## 5.6 Port Operations and Cargo Handling

(1) Each local Port Authority is headed by a Port Officer reporting directly to the Director of Ports and Traffic, BIWTA.

The major responsibilities of the local Port Officer and his staff concentrate on the safe passage of passengers and passenger vessels through the port, and ship allocation and conservancy administration within the port area. Today BIWTA's involvement in the daily cargo handling operation is limited to berth allocation and collection of landing and shipping charges.

(2) The cargo handling is performed by one handling contractor per port.

Cargo handling contracts for a period of one year are given to contractors following a public auctioning of each one-year contract.

The highest bidder is rewarded the contract which is based on a unit price set by the local port authority.

The same unit price is applied at all ports

# 6. Demand Forecast

## 6.1 Macroeconomic Framework

The future population of Bangladesh up to the year 2005 is estimated based on the middle projection of the Outline National Physical Plan (ONPP).

Table 6.1.1 Future Population and Labor Force

| Year | Population (Thousands) | G.R. (%) | L. Force (Thousands) | G.R. (%) |
|------|------------------------|----------|----------------------|----------|
| 1980/81 | 89,912 | – | 24,360 | – |
| 1984/85 | 99,529 | 2.57 | 27,509 | 3.09 |
| 1989/90 | 113,304 | 2.63 | 32,202 | 3.20 |
| 1994/95* | 129,147 | 2.65 | 37,807 | 3.26 |
| 1999/00 | 147,147 | 2.64 | 44,353 | 3.25 |
| 2004/05* | 167,395 | 2.61 | 51,869 | 3.18 |

Source: ONPP (Ministry of Works and UNCHS, 1985)
   *: Interpolated and extrapolated

The national average annual growth rate of the population is expected to continue at 2.6% and the population of Bangladesh in 2005 will be about 170 million people, or 70% more than at present.

Assuming that the net migration for the country as a whole is zero and the natural growth rates of each district for each age/sex group are equal, the future regional population distribution is also estimated based on the middle projection of the ONPP, as shown in the following table.

Table 6.1.2  Future Regional Population Projection

| District | 1984/85 | (g.r. %) | 1994/95 | (g.r. %) | 2004/05 |
|---|---|---|---|---|---|
| 1  Chittagong | 6,454 | 3.14 | 8,790 | 2.96 | 11,772 |
| 2  Chit. H.T. | 1,061 | 7.30 | 2,146 | 7.00 | 4,104 |
| 3  Comilla | 7,603 | 1.87 | 9,153 | 2.05 | 11,209 |
| 4  Noakhali | 4,192 | 1.70 | 4,963 | 1.78 | 5,921 |
| 5  Sylhet | 6,287 | 1.74 | 7,468 | 1.50 | 8,671 |
| 6  Dhaka | 12,382 | 4.21 | 18,698 | 4.07 | 27,854 |
| 7  Faridpur | 5,129 | 1.36 | 5,871 | 1.45 | 6,778 |
| 8  Jamalpur | 2,741 | 2.11 | 3,378 | 2.16 | 4,185 |
| 9  Mymensingh | 7,328 | 2.05 | 8,978 | 2.07 | 11,021 |
| 10  Tangail | 2,701 | 2.15 | 3,340 | 1.97 | 4,058 |
| 11  Barisal | 5,133 | 1.49 | 5,950 | 1.39 | 6,833 |
| 12  Jessore | 4,587 | 2.80 | 6,045 | 2.57 | 7,793 |
| 13  Khulna | 4,931 | 2.40 | 6,250 | 2.13 | 7,719 |
| 14  Kushtia | 2,638 | 2.97 | 3,534 | 2.74 | 4,630 |
| 15  Patuakhali | 2,081 | 1.84 | 2,498 | 1.55 | 2,913 |
| 16  Bogra | 3,156 | 3.07 | 4,270 | 3.01 | 5,746 |
| 17  Dinajpur | 3,764 | 3.28 | 5,197 | 3.22 | 7,134 |
| 18  Pabna | 3,933 | 3.02 | 5,297 | 3.07 | 7,167 |
| 19  Rajshahi | 6,075 | 2.89 | 8,032 | 2.40 | 10,177 |
| 20  Rangpur | 7,353 | 2.36 | 9,288 | 2.35 | 11,711 |
| Bangladesh | 99,529 | 2.64 | 129,147 | 2.63 | 167,395 |

Source:  ONPP (Ministry of Works and UNCHS, 1985)

Note:  g.r. = growth rate

The growth rates of population, especially in Chittagong Hill Tracts and Dhaka, are remarkably high, and the population of Dhaka is projected to reach 16.5% of the national population in the year 2005 from 12.4% in 1985 despite the government's decentralization policies.

## 6.2 National Economy

According to the Third Five Year Plan published by the Planning Commission, a target GDP growth rate of 5.4% per annum up to the year 1989/90 is adopted. However this figure is a relatively high target compared with the past achievement. In this study, therefore, the annual growth rate of GDP in this period of the TFYP is assumed to be 4.58% as estimated by the Bangladesh Energy Planning Project.

Table 6.2.1  Future sectoral value added and GDP in million Tk
             (at constant 1982/83 prices)

| Year | Agr | Ind | Tra | Con | Ene | Ser | GDP |
|------|------|--------|-------|-------|------|--------|---------|
| 1985 | 142473 | 31773 | 25989 | 16935 | 1376 | 97657 | 316206 |
| 1990 | 162141 | 42293 | 31665 | 22317 | 2261 | 134927 | 395604 |
| 1995 | 192125 | 65137 | 42727 | 31583 | 3590 | 193026 | 527188 |
| 2000 | 228901 | 103228 | 58386 | 50885 | 5895 | 294039 | 741334 |
| 2005 | 269804 | 167278 | 86337 | 82020 | 9713 | 464062 | 1079214 |

Table 6.2.2  Future GDP and value added annual growth rate (%)

| Year | Agr | Ind | Tra | Con | Ene | Ser | GDP |
|------|------|-------|------|-------|-------|------|------|
| 1985 | – | – | – | – | -- | – | – |
| 1990 | 2.62 | 5.89 | 4.01 | 5.67 | 10.44 | 6.68 | 4.58 |
| 1995 | 3.45 | 9.02 | 5.67 | 7.19 | 9.69 | 7.42 | 5.91 |
| 2000 | 3.56 | 9.65 | 6.95 | 10.01 | 10.43 | 8.78 | 7.06 |
| 2005 | 3.34 | 10.14 | 8.14 | 10.02 | 10.50 | 9.56 | 7.80 |

Note: Agr   Agriculture
      Ind   Industry
      Tra   Transport
      Con   Construction
      Ene   Energy
      Ser   Services
      GDP   Gross Domestic Product

Source:  BEPP (Planning Commission, 1985)

