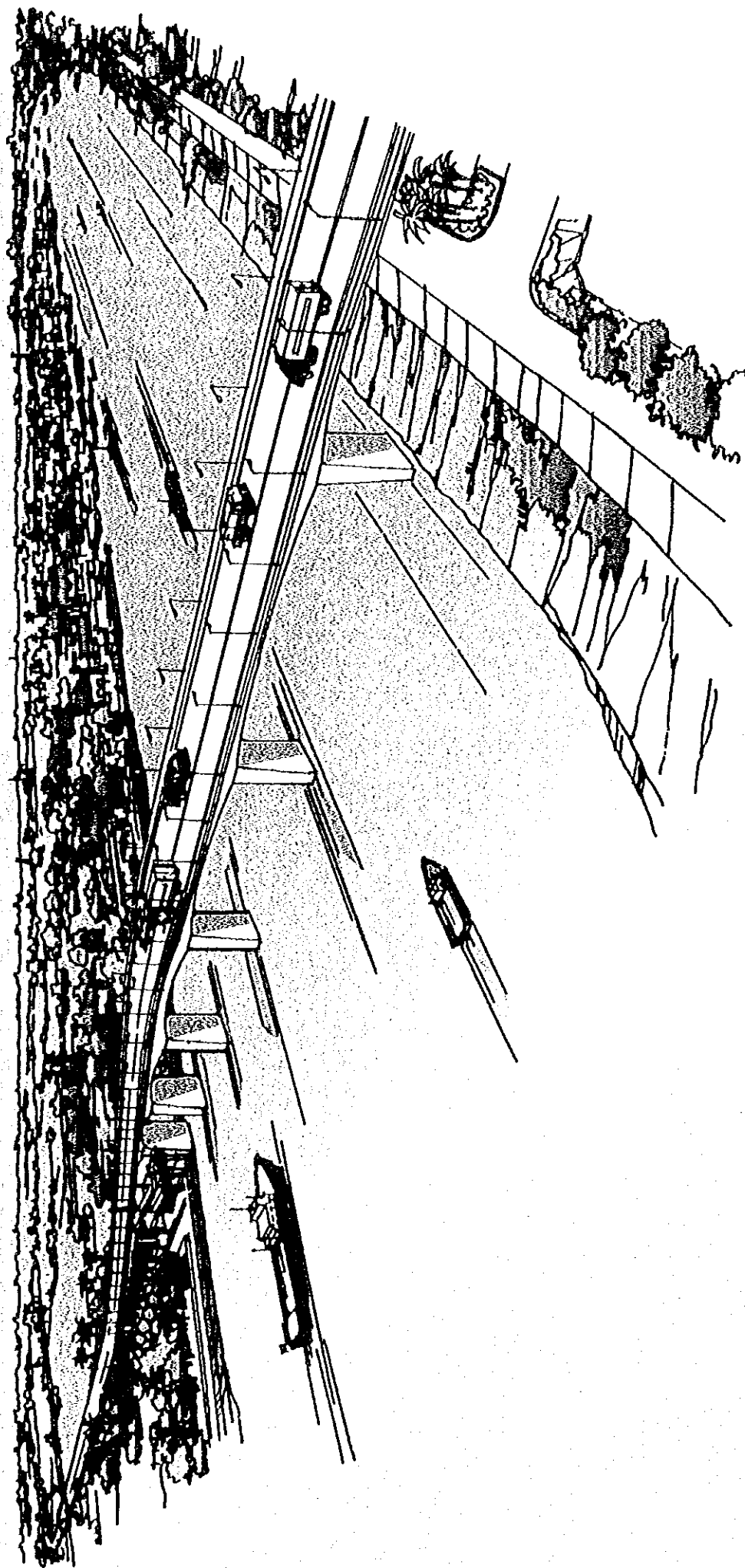
Yours faithfully,



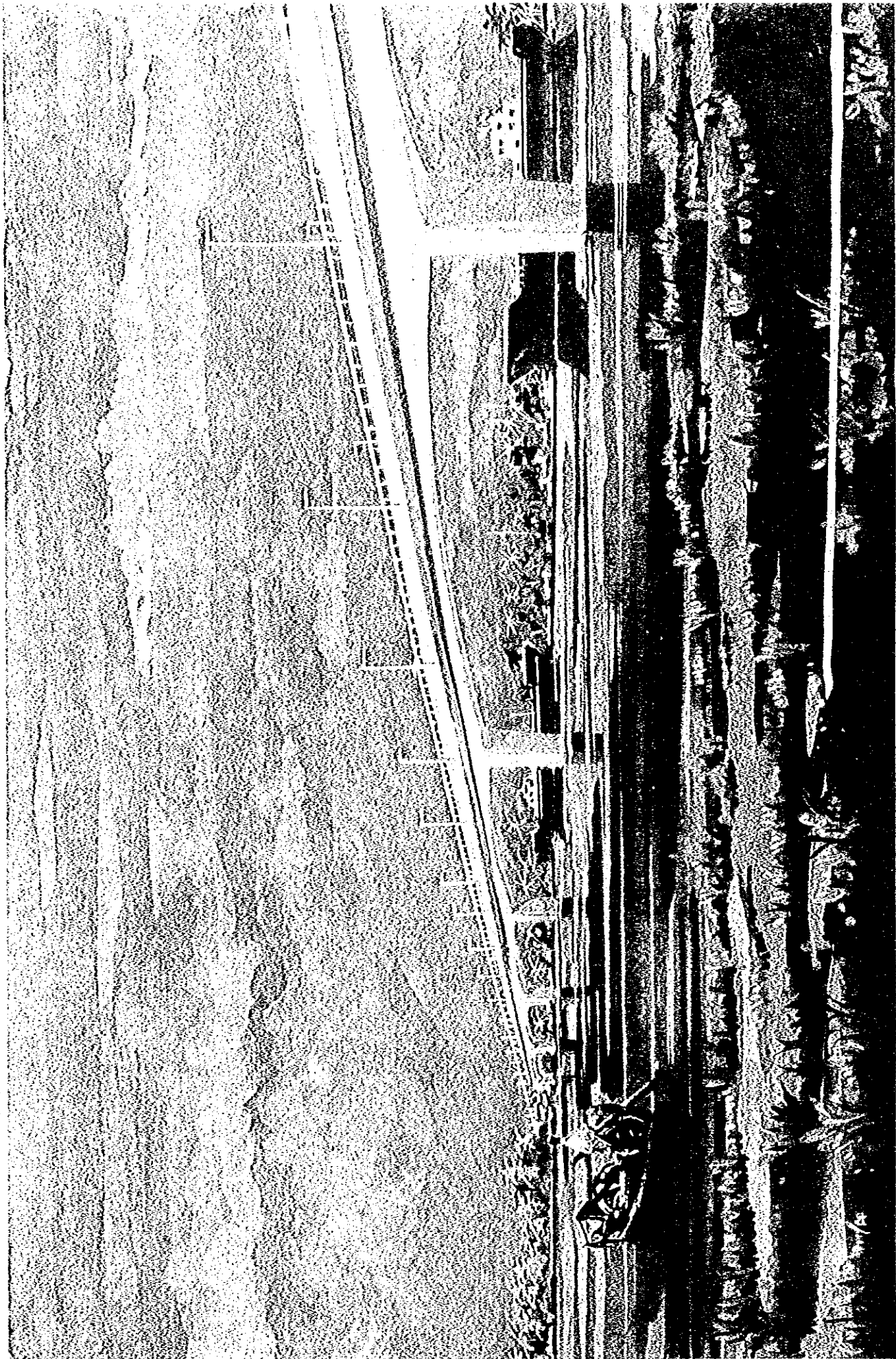
Kenji Maruoka

Team Leader

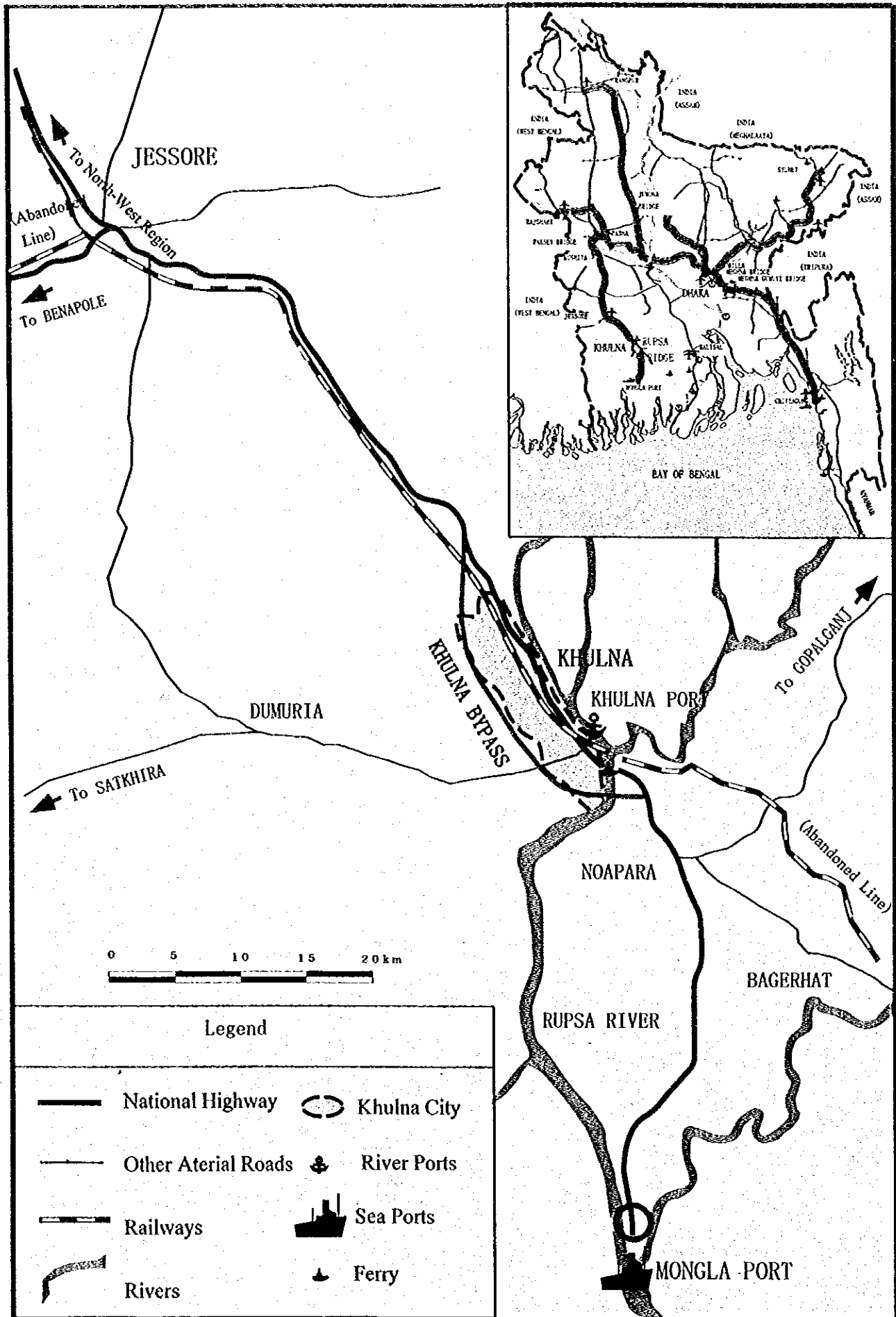
The Study on Construction of the Bridge over the
River Rupsa in Khulna (Phase 2)



