CHAPTER 2 CONTENTS OF THE PROJECT

2.1 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 1998 affected almost the whole of the country. 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 economic 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 to procure portable steel bridge materials necessary for constructing the bridges under the Flood Rehabilitation Project in 16 districts in eastern Bangladesh.

2.2 Basic Concept of the Project

The Study Team investigated to 127 requested bridge sites to collect the necessary data to examine the appropriateness and necessity of the Project under Japan's Grant Aid. After condition study of the bridge sites, the Study Team selected 81 candidate bridges for the Project and conducted necessary survey at each site.

As a result, 77 bridges were evaluated as having high priority. The other bridges were evaluated as having low priority and excluded from the project.

Socio-economic effects, engineering necessity and appropriateness of the project as a whole are summarized as follows:

Soico-economic effects

Since the roads on which project bridges are located connect villages, farms and markets in agricultural areas, construction of bridges contributes to activate farming

and production of marketable products and improve better accessibility to public facilities such as school, hospital and mosque. A population of 44,000,000 (1996 estimated) in 32,662 sq km in 16 districts is expected to have direct and indirect benefits by construction of the bridges.

Engineering necessity

The bridges for the project have an urgent necessity to be constructed to provide safe and reliable traffic facilities across rivers. The present conditions of the bridges are:

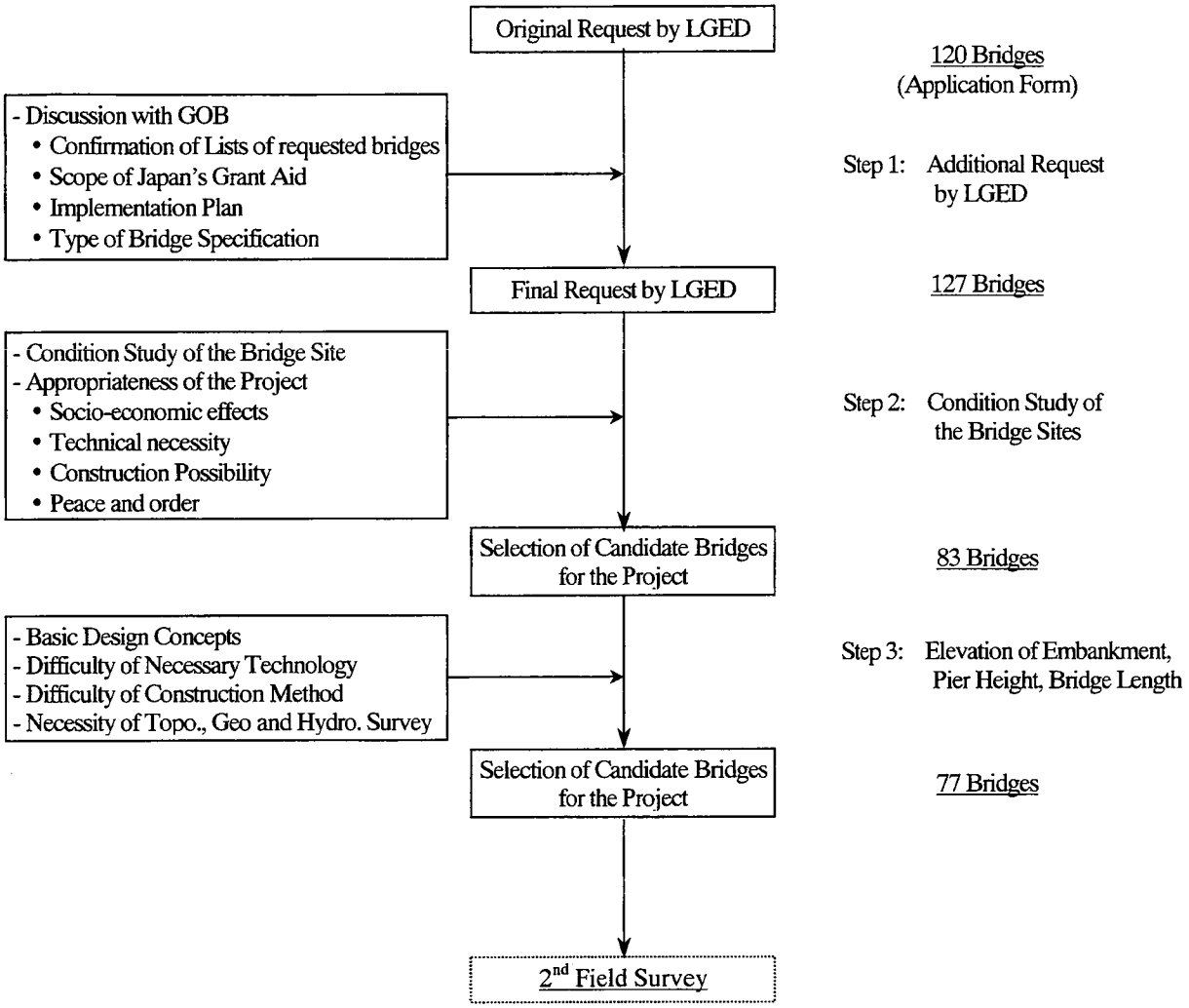
- Washed out or collapsed by flood, which cut roads.
- Dilapidated or seriously deteriorated, which are too weak to use.
- Not yet constructed, where travelers cross by boat.