The estimated future GDP is 615,155 million Taka and 1,259,290 million Taka at constant 1983/84 prices in 1994/95 and 2004/05, respectively.
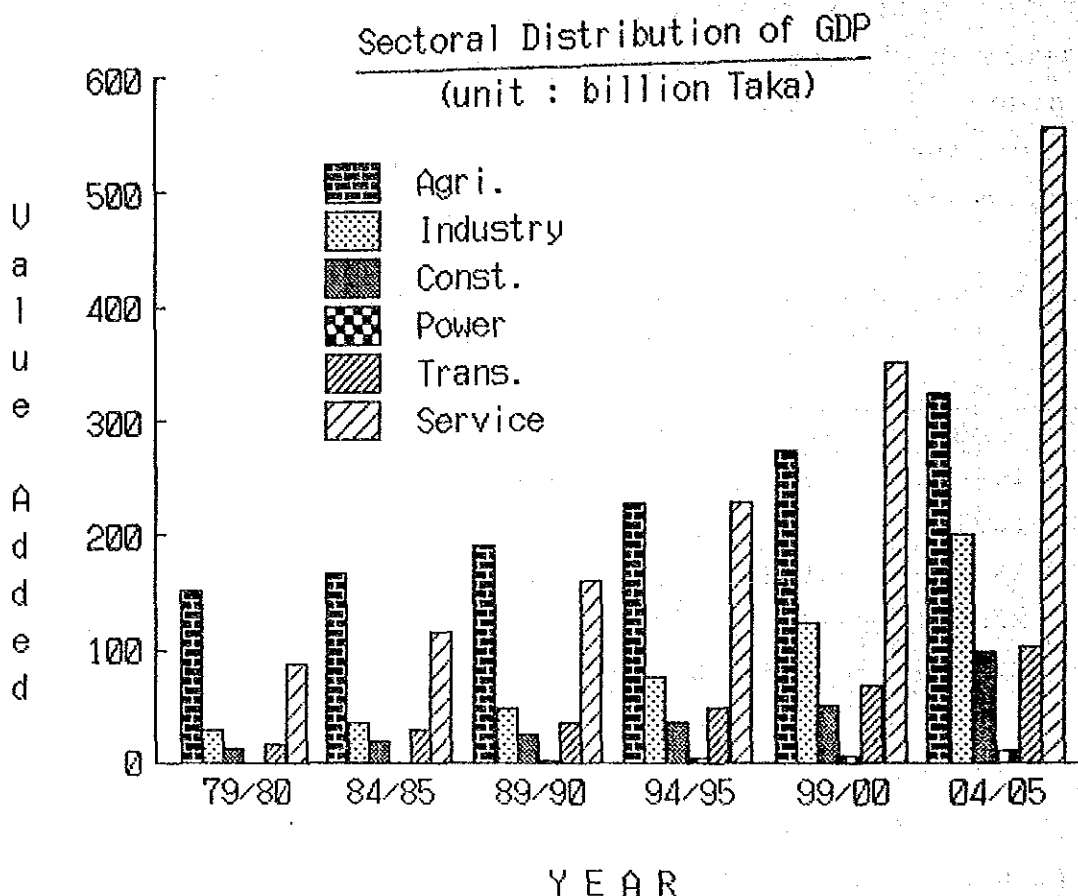
## Sectoral Distribution of GDP
### (unit : billion Taka)



Fig. 6.2.1   Sectoral Distribution of GDP

## 6.3   Basic Concept of the Traffic Forecast

(1)   The future cargo demand is forecast in consideration of the balance of supply and demand between regions by commodity, and based on the TFYP and other reports.

(2)   The hinterlands of Dhaka and Narayanganj Ports are determined based on the results of the cargo movement survey carried out by the study team from February 18 through March 19, 1986 and on a report prepared by BIWTA (Annual Ports & Traffic Report 1982/83).
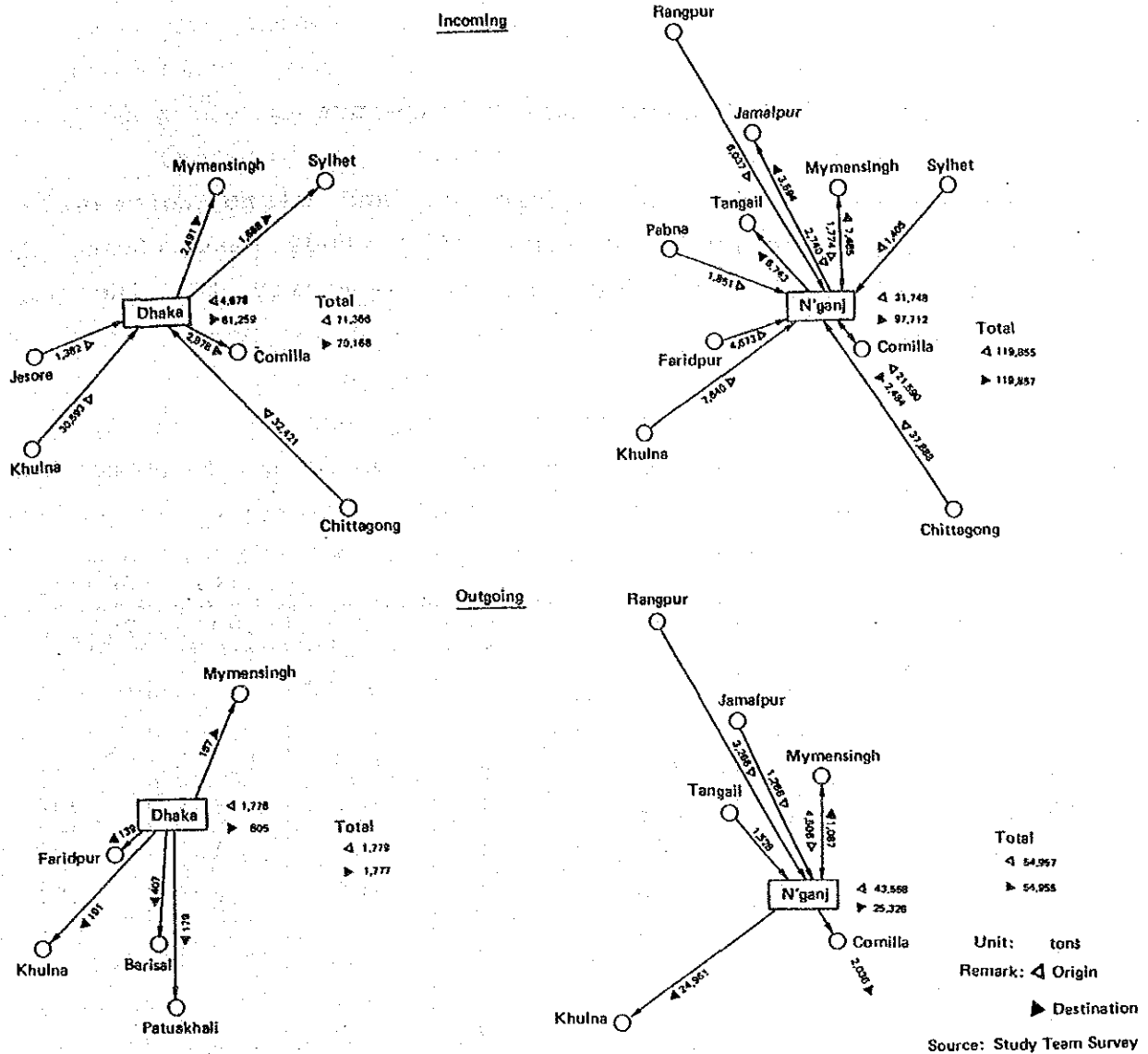
Fig. 6.3.1 Commodity Flow

(3) The Annual Ports & Traffic Report 1982/83 prepared by
    BIWTA is used for the basic data of the cargo forecast.

(4) The cargo forecast considers only transportation
    between regions and excludes the movement of cargo
    within regions by country boats and passenger launches.

## 6.4 Demand Forecast

(1) The results of the demand forecast are presented as follows:

The results of the macro forecast and micro forecast of cargo demand are much the same. The study team adopts the results of the micro forecast by commodity for the port planning.

Table 6.4.1 Future Cargo Handling Volume at Dhaka & Narayanganj Ports

(Unit: '000 tons)

| Year | 1982/83 | 1989/90 | 1994/95 | 1999/00 | 2004/05 |
|---|---|---|---|---|---|
| Incoming | | | | | |
| (Bulk) | | | | | |
| Food grains | 337 | 462 | 753 | 1,253 | 1,601 |
| Cement | 343 | 244 | 361 | 604 | 996 |
| Iron & Steel | 45 | 54 | 81 | 137 | 228 |
| POL | 470 | 555 | 595 | 636 | 681 |
| Others | 197 | 200 | 200 | 200 | 200 |
| (Non-Bulk) | | | | | |
| Jute | 4 | 6 | 6 | 6 | 6 |
| Others | 87 | 228 | 306 | 401 | 506 |
| Incoming-Total | 1,483 | 1,749 | 2,302 | 3,240 | 4,218 |
| Outgoing | | | | | |
| (Bulk) | | | | | |
| Fertilizer | 110 | 488 | 465 | 435 | 404 |
| Others | 108 | 131 | 139 | 147 | 156 |
| (Non-Bulk) | | | | | |
| Jute | 119 | 150 | 150 | 150 | 150 |
| Jute goods | 88 | 218 | 218 | 218 | 218 |
| Others | 11 | 33 | 52 | 88 | 143 |
| Outgoing-Total | 436 | 1,020 | 1,024 | 1,038 | 1,071 |
| Total | 1,919 | 2,769 | 3,326 | 4,278 | 5,289 |
| Macro Forecast | — | 2,267 | 2,955 | 4,126 | 5,965 |

Remark: 1982/83 shows movement between Dhaka and other regions based on the OD Table from BIWTA's report.