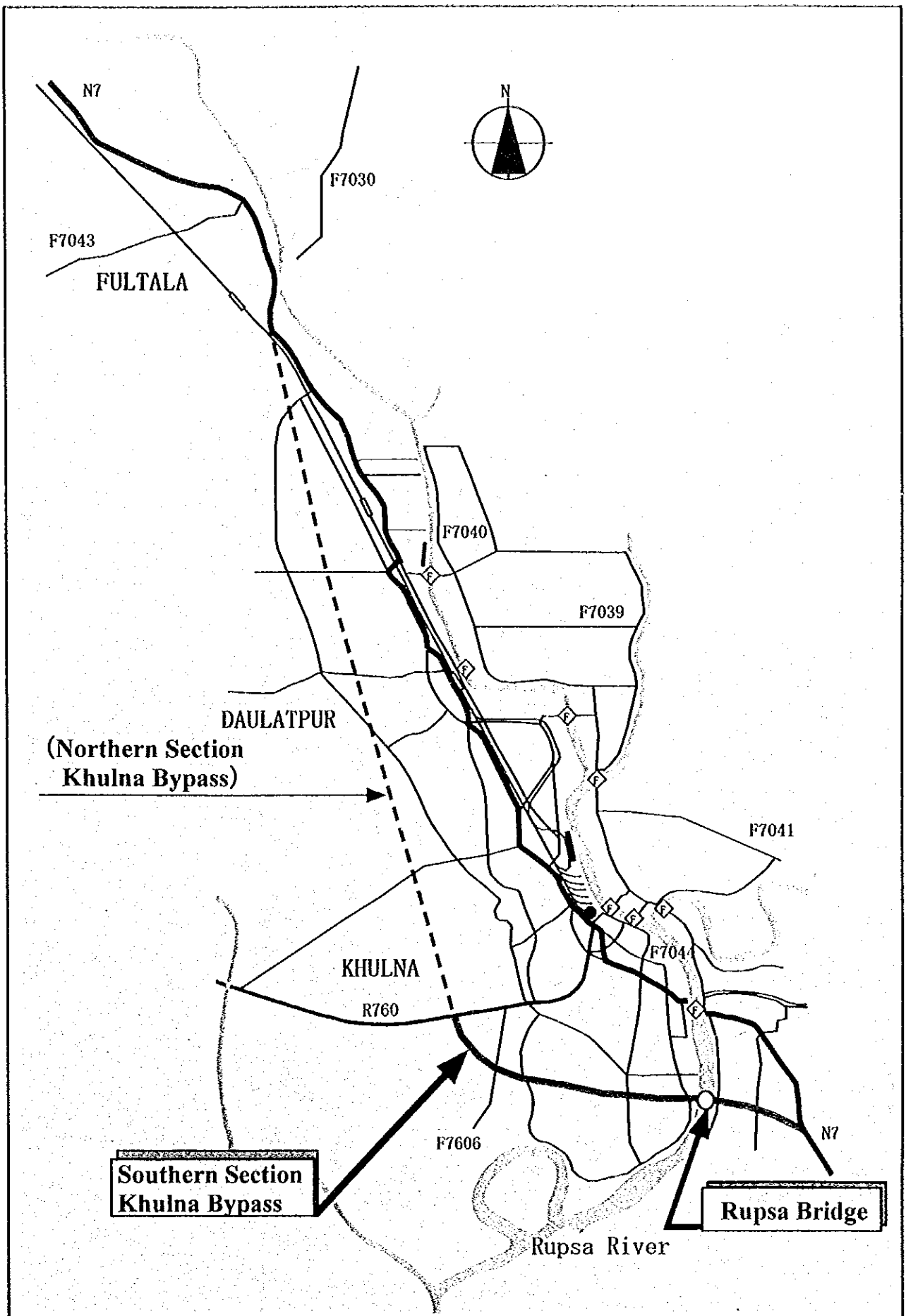
Rupsa Bridge, overlooking Khulna City



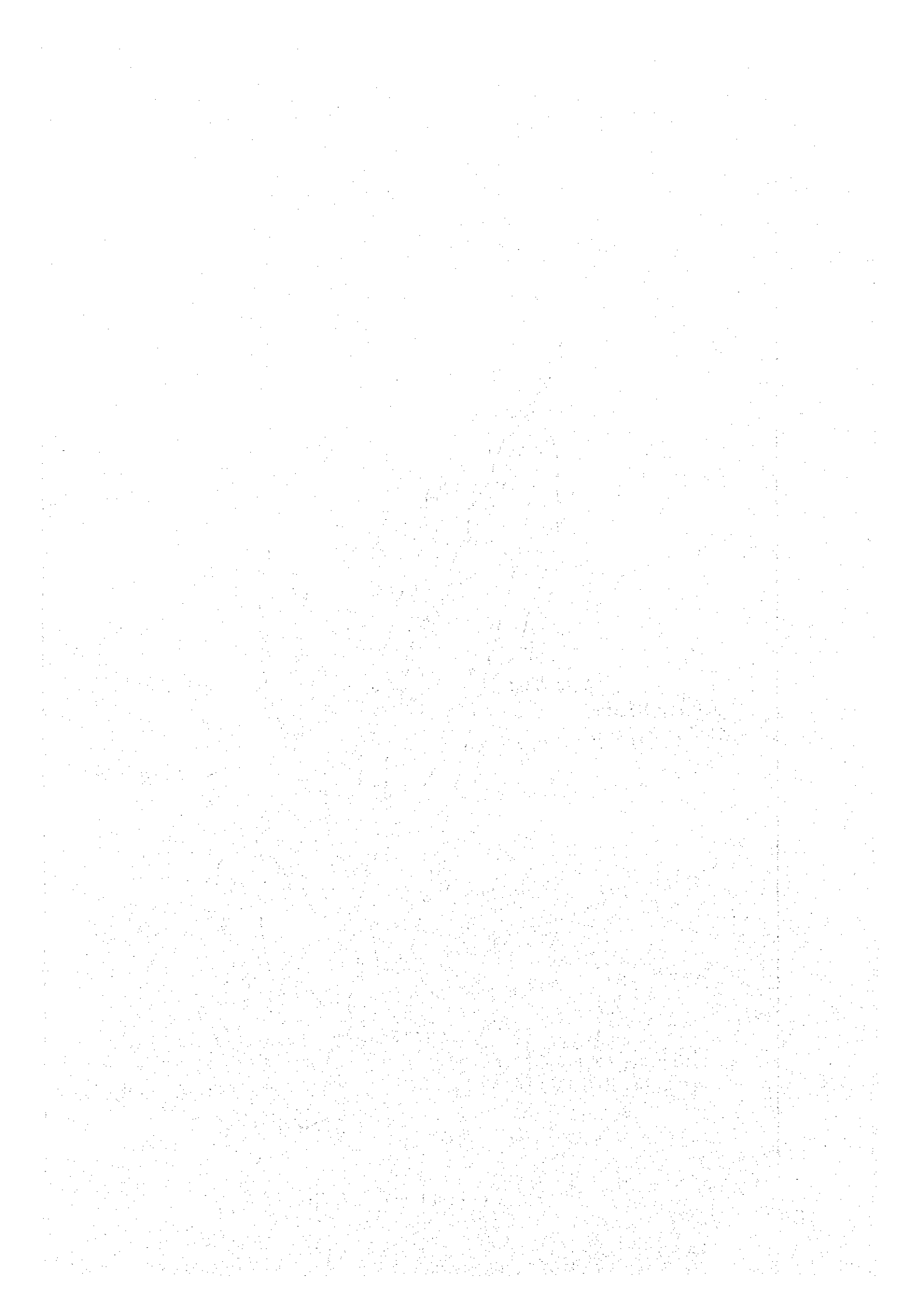
Rupsa Bridge, view from east bank



Map of the Study Area



Project Location Map



DEFINITIONS AND ABBREVIATIONS

(1) Agencies

ADB	Asian Development Bank
BIWTA	Bangladesh Inland Water Transport Authority
BR	Bangladesh Railways
CPA	Chittagong Port Authority
DOE	Department of Environment, Ministry of Environment and Forestry
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JMB	Jamuna Multipurpose Bridge
KCC	Khulna City Corporation
KDA	Khulna Development Authority
KFAED	Kuwait Fund for Arab Economic Development
LGED	Local Government Engineering Department, Ministry of Local Government, Rural Development and Co-operatives
MOC	Ministry of Communications
MPA	Mongla Port Authority
NBR	National Bureau of Revenue
NDF	Norway Development Fund
RHD	Roads and Highways Department, Ministry of Communications
WB	World Bank

(2) Technical Terms and others

5FYP	5 th Five Year Plan
B/C	Cost Benefit Ratio
BITSS	Bangladesh Integrated Transport System Study
CBD	Central Business District
EAM	Equilibrium Assignment Method
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EPZ	Export Processing Zone
EQS	Environmental Quality Standards
FDI	Foreign Direct Investment

FIRR	Financial Internal Rate of Return
G/A	Generated/Attracted
GDP	Gross Domestic Product
Ghat	Platform to the water's edge
ICB	International Competitive Bidding
IEE	Initial Environmental Examination
IRR	Internal Rate of Return
ISIE	Initial Social Impact Examination
LCB	Local Competitive Bidding
LPG	Liquefied Petroleum Gas
MMT	Multi Modal Terminal
MPADP	Mongla Port Area Development Project
N.P.V	Net Present Value
NGO	Non Governmental Organization
O & M	Operation and Maintenance
OD	Origin and Destination
PAPs	Project Affected Persons
PC	Prestressed Concrete
PCU or pcu	Passenger Car Unit
RIP-III	Third Road Improvement Project
ROW	Right-of-Way
SIA	Social Impact Assessment
SPM	Suspended Particulate Matter
SPT	Standard Penetration Test
STRADA	System for Traffic Demand Analysis developed by JICA
Tk	Taka
Thana	Lowest tier of administration
Zila	Administrative sub-unit of Division and group of Thanas

PROJECT SUMMARY

1. COUNTRY	The People's Republic of Bangladesh
2. NAME OF STUDY	The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)
3. COUNTERPART AGENCY	Roads and Highways Department, Ministry of Communications
4. OBJECTIVE OF STUDY	To conduct the feasibility study for the Southern Section of Khulna Bypass including Rupsa Bridge
1. STUDY AREA	Khulna City and its Surrounding
2. ECONOMIC FRAMEWORK	5.0 % p.a.(1996/97 - 2014/15)
3. TRAFFIC DEMAND FORECAST	Traffic Demand on the Bridge (2015) 11,100 veh./day (18,500 PCU/DAY)
4. OUTLINE OF FEASIBILITY STUDY AND ENGINEERING DESIGN	
(1) Feasibility Study and Design at a Preliminary Level (June 1999 to October 1999)	
<ul style="list-style-type: none"> • Major design elements in association with design criteria, route location, bridge structure type and area of river revetment were studied along the selected scheme of Khulna Bypass in Phase 1. • The economic analysis shows EIRR of 26.2% on the base case (VOC + 15% TTC). • In the financial analysis, the existing ferry tolls were applied to the new bridge. The estimated FIRR marks 2.4% after 25 years of toll operations (year 2029) and full cost recovery is reached in case of JBIC ODA Loan. • In the course of Phase 2 Study, EIA & SIA report was prepared based on IFE & ISIB in accordance with the environmental policy and laws of Bangladesh. The EIA and SIA concluded that there are no substantial or irreversible adverse environmental and social impacts arising from the Project. 	