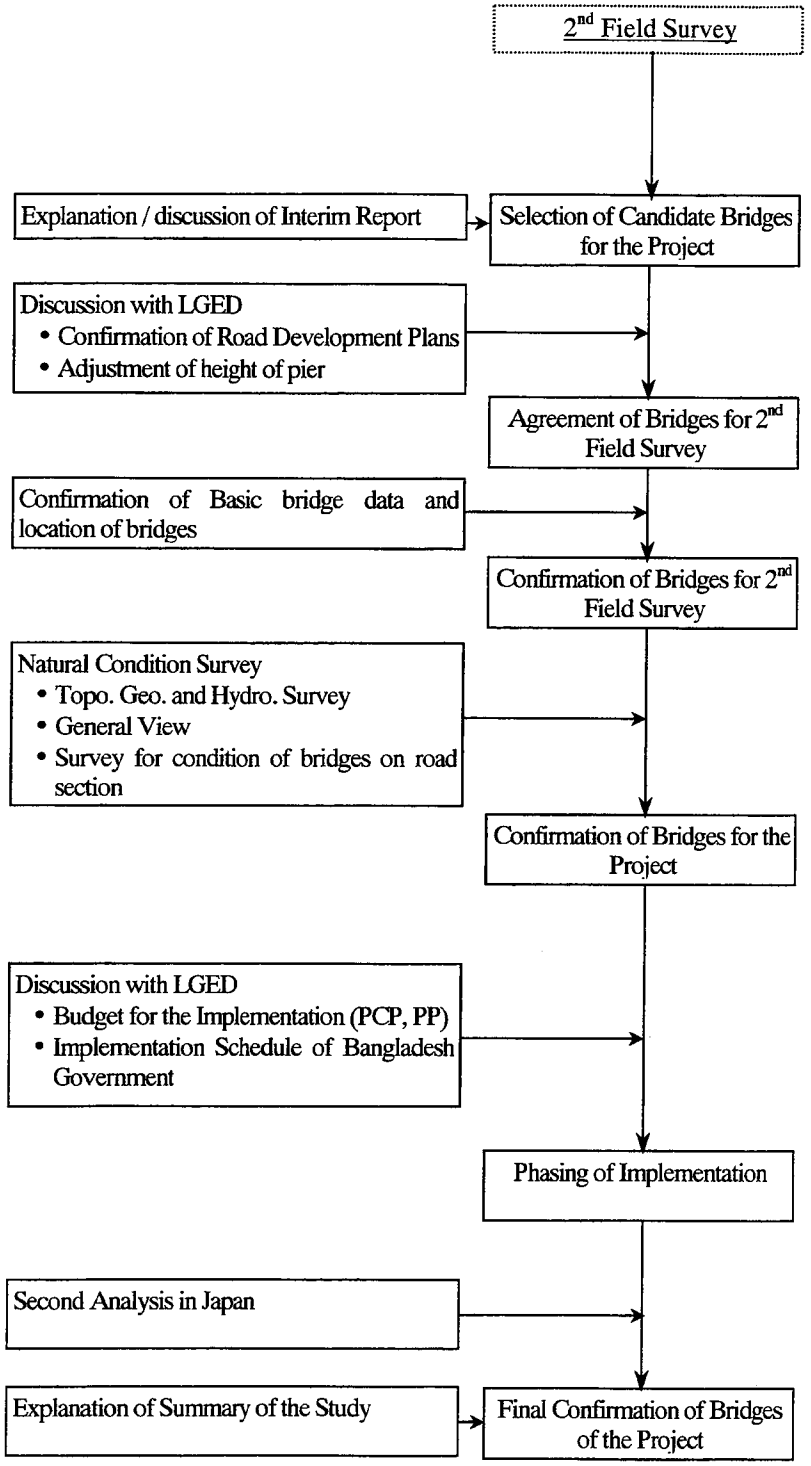
Appropriateness

- Urgency and necessity of the project is very high.
- Implementation of the project benefits a great number of ordinary citizens.
- Providing safe and reliable transportation means promotes more employment opportunities and higher income for people in the project area.
- No difficulty in implementation of the project is foreseen.

Figure 2.2-1 shows the flowchart of the selection of bridges of the Project.

Table 2.2-1 Flowchart of Selection of Candidate Bridge for the Project





Selected Bridges: 77 Bridges
Confirmation of road development plans: 5 Bridges
Adjustment of height of pier : 1 Bridge

Step 1: Discussion of Interim Report

83 Bridges

Step 2: Confirmation of Basic bridge data and location of bridge (05-02-01, out of selection)

82 Bridges (Refer Table 2.3.2-2)

Step 3: Natural condition survey, Summary Table of bridges, Condition of bridges on road section

80 Bridges

(Refer Table 2.3.5-7 Summary Table of Bridges)

Step 4: Implementation Schedule

Phase-I : 53 Bridges
Phase-II : 27 Bridges

Phase-I : 35 Bridges
Phase-II : 45 Bridges

Phase-I : 2 & 4 span bridges
Phase-II : 1, 3, 5 & 6 span bridges
Refer Table 2.3.5-7

2.3 Basic Design

2.3.1 Design Concept

(1) Bridge Location and Length

- Bridge location is decided during meeting with LGED at site.
- Bridge location is selected based on a plan of topographic features, river situation, house for circumference area, road condition, and erection yard.
- River widths between imaginary dikes are wide enough to discharge floods.
- Bridge height is decided by interview at the bridge site and through hydrological analysis.

(2) Plan of Superstructure

