JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF LOCAL GOVERNMENT RURAL DEVELOPMENT
AND CO-OPERATIVE (LOCAL GOVERNMENT DIVISION)
THE PEOPLE'S REPUBLIC OF BANGLADESH

BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
PROCUREMENT OF PORTABLE STEEL BRIDGES
FOR RURAL ROADS
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH

NOVEMBER 1993

KATAHIRA & ENGINEERS INTERNATIONAL

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PREFACE

In response to a request from the Government of the People's Republic of Bangladesh, the Government of Japan decided to conduct a basic design study on the Project for Procurement of Portable Steel Bridges for Rural Roads and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Bangladesh a study team headed by Mr. Yoshinori Hashiguchi, Study Review and Coordination Division, Grant Aid Study & Design Department, JICA, and constituted by members of Katahira & Engineers International, from July 17 to August 25, 1993.

The team held discussions with the officials of the Government of Bangladesh, and conducted a field study at the study area. After the team returned to Japan, further studies were made, and as this result, the present report was finalized.

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

I wish to express my sincere appreciation to the officials concerned of the Government of the People's Republic of Bangladesh for their close cooperation extended to the team.

November 1993

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

November 1993

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

We are pleased to submit to you the Basic Design Study Report on the Project for Procurement of Portable Steel Bridges for Rural Roads in the People's Republic of Bangladesh.

This study was conducted by Katahira & Engineers International, under a contract to JICA, during the period from July 14 to November 30, 1993. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Bangladesh and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

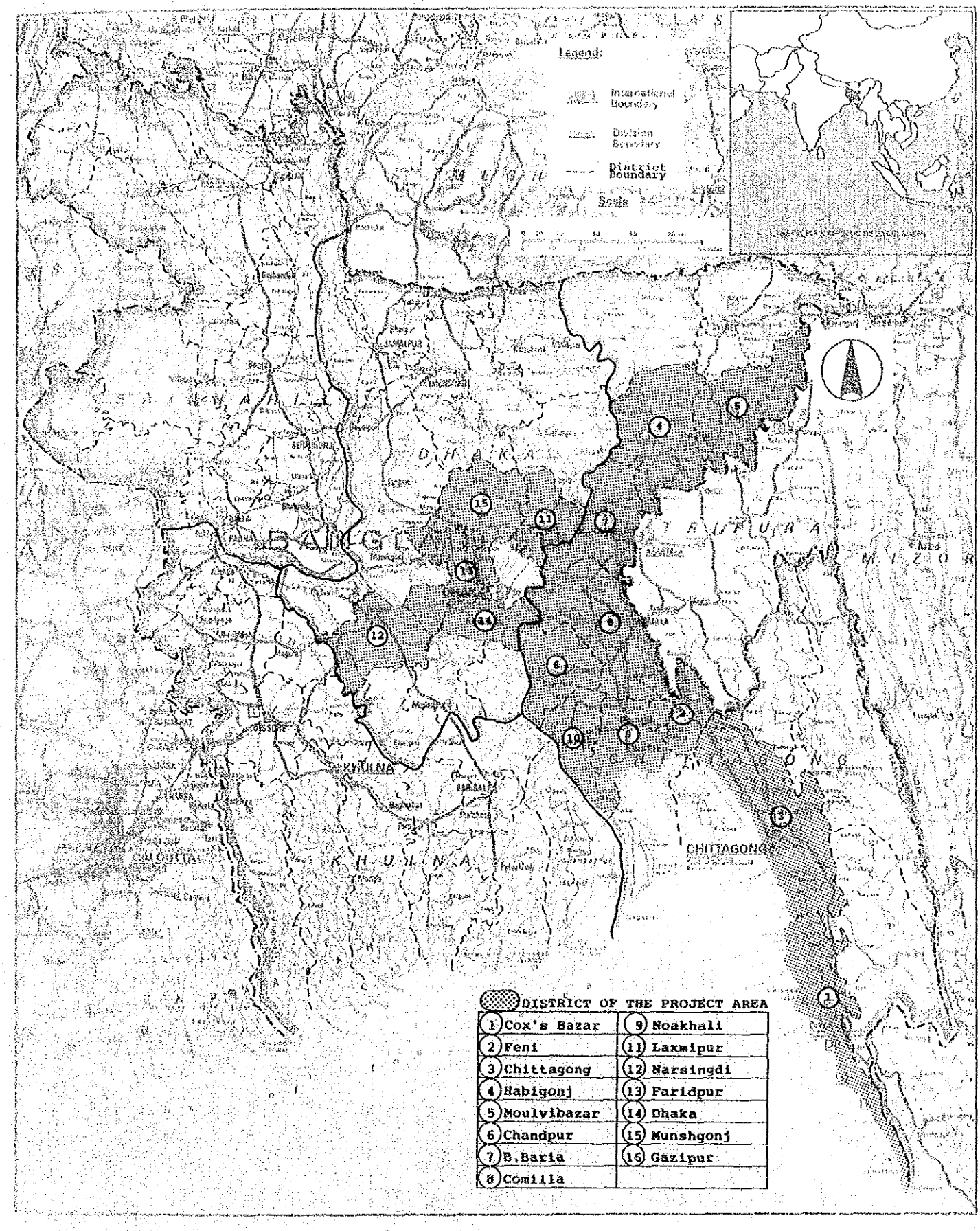
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA and the Ministry of Foreign Affairs. We would also like to express our gratitude to the officials concerned of the Ministry of Local Government Rural Development and Co-operative, the JICA Bangladesh office, the Embassy of Japan in Bangladesh for their cooperation and assistance throughout our field survey.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

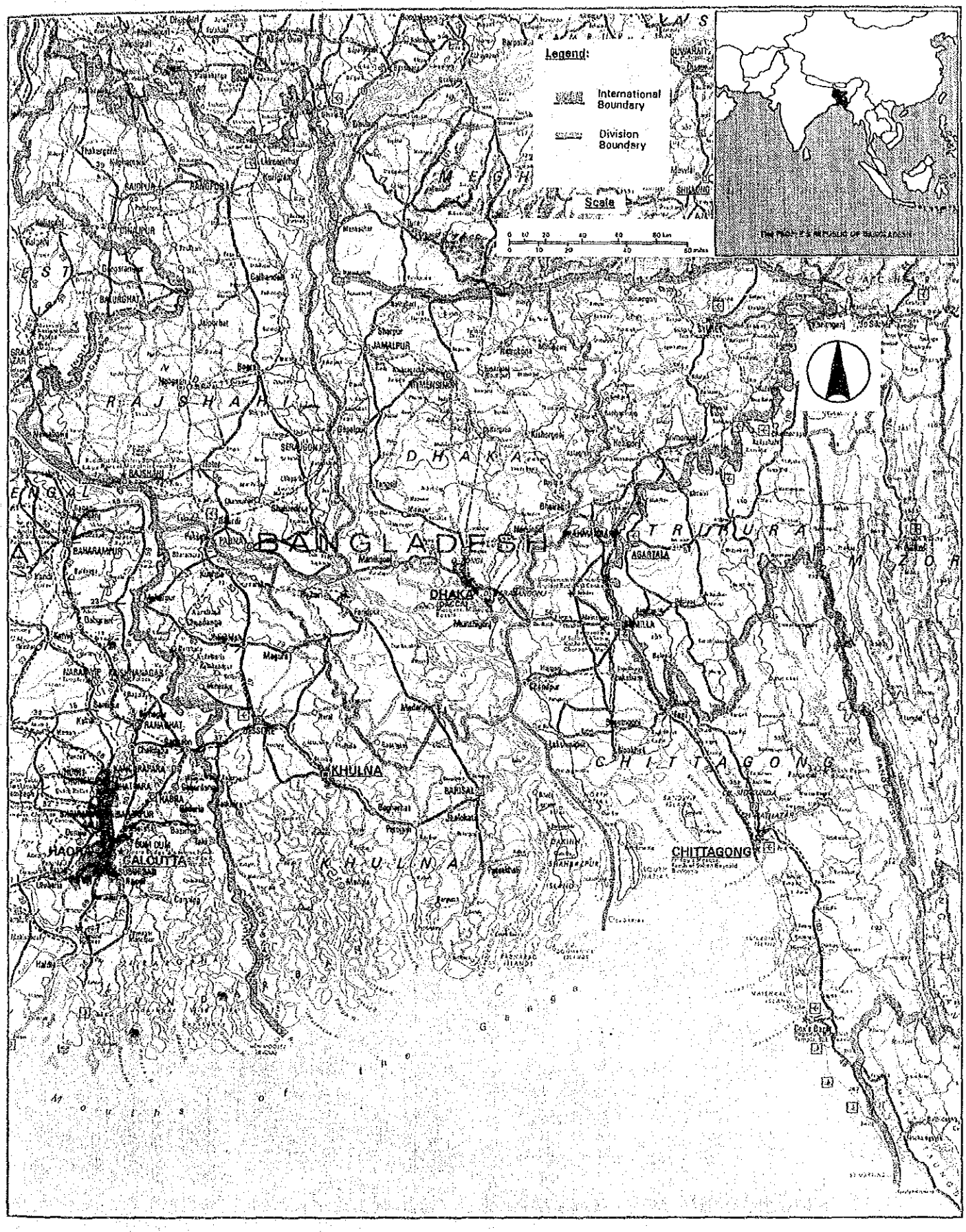
M. Miura

Minoru MIURA
Project Manager,
Basic Design Study Team on
The Project for Procurement of Portable
Steel Bridges for Rural Roads
Katahira & Engineers International