(2) Design at a Detailed Level (November 1999 to February 2000)	
<ul style="list-style-type: none"> • Alternative Route-1 was selected to minimize adverse social impacts. • The typical cross section comprises undivided 2-lane with sidewalks and lanes for slow-moving vehicles at both sides. • Rupsa Bridge: L=1,360m W=16.0m <ol style="list-style-type: none"> 1) Rupsa Main Bridge (16m effective width) : Superstructure: 7-span PC Box Girder with span length of 70m + 5@100m + 70m = 640m : Substructure: RC Bored Piles and Pile-cap on water level 2) Rupsa Approach Bridge (16m effective width) : Superstructure: Standard PC I-girder composite with RC deck slab 2 x 12 @30m = 720m : Substructure: RC Bored Piles 3) River Revetment : 50m x 150m wide river revetment on the East Bank 4) Pier Protection : at piers of Rupsa Bridge in the water against scouring • Approach road: L=8,679m (West section L=5,880m, East section L=2,799m) <ol style="list-style-type: none"> 1) Typical Cross section : Roadway Width : 21.5m : Through Traveled Way: 2x6m (Through traveled lane 3.5m, Slow-moving track 2.5m) : Median: 5.5m : Inner Shoulder : 1.0m (part of median) : Outer Shoulder : 2.0m (used for sidewalk) 2) Canal Bridge: Hatia Br. (L=90m W=2x9m), Molonghata Br. (L=30m W=2x9m) Superstructure: Standard PC I-girder composite with RC deck slab :Hatia Br.: 3 x 30m = 90m, Molonghata Br.: 1 x 30m = 30m Substructure: RC Bored Piles 3) Box Culvert : Nine (9) locations • Related Facilities <ol style="list-style-type: none"> 1) At-grade Intersections : Six (6) locations 2) Toll Plaza : Barrier type toll gates of five booths for fast-moving vehicles and four booths for slow-moving vehicles 3) Bus Bay : Two (2) locations 4) Staircases with Slope for Bicycle Pulling : Both sides and both ends of Rupsa Bridge • The land acquisition plan, draft pre-qualification documents, draft tender documents and cost estimates were prepared for the project implementation. RHD as the executing agency for the Project has submitted the environment clearance application to DOE based on the EIA & SIA report prepared by the Study. 	
5. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS	
The EIA and SIA were conducted along the selected route and it revealed that the land acquisition for the route would require relocating 53 households. It is confirmed that neither public facilities/cultural heritages nor vulnerable flora and fauna are affected by the land acquisition for the selected route.	
6. CONSTRUCTION PLANNING AND COST ESTIMATES	
The construction of Main Bridge is to be one of the major components for Rupsa Bridge Construction Project because of its scale and technical difficulties, and the Approach Bridges are also to be another because of voluminous fabrications of standard I-girder. The scheme of single contract package is evaluated superior from all aspects. The project cost is estimated 4.12 billion taka at August 1999 prices.	
7. CONCLUSION AND RECOMMENDATIONS	
It is concluded that the Study reveals high feasibility for the project implementation. It may be concluded that the institutional arrangement for project implementation should be taken without interruption.	