The superstructure is made of steel. Bridge type and structure type are designed to have low cost and easy to construct. The selected bridges are shown in Table 2.3.2-1.

Superstructure used for the bridge design is as follows.

- Member is designed to weigh not more than 250 kg so that it can be carried by hand.
- The truss members are designed to be galvanized in order to be maintenance free.

(3) Plan of Substructure

The plan considered for the bridge substructure design is as follows:

- Type of substructure depends on the examination for topographic features and soil survey on LGED standard in Bangladesh.
- Type of abutments and piers apply to standards in Bangladesh.
- The footing for abutments and piers should be embedded deep enough into the ground to be safe against future scouring (more than 1.0 m depth from ground level).
- The footings of pier is more than 1.5 m deep from river bed.
- River protection is planned where scouring at abutment foundations and approach embankments are foreseen.

(4) Design Conditions

- The following standard designs prepared by LGED are used in planning and design.
  - Road Structure Manual (PART B) LGED
- The standard types of substructures given in LGED design manual are as follows:
  - Abutment : Wall type abutment
  - Pier : Column type pier / pile-bent pier

(5) Construction

- Maximum size of structure element is less than 3.5 m in length and less than 0.25t by weight.
- Case of underwater construction is pile-bent pier and for other case the pier rest on footing supported by piles.

2.3.2 Natural Condition Survey and Analysis

(1) Site Survey and Meeting with LGED

Site investigation is composed of topographical survey, geological survey and hydrological survey and analysis.