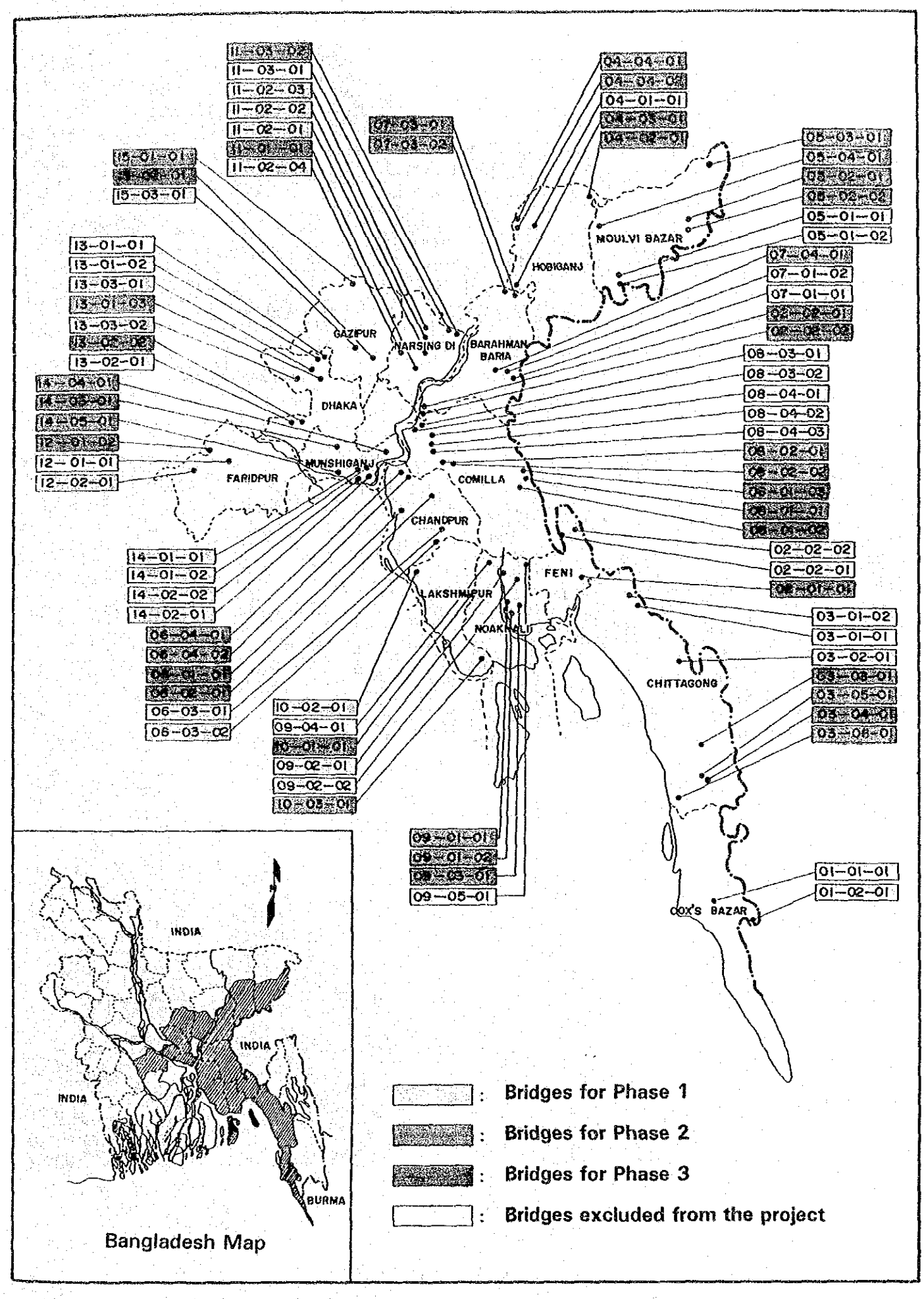


LOCATION OF PROJECT AREA

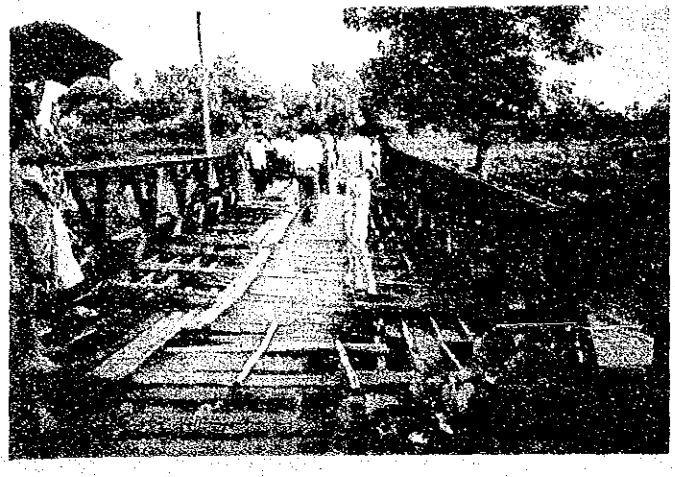
District Boundary
DISTRICT OF THE PROJECT AREA
1 Cox's Bazar
2 Feni
3 Chittagong
4 Rabipont
5 Noulybazar
6 Chandpur
7 B.Baria
8 Comilla
9 Noakhali
11 Laxmipur
12 Narsingdi
13 Faridpur
14 Dhaka
15 Munshipont
16 Gazipur



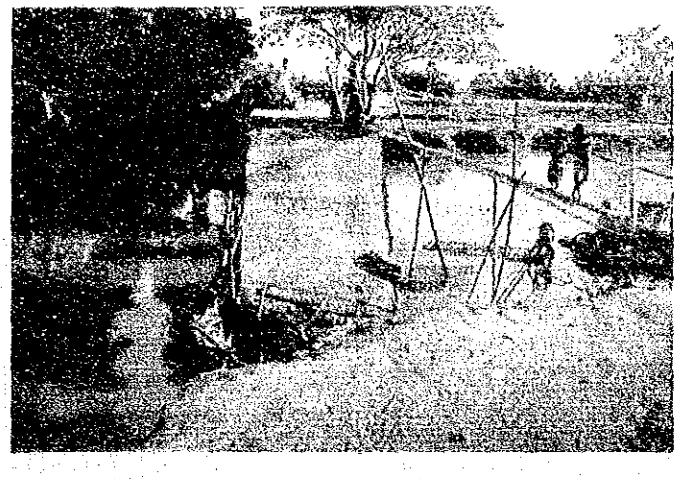
LOCATION OF PROJECT AREA



LOCATION OF PROJECT BRIDGES

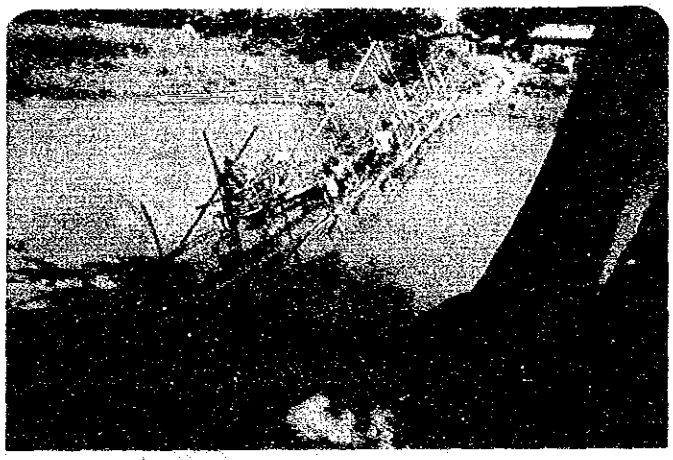


Bridge No. 08-01-01
Dilapidated Bailey bridge impassable for vehicles.



Bridge No. 05-02-01
Damaged bridge with abutment washed out.

Bridge No. 15-01-01
Damaged wooden bridge unsafe for traffic.



Bridge No. 12-02-01
Temporary bridge made of bamboo.

Bridge No. 02-01-01
Bridge washed out by flood.