(2) The number of passengers in the future is forecast first for the entire nation, and the number of passengers to be carried by IWT in the Dhaka zone is then forecast based on the future transportation mode share and the regional share.

## 6.5 Land Demand for Urban Activities

The land demand is estimated for basic industries considering that the land demand for population-related industries will be absorbed in the gross demand of residential areas. The employment in manufacturing industries in the Port Related Zone will increase by 135 thousand persons between 1985 and 2005; 40 thousand during the first decade and 95 thousand during the second one. A rough estimation of the land demand is made assuming 5 sq.m. per employee which is derived from studying the existing industrial estate. The increase of employment in the service industries will total 105 thousand persons between 1985 and 1995, and 125 thousand persons between 1995 and 2005. About 30% of the basic service employment is estimated to consist of construction and transportation employment which will require very little land. Applying the same unit demand of 5 sq.m. per employee as for the manufacturing industries (almost the same as the unit demand for tertiary industries in foreign countries), an estimation of land demand for the service industries is made as shown in Table 6.5.1.

Table 6.5.1  Land Demand for Urban Activities in the Port Related Zone

(in hectares)

| Year | Manufacturing Industries | Service Industries |
|---|---|---|
| 1985 – 1995 | 20 | 37 |
| 1995 – 2005 | 48 | 44 |
| Total | 68 | 81 |

Source:  Study Team Estimates

# 7. Engineering Aspects of the Port Facilities

## 7.1 Design Guideline

The following items should be included in the guideline on designing port facilities: practical use of local engineering, application of Japanese design standards, and designing facilities which can accommodate both present and future cargo handling systems and which can also be used year-round despite heavy water level fluctuations.

## 7.2 Basic Design Conditions

(1) General conditions
1. Design vessels
   Container berth, General Cargo berth : 1,000D/W
   Passenger berth : 500D/W
2. Ground elevation of the port storage area : +7.00m P.W.D
3. Water depth for navigation channel
   and basin : -3.57m P.W.D

(2) Natural conditions
1. Water level
   H.W.L : +5.70m P.W.D, L.W.L.: +0.70m P.W.D
2. Current velocity : v=1.30m/sec
3. Earthquake intensity : Kv=0.0, Kh=0.06
4. Soil conditions : sandy soil

(3) Other Factors
1. Corrosion : 0.15mm/year

## 7.3 Fundamental Type of Mooring Facilities

The fundamental type of mooring facilities to be constructed at the two ports for the development plan should be selected among the three existing types (off river bank type (A), dredged type (B) and dredged type with lock chamber (C))

in consideration of the construction and operation costs and the ability to accommodate vessels in different seasons despite the marked fluctuations in water level.

Off river bank type facilities are located along the natural river bank. Dredged type facilities are constructed by dredging the bank and adjacent land to provide a berth and a basin. Alternative B is connected to the river directly. Alternative C is connected via a lock chamber.

The off river bank type is the best type for this project because the construction cost is the cheapest, and this alternative is flexible allowing for future development of the ports.

8. Port Planning

8.1 Port Planning Concepts

(1) Dhaka and Narayanganj Ports play a very important role in supporting the economic activities of the Dhaka Metropolitan Area which is the largest urban center in Bangladesh. These ports should function smoothly, and the development of these ports should take place in harmony with the development of the entire urban area in order to maximize the benefits of the development project.

(2) There are many suitable project sites at both ports, but it is necessary to develop the ports efficiently using the existing concentration of port and urban facilities when appropriate. The basic port functions are allocated as follows.

(Dhaka Port)   To support urban consumer activities.

   To provide land for port related urban activities in harmony with port development.

(Narayanganj Port)   To handle the overflow cargo of Dhaka Port.

   To support the activities of primary industries.

   To provide land for port-oriented industries in the future.

(3) The container transport by Inland Water Transport will be optimized if exclusive container vessels are utilized, but the required investment for an inland container depot would be very costly as it would include container cranes, a container freight station and a marshalling yard. Before making a decision on the desirability of constructing an inland depot, it is first necessary to conduct a study on

the modal split of container transportation considering the comprehensive transportation network. There are two ongoing studies being conducted by IBRD and ADB concerning these factors. The comprehensive flow of inland container transportation is beyond of the scope of this JICA Study. In this connection, the Study Team proposes only the appropriate location and scale of the container terminal in the Master Plan, and a Short-term Development Plan for the container terminal is not considered.

(4) There are two groups of I.W.T. passenger services running to and from Dhaka/Narayanganj Ports. One of these is the short distance routes serving Dhaka and Comilla Districts. The other is the middle to long distance routes serving Barisal, Khulna and Patuakhali Districts. Because of the development of the road network, the Meghna Bridge Project and the progress of motorization in the future, it is not likely that the short distance services by I.W.T. will grow from now on. On the other hand, the middle to long distance services will continue to play an important role. In this connection and in terms of relieving the port congestion from passengers and passenger launches, a new passenger terminal exclusively for middle and long distance service is proposed in the Master Plan.

(5) The coasters which presently use the port facilities at Badamtali and Mill Barrack may be unable to use these facilities after the completion of the Buriganga River Bridge. Thus, Badamtali will not be used by coasters after the completion of the Buriganga River Bridge, but Mill Barrack will continue to function as the Central Storage Depot. The cargo handling facilities for coasters should be replaced by new facilities to be located downstream of the new bridge. The existing facilities at Badamtali and Mill Barrack can continue to accommodate smaller size vessels.

coasters should be replaced by new facilities to be located downstream of the new bridge. The existing facilities at Badamtali and Mill Barrack can continue to accommodate smaller size vessels.

8.2 Land Use around the Port Area

New industrial areas will be formed as described below in addition to the existing areas along the sides of the two rivers.

a. An industrial estate will be developed just behind the port area in Keraniganj. The main factories which will be introduced into this estate are spare parts industries for various machinery and construction materials industries.

b. The area around Kachpur Bridge in Bandar will be designated as an industrial zone for textile and apparel industries including textile machinery industries.

Special areas for service industries are as follows:

a. At Shampur port-related service industries, shopping and recreational facilities are expected to locate along with the development of site A.

b. In Keraniganj, a new commercial center will be developed adjoing Site B.

c. The port functions of Old Dhaka Port shall be reorganized. An integrated redevelopment plan including commercial facilities, warehouses, the passenger terminal, parking lots, roads, pedestrian ways and high rise apartment houses will be prepared.

For the improvement of transport networks, a new road between the southern part of Narayanganj and the Dhaka-