OUTLINE OF THE STUDY

The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)

- Study Period : June, 1999 - March, 2000
- Counterpart Agency : Roads and Highways Department (RHD), Ministry of Communications

1. Background of the Study

Khulna City, the 3rd biggest city and the hub of commerce and administration in the southwestern region, is located 150km far from Dhaka having 600,000 population (1991). Major agricultural products in Khulna and its surroundings are paddy rice, jute, sugar cane and prawn. The Rupsa River disrupts the urbanized area that has been developed along National Highway No. 7 and Rupsa Ferry is only one transport means to connect the east to the west. Since the incremental congestion of the ferry terminal at Rupsa ghat increases transport costs as well as aggravating the severance of the local community, the scheme of bridge construction is deemed a drastic measure to improve the situation.

Mongla Port, as the 2nd international port in Bangladesh, is located 40km south from Khulna City. Khulna-Mongla Road will have no river interruption after Rupsa Bridge is completed, and accordingly Rupsa Bridge is expected to play an expanded role in future to cope with incremental freight traffic and further transit cargo movement to the landlocked counties of Nepal and Bhutan.

The Government of Bangladesh and the Japan International Cooperation Agency (JICA) have agreed to the Scope of Work in March 1999 to conduct Phase 2 of the Study on Construction of the Bridge over the River Rupsa in Khulna (hereinafter referred to as "the Study") based on the findings and recommendations prepared under Phase 1 in close cooperation with the Government of Bangladesh.

2. Study Objectives

The objectives of the Study are as follows;

- (1) to conduct the feasibility study for the construction of a road bridge over the river Rupsa including its approaches and the Southern Section of Khulna Bypass from Khulna-Sathkira Road to Khulna-Mongla Road; and
- (2) to pursue technology transfer to Bangladesh counterpart personnel in the course of the Study.

3. Study Area

The study area covers the location of Rupsa Bridge to be in 1 – 3 km south of existing ferry crossing point, the Southern Section of Khulna Bypass in Khulna and resettlement site, if any.

4. Target Year

The target year of the plan is the year 2015 which accords with that of the studies implemented by the World Bank.

5. Outline of the Study

The Study was conducted regarding the Southern Section of Khulna Bypass including Rupsa Bridge in accordance with the agreed scope of work.

5.1 Socio-Economic Framework

During recent years Bangladesh has achieved a GDP growth rate of about 4% per annum. Based on the Fifth Five-Year Plan (5FYP) GDP is projected to grow at an average annual rate of 7% over the five-year period ending 2001/02. This forecast now looks optimistic, given the recent severe floods in Bangladesh and the possibility of some fallout from the ongoing economic crisis in nearby East Asia.

The population growth rate in Bangladesh is expected to continue to decline, to an average annual rate of around 1.37% during the 5FYP (123.8 million population in 1996/97 increasing to 132.5 million by 2001/02, 147.1 million by 2010 and 166.5 million by 2020).

The motorized vehicle ownership is forecasted based on the growth of GDP to be 584,000 vehicles (1997/98) up to 1,558,000 vehicles (2014/15).

5.2 Traffic Demand Forecast and Typical Cross Sections

The future OD tables are subdivided into more detailed traffic zones in the study area, and the future traffic is assigned on more detailed road network than that of Phase 1 Study to examine necessary improvement of connecting roads. Additional traffic survey was conducted to supplement traffic survey data obtained in Phase 1 Study.

- 1) Totaling 35 traffic zones were established in Bangladesh; subdivided are four zones of Khulna City in Phase 1 to eleven zones in Phase 2. Based on total traffic demand (control total) derived within the national transport plan forecasted by “Bangladesh Integrated Transport System Study (BITSS)”, this study applied future increases

The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)

between 1997/98 and 2014/15 of 2.54 times for passenger demand, and 2.75 for freight demand.

- 2) The total cargo at Mongla Port in 2015, excluding that to/from Nepal, is projected at 5,800 thousand tons. The estimated volume of the Nepalese cargo handled at Mongla Port in 2015 is 400 thousand tons including 41 thousand TEUs of containers. The total cargo volume handled at the jetty, all of which is to be transhipped by road transport, will reach more than 2,125 thousand tons. Port related land traffic is defined as that generated from the port area, which covers the public jetty, cement factories, a planned LPG distribution depot, a planned EPZ, and port administration facilities. While currently the number of trucks generated from Mongla Port is not so large, the future land traffic is projected to reach approximately 5 thousand trips a day
- 3) Latent demand for the Rupsa Ferry is presently indicated by much shuttle service to the Rupsa Ferry ghat. It is predicted that traffic flow pattern will greatly change in the future with the construction of a bridge nearby. The latent traffic demand for Rupsa River crossing that will arise upon the construction of the bridge can be forecasted on the basis of Origin-Destination studies of the existing situation.

(trips/day)

	Khulna from Rupsa		Rupsa from Khulna	
	1998	2015	1998	2015
Autorickshaw	455	1,373	352	1,062
Bus	296	847	260	745

Source: Study Team

- 4) The traffic demand passing the Rupsa Bridge is forecasted about 11,100 vehicles/day (about 18,500 pcu/day) as the heaviest traffic volume on the Southern section of Khulna Bypass, and its average trip length is 53.8 km. Accordingly, undivided 2-lane highway was warranted by traffic capacity analysis.
- 5) The cross section of undivided 2-lane with sidewalks was the basis for the Study. However, Rupsa Bridge is located in the urbanized area of Khulna and major users are expected local commuters. It is necessary to deliberate transport means for citizens such as auto-rickshaws and motorcycles, and accordingly separated lanes for slow-moving vehicles were added to accommodate commuters as well as contribute traffic safety and steady flow of traffic.

5.3 Outline of Feasibility Study and Engineering Design

Natural condition surveys such as topographic survey, soil investigations and hydrological survey were carried out to supplement the results of engineering site surveys obtained in Phase 1. Engineering study was conducted in two phases based on these survey results.

5.3.1 Feasibility Study and Design at a Preliminary Level (June 1999 to October 1999)

Major design elements in association with design criteria, route location, bridge structure type and area of river revetment were studied along the selected scheme of Khulna Bypass in Phase 1. The design at a preliminary level, cost estimates and economic/financial analyses were made for the project evaluation. The economic analysis shows EIRR of 26.2% on the base case (VOC + 15% TTC). In the financial analysis, the existing ferry tolls were applied to the new bridge. The estimated FIRR marks 2.4% after 25 years of toll operations (year 2029) and full cost recovery is reached in case of JBIC ODA Loan. The study results of economic/financial analyses reveal high feasibility of the project.

In the course of Phase 2 Study, EIA & SIA report was prepared based on IEE & ISIE in accordance with the environmental policy and laws of Bangladesh as well as environmental guidelines of international institutions including JICA and JBIC. The EIA and SIA concluded that there are no substantial or irreversible adverse environmental and social impacts arising from the Project.

5.3.2 Design at a Detailed Level (November 1999 to February 2000)

The design at a detailed level was carried out based on topographic maps and results of soil investigations. The land acquisition plan and draft tender documents were also prepared for the institutional arrangement for the project implementation. RHD as the executing agency for the Project has submitted the environment clearance application to DOE based on the EIA & SIA report.