Site meeting with LGED:
- Bridge location on plan
- Pre-assembly yard for erection
- Improvement of approach road
- Removal of electric pole and water pipe
- Removal of houses

(2) Natural Condition Survey

Topographical Survey

Contents for investigation
- Survey Area : 82 Bridge sites (See Table 2.3.2-1)

- Survey Contents
  - Profile survey : Along the road with bench mark
  - Plane-table survey : Around the bridge sites
  - Sectional leveling : Along the road at 20m intervals
  - Vertical Profile
    Vertical scale : V = 1/100
    Horizontal scale : H = 1/200
- Cross Section (scale 1/100)
- Topographical map (scale 1/200 to 1/400)

Geological Survey

- Contents for investigation
  - Drilling test
  - Standard penetration test
  - Specific gravity
  - Natural moisture content
  - Sieve analysis
  - Unconfined compression test

Hydrological Survey (See Hydrological Analysis)

Table 2.3.2-1 LIST OF BRIDGES

NO	DISTRICT / Thana	Bridge no	Length (m)
1	DHAKA		
	Savar	01-01-01	50
	Savar	01-02	100
	Savar	01-03	120
	Dhamrai	02-01	120
	Nawabgonj	04-01	75
2	GAZIPUR		
	Kaliganji	02-02-02	60
	Sadar	00-02	50
3	MUNSHIGONJI		
	Sadar	03-01-01	40
	Shiragdhikhan	02-01	80
	Gazaria	03-01	100
	Gazaria	03-02	80
	Lohajang	05-01	50
	Sreenagar	06-01	35
4	HABIGONJ		
	Madhabpur	04-02-01	75
	Nabigonj	04-01	65
	Nabigonj	04-02	90
	Azmirigonj	06-01	40
	Bahubal	00-01	30
5	MOULVBAZAR		
	Komolgonj	05-01-01	75
	Komolgonj	01-02	60
	Sreemargol	03-02	40
	Barlekha	04-01	45
	Rejuagar	05-01	25
6	CHANDPUR		
	Sadar	06-01-02	25
	Faridgonj	02-01	50
	Kachua	03-02	20
	Martlab	04-01	20
	Shahrashi	06-01	20
	Shahrashi	06-02	130

NO	DISTRICT / Thana	Bridge no	Length (m)
7	B.BARIA		
	Akhaurz	07-01-01	25
	Nabinagar	03-01	25
	Nabinagar	03-02	35
	Sarail	04-01	45
	Sarail	04-02	40
	Bancharampur	05-01	25
	Bancharampur	05-02	75
	Bancharampur	05-03	40
	Nasirnagar	06-01	60
	Nasirnagar	06-02	60
	Nasirnagar	06-03	75
	Nasirnagar	06-04	50
	Sadar	07-02	25
8	COMMILA		
	Choddogiam	08-01-02	100
	Chandina	02-01	25
9	NOAKHALI		
	Sadar	09-01-01	45
	Sadar	01-02	90
	Chatkhill	02-02	15
	Companigonj	03-01	80
10	LAXMIPUR		
	Sadar	10-01-01	60
	Sadar	01-02	45
	Sadar	01-03	45
	Ramgonj	02-01	20
	Ramgonj	02-03	30
	Ramgonj	02-04	20
	Ramgoti	03-01	80
11	NARSINGDI		
	Sadar	11-01-01	40
	Sadar	01-02	65
	Sadar	01-07	25
	Monohardi	02-01	75
	Monohardi	02-04	30
	Shibpur	03-01	100

NO	DISTRICT / Thana	Bridge no	Length (m)
12	FARIDPUR		
	Alfadhanga	12-01-02	50
	Boalmari	02-01	75
	Boalmari	02-02	75
	Sadapur	04-01	65
	Char Bhadrason	05-01	25
13	CHITTAGONG		
	Anowara	13-01-01	25
	Anowara	01-02	50
	Anowara	01-03	25
	Banshkhali	02-01	100
	Banshkhali	02-02	65
	Banshkhali	02-03	30
14	COX'S BAZAR		
	Chokoria	14-01-01	65
15	KISHOREGONJ		
	Kuliarchar	15-01-01	125
	Kuliarchar	01-02	30
	Kuliarchar	01-03	25
	Karimgonj	02-01	45
	Bajitpur	03-01	30
	Bajitpur	03-02	90
16	MANIKGANJ		
	Daulatpur	16-01-01	40
	Daulatpur	01-02	40
	Daulatpur	01-03	100
	Total	82	4,515m

Hydrologic Analysis

Design Discharge for the Bridge Design

In Bangladesh, the design discharge for which the bridge is to be designed, shall be the maximum flood discharge in records or the estimated maximum discharge for a return period of not less than 50 years. Figure 2.3.2-1 shows a Flow of Hydrological Analysis and Bridges Planning.