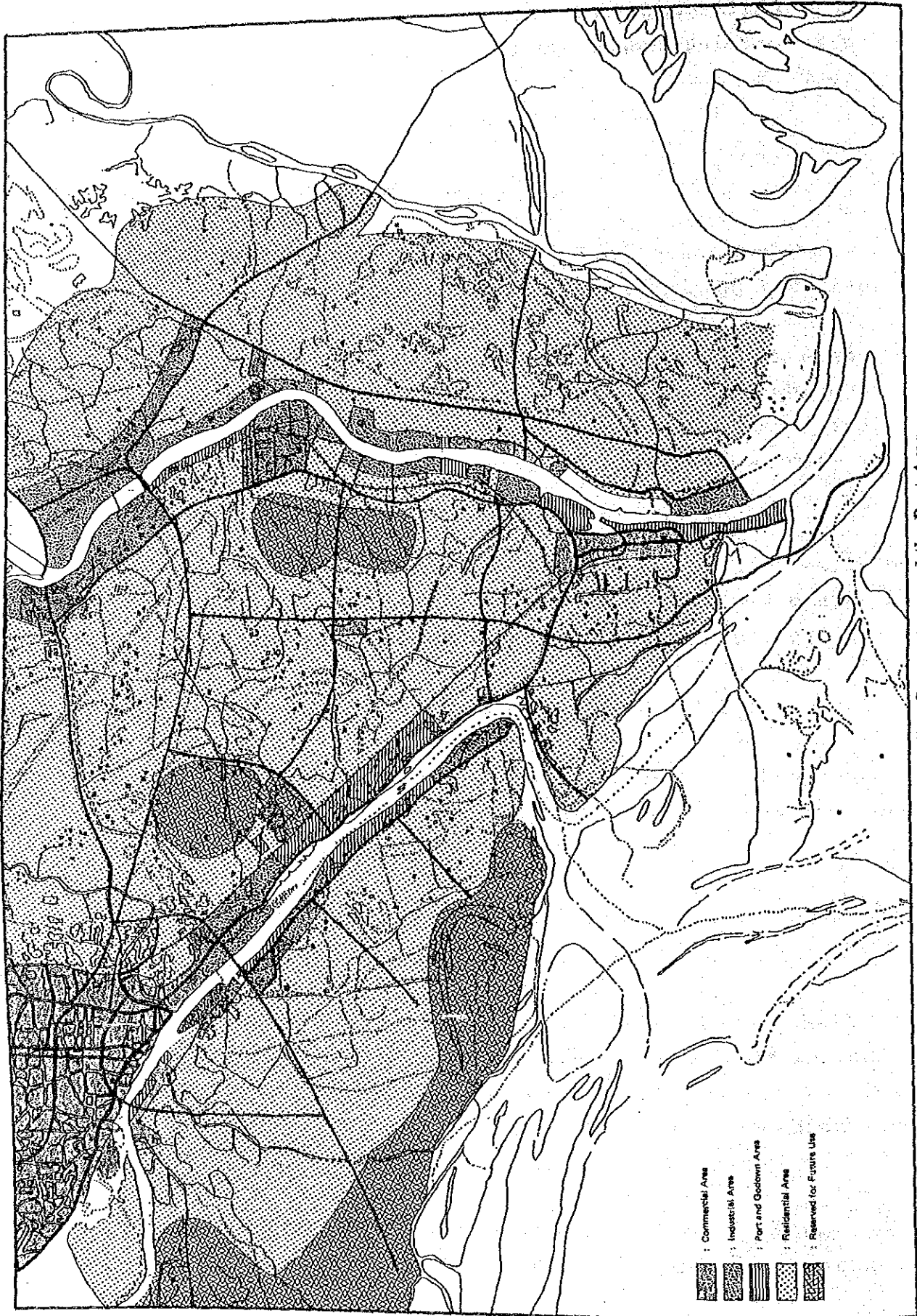Chittagong Road will be constructed in addition to the ongoing road projects.

Fig. 8.2.1 Land Use Concept around the Port Area

Legend:
- : Commercial Area
- : Industrial Area
- : Port and Godown Area
- : Residential Area
- : Reserved for Future Use

## 8.3 Forecast Demand Allocation by Facility

Based on the analysis of the handling capacities of the existing facilities and on the forecast cargo volume and number of passengers in the target year, the forecast demand allocation plan is given in Table 8.3.1 - 8.3.2.

### Table 8.3.1  Cargo Handling Plan by Jetty

(Unit:  thousand tons)

|  | the year 1995 | | the year 2005 | |
|---|---|---|---|---|
| **(the existing facilities)** | | | | |
| Badamtali | Cement | 118 | | |
|  | Bulk | 54 | | |
| Mill Barrack | Grain | 32 | Grain | 32 |
| M.M. Oil Mill | Cement | 152 | Cement | 152 |
| Khanpur | Fertilizer | 142 | Fertilizer | 142 |
| Ekranpur | Grain | 84 | Grain | 84 |
| Ghat No.5-8 | Fertilizer | 315 | Cement | 244 |
|  | Bulk | 146 | Fertilizer | 71 |
|  | | | Bulk | 146 |
| **(the proposed new facilities)** | | | | |
| General Cargo Berths | Non-Bulk | 167 | Non-Bulk | 195 |
|  | Iron & Steel | 81 | Cement | 509 |
|  | Fertilizer | 8 | Fertilizer | 191 |
|  | Bulk | 20 | Iron & Steel | 228 |
|  | | | Bulk | 74 |
| Transfer cargo to Container Terminal (Inland Depot) | Non-Bulk | 191 | Non-Bulk | 455 |
|  | Jute | } 195 | Jute | } 228 |
|  | Jute Goods | | Jute Goods | |

(47)

Table 8.3.2  Passenger Allocation by Terminal

(Unit: number of passengers per day)

|  | the year 1995 | the year 2005 |
|---|---|---|
| The existing two passenger terminals | Short distance service 44,500<br><br>Middle/long distance service     29,400 | Short distance service 69,800 |
| The proposed new passenger terminal | ― | Middle/long distance service 40,200 |

## 8.4  Required Principal Port Facilities

Based on the forecast demand allocation by facility, the required principal port facilities are proposed as follows:

Table 8.4.1  Scale of the Principal Port Facilities

|  | the year 1995 | the year 2005 |
|---|---|---|
| General Cargo Berths | | |
|    Number of Berths | 4 | 12 |
|    Transit Shed Area<br>   per berth ($m^2$) | 1500 ($50^m$x$30^m$) | 1500 ($50^m$x$30^m$) |
| Passenger Terminal | | |
|    Number of Berths | ― | 8 |
|    Area of Terminal<br>   Building ($m^2$) | | 2400 ($80^m$x$30^m$) |
| Container Terminal | | |
|    Number of Berths | | 5 |
|    C.F.S. Area<br>   per berth ($m^2$) | ― | 10000 |
|    Marshalling Yard Area<br>   per berth ($m^2$) | | 4000 ($100^m$x$40^m$) |

8.5  Master Plan

     Three alternative master plans are evaluated including land
use plans for the land areas nearby the ports which will be used
for port activities and other urban activities.

     The selected Master Plan shown in Fig 8.5.1 has the
following merits compared with the other two alternative plans.

     (i)   Maximum utilization of the development of the new
           Buriganga River Bridge.

     (ii)  Efficient port operation due to the concentrated layout
           of new port facilities.

     (iii) Flexibility in terms of stage-by-stage construction.

8.6  Short-term Development Plan

     (1)   The major short-term goals for the development of Dhaka
           and Narayanganj Ports by 1995 are supplementation of
           facilities and improvement of operations.  With regard
           to facilities, the problems are the shortage of
           capacity to adequately handle the large cargo volume
           (including the use of transit sheds) and the cargo
           damage during loading, unloading and storage.  Thus,
           within the framework of the selected Master Plan, the
           Short-term Development Plan is proposed to resolve
           these problems as shown in Fig. 8.6.1 - 8.6.2.

     (2)   The operational aspects that should be improved to
           ensure improved productivity and smooth port operation
           in the future are as follows.

           (i) to introduce a cargo handling system using fork-
               lifts at the new general cargo berths.

(ii) to apply a new tariff system for the proposed transit sheds to prevent their misuse as warehouses by consignors and cargo handling contractors.