The Southern Section of Khulna Bypass is of 10,039m long, comprising the following components:

(1) Rupsa Bridge: L=1,360m W =16.0m

1) Rupsa Main Bridge (16m effective width)

Superstructure : 7-span PC Box Girder with span length of
70m + 5@100m + 70m = 640m

Substructure : RC Bored Piles and Pile-cap on water level

The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)

2) Rupsa Approach Bridge (Viaduct : 16m effective width)

- Superstructure : Standard PC I-girder composite with RC deck slab,
2 x 12 @30m = 720m
- Substructure : RC Bored Piles

3) River Revetment : 50m x 150m wide river revetment on the East Bank

4) Pier Protection : at piers of Rupsa Bridge in the water against scouring

(2) Approach road: L=8,679m (West section L=5,880m, East section L=2,799m)

1) Typical Cross section

Roadway Width : 21.5m

Through Traveled Way : 2 x 6m

(Through traveled lane 3.5m, Slow-moving track 2.5m)

Median : 5.5m

Inner Shoulder : 1.0m (part of median)

Outer Shoulder : 2.0m (used for sidewalk)

2) Canal Bridge: Hatia Br. (L=90m W=2x9m), Molonghata Br. (L=30m W=2x9m)

Superstructure : Standard PC I-girder composite with RC deck slab
Hatia Br.: 3 x 30m = 90m,
Molonghata Br.: 1 x 30m = 30m

Substructure : RC Bored Piles

3) Box Culvert : Nine (9) locations

(3) Related Facilities

Following facilities are to be constructed related to the Southern Section of Khulna Bypass:

1) At-grade Intersections : Six (6) locations

2) Toll Plaza : Barrier type toll gates of five booths for fast-moving vehicles and four booths for slow-moving vehicles

3) Bus Bay : Two (2) locations

4) Staircases with Slope : Both sides and both ends of Rupsa Bridge for Bicycle Pulling

5.4 Major Design Specifications

- (1) The design speed for through traveled way is 60km/h and the vertical and horizontal alignments have maximum grade of 3% and minimum horizontal curve radius of 600m. The lowest elevation of road surface is determined so as to keep subgrade above the flood level of 1.9 PWD.
- (2) The service roads are provided at both sides of Rupsa Bridge approach roads to connect dike roads along the Rupsa River. The location of toll plaza is selected to levy tolls from all vehicles on Rupsa Bridge, including traffic access to/egress from dike roads.
- (3) At-grade intersections are designed to be channelized by auxiliary lanes. Bus bays are provided at far side nearby intersections with Batiaghata and Jabusa.
- (4) RC Bored Piles are selected from the viewpoints of construction cost and practicality against soil condition. The foundation of Rupsa Main Bridge is designed six bored piles of 2.5m diameter with maximum length of 75m, while that of Rupsa Approach Bridge and other canal bridges is eight bored piles of 0.9m diameter with the range of 30m to 50m. The position of pile-cap is selected on the water due to its superiority of cheaper construction cost, shorter construction period and lesser effect against scouring. The design wind of 75m/sec governed required number of piles.
- (5) The superstructure of Rupsa Main Bridge is selected as PC Box Girder type by the balanced cantilever cast-insitu segmental method from the viewpoints of construction cost and practicality, while that of Rupsa Approach Bridge and other canal bridges are PC I-girder composited with RC deck slab.
Since 200 PC I-girders should be fabricated within a certain period, a full-equipped fabrication yard is required to produce PC I-girders systematically.
- (6) The navigation clearance for the Hatia River is kept the same (3.5m) as that of Garamari Bridge on Khulna-Satkhira Road. Accordingly, the embankment at the abutment of Hatia Bridge is 5.2m high. Surcharge together with counterweight fill is required on embankment to stabilize subsurface soil. The resulting Right-of-Way requires 80m wide.
- (7) Neither guide bank nor a kind of river training works, whose basic objective is to constrict waterway, is required at the selected bridge location. However, it is planned to construct 50m x 150m revetment on the east bank as a slope protection measure because there is a possibility for small-scale slope erosion of which the

The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)

causes are the wind, the waves generated by winds shipping vessels, apart from river flow velocity.

Protection work against scouring is required at six piers in the water among totaling eight piers of Rupsa Main Bridge.

- (8) Water level in Rupsa is greatly influenced by tide in Bay of Bengal and the flood of the Ganges river and the Garai river which are upstream rivers, do not have any direct influence on Rupsa river. Accordingly, no seasonal constraint for construction planning is considered but emphasis is put on securing traffic safety for water transport during construction period and procurement and transportation plans of necessary construction equipment and materials.

5.5 Environmental and Social Impact Assessments

The EIA and SIA were conducted along the selected route and it revealed that the land acquisition for the route would require relocating 53 households.

- 1) Almost all of the affected households are located in the residential area adjacent to the west bank of the Rupsa River.
- 2) Of the households under the selected route who would need relocation, majority clearly expressed their opinion in favor of on-site relocation within the same village.
- 3) Nearly 90% of affected households desired cash compensation, while only eleven households wished having the land, house lot and house in resettlement site.

Considering the practical realities of resettlement site development by public sector, it is better to let the affected households to choose individual housing lot location with satisfactory scale of cash compensation. It is confirmed that the executing agency has firm policy to acquire land without any problems in this case.

It is confirmed that neither public facilities/cultural heritages nor vulnerable flora and fauna are affected by the land acquisition for the selected route.

5.6 Construction Planning and Cost Estimates

The construction of Main Bridge is to be one of the major components for Rupsa Bridge Construction Project because of its scale and technical difficulties, and the Approach Bridges are also to be another because of voluminous fabrications of standard I-girder. The construction planning is studied as a whole to cover these major works and three construction sections are deliberated from the viewpoints of dominant work components and accessibility.

The scheme of single contract package is evaluated superior from reasons of (i) suiting methods of access to work components, land access for earthwork and pavement and riverine access for bridge works and (ii) sharing heavy construction equipment in order to ensure quality of work as well as to keep substantial progress.

Two types of cost estimates were carried out, namely for the feasibility study based on the design at a preliminary level and for the tendering based on the design at a detailed level. The costs for the feasibility study was referred for the purpose of funding arrangement because no major design element was changed in the period of design at a detailed level. The project cost is estimated 4.12 billion taka at August 1999 prices.

5.7 Project Implementation Plan

The project implementation plan is made, consisting of 10 months of design review, 12 months of land acquisition, 6 months of tendering and 42 months of construction. Five-year implementation time schedule is set as a whole.

The project of Rupsa Bridge Construction will follow a general flow concept of project implementation on the assumption that the project should be implemented under JBIC ODA Loan proceeds. To avoid delays in project implementation, it will be necessary for RHD and other concerned government agencies to pay close attention to the numerous project processing steps of both the Bangladesh side and an international lending agency. The budget for land acquisition and property compensation should be allocated earlier because of the required fund at the first year and non-eligible portion of the lending agency.

5.8 Maintenance and Operation Plan

Rupsa Bridge is designated to replace the existing ferry and the present ferry tolls should be applied to the new bridge. The cash flow analysis is in real terms and indicates that tolls revenues would be sufficient to cover interest and O/M expenses.

Given the economic importance of the Project, it is envisaged that annual budgets for routine and periodic maintenance will be specifically allocated to the Project (i.e., dedicated) rather than being part of a zonal/block budget allocation. It is proposed that routine maintenance should be funded from the Revenue budget while periodic maintenance should be under an ADP allocation.

5.9 Conclusion and Recommendations

It is concluded that the Study reveals high feasibility for the project implementation. It is obvious that (i) technical soundness is warranted from all technical aspects, (ii) neither

The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)

substantial nor irreversible adverse environmental and social impacts arise from the project, (iii) route is selected to minimize adverse social impacts as well as to make realistic resettlement plan and (iv) economic and financial analyses show high feasibility of the project.

It may be concluded that the institutional arrangement for project implementation should be taken without interruption.