Bangladesh is divided into 6 hydrological regions. The regions are shown in Figure 2.3.2-2. Figure 2.3.2-3 is summarized to show the location of Bridges in hydrological regions. Figure 2.3.2-4~2.3.2-8 show the location of Bridges in Region Model.

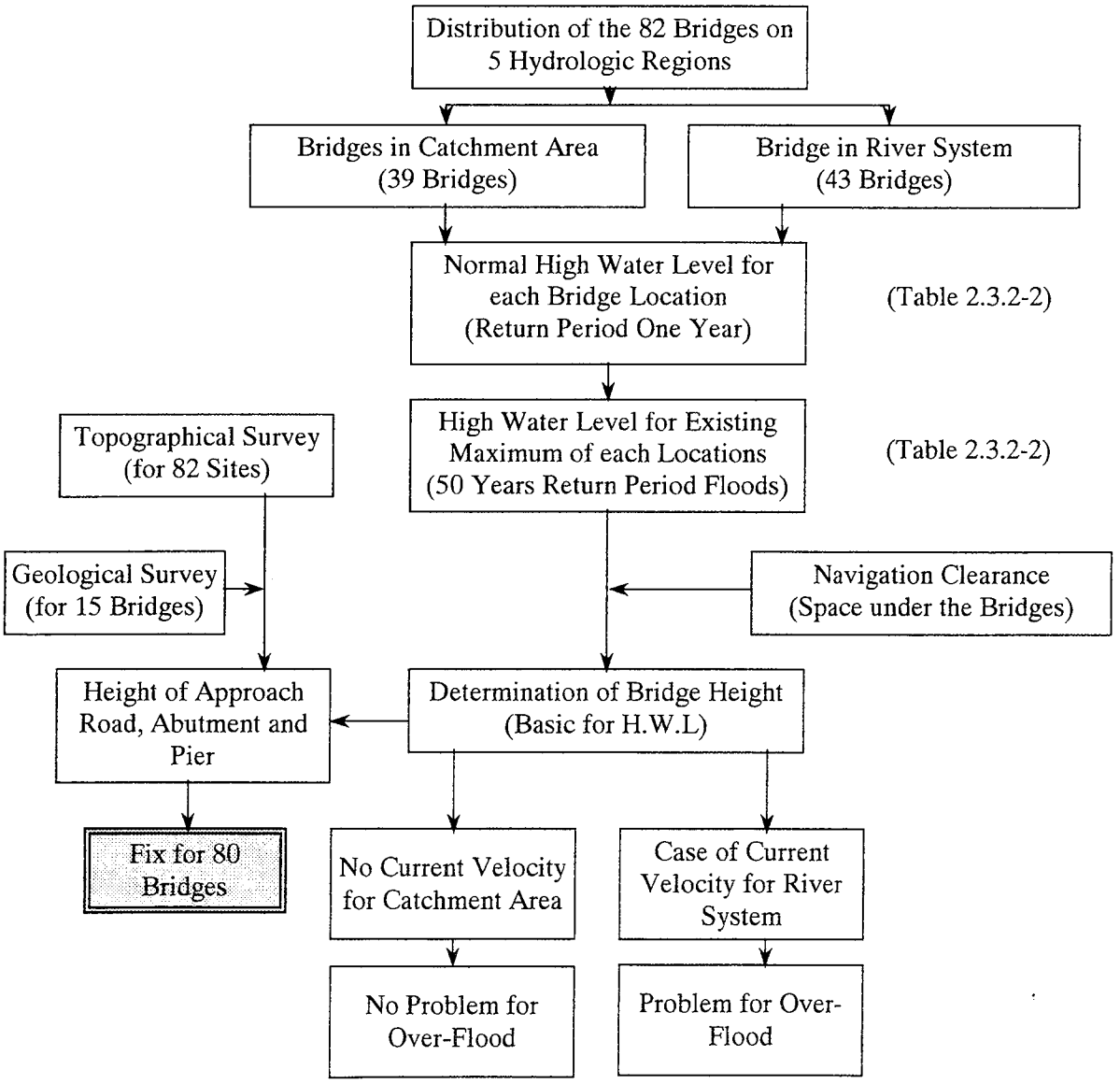
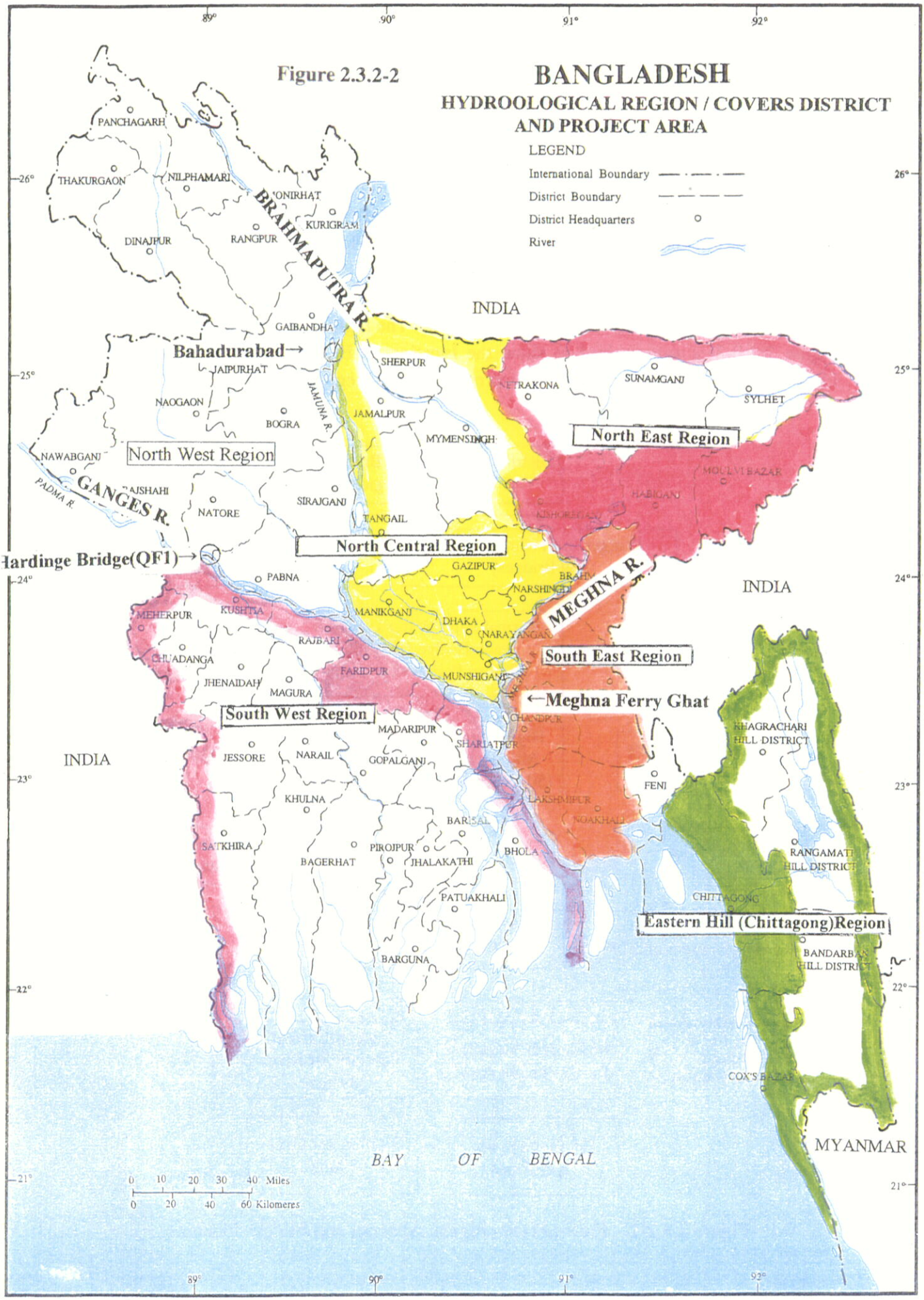