(iii) to operate the proposed new general cargo berths as priority berths for coasters.
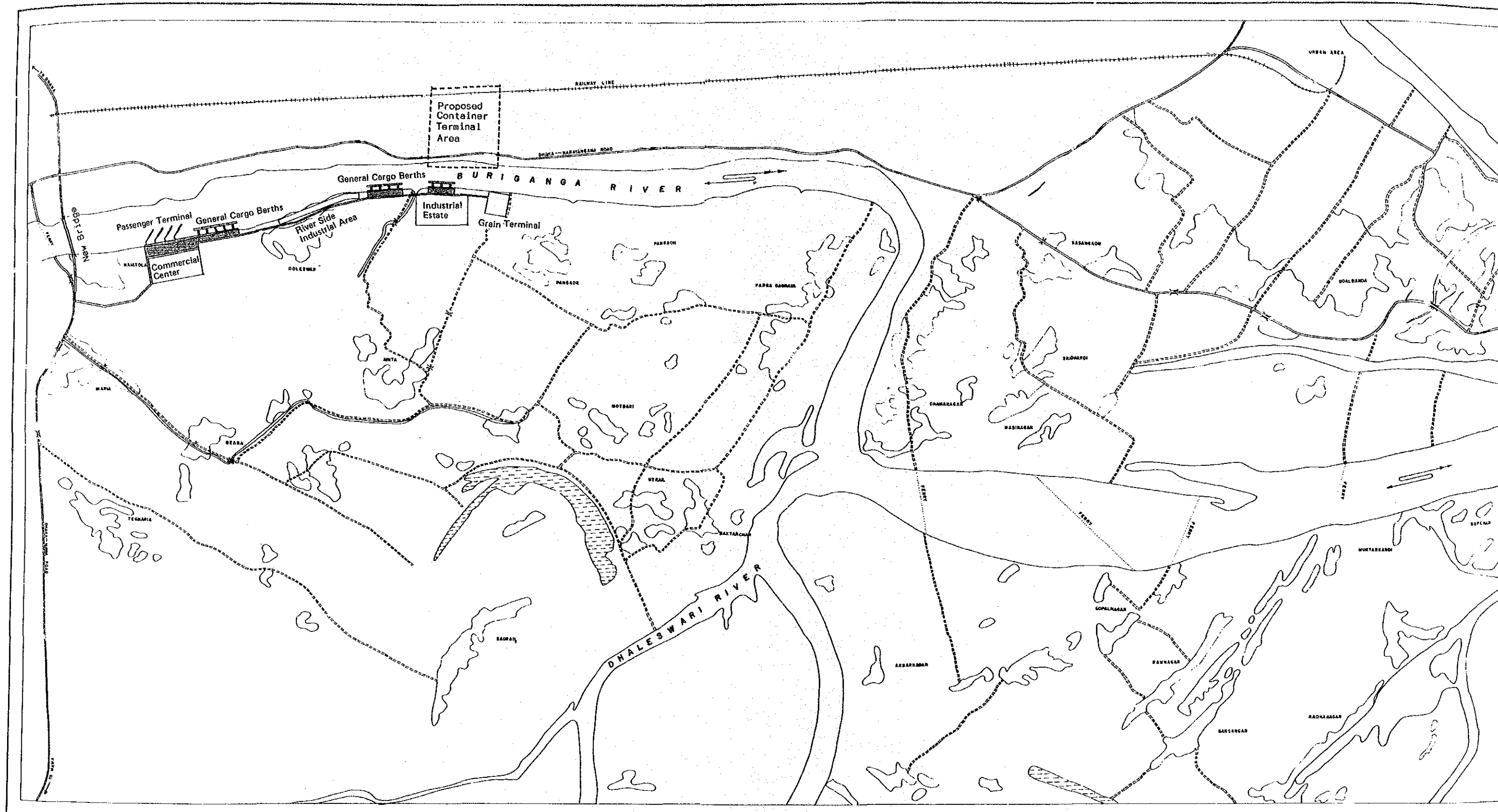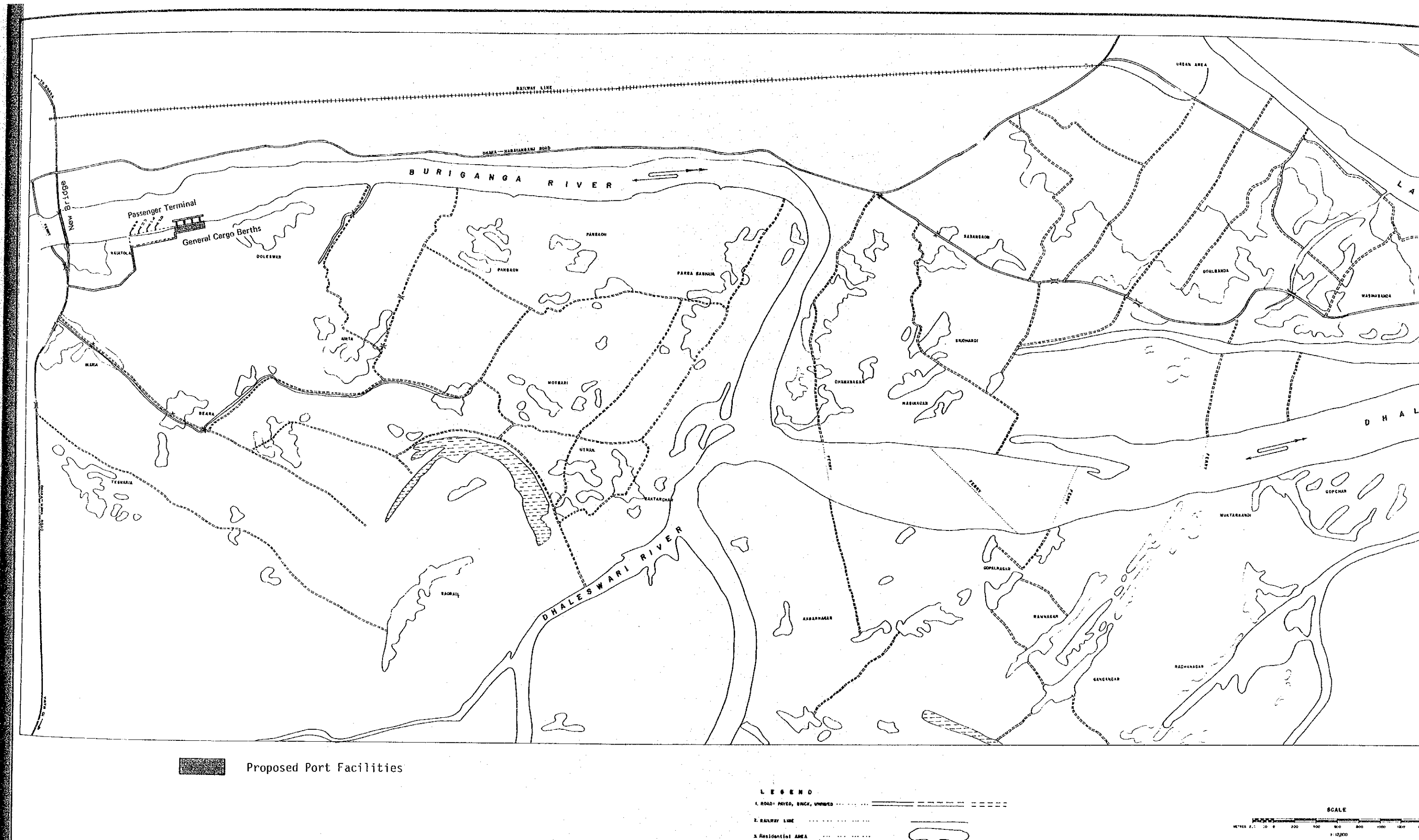
Proposed Port Facilities

Fig. 8.5.1     Alternative Master Plan "A"

**LEGEND**

1. ROAD: PAVED, BRICK, UNPAVED
2. RAILWAY LINE
3. Residential AREA
4. WATER: RIVER, KHAL
5. BRIDGE & CULVERT

**SCALE**

METRES 200 100 0    200   400   600   800   1000   1200   1400 METRES

1:12,000

| JICA STUDY TEAM | BIWTA |
|---|---|
| FEASIBILITY STUDY ON THE DEVELOPMENT PROJECT OF DHAKA AND NARAYANGANJ RIVER PORTS | |
| TRANSPORTATION NET WORK MAP | |
| THE SURVEYS | |