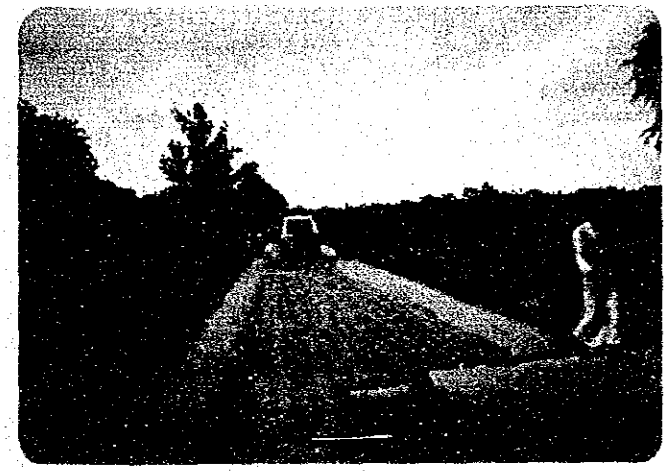
Bridge No. 03-02-01
Boat used for crossing river.

PROJECT BRIDGE SITES

National Road (Dhaka - Comilla road)
(2 lane, asphalt concrete pavement)

Regional Road (Feni - Parshuram road)
(2 lane, bituminous surface treatment)

Type-A Feeder Road (Machichailbazar, Comilla)
(single lane, bituminous surface treatment)



Type-B Feeder Road (Belabo, Narsingdi)
(single lane, herringbone brick pavement)

Rural Road (R1) (Parshuram, Feni)
(single lane, herringbone brick pavement)

Rural Road (R2) (Chandina, Comilla)
(earthen surface)

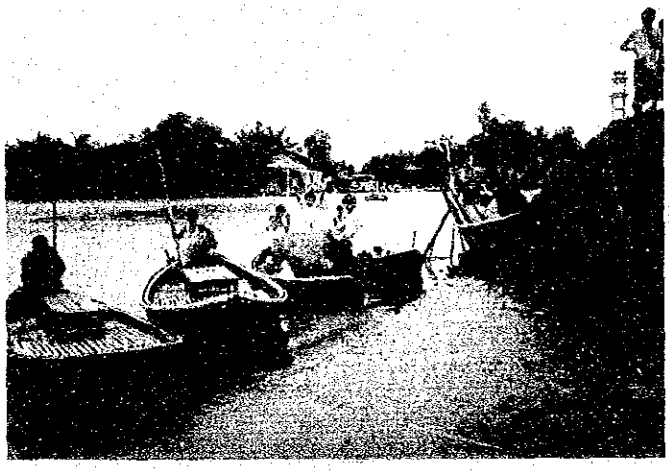
ROADS IN BANGLADESH

Photos (2)

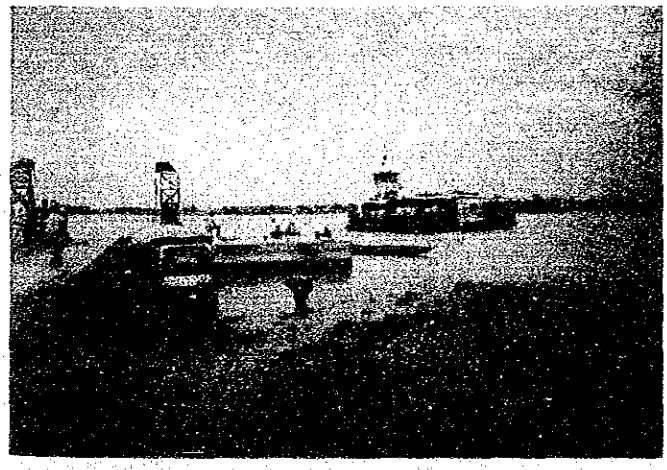
Bus (for long distance trips)

Auto-rickshaw (for local trips within cities)

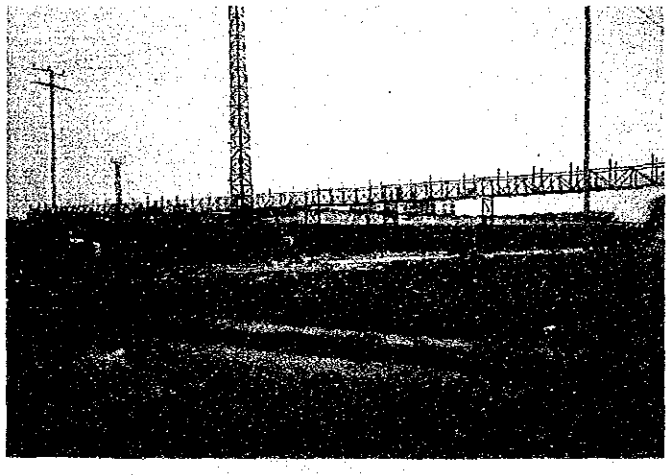
Rickshaw (for local trips)



Boats (for crossing medium/small rivers)



Ferryboat (for crossing large rivers)

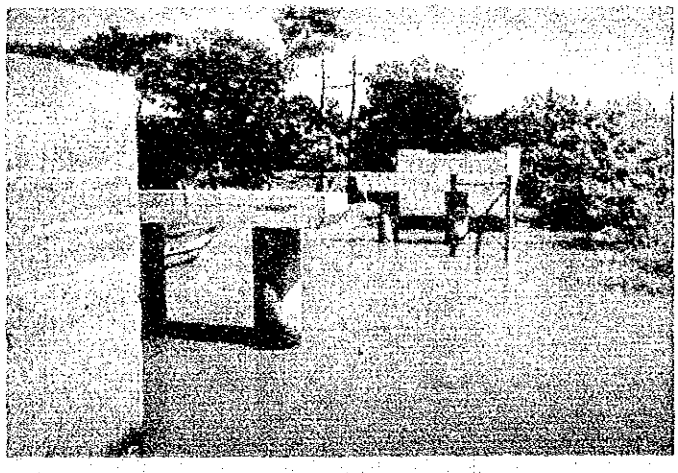


Railway (for long distance trips/cargo)

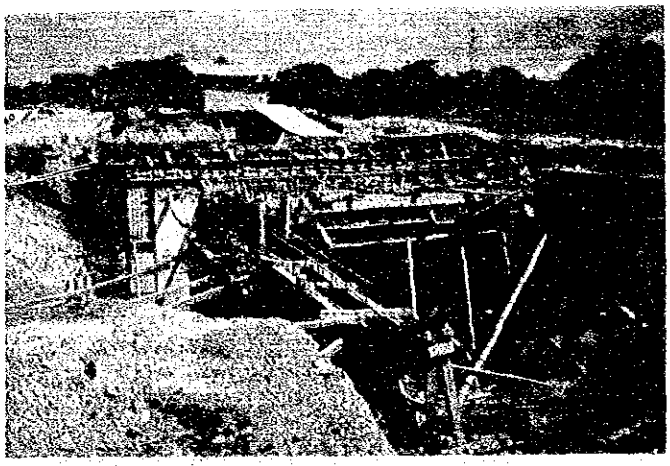
TRANSPORTATION MEANS IN BANGLADESH

Photos (3)

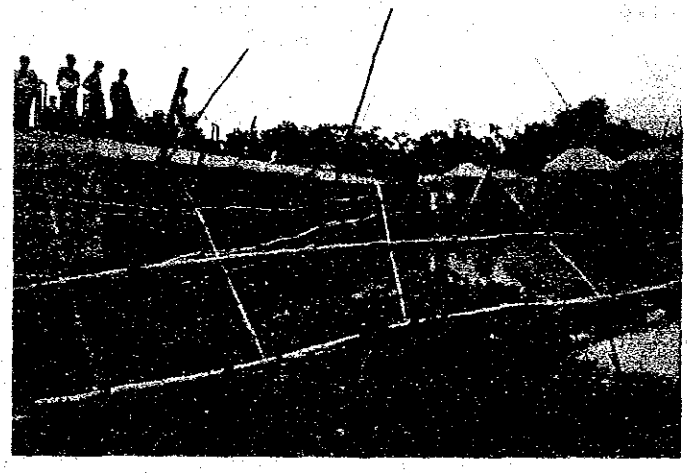
Pile-bent type pier (for deep LWL river)



Pier and abutment (LGED standard type)



Form work (for construction of substructures)



Support work (for construction of superstructure)

Piling work (cast-in-place concrete piles)

Bar arrangement work (for superstructure)

BRIDGE CONSTRUCTION WORKS IN BANGLADESH

SUMMARY

The People's Republic of Bangladesh has a total population of approximately 110 million on 140 thousand sq.km of land area which extends over the Ganges-Brahmaputra-Meguna deltic plain. The main economic activity are agriculture, of which the major products are jute and rice.

Road transport has been playing an increasingly dominant role in the socio-economic development of Bangladesh and is the largest mode for inland transport of the country. However, since feeder and rural roads in Bangladesh are in such a rudimentary state that most of them are unpaved, all weather year-round communication cannot be ensured. In addition, destructive floods in recent years affected almost the whole country and destroyed infrastructures including bridges along feeder and rural roads.

To rehabilitate the roads and bridges damaged by floods and to pursue the development of the feeder and rural road network in rural areas, the Government of Bangladesh formulated its Flood Rehabilitation Project. To construct 83 bridges under that Project, the Government of Bangladesh requested Japan's Grant Aid for the procurement of portable steel bridge materials necessary for constructing the bridges.