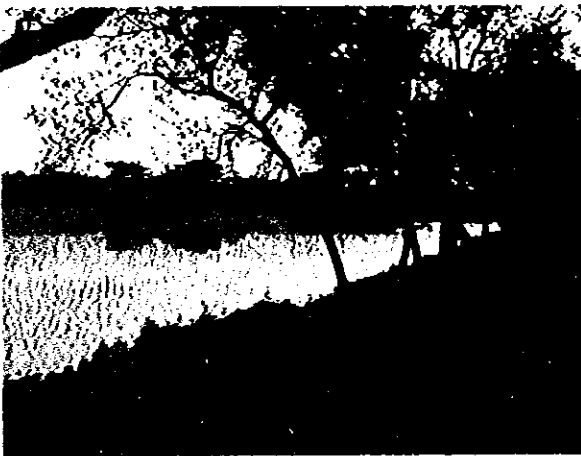
The following recommendations are made for the implementation of the project:

- 1) It is vital that the northern section of Khulna Bypass should be implemented to meet the implementation time schedule of the southern section of Khulna Bypass.
- 2) It is quite important that the development within and along the proposed Right-of-Way should be effectively controlled to facilitate the land acquisition process.
- 3) RHD Khulna Zone should immediately commence due procedure for land acquisition, and simultaneously try to get BWDB's consent for the construction of river revetment, pier protection in the Rupsa River and the installation of bridges and box culverts to canals, branches and tributaries.
- 4) It is necessary for RHD to procure a consultant for supervisory services that may review the technical design to hold a professional liability. Since tender documents have close relation to the design, the procurement of consultant should be made prior to starting the pre-qualification process for contractors.
- 5) The Multi Modal Terminal that was proposed in the transport masterplan during Phase 1 Study may be required together with the implementation of Rupsa Bridge to accommodate expected increase in cargo throughput of Mongla Port up to 2015.
- 6) It is desirable that connecting roads will be improved to meet the implementation time schedule of the southern section of Khulna Bypass and a city planning road will be developed accordingly.
- 7) Existing Rupsa Ferry will be closed after opening of Rupsa Bridge. However, existing ferry terminals should be utilized effectively as follows:
 - to transfer existing facilities to Khulna City Corporation (KCC) to accommodate non-motorized traffic.
 - to build bus terminals at present ferry terminals and to provide circumferential bus services between two terminals through Rupsa Bridge as shown in the Appendix.

Final Report : Photographs



The starting point is designated and clearly marked up on Khulna-Sathkira Road by KDA at 150 m toward Sathkira from the western corner of Weather Office under Meteorological Department.



The route is planned to connect with Batiaghta Road (F7606) at Sta.2+800 which is the feeder road in the district.



The route is planned to pass through open spaces from Sta. 3+000 to Sta. 6+100 such as paddy land and coconut farm.

The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)



The route will cross Laban Chara Main Road (Western Dyke Road) by a grade separation structure because the approach bridge of the Rupsa Bridge is planned to become the elevated viaduct so as to secure the navigation clearance of the Rupsa River at Sta.7+400.



The route is planned to connect with Jabusa Road at Sta.9+600 which is the feeder road in the district.



The route is planned to connect to Khulna-Mongla Road (NH-7) at existing at-grade intersection in Teelok area where Kudir 5m wide road of Bat Tala Sarak exists to lead to Abdul Wadud Memorial Hospital.

Final Report : Photographs



The route will cross Laban Chara Main Road (Western Dyke Road) by a grade separation structure because the elevation of approach road is too high to connect directly.



It is so inhabited area in Amitala that the route will affect a cluster of homesteads and it will be required to be relocated in groups.



The route is planned to connect to Khulna-Mongla Road (NH-7) in Amda Bad area where it is approximately 1.0km far from the existing intersection between NH-7 and Jabusa Road.

The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)

The route is planned to divert from Alternative-2 at Sta.3+900 to run eastward in the built-up area of the southern part of Khulna City.



The route is planned to avert primary controls such as mosque, primary school and cemetery in Matia Khali area.

However, it is inevitable to demolish a densely inhabited area, and it is necessary to relocate on large scale.



The route continues to pass through residential area to keep distance from Khulna Shipyard, and will run to cross Rupsa Stand Road (Western Dyke Road) by a grade separation structure.



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CHAPTER 1 SOCIO-ECONOMIC CONDITIONS

1.1 General Situation of Bangladesh

Located in the Bengal plain of South Asia, Bangladesh has a population of 124.3 million with the territory of 144,000 sq.km. This sub-tropical monsoonal country is lies in between 20°34" to 26°38" north latitude and 88°01" to 92°41" east longitude and encompassed almost the whole border land by India except the southeastern part with Myanmar.

The country is severed by the rivers of Jamuna, Padma (Ganges) and Meghna, each of which is crisscrossed by thousands of tributaries and distributaries of the major rivers, and experiences frequent natural disasters such as flood, drought and cyclone.

During recent years Bangladesh has achieved a GDP growth rate of about 4% per annum. Based on the Fifth Five-Year Plan (5FYP) GDP is projected to grow at an average annual rate of 7% over the five-year period ending 2001/02. This forecast now looks optimistic, given the recent devastating floods in Bangladesh and the possibility of some fallout from the ongoing economic crisis in nearby East Asia.

The population growth rate in Bangladesh is expected to decline, to an average annual rate of around 1.37% during the 5FYP (123.8 million population in 1996/97 increasing to 132.5 million by 2001/02).

In the 5FYP the main structural changes in GDP are forecast to be: a reduction in the share of Agriculture, from 29.82% in 1996/97 to 25.87% by 2001/02; and increases over the same period for Industry (9.28% to 12.70%) and Power & Gas (2.20% to 4.41%).

1.2 Socio-economic Conditions

(1) Present Socio-economic Conditions

The population of Bangladesh was 111.455 million in 1991 as shown in Table 1.2.1. The population growth rate from 1981 to 1991 was 2.5% per annum, and it was estimated as 1.85% per annum from 1991 to 1995.

The population density was approximately 590 persons/Km² in 1981. It has increased to 755 persons/Km² in 1991. There were 19.4 million households in the country, and the average household size was 5.6 persons in 1991.

Table 1.2.1 Population in Bangladesh

	1974	1981	1991	1995
Population (million persons)	71.5	87.1	111.5	120.0
Population Annual Average Growth Rate (%)	-	2.86	2.50	1.85
Population Density (persons/ Sq. Km)	485	590	755	813
Population by Age Group (%)				
0 - 14	48.00	46.70	45.30	42.90
15 - 64	48.50	50.80	52.10	53.10
65 -	3.50	2.50	2.60	4.00
Urban population (as % of total population)	8.80	15.20	19.63	22.00
Sex Ratio (Male/Female)	108	106	106	106

Source : 1997 Statistical Yearbook of Bangladesh

Note : Population in 1995 was estimated by BBS.

Table 1.2.2 shows population in various Khulna areas such as Khulna City Corporation (KCC), Khulna Statistical Metropolitan Area (SMA), Khulna Zila (district), Khulna Former District and Khulna Division in 1991.

Table 1.2.2 Population in Various Khulna Areas in 1991

	Khulna City Corporation	Khulna SMA	Khulna Zila	Khulna Former District	Khulna Division
Population (thousand persons)	663	921	2130	5039	12689
Population Annual Growth Rate (1981-91, %)	1.67	3.67	1.82	1.53	1.78
Population Density (persons/ Sq. Km)	9471	3449	485	413	570
Urban population (as % of total population)	-	-	47.3	26.4	18.3
Sex Ratio (Male/Female)	121	118	111	107	106

Source : (1) 1997 Statistical Yearbook of Bangladesh

(2) Bangladesh Population Census 1981, Community Tables of All Thanas of Khulna District

(3) Bangladesh Population census 1991, Volume 3 Urban Area Report (Nov. 1997)

Note : (1) Khulna SMA (Statistical Metropolitan Area) includes Khulna City Corporation and whole of Rupsa and Dighalia thanas.

(2) Khulna Former District includes Khulna, Bagerhat and Satkhira Zilas.

According to 1995/96 Labor Force Survey (LFS), the total labor force of the country was estimated at 56.0 million, of which 34.7 million are male and 21.3 million are female. Out of the number of employed population by sector, the agriculturally based population is the largest one. Its share to total employed population was 66.7% in 1990/91 and 62.7% in 1995/96, respectively. It is estimated that about 40% of the 56.0 million labor force are underemployed, or forced to work less than full time.

As shown in Table 1.2.3, an annual GDP growth rate of 4.8% was observed from 1990/91 to 1996/97. Because Bangladesh economy is structurally an agrarian economy, the agriculture sector continued to play a major role in the national economy. Although its share has declined in the last decade, it still constitutes about one third (32.4% in 1996/97) of total GDP, and engages two third (62.7% in 1995/96) of total domestic labor force. Food security and the performance of

The Study on Construction of the Bridge over the River Rupsa in Khulna (Phase 2)

agriculture both continue to be important factors in the country's overall economic performance in general and poverty alleviation in particular.