MAY, 1986

**BURIGANGA RIVER**

**DHALESWARI RIVER**

Passenger Terminal

General Cargo Berths

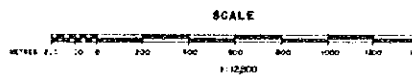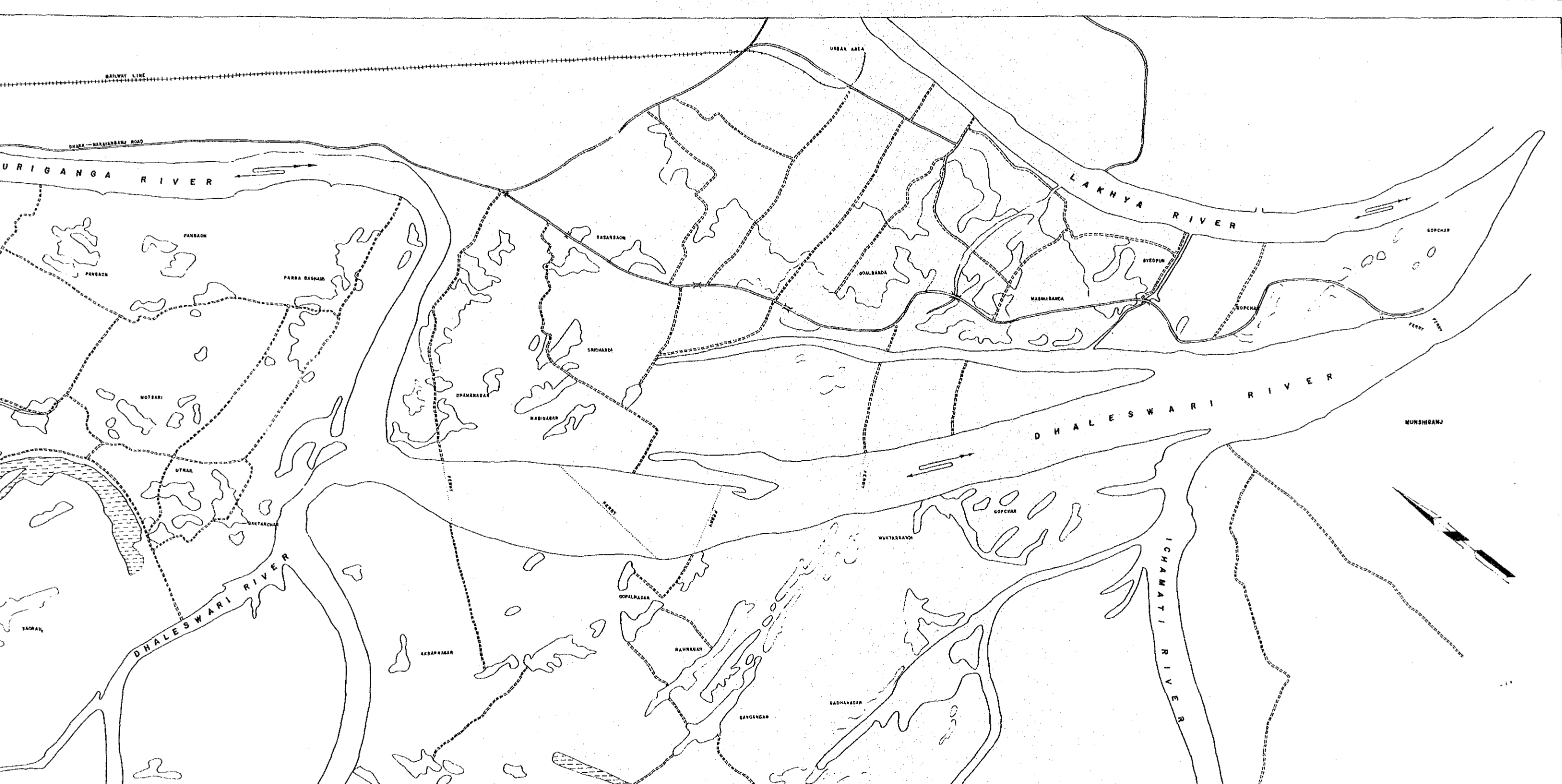Proposed Port Facilities

SCALE

1:12,500

Fig. 8.6.1  Short-term Development Plan

6.1 Short-term Development Plan

L E G E N D
1. ROAD: PAVED, BRICK, UNPAVED
2. RAILWAY LINE
3. Residential AREA
4. WATER: RIVER, KHAL
5. BRIDGE & CULVERT

SCALE
1:13,000

URIGANGA RIVER

DHALESWARI RIVER

LAKHYA RIVER

DHALESWARI RIVER

ICHAMATI RIVER

DHAKA - NARAYANGANJ ROAD
RAILWAY LINE

URBAN AREA

PANGAON
PANGAON
PARBA BAGHAIR
MOTBARI
UTRAK
BAKTARCHAR

BASANGAON
SNOHARDI
DHAMARGAR
MABINAGAR

GOALBANDA
MASIMABANDA
SYEDPUR
GOPCHAR

GOPCHAR

MUNSHIGANJ

GOPCHAR
MUKTARCHAR

GOPALNAGAR
RAMNAGAR
ACBARNAGAR
BAGHAN
RADHANAGAR
GANGANGAR

| JICA STUDY TEAM | BIWTA |
| FEASIBILITY STUDY ON THE DEVELOPMENT PROJECT OF DHAKA AND NARAYANGANJ RIVER PORTS | |
| TRANSPORTATION NET WORK MAP | |

THE SURVEYS
22/16, TANNAYAL ROAD MOHAMMADPUR DHAKA-7

| DRAWN BY :- | CHECKED BY :- | APPROVED BY :- |
| CHECKED BY :- | | |

MAY, 1986

Dredging (-3)

75$^m$ x 4 berth

Road (Total Length 1,750m)

(River)

| | | |
|---|---|---|
| 75m | | |
| Pontoon | | 8m |

4.6m

Gangway

Waterfront

Transit Shed
(50m x 30m)

50m

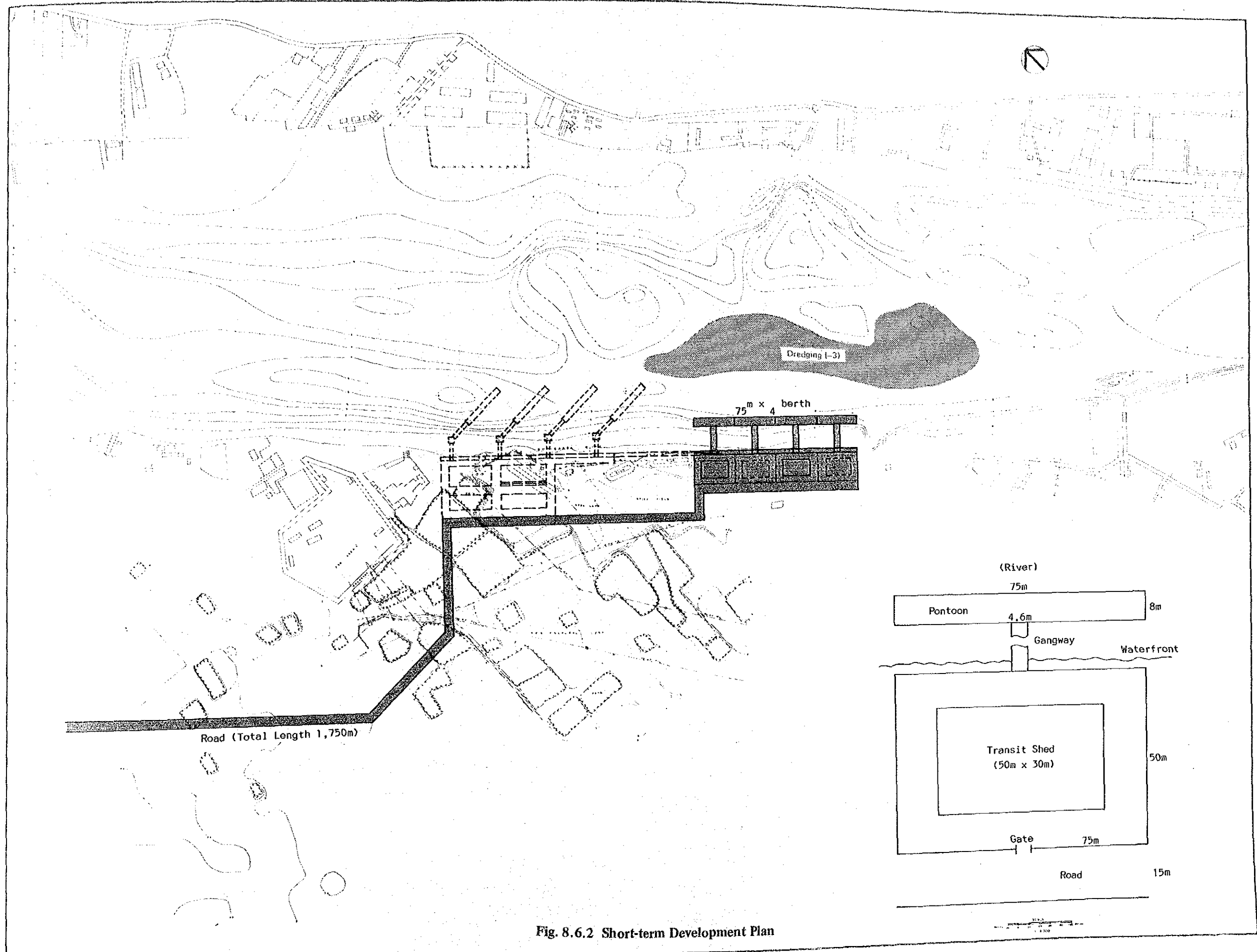Gate     75m

Road     15m

Fig. 8.6.2  Short-term Development Plan

9. Design, Construction and Cost Estimate

9.1 Master Plan

9.1.1 Basic Design

The master plan contains a general cargo terminal and a passenger terminal. These terminals consist of the following main facilities.

    1. General cargo terminal
       mooring facilities, transit sheds.
    2. Passenger terminal
       mooring facilites, terminal building, parking yard.