In response to the request of the Government of Bangladesh, the Government of Japan decided to conduct a basic design study on the Project for Procurement of Portable Steel Bridges for Rural Roads. Japan International Cooperation Agency (JICA) dispatched the Basic Design Study Team from July 17 to August 25, 1993, for field investigation.

The Basic Design Study Team, during its stay in Bangladesh, confirmed the background, objectives and contents of the Project, collected relevant data, and surveyed the requested bridge site conditions.

After returning to Japan, the Team evaluated the Project in respect of appropriateness, necessity, socio-economic effects and other factors based on the results of their investigations, and studied the basic design of the Project and implementation plan.

As a result of the evaluation, 74 bridges were selected for the Project out of the 83 bridges requested. These bridges are located along Type-B feeder and rural roads in 15 districts in eastern Bangladesh.

Reflecting local conditions in formulating the most appropriate plan for the Project, basic planning of the 74 Project bridges and the basic design of the portable steel bridges were conducted. As a result, the Project summarized in the table below is proposed.

The Government of Bangladesh plans to implement construction in 3 phases. The undertakings of the Government of Japan, which are procurement of portable steel bridge materials, erection tools and erection training, are planned to be implemented in 2 stages as shown in the table.

Works		Unit	First Stage		Second Stage	Total
			Phase 1	Phase 2	Phase 3	
Number of Bridges		Bridge	32	22	20	74
Portable Steel Bridge Materials	No. of 15m Spans	Span	9 (135m)	6 (90m)	8 (120m)	23 (345m)
	No. of 20m Spans	Span	28 (560m)	20 (400m)	7 (140m)	55 (1100m)
	No. of 25m Spans	Span	31 (775m)	24 (600m)	25 (625m)	80 (2000m)
	Total	Span	68 (1470m)	50 (1090m)	40 (885m)	158 (3445m)
Erection Tools	Assembly Tools	Set	12	0	0	12
	Launching Tools	Set	12	0	0	12
Erection Training		Bridge	3	0	0	3

Implementation of the Project is structured in three steps, i.e., detailed design (including tendering), procurement (including transportation and handover), and erection training. The periods required are 5 months for detailed design, 8 months for procurement and 4.5 months for erection training in the First Stage, and 5 months for detailed design and 8 months for procurement in the Second Stage.

The Local Government Engineering Department (LGED) under the Ministry of Local Government Rural Development and Co-operative (Local Government Division) is the executing agency of the Project. The Project Implementation Office to be established in the headquarters of LGED will carry out planning and design of the bridges, while Executive engineers at district level and Thana engineers will be involved in construction and maintenance of the bridges.

This Project aims to reconstruct bridges which were damaged or washed out and to construct new bridges over rivers which cut roads and obstruct travel and transportation. Consequently, it will contribute to a rise in living standards and promote socio-economic development in rural areas. The implementation of this Project will benefit a population of 36 million people spread over a land area of 33 thousand sq.km. As a result, it is appropriate to implement this project under Japan's Grant Aid.

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ABBRIBIATIONS

LGED	:	Local Government Engineering Department
RHD	:	Road and Highway Department
RDP	:	Rural Development Project
GCCR	:	Growth Center Connection Road
WFP	:	World Food Program
PIO	:	Project Implementation Office
AASHTO	:	The American Association of State Highways and Transport Officials
HWL	:	High Water Level
LWL	:	Low Water Level
HBB	:	Herringbone Brick

CHAPTER 1

INTRODUCTION

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INTRODUCTION

In response to a request from the Government of the People's Republic of Bangladesh, the Government of Japan decided to conduct a basic design study on the Project for Procurement of Portable Steel Bridges for Rural Roads in the People's Republic of Bangladesh. Japan International Cooperation Agency (JICA) dispatched the Basic Design Study Team from July 17 to August 25, 1993, for the field investigation.

The Basic Design Study Team, during its stay in Bangladesh, confirmed the background, objectives and contents of the Project, collected relevant data, and surveyed the requested bridge site conditions.

After returning to Japan, the Team evaluated the Project in respect of appropriateness, necessity, socio-economic effects and other factors based on the results of their investigations, and selected 74 bridges for the Project out of 83 requested bridges. The basic design of the Project and the implementation plan were studied.

As a result of the studies, the Basic Design Study Report has been prepared. The member list of the Study Team, their itineraries, and the list of persons met in Bangladesh are filed in the Appendices in this report.

CHAPTER 2

BACKGROUND
OF
THE PROJECT

CHAPTER 2

BACKGROUND OF THE PROJECT

2.1 Outline of Road Sector

Road transport has been playing an increasingly dominant role in the socio-economic development of Bangladesh and turns out to be the largest mode for inland transport of the country. Table 2-1 presents estimates of overall transport outputs and the relative shares of the various transport modes for 1975, 1985 and 1989. The data illustrates the rapidly expanding role of the road sector.

Table 2-1 OUTPUT AND MODAL SHARE IN PASSENGER AND FREIGHT TRANSPORT

	Passenger				Freight			
	Total	Mode Shares (%)			Mode Shares (%)			
	(Pass.km)	Road	IWT	Rail	(Ton.km)	Road	IWT	Rail
1975	17 bill	54%	16%	30%	2.6 bill	35%	37%	28%
1985	35 bill	64%	16%	20%	4.8 bill	48%	35%	17%
1989	57 bill	68%	15%	17%	6.3 bill	59%	30%	11%

Source : Report on Maintenance of Rural Infrastructure 1992, LGED

The road system in Bangladesh is classified into the categories shown in Table 2-2. Road length by surface type and by road class is shown in Table 2-3, which describes the present conditions of roads in Bangladesh.

The Road and Highway Department (RHD) is responsible for construction and maintenance of three categories of road, namely, national highways, regional highways and Type-A feeder roads. The Local Government Engineering Department (LGED) is responsible for construction and maintenance of Type-B feeder roads and rural roads, such as R1, R2 and R3.

Table 2-2 ROAD CLASSIFICATION IN BANGLADESH

Control Department	Classification		Definition	Pavement Criteria		
				Crest Width (m)	Pavement Width (m)	Pavement Type
R H D	Arterial Roads	National Highways	Highways connecting regions with the national capital	12.0 12.0	6.0 5.4	Cement Concrete Asphalt Concrete Bituminous Carpeting
		Regional Highways	Highways connecting different regions with each other not connected by national highways	10.8 9.0	5.4 3.6	Asphalt Concrete Bituminous Carpeting
	Feeder Roads	Type-A Feeder Roads (FRA)	Roads connecting thana HQs with the arterial road system	7.2	3.6	Bituminous Carpeting
L G E D		Type-B Feeder Roads (FRB)	Roads connecting growth centres and major rural markets with thana HQs and the arterial road system	7.2	3.6	Herringbone Brick (HBB)
	Rural Roads	Rural Roads (R1)	Roads connecting union HQs/ local markets with thana HQs	4.8	3.6	Herringbone Brick (HBB)
		Rural Roads (R2, R3)	Roads connecting villages and farms to local markets/ union HQs Roads within villages	3.6 2.4	- -	Earthen Earthen

Source : L G E D

Table 2-3 ROAD LENGTH BY SURFACE TYPE

(As of 1988)

Classification	Paved Road		Partly Paved or Brick Paved Rd.		Earthen Road		Total Length	
	(km)	(%)	(km)	(%)	(km)	(%)	(km)	(%)
National Highways	2,727	96	53	2	55	2	2,835	100
Regional Highways	1,271	92	83	6	28	2	1,382	100
Type-A Feeder Roads	3,561	41	2,021	23	3,161	36	8,743	100
Type-B Feeder Roads	0	0	2,163	26	6,276	87	8,439	100
Rural Roads (R1)	0	0	545	2	35,690	98	36,235	100
Rural Roads (R2, R3)	0	0	0	0	113,725	100	113,725	100
Total	7,559	4	4,865	3	159,935	93	171,359	100

Source: Report on Maintenance of Rural Infrastructure 1992, LGED

Formerly, Type-B feeder roads and R1 rural roads are the primary responsibility of thana parishads, while other rural roads are the responsibility of union prishads and purshavas, respectively.

Recognizing the need and importance to develop rural infrastructure, LGED was established in 1984 as the implementing agency for rural infrastructure development activities including Type-B feeder roads and rural roads with the Development Assistance Fund received from the Government and international lending institutions.

The Fourth Five Year Plan targets construction of a total of 6,121 km of roads and 444,395 m of bridges and culverts, and rehabilitation of 7,383 km of roads.

The rural infrastructure situation in Bangladesh is in such a rudimentary state that it cannot ensure all weather year-round road communication. As a result, movement of goods and services in the rural areas is severely limited and links with the nearest growth centers and/or markets are prevented.

Problems on Type-B feeder roads and rural roads are as follows.

- Floods repeatedly cause pavement failure by high velocity water flows and embankment failure by wave action on unprotected slopes in flood prone areas.

- Pavements have almost no durable structures since suitable materials for embankments and pavement are difficult to procure in clayey and silty land.

- Numerous rivers and creeks cut roads in many places, so construction of bridges is very costly.

- Road users are exposed to danger when crossing rivers by small boat or on weak bridges.