Table 1.2.3 GDP by Sector in Bangladesh (Constant 1984/85 Prices)

(Unit: million TK)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98 ¹
A. Agriculture	193,421	197,662	201,230	201,915	199,822	207,126	220,456	227,325
1. Crops	152,575	155,101	156,392	153,852	148,068	152,168	161,572	164,193
2. Forestry	12,845	13,147	13,536	14,077	14,712	15,338	15,980	16,667
3. Livestock	14,102	14,615	15,522	16,841	18,239	19,706	21,278	22,980
4. Fisheries	13,899	14,799	15,780	17,145	18,803	19,914	21,626	23,485
B. Industry	88,294	94,558	102,105	110,044	119,234	125,603	130,389	139,869
1. Mining & Quarrying	80	94	107	121	137	174	222	278
2. Manufacturing	50,423	54,117	59,033	63,665	69,165	72,823	75,401	81,480
a. Large Scale	29,269	32,342	36,627	40,363	44,884	47,595	49,189	54,167
b. Small Scale	21,154	21,775	22,406	23,302	24,281	25,228	26,212	27,313
3. Construction	31,087	32,471	34,032	36,074	38,593	40,146	42,098	44,708
4. Electricity, Gas & Water	6,704	7,876	8,933	10,184	11,339	12,460	12,668	13,403
C. Services	232,727	243,969	256,894	271,881	290,737	309,712	329,361	350,933
1. Transport & communications	60,840	63,349	66,416	70,089	74,203	77,889	82,949	88,506
2. Trade Services	46,707	48,561	50,631	53,284	58,669	64,544	68,797	73,069
3. Housing Services	39,316	40,656	42,197	43,792	45,457	47,204	49,039	50,965
4. Public Administration & Defence	22,334	24,184	26,240	28,484	30,962	33,533	36,344	40,087
5. Banking & Insurance	9,755	10,002	10,302	10,663	11,090	11,478	11,914	12,366
6. Professional & Miscellaneous Services	53,275	57,217	61,108	65,569	70,356	75,064	80,318	85,940
GDP at Constant Prices	514,442	536,189	560,229	583,840	609,793	642,441	680,206	718,127
Population (million)	109.6	113.3	115.5	117.7	119.9	122.1	124.3	126.6
Per Capita GDP	4,694	4,732	4,850	4,960	5,086	5,262	5,472	5,677
Annual Growth of GDP (%)	3.4	4.2	4.5	4.2	4.4	5.3	5.9	5.6
Annual Growth of Per Capita GDP (%)	1.4	2.1	2.5	2.3	2.5	3.5	4.0	3.7

Note : a; provisional

Source : 1997 Statistical Yearbook of Bangladesh

In Khulna Former District, the regional GDP and per capita GDP were TK 35,909 million and TK 5,985 in 1996/97 respectively as shown in Table 1.2.4. It accounts for 5.3% of the whole Bangladesh GDP. The annual growth rate of GDP during 1990/91-1996/97 in Khulna was 4.6%, which was almost same as that of GDP of the country. Although the composition of GDP by industrial sector in Khulna is structurally same as that of whole country, the shares of manufacturing and transport & communication sector in Khulna are slightly higher than that in whole country.

Table 1.2.4 GDP by Sector in Khulna Former District (Constant 1984/85 Prices)

	(Unit: million TK)						
	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
A. Agriculture	10,279	10,643	11,508	11,435	11,006	11,579	11,572
1. Crops	6,041	6,302	6,502	6,472	5,811	6,118	5,811
2. Forestry	3,137	3,205	3,370	3,549	3,582	3,735	3,892
3. Livestock	662	671	1,053	778	835	902	974
4. Fisheries	439	465	583	636	778	824	895
B. Industry	4,409	4,753	5,235	5,784	6,259	6,611	6,856
1. Mining & Quarrying	0	0	0	0	0	0	0
2. Manufacturing	2,562	2,825	3,189	3,589	3,895	4,128	4,267
a. Large Scale	2,473	2,733	3,095	3,411	3,793	4,022	4,157
b. Small Scale	89	92	94	98	102	106	110
3. Construction	1,568	1,638	1,717	1,820	1,947	2,025	2,123
4. Electricity, Gas & Water	279	290	329	375	417	458	466
C. Services	12,794	12,988	13,643	14,446	15,437	16,440	17,481
1. Transport & communications	3,743	3,897	4,086	4,312	4,565	4,792	5,103
2. Trade Services	2,485	2,161	2,810	2,957	3,256	3,582	3,818
3. Housing Services	1,983	2,051	2,128	2,209	2,293	2,381	2,473
4. Public Administration & Defence	1,070	1,159	1,244	1,364	1,498	1,620	1,754
5. Banking & Insurance	491	504	479	496	490	507	526
6. Professional & Miscellaneous Services	3,022	3,216	2,896	3,108	3,335	3,558	3,807
GDP at Constant Prices	27,482	28,384	30,386	31,585	32,702	34,630	35,909
Population (million)	5.3	5.4	5.4	5.5	5.8	6	6
Per Capita GDP	5,185	5,256	5,627	5,743	5,638	5,869	5,985
Annual Growth of GDP (%)	3.0	3.3	7.1	3.9	3.5	5.9	3.7
Annual Growth of Per Capita GDP (%)	1.1	1.4	7.1	2.1	-1.8	4.1	2.0

Source : 1997 Statistical Yearbook of Bangladesh

2) Socio-economic Framework

The Fifth Five Year Plan (1997-2002) (hereinafter referred to as the "5FYP") was formulated in June 1997, as a vision-rich guide toward comprehensive development in Bangladesh.

The 5FYP aims to achieve a target GDP growth rate of over 7% with an estimated outlay of TK 2,034 billion. Out of this, the public sector will contribute about 42% of the total outlay with the remaining 58% to be financed by the private sector. The 5FYP aims toward achieving a high degree of self-reliance. That is to say, about 74% of the total outlay will be financed from domestic sources.

The 5FYP will give priority to the agricultural sector so as to maximize its contribution to overall growth of the economy and food security. Next in priority is the industrial sector, the key to Bangladesh's entry into the 21st century as a modern growing economy.

Table 1.2.5 shows the scale of the Plan by the terminal year (2001/2002). The average annual growth rates during the 5FYP period are 7.3% for GDP, 1.36% for population, 4.1% for employment, and 5.5% for per capita GDP, respectively.

agriculture both continue to be important factors in the country's overall economic performance in general and poverty alleviation in particular.

Table 1.2.3 GDP by Sector in Bangladesh (Constant 1984/85 Prices)

(Unit: million TK)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98 ^a
A. Agriculture	193,421	197,662	201,230	201,915	199,822	207,126	220,456	227,325
1. Crops	152,575	155,101	156,392	153,852	148,068	152,168	161,572	164,193
2. Forestry	12,845	13,147	13,536	14,077	14,712	15,338	15,980	16,667
3. Livestock	14,102	14,615	15,522	16,841	18,239	19,706	21,278	22,980
4. Fisheries	13,899	14,799	15,780	17,145	18,803	19,914	21,626	23,485
B. Industry	88,294	94,558	102,105	110,044	119,234	125,603	130,389	139,869
1. Mining & Quarrying	80	94	107	121	137	174	222	278
2. Manufacturing	50,423	54,117	59,033	63,665	69,165	72,823	75,401	81,480
a. Large Scale	29,269	32,342	36,627	40,363	44,884	47,595	49,189	54,167
b. Small Scale	21,154	21,775	22,406	23,302	24,281	25,228	26,212	27,313
3. Construction	31,087	32,471	34,032	36,074	38,593	40,146	42,098	44,708
4. Electricity, Gas & Water	6,704	7,876	8,933	10,184	11,339	12,460	12,668	13,403
C. Services	232,727	243,969	256,894	271,881	290,737	309,712	329,361	350,933
1. Transport & communications	60,840	63,349	66,416	70,089	74,203	77,889	82,949	88,506
2. Trade Services	46,707	48,561	50,631	53,284	58,669	64,544	68,797	73,069
3. Housing Services	39,316	40,656	42,197	43,792	45,457	47,204	49,039	50,965
4. Public Administration & Defence	22,334	24,184	26,240	28,484	30,962	33,533	36,344	40,087
5. Banking & Insurance	9,755	10,002	10,302	10,663	11,090	11,478	11,914	12,366
6. Professional & Miscellaneous Services	53,775	57,217	61,108	65,569	70,356	75,061	80,318	85,940
GDP at Constant Prices	514,442	536,189	560,229	583,840	609,793	642,441	680,206	718,127
Population (million)	109.6	113.3	115.5	117.7	119.9	122.1	124.3	126.6
Per Capita GDP	4,694	4,732	4,850	4,960	5,086	5,262	5,472	5,677
Annual Growth of GDP (%)	3.4	4.2	4.5	4.2	4.4	5.3	5.9	5.6
Annual Growth of Per Capita GDP (%)	1.4	2.1	2.5	2.3	2.5	3.5	4.0	3.7

Note : a, provisional

Source : 1997 Statistical Yearbook of Bangladesh

In Khulna Former District, the regional GDP and per capita GDP were TK 35,909 million and TK 5,985 in 1996/97 respectively as shown in Table 1.2.4. It accounts for 5.3% of the whole Bangladesh GDP. The annual growth rate of GDP during 1990/91-1996/97 in Khulna was 4.6%, which was almost same as that of GDP of the country. Although the composition of GDP by industrial sector in Khulna is structurally same as that of whole country, the shares of manufacturing and transport & communication sector in Khulna are slightly higher than that in whole country.