The structural types of the mooring facilities vary between floating wharves and open-type jetties, selected mainly by means of economic evaluation and cargo handling efficiency as explained below.

(1) General cargo terminal

Considering the development stage and the national policy, two types of mooring facilities are recommended for general cargo berths: a floating wharf and an open type jetty.

(a) Floating wharf
A floating wharf type is recommended as an improved mooring facility. The loading and unloading of cargo is handled by human labour and ship gear, and the cargo is carried using a 2 ton forklift. The floating wharf offers smooth cargo handling in both flood and dry seasons.

(b) Open type jetty
An open type jetty is recommended as a mechanized mooring facility. The loading and unloading of cargo is handled by mechanized equipment a 20 ton capacity mobile

truck crane, a 5 ton forklift and a truck (T-20), from the viewpoint of realizing a reasonable cargo handling efficiency. The same criteria is applied to the selection of the container terminal, indicating the advantage of an open type jetty.

(2) Passenger terminal

A floating wharf is recommendable from the viewpoint of the smooth embarkation and disembarkation of passengers.

9.1.2 Construction

The main construction operations for this project include site reclamation, mooring facilities, buildings and road work. Site reclamation shall be done with pump ships to obtain soil from the river bed in front of the planned construction site.

9.1.3 Cost Estimate

The total constructions cost for master plan is estimated at 1,790 million taka according to currency exchange rates in mid-1986 (refer to Table 9.1.1).

Table 9.1.1 Constuction Cost for Master Plan

Unit: million taka

| Item | General (12 berths) | Passenger (8 berths) | Total |
|---|---|---|---|
| Mooring Facility | 770 | 280 | 1,050 |
| Site preparation | 50 | 20 | 70 |
| Structure | 350 | 90 | 440 |
| Road, yard | 100 | 20 | 120 |
| Shore protection | 50 | 10 | 60 |
| Others | 40 | 10 | 50 |
| TOTAL | 1,360 | 430 | 1,790 |

## 9.2 Short-term Development Plan

Four berths are planned as general cargo berths under the Short-term Development Plan within the Master Plan. A floating wharf type with an approach bridge is recommended for these berths.

### 9.2.1 Basic Design

The main facilities in the Short-term Development Plan are as follows.

- Mooring facilities          : 4 berths
- Transit shed               : 2
- Roads
    - Access road            : 1,750m
    - Roads within the port  : 1,000m
- Bank protection            : 9,500m$^2$

(1) Design of mooring facilities

  (a) Pontoon                : 75.0m(L) x 8.0m(B) x 3.0m(D)
  (b) Approach bridge       : span 42.0m, width 4.6m

(2) Design of transit sheds

The major dimensions of the transit sheds are as follows.

     width : 30m,  length : 50m

The structures will include steel trusses as a roof. Both the sides and the center will be supported by reinforced concrete pillars. There will be four entrances, and a steel hanger door will be included.

(3)  Design of the roads

  (a)  Access road
      The access road connecting the terminal with the main
  road will be 15.0m wide including a 2-lane motor vehicle road
  (6.5m), a rickshaw road (4.0m), dividers (1.0m) and
  pedestrian ways (3.5m).  The thickness of the pavement will
  be 45cm.

  (b)  Roads within the Port
      The roads within the port will consist of a 2-lane motor
  vehicle road (6.5m), dividers (1.0m) and pedestrian ways
  (3.5m).  The roads will be 10 m in total width with a
  pavement thickness of 45cm.

(4) Design of Bank protection facilities

      The slope of the Bank protection will be 1:2.  Bricks will
  be laid on the face to prevent corrosion due to washing away.
  In order to prevent the bricks from falling down at the back of
  the face, holes will be drilled and filled with brick chips as
  foot protection.

9.2.2  Construction Plan

      The main projects for construction in the Short-term
  Development Plan can be divided into the following: prepara-
  tions, temporary work, land reclamation, mooring facilities
  construction, road construction, transit shed construction,
  bank protection, abutment construction and miscellaneous
  construction works.

      As the site will be in the form of an island until the
  completion of the Buriganga river bridge, a temporary pier will
  be needed to deliver the construction materials and equipment
  to the site.

(60)

The reclaimation soil will be obtained from the relatively shallow area of the river at the mooring point in front of the berth. The schedule of the construction works is shown in Table 9.2.1.

9.2.3 Cost Estimate

The total cost based on exchange rates in mid-1986 is 302,300 thousand taka. The foreign currency portion is 175,100 thousand taka which is 58% of the total.

Table 9.2.2 shows the yearly investment plan for the short-term development plan according to the construction schedule.

Table 9.2.1  Construction Schedule for the Short-term Development Plan

| No. | | Item | Unit | Volume | 1987 | 1987/88 | 1988/89 | 1989/90 | 1990/91 | 1991/92 | 1992/93 | 1993/94 | 1994/95 | 1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Construction Project | Preparations and Temporary Work | set | 1 | | | | | | | | | | |
| 2 | | Mooring Facilities (Pontoon, Approach Bridge) | set | 4 | | | | | | | | | | |
| 3 | | Land Reclamation | m³ | 230,000 | | | | | | | | | | |
| 4 | | Access road | m | 1,750 | | | | | | | | | | |
| 5 | | Roads within the port | m | 1,000 | | | | | | | | | | |
| 6 | | Sheds | set | 2 | | | | | | | | | | |
| 7 | | Bank protection, etc. | m² | 9,500 | | | | | | | | | | |
| 8 | | Others (Fence, Lighting, etc.) | set | 1 | | | | | | | | | | |
| 9 | | Post-construction cleanup | set | 1 | | | | | | | | | | |
| 10 | Engineering | Survey and Design | set | 1 | | | | | | | | | | |
| 11 | | Construction Supervision | set | 1 | | | | | | | | | | |

(mooring facilities: 3 sets)
( sheds : 2 sets)

(mooring facilities: 1 set)

(62)

Table 9.2.2 Yearly Investment Plan

(Unit: Thousand taka)

| | Item | Volume | Unit | 1987/88 Foreign Currency | 1987/88 Local Currency | 1987/88 Total | 1988/89 Foreign Currency | 1988/89 Local Currency | 1988/89 Total | 1989/90 Foreign Currency | 1989/90 Local Currency | 1989/90 Total | 1990/91 Foreign Currency | 1990/91 Local Currency | 1990/91 Total | Total Foreign Currency | Total Local Currency | Total Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Construction Project | Preparations and Temporary Work | 1 | set | 7,900 | 5,500 | 13,400 | 7,800 | 5,600 | 13,400 | | | | | | | 15,700 | 11,100 | 26,800 |
| | Mooring Facilities | 4 | set | 8,300 | 6,600 | 14,900 | 24,800 | 19,800 | 44,600 | 22,600 | 18,000 | 40,600 | 10,600 | 8,400 | 19,000 | 66,300 | 52,800 | 119,100 |
| | Land Reclamation | 230,000 | m³ | 6,300 | 4,400 | 10,700 | 6,200 | 4,500 | 10,700 | | | | | | | 12,500 | 8,900 | 21,400 |
| | Access road | 1,750 | m | | | | 6,800 | 4,300 | 11,100 | 6,800 | 4,300 | 11,100 | | | | 13,600 | 8,600 | 22,200 |
| | Roads within the port | 1,000 | m | | | | 3,200 | 2,100 | 5,300 | 1,000 | 700 | 1,700 | | | | 4,200 | 2,800 | 7,000 |
| | Sheds | 2 | set | | | | 10,200 | 8,900 | 19,100 | 8,100 | 7,100 | 15,200 | | | | 18,300 | 16,000 | 34,300 |
| | Bank protection, etc. | 9,500 | m² | | | | 5,200 | 4,500 | 9,700 | | | | | | | 5,200 | 4,500 | 9,700 |
| | Others | 1 | set | | | | | | | 5,800 | 3,700 | 9,500 | | | | 5,800 | 3,700 | 9,500 |
| | Sub Total | | | 22,500 | 16,500 | 39,000 | 64,200 | 49,700 | 113,900 | 44,300 | 33,800 | 78,100 | 10,600 | 8,400 | 19,000 | 141,700 | 108,400 | 250,000 |
| Engineering | Survey and design | 1 | set | 6,500 | | 6,500 | | | | | | | | | | 6,500 | | 6,500 |
| | Construction supervision | 1 | set | 2,000 | | 2,000 | 6,200 | | 6,200 | 6,200 | | 6,200 | 4,100 | | 4,100 | 18,500 | | 18,500 |
| | Sub Total | | | 8,500 | | 8,500 | 6,200 | | 6,200 | 6,200 | | 6,200 | 4,100 | | 4,100 | 25,000 | | 25,000 |
| | Physical contingency | 1 | set | 1,600 | 800 | 2,400 | 3,500 | 2,500 | 6,000 | 2,500 | 1,700 | 4,200 | 800 | 400 | 1,200 | 8,400 | 5,400 | 13,800 |
| | Total | | | 32,600 | 17,300 | 49,900 | 73,900 | 52,200 | 126,100 | 53,000 | 35,500 | 88,500 | 15,500 | 8,800 | 24,300 | 175,100 | 113,700 | 288,800 |
| | Land Acquisition | 10.8 | ha | | 13,500 | 13,500 | | | | | | | | | | | 13,500 | 13,500 |
| | Grand Total | | | 32,600 | 30,800 | 63,400 | 73,900 | 52,200 | 126,100 | 53,000 | 35,500 | 88,500 | 15,500 | 8,800 | 24,300 | 175,100 | 100,200 | 302,300 |