2.2 OUTLINE OF RELATED DEVELOPMENT PLANS

2.2.1 National Development Plan

The Fourth Five Year Plan (1990-95) has been formulated as part of a twenty year Perspective Plan (1990-2010). The Fourth Plan has the following major objectives:

- Accelerated economic growth. It is envisaged that the annual growth rate of GDP will be 5 % during the plan period.

- Poverty alleviation and employment generation through human resource development.

- Increased self-reliance.

Poverty is the most pressing problem in Bangladesh. The Fourth Five Year Plan addresses special focus on rural development to promote greater opportunities for the rural poor for productive employment.

2.2.2 Rural Development Plan

Bangladesh is one of the most densely populated countries in the world. Over 80 % of the people live in rural areas. Economic and social conditions for most people are extremely difficult. The majority of rural people remain unemployed for at least some months of the year with as many as 40 % unemployed most of the time. According to the 1988-89 Household Expenditure Survey, 48 % of the rural population lives below the poverty line and has insufficient income to meet the minimum nutritional standard.

For alleviation of rural poverty, the objectives of the Rural Development Plan of the Fourth Five Year Plan are to:

- Reduce rural poverty by means of increasing gainful employment and

income opportunities on a sustained basis though expansion of the productive sectors.

- Improve the basic physical infrastructure (roads, market) in rural areas.

- Facilitate agricultural development through institutional support and expansion of irrigation.

- Improve technology and skills for productive activities and ensure better access for the rural poor to the means of production.

- Promote the participation of women in rural development.

The Fourth Five Year Plan allocation for rural development and institutions sector is TK.1581 crore. The allocation of the amount by program in the public sector is provided in Table 2-4.

Table 2-4 ALLOCATION FOR RURAL DEVELOPMENT DURING FFYP

(Taka in Crore)

Programme	Allocation
• Development of physical infrastructure, spill-over and new projects	950.0
• Irrigated agriculture, drainage and minor flood control, spill-over and new projects	80.0
• Production and employment programme for the rural poor, spill-over and new projects	395.0
• Small farmers development	8.0
• Comprehensive village development	6.0
• Technology development units	4.0
• Implementation of cooperative policy	20.0
• Development/strengthening of institutional infrastructure/ capabilities of cooperatives, BRDB, DOC, etc.	10.0
• Operation Thikana, land administration training, modernization of land records	65.0
• Rural development academies, cooperative training institutes/facilities, NTLG	10.0
• Others	33.0
Total	1,581.0

Source: Fourth Five Year Plan

2.2.3 Rural Infrastructure Development Plans

Recognizing the need and importance of rural development, the Government of Bangladesh formulated the Strategy for Rural Development Projects. Based on the strategy, development of physical infrastructure including roads, storage and markets are stressed.

LGED is involved with the infrastructure development activities undertaken through the Development Assistance Fund received from the Government.

LGED is currently responsible for implementation of 16 rural infrastructure development projects. Among them, the projects involved in development of Type-B feeder and rural roads in this project area are outlined as follows.

(1) Rural Development Projects (RDP)

As shown in Table 3-1 in Section 3.2.2, 11 rural development projects are ongoing. Each project covers 3 to 7 districts, is scheduled to last about 5 years and is funded about TK.20 crore to TK.300 crore which is financed with the assistance of international development aid organizations.

The type of development activities under rural development projects are as follows:

- Construction of Type-B feeder roads
- Construction of rural roads
- Construction of bridges and culverts on Type-B feeder roads and rural roads
- Development of growth centers and rural markets
- Tree plantation on slopes of Type-B feeder roads
- Construction and operation of training centers

(2) Flood Rehabilitation Project

In recent years, there were major floods in July-September 1987 and in August-September 1988. The 1987 floods were considered to be the most destructive in three decades, affecting 36 % of the total land area of Bangladesh. However the floods in 1988, affecting 85 % of the country, were even more severe. Those floods caused thousands of deaths and destroyed infrastructure including roads and bridges.

Pavement failure was caused by high velocity water flows when the roads were flooded, and erosion of embankments was caused by overtopping and consequent high water velocity over the downstream slopes. Undermining of bridge and culvert foundations caused consequent partial or complete failure of the structures, and embankments at the approaches of the structures were washed out.

The project was formulated by the Government with financial assistance by the Asian Development Bank (ADB) to rehabilitate rural infrastructure to reduce the adverse economic impact of damaged transport infrastructure and to reduce exposure to future floods.

LGED is the responsible agency for the project. The project covers 28 districts in northeast and southeast Bangladesh. The project has been revised in scope and schedule to extend the rehabilitation of rural infrastructure.

The scope of the project is as follows:

Table 2-5 INVESTMENT OF FLOOD REHABILITATION PROJECT

(Taka in Lakh)

Item	Quantity	Amount
Rehabilitation of Type-B feeder roads, rural roads, pourashva roads	2,163 km	14,131
Construction of bridges and culverts	9,880 m	4,249
Construction of drains	90,000 m	710
Construction of retaining walls	14,820 m	560
Equipment and transport	-	1,096
Technical assistance	-	304
Service charges	-	267
Manpower	-	33
CDST	-	748
Cost escalation	-	422
Total		22,521

Source: Project Proforma for ADB Assisted Flood Rehabilitation Project

(3) Growth Center Connecting Road Project (GCCR)

The project is implemented by LGED with food aid from the World Food Programme (WFP) and other bilateral donors, such as Australia, Canada, the European Community and the Federal Republic of Germany. Under the project, earth work is done on Type-B feeder roads by utilizing the wheat received. Construction of bridges and culverts is also undertaken through the monetization of wheat. The achievements of the project from 1987/88 to 1991/92 and the target for 1992/93 are indicated in Table 2-6.

Table 2-6 ACHIEVEMENT OF GCCR PROJECT

Fiscal Year	Roads			Bridges & Culverts		
	Wheat Utilized		Length Accomplished (km)	Wheat Monetized		Total Span Completed (m)
	Q'ty (ton)	Fund Converted (Taka in Lakh)		Q'ty (ton)	Fund Utilized (Taka in Lakh)	
1987/88	10,114	641	428	-	-	-
1988/89	14,153	893	722	4,054	257	351
1989/90	18,195	1,153	889	21,987	1,394	1,298
1990/91	23,569	1,494	1,082	24,369	1,545	1,248
1991/92	25,272	1,602	1,032	25,489	1,616	1,953
1992/93	36,733	2,497	1,017	26,417	1,796	1,686
Total	128,036	8,282	5,170	102,316	6,608	6,536

Source: LGED
Notes: Figure for 1992/93 is target

2.3 OUTLINE OF THE REQUEST

Rural development plans aimed at promoting poverty alleviation and economic development in rural areas have been high priority strategies of the National Development Plan.

The rural infrastructure situation in Bangladesh is in such a rudimentary state that it cannot ensure all weather year-round communication, since the lack of bridges crossing numerous creeks and small rivers cuts road sections.

As a result, such difficult accessibility to markets constitutes a major disincentive to farmers to produce marketable surpluses and constrains the expansion of rural industries and the provision of a range of social services to the majority of the rural population.

Under these circumstances, the Government of Bangladesh established the "Upazila Connection Road Project" to construct a Type-A feeder road network nationwide. For the project, portable steel bridge materials were procured under Japan's Grant Aid in 1985.

This time, the Government of Bangladesh has requested that the Government of Japan provide steel portable bridge materials necessary to reconstruct bridges destroyed by flood and to construct new bridges at river crossing along Type-B feeder road and rural roads. These bridge constructions are part of Flood Rehabilitation Project which is implemented by LGED.

Originally, portable steel bridge materials necessary for 141 bridges in 13 districts was requested. When the Study Team arrived in Bangladesh, replacement of the 141 bridges by 83 new bridges in 15 districts was requested by LGED. (Please refer to Appendix 3) The reason for the change of bridges was mainly that the originally requested bridges had been incorporated in other projects since the request had been prepared.

The change of request was accepted, and the Basic Design Study of the project is conducted based on the revised request.

The contents of the request are portable steel bridge materials and erection tools necessary for constructing the requested 83 bridges. The total length of the bridges was estimated at 3,600 m in the request. The list of requested bridges is presented in Table 2-7.

As part of construction of the requested bridges, substructures and approach roads will be constructed by the Government of Bangladesh.