Figure 2.3.2-1 Flow of Hydrological Analysis and Bridges Planning



GRAPHOSMAN, 3/3-C PURANA PALTAN, Tel : 9552394, 9557596

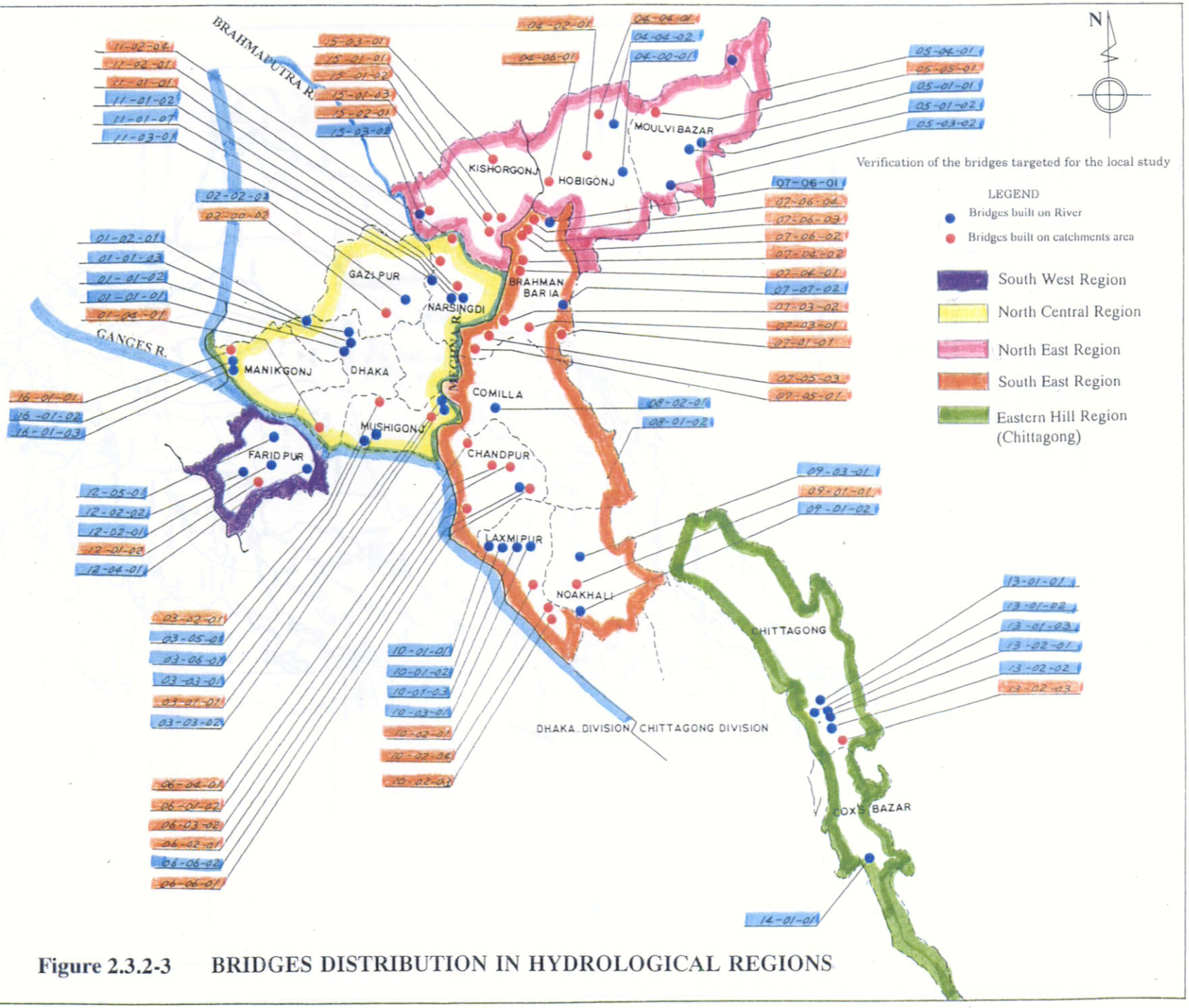


Figure 2.3.2-3 BRIDGES DISTRIBUTION IN HYDROLOGICAL REGIONS