Table 1.2.4 GDP by Sector in Khulna Former District (Constant 1984/85 Prices)

	(Unit: million TK)						
	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
A. Agriculture	10,279	10,643	11,508	11,435	11,005	11,579	11,572
1. Crops	6,041	6,302	6,502	6,472	5,811	6,118	5,811
2. Forestry	3,137	3,205	3,370	3,549	3,582	3,735	3,892
3. Livestock	662	671	1,053	778	835	902	974
4. Fisheries	439	465	583	636	778	824	895
B. Industry	4,409	4,753	5,235	5,784	6,259	6,611	6,856
1. Mining & Quarrying	0	0	0	0	0	0	0
2. Manufacturing	2,562	2,825	3,189	3,589	3,895	4,128	4,267
a. Large Scale	2,473	2,733	3,095	3,411	3,793	4,022	4,157
b. Small Scale	89	92	94	98	102	106	110
3. Construction	1,568	1,638	1,717	1,820	1,947	2,025	2,123
4. Electricity, Gas & Water	279	290	329	375	417	458	466
C. Services	12,794	12,988	13,643	14,446	15,437	16,440	17,481
1. Transport & communications	3,743	3,897	4,086	4,312	4,565	4,792	5,103
2. Trade Services	2,485	2,161	2,810	2,957	3,256	3,582	3,818
3. Housing Services	1,983	2,051	2,128	2,209	2,293	2,381	2,473
4. Public Administration & Defence	1,070	1,159	1,244	1,361	1,498	1,620	1,754
5. Banking & Insurance	491	504	479	496	490	507	526
6. Professional & Miscellaneous Services	3,022	3,216	2,896	3,108	3,335	3,558	3,807
GDP at Constant Prices	27,482	28,384	30,386	31,585	32,702	34,630	35,909
Population (million)	5.3	5.4	5.4	5.5	5.8	6	6
Per Capita GDP	5,185	5,256	5,627	5,743	5,638	5,869	5,985
Annual Growth of GDP (%)	3.0	3.3	7.1	3.9	3.5	5.9	3.7
Annual Growth of Per Capita GDP (%)	1.1	1.4	7.1	2.1	-1.8	4.1	2.0

Source : 1997 Statistical Yearbook of Bangladesh

2) Socio-economic Framework

The Fifth Five Year Plan (1997-2002) (hereinafter referred to as the "5FYPP") was formulated in June 1997, as a vision-rich guide toward comprehensive development in Bangladesh.

The 5FYPP aims to achieve a target GDP growth rate of over 7% with an estimated outlay of TK 2,034 billion. Out of this, the public sector will contribute about 42% of the total outlay with the remaining 58% to be financed by the private sector. The 5FYPP aims toward achieving a high degree of self-reliance. That is to say, about 74% of the total outlay will be financed from domestic sources.

The 5FYPP will give priority to the agricultural sector so as to maximize its contribution to overall growth of the economy and food security. Next in priority is the industrial sector, the key to Bangladesh's entry into the 21st century as a modern growing economy.

Table 1.2.5 shows the scale of the Plan by the terminal year (2001/2002). The average annual growth rates during the 5FYPP period are 7.3% for GDP, 1.36% for population, 4.1% for employment, and 5.5% for per capita GDP, respectively.

Table 1.2.5 Scale of the 5FYP (at 1996/97 Prices)

	1996/97	2001/2002	Annual Growth Rate (%)
GDP (million TK)	1,402,235	1,993,504	7.3
Agriculture	418,306	508,933	4.0
Industry	129,765	263,919	15.3
Construction	82,346	115,495	7.0
Power, Gas	30,834	94,099	25.0
Transport	158,040	225,048	7.3
Housing Services	134,117	165,109	4.2
Public Administration	79,048	98,508	4.5
Health	19,184	27,541	7.5
Education	58,685	83,566	7.3
Trade Services	125,799	179,137	7.3
Banking, Insurance	28,084	37,583	6.0
Prof. & Misc. Services	138,026	194,565	7.1
Population (million)	123.8	132.5	1.36
Employment (x1000 persons)	49,071	62,312	4.1
Agriculture	30,912	36,918	3.0
Industry	3,650	6,466	10.0
Power, Gas	103	238	15.0
Construction	1,015	1,323	4.5
Transport, Communications	2,196	2,904	4.8
Trade, Other Services	11,195	14,463	4.4
Per Capita GDP (TK)	11,494	15,045	5.5

Note : Base year of Employment is 1995/96 (from Labour Force Survey).

Per Capita GDP is calculated by the Study Team.

Source : The Fifth Five Year Plan 1997-2002

To achieve an average GDP growth rate of over 7% per annum and to transform from subsistence to a market-based economy, the transport sector growth rate would be expected to increase considerably by 8-9% per annum.

The relative items of priority investment programs or projects in the 5FYP are as follows:

- Completion of the Jamuna Multipurpose Bridge project along with access roads.
- Completion of Dhaka Eastern Bypass.
- Construction of three major road bridges: Rupsa Bridge at Khulna, the Paksey bridge on the Khulna - Northwest Corridor, and the Bhairab bridge at Ashuganj on the Dhaka - Sylhet Corridor.
- Completion of the Jamuna Railway project.
- Rehabilitation and completion of the construction of ongoing arterial roads projects including their maintenance.
- Development of the airports at Barisal, Khulna (or Bagerhat), Bogra, Rajshahi and Saidpur to accommodate larger aircraft, (among other targets).

Table 1.2.6 shows the forecasted socioeconomic framework for Khulna Former District based on the national socioeconomic framework.

Table 1.2.6 Socioeconomic Framework for Khulna Former District

	1996/97	Estimate			Average Annual Growth Rate (%)		
		2004/05	2009/10	2014/15	2000-05	2005-10	2010-15
Population (million)	5.919	6.635	7.100	7.568	1.40	1.36	1.28
Khulna zila	2.501	2.931	3.205	3.490	1.85	1.80	1.71
Bagerhat zila	1.630	1.782	1.881	1.978	1.15	1.08	1.01
Satkhira zila	1.788	1.922	2.014	2.100	0.97	0.94	0.83
GDP (billion TK)	79.187	128.725	156.614	190.545	6.54	4.00	4.00

Note : GDP at 1996/97 prices

Source : Estimates by JICA Study Team

(1) Social Conditions

The urbanized area of Khulna is situated on narrow and slightly high natural levee, formed in south-north direction along the both sides of the Rupsa River. The ground of natural levee is good on sandy soil in general, while the back swamp outside such levee is located on soft ground. Development in the east-west direction of Khulna is hindered making a boundary due to this back swamp which is between the natural levee and the back swamp.

KDA Master Plan Study revealed three broad categories of land use in Khulna. Of the total 41,966 ha of 69% is used for field crop production, while about 19% are used as rural settlements, followed by water-bodies such as ponds, rivers, canals, swamps, etc. The urban residential area comprise mixed and planned housing areas. The coverage under urban housing constitutes 3.4% of the estimation indicates about 1,424 ha belong to urban housing of which planned area cover about 20%.

Most of people are grouped into small communities called "homestead". These lands of homestead are raised by about 1 m high above farmlands to get protected from flooding. Usually they have a pond for livelihood in an average area of 200-300 m², surrounded by woods and the family and relatives are living together in small houses. The woods are mostly fruit trees and timber trees, often used as source of fuel along with dung of domestic animals. These homesteads are either located scattered or clustered.

Literacy of aged 7 years old and above is 43.6% in Khulna District, higher than that of national average and it is believed being improved remarkably recently by NGO's activities.