TABLE 2-7 LIST OF REQUESTED BRIDGES (1/5)

NO.	BRIDGE NO.	DISTRICT	THANA	ROAD NAME	DISTANCE (m)
1.	01-01-01	COX'S BAZAR	SADAR	EIDGAON TO POKHALI ROAD	5635.00
2.	01-02-01	COX'S BAZAR	RAMU	NIKKONCHARI-GARJANIA	62.00
3.	02-01-01	FENI	SADAR	SELONIA R.B.HAT ROAD OVER KALIDASH PAHALIA RIVER	1500.00
4.	02-02-01	FENI	PARSHURAM	FULGAZI-MONTALA ROAD OVER SILONIA RIVER	1200.00
5.	02-02-02	FENI	PARSHURAM	GOTUMA BRIDGE	3000.00
6.	03-01-01	CHITTAGONG	FATIKCHARI	FATIKCHARI-HEAKO HAT ROAD	15980.00
7.	03-01-02	CHITTAGONG	FATIKCHARI	FATIKCHARI-HEAKO HAT ROAD	19022.00
8.	03-02-01	CHITTAGONG	RAOZAN	DOST MOHAMMAD ROAD(RAUZAN -WEST GOHIRA SHARTAR KHAL)	4780.00
9.	03-03-01	CHITTAGONG	CHANDANAISH	DOHAZARI-LALUTIA ROAD	3500.00
10.	03-04-01	CHITTAGONG	LOHAGARA	SHAH-PIR ROAD	2100.00
11.	03-05-01	CHITTAGONG	SATKANIA	RAMPUR-D.C.ROAD (SATKANIA PORTION)	2300.00
12.	03-06-01	CHITTAGONG	BHANSKHALI	JOLDI-D.C.ROAD, JOLKADAR KHAL)	3000.00
13.	04-01-01	HABIGONJ	BANIYACHONG	BANIACHONG-SUJATPUR BAZAR ROAD	5275.00
14.	04-02-01	HABIGONJ	NABIGONJ	NABIGONJ-INNATGONJ ROAD	7377.00
15.	04-03-01	HABIGONJ	LAKHAI	THANA H.Q.-LAKHAI BAZAR	5400.00
16.	04-04-01	HABIGONJ	AZMIRIGONJ	AZMIRIGONJ-KAKAILSEE ROAD	3750.00
17.	04-04-02	HABIGONJ	AZMIRIGONJ	AZMIRIGONJ-KAKAILSEE ROAD	4174.00
18.	05-01-01	MOULVIBAZAR	SREEMANGAL	SHINDUR KHAN-DUBAR HAT BAZR	1800.00
19.	05-01-02	MOULVIBAZAR	SREEMANGAL	SHINDUR KHAN-DUBAR HAT BAZR	4950.00
20.	05-02-01	MOULVIBAZAR	KULAURA	KULAURA-RABIBAZAR ROAD	1669.00
21.	05-02-02	MOULVIBAZAR	KULAURA	KULAURA-RABIBAZAR ROAD	2834.00
22.	05-03-01	MOULVIBAZAR	BARLEKHA	DASHER BAZAR-FAKIRER BAZAR	2400.00

TABLE 2-7 LIST OF REQUESTED BRIDGES (2/5)

NO.	BRIDGE NO.	DISTRICT	THANA	ROAD NAME	DISTANCE (m)
23.	05-04-01	MOULVIBAZAR	SADAR	SHAHBANDAR-DIGHIRPAR-KAGABHOLA ROAD	10255.00
24.	06-01-01	CHANDPUR	SADAR	IBRAHIM BAZAR-THANA ROAD	7264.00
25.	06-02-01	CHANDPUR	KACHUA	PALGHIRI-DARBESHGONJ ROAD (NEAR CHANDPUR BAZAR)	3500.00
26.	06-03-01	CHANDPUR	FARIDGONJ	MUNSHIRHAT-UBHARAMPUR ROAD (NEAR MUNSHIRHAT CANAL)	500.00
27.	06-03-02	CHANDPUR	FARIDGONJ	GUPTI-BAICHATALI ROAD OVER B.W.D.B. CANAL	4500.00
28.	06-04-01	CHANDPUR	MATLAB	KALIR BAZAR-CHENGARCHAR ROAD	5699.00
29.	06-04-02	CHANDPUR	MATLAB	KALIR BAZAR-CHENGARCHAR ROAD	6888.00
30.	07-01-01	B'BARIA	AKHAURA	AKHAURA-BARABAZAR DHARKAR GCCR ROAD	2414.00
31.	07-01-02	B'BARIA	AKHAURA	AKHAURA-BARABAZAR DHARKAR GCCR ROAD	5507.00
32.	07-02-01	B'BARIA	B'RAMPUR	BANCHARAMPUR-UJANCHAR GCCR ROAD	6473.00
33.	07-02-02	B'BARIA	B'RAMPUR	BANCHARAMPUR-UJANCHAR GCCR ROAD	6898.00
34.	07-03-01	B'BARIA	N'NAGAR	NASIRNAGAR-MADHABPUR ROAD AT KHASTI	00.00
35.	07-03-02	B'BARIA	N'NAGAR	BRIDGE AT HAREENBEER (NORHA)	2500.00
36.	07-04-01	B'BARIA	SADAR	HALIDAY ROAD	3500.00
37.	08-01-01	COMILLA	SADAR	COMILLA-BIBIRBAZAR ROAD OVER SONAICHARI KHAL NEAR KOTAKBAZAR	5500.00
38.	08-01-02	COMILLA	SADAR	NALKORI-MATIARA ROAD OVER SONAICHARI KHAL AT MATIARA	300.00
39.	08-01-03	COMILLA	SADAR	BHUBANGHAR-SHIBER BAZAR ROAD OVER GUNGUR KHAL	5400.00
40.	08-02-01	COMILLA	CHANDINA	ELLIOTGONJ-KRISHNAPUR ROAD	988.00

TABLE 2-7 LIST OF REQUESTED BRIDGES (3/5)

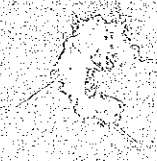
NO.	BRIDGE NO.	DISTRICT	THANA	ROAD NAME	DISTANCE (m)
41.	08-02-02	COMILLA	CHANDINA	GUMTA-NORTH KRISHNAPUR ROAD	10.00
42.	08-03-01	COMILLA	HOMNA	HOMNA-TAKER BAZAR ROAD	1880.00
43.	08-03-02	COMILLA	HOMNA	HOMNA-TAKER BAZAR ROAD	2135.00
44.	08-04-01	COMILLA	DAUDKANDI	BATAKANDI-RAIPUR ROAD	4188.00
45.	08-04-02	COMILLA	DAUDKANDI	BATAKANDI-RAIPUR ROAD	4910.00
46.	08-04-03	COMILLA	DAUDKANDI	BATAKANDI-RAIPUR ROAD	8953.00
47.	09-01-01	NOAKHALI	SADAR	SONAPUR-AKHTERMIARHAT ROAD OVER PETKATA KHAL	11350.00
48.	09-01-02	NOAKHALI	BEGAMGONJ	SONAPUR-AKHTERMIARHAT ROAD OVER JALIARDONA	18440.00
49.	09-02-01	NOAKHALI	BEGAMGONJ	BAZRA-BATTOLI ROAD OVER CHOWMUHANI-SONAIMURI KHAL NEAR BAZRA BAZAR	00.00
50.	09-02-02	NOAKHALI	BEGAMGONJ	SARURPOOL-DURGAPUR HIGH SCHOOL ROAD OVER FENI-CHOWMUHANI KHAL	00.00
51.	09-03-01	NOAKHALI	COMPANIGONJ	CHARGANGCHIL-CHARLAXMI ROAD OVER GANGCHIL KHAL	350.00
52.	09-04-01	NOAKHALI	CHATKHIL	CHATKHIL-SONACHAKA ROAD NEAR R & H ROAD	00.00
53.	09-05-01	NOAKHALI	SENBAG	SENBAG-CROSH MUNSHI ROAD NEAR SENBAG BAZAR	00.00
54.	10-01-01	LAXMIPUR	SADAR	HAZIRPARA-BASUDHUHITHA-BASHURHAT ROAD (OVER RAHAMAT KHALI KHAL)	330.00
55.	10-02-01	LAXMIPUR	RAIPUR	CHALTATOLI-KASERHAT ROAD (OVER DAKATIA RIVER NEAR BONGSHI FERRY GHAT)	5500.00
56.	10-03-01	LAXMIPUR	RAMGATI	MATHABBAR HAT (BHOLA LAUNCHGHAT)-MONOHARPUR-ODARHAT ROAD (OVER BOLUA KHAL)	3000.00

TABLE 2-7 LIST OF REQUESTED BRIDGES (4/5)

NO.	BRIDGE NO.	DISTRICT	THANA	ROAD NAME	DISTANCE (m)
57.	11-01-01	NARSHINGDI	SADAR	BRIDGE OVER PURANPARA-HORIDUA RIVER OF NARSHINDI -HASNABAD ROAD	3000.00
58.	11-02-01	NARSHINGDI	SHIBPUR	SHIBPUR BAZAR-JALLARA BZR	4147.00
59.	11-02-02	NARSHINGDI	SHIBPUR	SHIBPUR BAZAR-JALLARA BZR	4638.00
60.	11-02-03	NARSHINGDI	SHIBPUR	SHIBPUR BAZAR-JALLARA BZR	4978.00
61.	11-02-04	NARSHINGDI	SHIBPUR	CHARSINDUR-BIRAJNAGAR ROAD	10420.00
62.	11-03-01	NARSHINGDI	BELABO	BRIDGE OVER ARIALKHA RIVER NEAR BELABO BAZAR	250.00
63.	11-03-02	NARSHINDGI	BELABO	NILOKKHAI BRIDGE	1500.00
64.	12-01-01	FARIDPUR	SADAR	CHARKAMLAPUR-WEST KHABASPUR	2500.00
65.	12-01-02	FARIDPUR	SADAR	KHALILPUR-SIBRAMPUR ROAD ADJACENT TO KHALILPUR GROWTH CENTRE	4500.00
66.	12-02-01	FARIDPUR	BOALMARI	CHANDPUR-CHITAR BAZAR ROAD	5000.00
67.	13-01-01	DHAKA	SAVAR	JIRANI-SHIMULIA	4840.00
68.	13-01-02	DHAKA	SAVAR	JIRANI-SHIMULIA	5210.00
69.	13-01-03	DHAKA	SAVAR	DHATPUR-ROSTAMPUR	0.80
70.	13-02-01	DHAKA	NAWABGONJ	NAWABGONJ-SULLAPARA GRAM	268.00
71.	13-02-02	DHAKA	NAWABGONJ	NAWABGONJ-SULLAPARA GRAM	15050.00
72.	13-03-01	DHAKA	DHAMRAI	DHAMRAI-DHANTARA HAT	00.00
73.	13-03-02	DHAKA	DHAMRAI	RHD-CHARDAUBA ROAD	10.00
74.	14-01-01	MUNSHIGONJ	SADAR	RATANPUR-CHAMPATALA ROAD	1175.00
75.	14-01-02	MUNSHIGONJ	SADAR	RATANPUR-CHAMPATALA ROAD	2175.00
76.	14-02-01	MUNSHIGONJ	TONGIBARI	TONGIBARI-DIGHIRPAR ROAD	3000.00
77.	14-02-02	MUNSHIGONJ	TONGIBARI	TONGIBARI-HASAIL ROAD	2500.00
78.	14-03-01	MUNSHIGONJ	SERAJDIKHAN	SERAJDIKHAN-BALURCHAR ROAD	500.00

TABLE 2-7 LIST OF REQUESTED BRIDGES (5/5)

NO.	BRIDGE NO.	DISTRICT	THANA	ROAD NAME	DISTANCE (m)
79.	14-04-01	MUNSHIGONJ	GAZARIA	MEGNA BRIDGE-HOSSAINDI ROAD	349.00
80.	14-05-01	MUNSHIGONJ	LOHAGONJ	LOHAGONJ-NOAPARA BAZAR ROAD	2015.00
81.	15-01-01	GAZIPUR	SREEPUR	BRIDGE OVER MATIKATA RIVER KAWRAID U.P.	10600.00
82.	15-02-01	GAZIPUR	SADAR	JOYDEBPUR-CHANDPUR-ZANGALIA ROD OVER CHELYE KHAL NEAR TITERKUL	3000.00
83.	15-03-01	GAZIPUR	KALIGONJ	KALIGONG-ZANGALIA ROAD OVER NALI KHAL	5500.00
	T O T A L	83 BRIDGES			



CHAPTER 3

STUDY OF THE PROJECT

CHAPTER 3

STUDY OF THE PROJECT

3.1 OBJECTIVES OF THE PROJECT

The National Development Plan of Bangladesh has been pursuing the development of feeder and rural roads as a measure for promoting employment generation and economic growth to alleviate poverty in the rural areas.

However, destructive floods which occurred in 1987 and 1988 affected almost the whole of the country. Additionally, a cyclone and tidal surge hit the coastal districts of Bangladesh in 1991.

These floods destroyed infrastructures including feeder and rural roads. Pavement failure and erosion of embankments were caused by water flows where the roads were flooded, and many bridges were destroyed and washed out by flooded flows.

To rehabilitate rural infrastructures in order to reduce the adverse eco nomic impact of damaged transport infrastructure and also to pursue development of the feeder and rural road network, the Government of Bangladesh formulated the Flood Rehabilitation Project. The rehabilitation of feeder and rural roads, reconstruction of destroyed bridges and new construction of bridges at river crossings along these roads are being implemented under the Flood Rehabilitation Project.

The objective of this project is to procure portable steel bridge materials necessary for constructing the bridges under the Flood Rehabilitation Project in 15 districts in eastern Bangladesh.

3.2 DESCRIPTION OF THE PROJECT

3.2.1 Outline of the Project

This project is to construct portable steel bridges along Type-B feeder roads and rural roads in 15 districts in the eastern part of Bangladesh.

The bridges subject to the project are damaged bridges needing replacement and river crossings without bridges needing newly constructed bridges. Out of the 83 requested bridges, appropriate bridges based on Japan's Grant Aid Program will be selected for the project based on the site survey results.

Of the project, design and fabrication of superstructures (portable steel bridges) will be undertaken by this project. The design and construction of substructures, approach roads, river protection and other necessary works will be undertaken by the Government of Bangladesh.

3.2.2 Executing Agency and Operational Organization

LGED under the Ministry of Local Government Rural Development and Co-operative (Local Government Division) is the executing agency of the project. The organization chart of LGED is shown in Figure 3-1.

LGED is headed by a Chief Engineer who is supported by 1 additional Chief Engineer and 5 Superintending Engineers at Dhaka Headquarters, 64 Executive Engineers at the district level and 460 Thana Engineers at the thana level.

LGED has been providing technical support at the thana level in implementing infrastructure development activities with the Development Assistance Fund received from the Government. LGED is currently responsible for implementing 16 rural infrastructure development projects which are presented in Table 3-1. The locations of the projects are shown in Figure 3-2.

The project implementation office (PIO), headed by the superintending engineer for maintenance, established in the headquarters of LGED, will control the project. PIO will carry out planning and design of the project with the technical assistance of hired consultants. Executive engineers of district offices and Thana engineers will be involved in tendering for contract, supervision of construction and maintenance of the bridges.

The annual budget of LGED for the last 3 years is shown in Table 3-2. The fund for the project will be allocated from "Block allocation under Annual Development Programme to complete foreign aided projects works". Annual fund (TK.3,500 lakh) for maintenance of rural infrastructure is allocated for LGED since 1992/93.

The project bridges will require maintenance by routine inspection every month and periodic inspection every 3 years. LGED is able to conduct these maintenance activities.

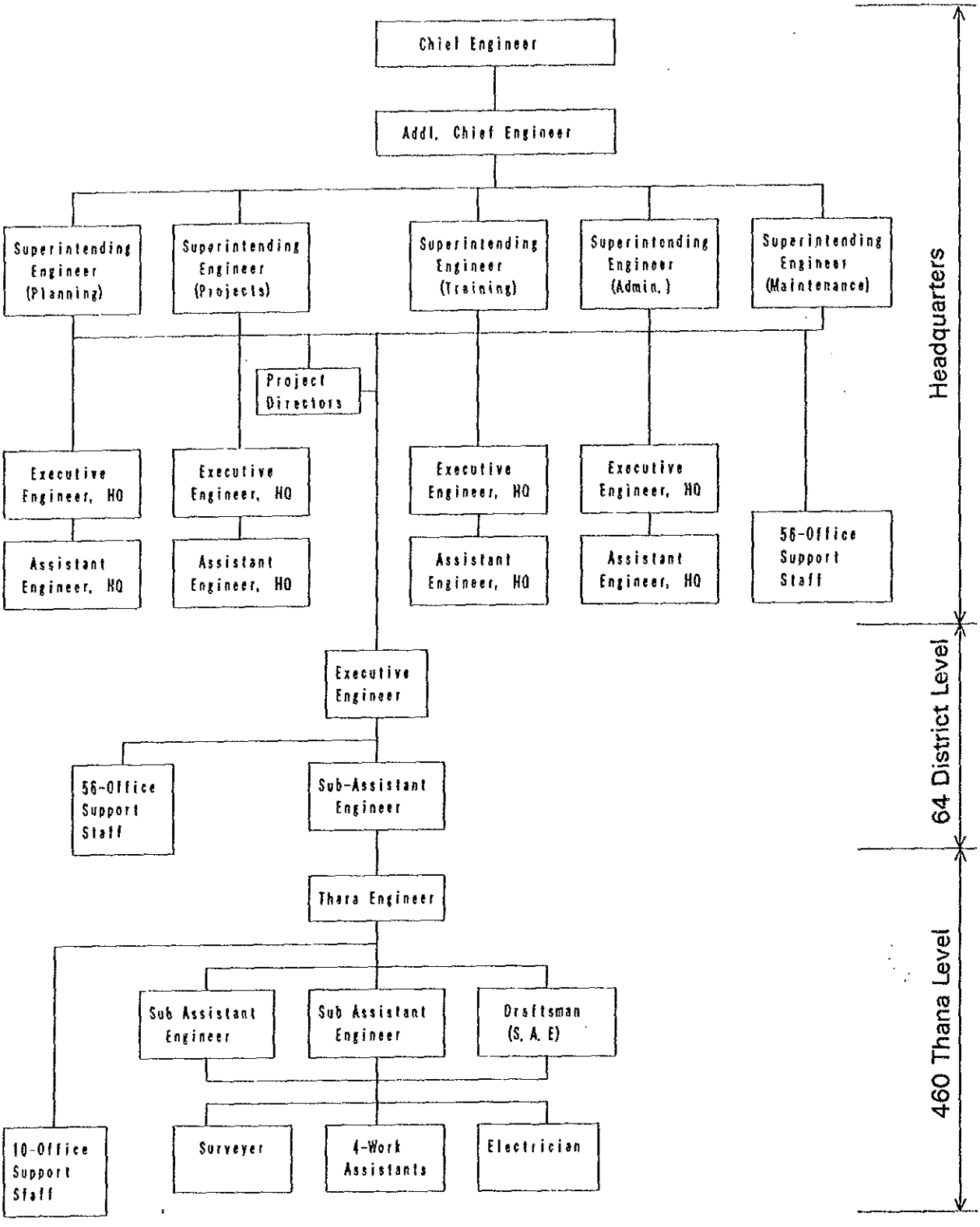


Figure 3-1 ORGANIZATION OF LGED

Table 3-1 RURAL INFRASTRUCTURE DEVELOPMENT PROJECTS BEING IMPLEMENTED BY LGED

(Taka in Lakh)

Project Title	Duration	Estimated Cost	ADP Allocation 92-93	Source of Aid	Outline of Project	Project Area
Rural Development Project-3	1986/87-1993/94	4,606	1,550	USAID, IDB	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-4	1990/91-1992/93	7,506	2,923	SIDAD, NORAD	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-6	1988/89-1992/93	3,944	1,037	SDC	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-7	1988/89-1994/95	28,660	4,000	IDA, KFW, SDC	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-8	1988/89-1992/93	7,821	2,485	EC	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-10	1990/91-1992/93	1,800	7	UNCDF	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-13	1988/89-1994/95	34,953	7,036	ADB	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-14	1990/91-1994/95	2,790	1,175	GTZ	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-16	1990/91-1996/97	27,912	1	DANIDA	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-17	1990/91-1994/95	4,356	5	CIDA	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Rural Development Project-18	1992/93-1998/99	40,930	758	ADB	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Model Rural Development Project	1990/91-1993/94	6,100	2,475	JAPAN	Construction of Infrastructure (Feeder & Rural Rds, Bridges, Markets)	Refer to Figure 3-2
Flood Rehabilitation Project	1989/90-1992/93	21,936	7,981	ADB	Rehabilitation of Feeder & Rural Roads and Bridges	Dhaka, Chittagong (except Greater Faridpur District)
3rd Flood Rehabilitation Project	1989/90-1992/93	8,817	1,876	IDA	Rehabilitation of Feeder & Rural Roads and Bridges	Rajshahi, Khulna and Greater District District
Cyclone Rehabilitation Project	1991/92-1993/94	1,150	110	Saudi Arabia	Rehabilitation of Feeder & Rural Roads and Bridges	Feni, Noakhali, Laxmipur
Growth Centre Connecting Road Project	1987/88-	Refer to Table 2-6	Refer to Table 2-6	WFP, Canada, Australia, EC	Construction of Type-B Feeder Roads	Entire country

Source : Local Government Engineering Department

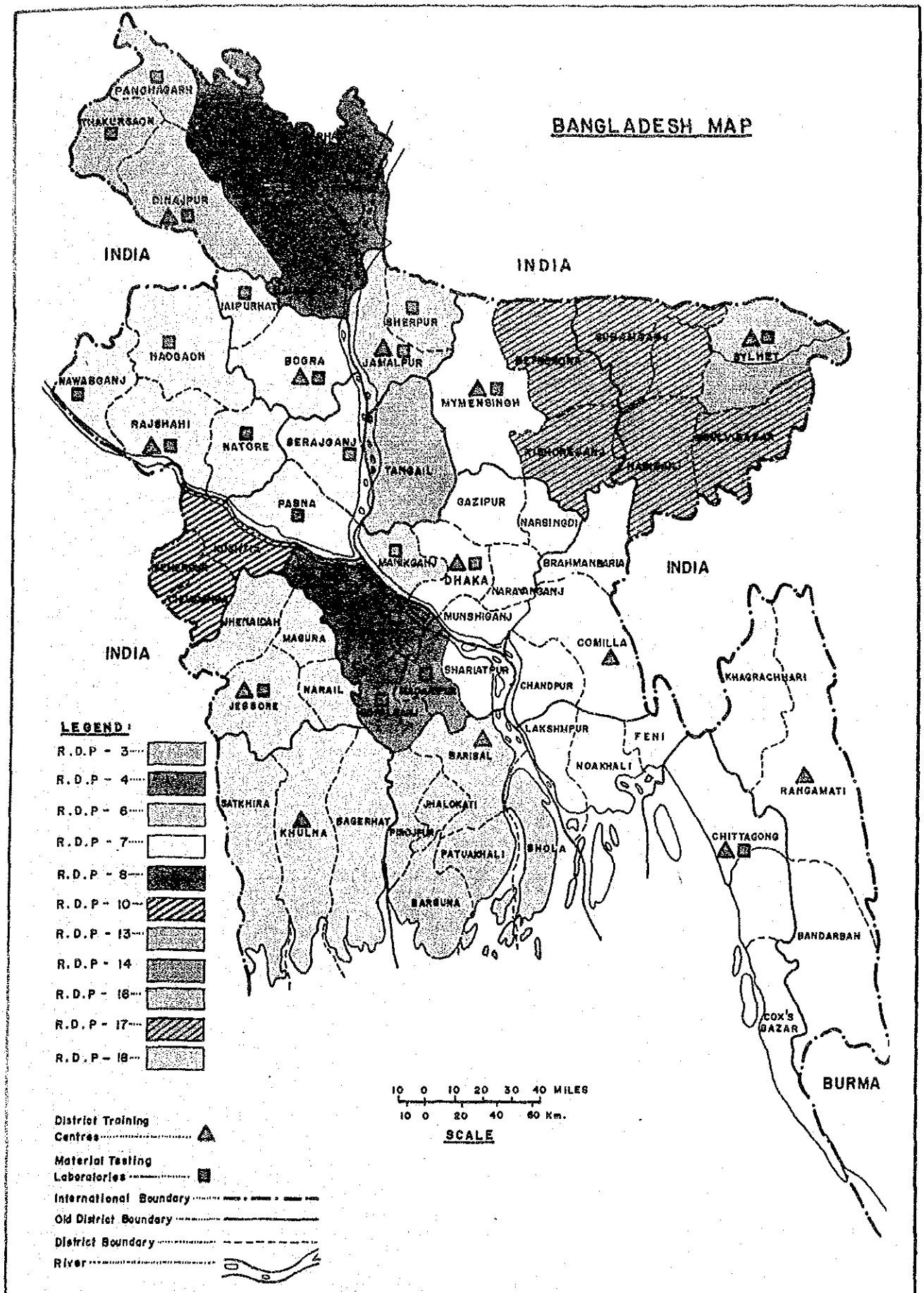


Figure 3-2 LOCATION OF RURAL INFRASTRUCTURE DEVELOPMENT PROJECT (RDP) BEING IMPLEMENTED BY LGED

Table 3-2 ANNUAL BUDGET OF LGED

(Taka in Lakh)

Item	1990/91	1991/92	1992/93
Rural Infrastructure Development Project (R D P)	10,120	11,250	12,500
Growth Centre Connecting Road Project (G C C R)	1,490	1,600	2,500
Bridge & Culvert Construction Programme	1,550	1,620	1,800
Construction of Primary Schools	8,100	9,000	10,000
Water Resources Development Programme	610	900	1,000
Secondary Town Development Programme	4,050	4,500	5,000
Routine & Preventive Maintenance Programme of Rural Infrastructure	-	-	3,500
Annual Development Programme of the Govt. for Local Infrastructure	8,100	9,000	10,000
Block allocation under Annual Development Programme to completed foreign aided project work	4,050	4,050	5,000
T o t a l	38,270	42,370	51,300

Source : LGED

3.2.3 Outline of the Project Area

The project covers 15 districts in the eastern part of Bangladesh as shown on the location map of the project area which is presented at the beginning of the report. This chapter outlines the project area.

(1) Nature

Land

Bangladesh extends between 20°34' and 26°38' north, and between 88°01'and 92°41' east along the Tropic of Cancer. It is almost surrounded by Indian territory except for a small strip of frontier with Myanmar on the southeast and the southern border fronting the Bay of Bengal.

It has an area of about 144,000 sq.km most of which is relatively flat lying in the deltaic plain of the Ganges-Brahmaputra-Meguna river system. The country is covered with a network of numerous rivers and canals forming a maze of interconnecting channels.

Climate

Bangladesh has a tropical monsoon climate marked by sweltering temperatures and high humidity almost year round. The rainy season usually lasts about 6 months, from May to October. The rest of the year is generally dry. The average temperature ranges from 10°C to 40°C. Annual rainfall ranges from 2,000 mm to 2,500 mm. In the summer and monsoon tropical cyclones, storms and tidal bores are not uncommon.