10. Economic Analysis

10.1 General

The purpose of the economic analysis is to appraise the economic feasibility of the short-term development from the viewpoint of the national economy. The economic internal rate of return (EIRR) of the project based on cost-benefit analysis is used to appraise the feasibility of the project.

All benefits and costs adopted in the economic analysis are evaluated in economic prices based on eliminating transfer items from market prices using conversion factors and the shadow wage rates for labor.

10.2 Benefits and Costs

In the cost-benefit analysis, the costs and benefits are defined as the difference between the cases "with" the project and "without" the project.

The following items are identified as benefits arising from the Short-term Development Plan.

(a) Savings in Berth Waiting Costs

The reduction of ship waiting time for berthing in the ports between the "with" and "without" cases creates savings in berth waiting costs.

(b) Savings in Transportation Costs

The transportation costs compared with alternative transport modes are examined in terms of total door to door costs. The difference of the transportation costs on several transport routes creates savings in transportation costs.

(c)   Savings in Cargo Handling Costs

The introduction of mechanical equipment makes the cargo handling operation more efficient from the viewpoint of the national economy. The reduction of cargo handling costs is one of the benefits of the project.

(d)   Savings in Damage and Pilferage

The use of improved transit sheds will result in a reduction of damage and pilferage of cargoes. A savings equivalent to 1.5% of the cargo value is assumed.

As for costs, construction costs, maintenance costs, administrative costs and land costs are estimated as direct costs of the project, and handling equipment costs are also included as indirect costs.

10.3  Economic Internal Rate of Return

Based on the foregoing analysis, the Economic Internal Rate of Return (EIRR) of the Short-term Plan is estimated to be 17.84%. Some sensitivity analyses are then performed as follows:

| Case | | EIRR (%) |
|---|---|---|
| Base Case | | 17.84 |
| Cost Increase | 10% | 16.05 |
| Benefit Decrease | 10% | 15.86 |

The calculated EIRRs show that the project is feasible even if certain factors are changed. However, it is necessary to ensure that the construction cost remains as low as possible to ensure the maximum benefits from the project.

# 11. Financial Analysis

## 11.1 Methodology

The construction cost for the Short-term Development Plan amounts about 300 million Taka. In order to amortize this cost during 20 - 30 years, in other words, to calculate a financial internal rate of return, an annual port revenue of at least 15 million Taka is required. As described in the following section, however, the projected annual port revenue does not reach 3.5 million Taka according to the existing tariff. It means that the existing tariff should be raised to the level of 4 to 5 times to recover the investment and operating cost.

According to the economic analysis, this project is valuable as a national development scheme. Therefore, it is considered to be admitable that the national government pay the most part of the capital investment cost. Considering that raising of the changes and fees would be rather difficult under the existing situation in Bangladesh, the following analysis is aimed to clarify the payable initial investment cost for BIWTA and the financial condition of the project based on the existing tariff.

## 11.2 Financial Internal Rate of Return in Alternative Case

### (1) Alternative Cases of Investment by BIWTA

If BIWTA pays the total capital invetment cost, it is obvious that the agnecy will suffer the great loss financially. So the following cases are selected for the comparison.

   (a) Pay land acquisition cost
   (b) Pay land acquisition and reclamation cost
   (c) Pay land acquisition and access road construction cost
   (d) Pay land acquisition, reclamation and access road construction cost
   (e) Pay land acquisition, reclamation, access road roads

within port, sheds and other misscellaneous construction cost.

From Case 'a' to Case 'd' the charges and fees are fixed at the existing level, but in Case 'e' the berthing charges and land & shipping charges are raised to 2 times and the storage charges and road charges to 1.5 times.

(2) Results of Alternative FIRR

The investment plan, the projected operating revenue flown and the projected operating cost flow for calculating the FIRR of each case are shown in the following Table 11.2.1.

Table 11.2.1  FIRR of Each Case

(Unit: %)

| Case | FIRR |
|------|------|
| a | 10.4 |
| b | 4.3 |
| c | 2.7 |
| d | 1.5 |
| e | 1.7 |

The FIRR of each case is very low except Case 'a', which assumes that BIWTA pays only the land acquisition cost. Under the existing tariff, the maximum payable portion of the initial investment cost by BIWTA is limited to about 20% of the total, which is equivalent to Case 'd'. In this case, it is required that the most part of investment fund is the own capital and that the interest rate of loan is very low. If such raising of the tariff as assumed in Case 'e' is possible, BIWTA can pay about one thirds of the total investment cost, on the condition that they get a loan of extremely low rate.

In the cash flow table BIWTA will obtain a re-investment fund of 171 million Taka, in 2015. The amount is equivalent to the total constuction cost of mooring facilities (125 million Taka), sheds(36 million Taka) and other miscellaneous facilities (10 million Taka).

This result shows that if BIWTA gets rid of debt service they will be able to re-invest the deposited fund for the depreciable port facilities. In other words, if they make use of loan and want to reinvest, it is necessary to raise the cahrges and fees equivalent to debt service.

## 11.3 Some Suggestions

Based on the above mentioned study some suggestions for BIWTA to conduct this project financially are described below.

(a) In case that BIWTA pays a part of the initial investment cost (for example, land acquicition cost), it is desirable to use own capital.

(b) The surplus of cash flow should be deposited as a reinvestment fund.

(c) In case of getting loan (for example, land reclamation cost or access road consturction cost) raising of the charges and fees should be done according to the amount and period of debt service.

# MAIN REPORT

# CHAPTER 1
# INTRODUCTION

# CHAPTER 1  INTRODUCTION

## 1.1 Background

Dhaka Port is located at the edge of the City of Dhaka, the capital of Bangladesh, and faces the Buriganga River. It is the liveliest port in Bangladesh. The Dhaka District is a major political and economic center, and serves as a terminal for land transportation networks to the northwest and northeast regions where inland waterway transportation has not been greatly developed. The cargo handling volume at Dhaka port has been gradually increasing year after year. However, because of the scarcity of mooring facilities and backup areas, ships must wait for berths. Moreover the port is not efficiently connected with any railways or road networks, and existing access roads are jammed with trucks, cars and rickshaws. Also, a new bridge over the Buriganga River is expected to be constructed in 1990 at the center of the port and its clearance will restrict ship navigation.

At Narayanganj Port, which has almost the same hinterland as Dhaka Port, a greater cargo volume is handled and more passengers get on and off vessels than at Dhaka. Although the importance of Dhaka Port has increased in recent years. Narayanganj Port is a key port which must support the metropolitan area activities together with Dhaka Port. Appropriate measures should be taken to make the port function more smoothly and to facilitate further growth.

In this connection, the Government of Bangladesh has requested the Japanese Government to provide technical cooperation to assist with the development planning of the two ports.

## 1.2 Objectives of the Study

The objectives of the Study are to prepare Master Plans for Dhaka and Narayanganj ports for the period up to the year 2005, and further to determine the technical, economic and financial feasibility of the Short-term Plan to be formulated for the Ports within the framework of the Master Plans. The target year for the Short-term Development Plans is up to the year 1995.

## 1.3 Participants in the Study

### (1) JICA Study Team

| | |
|---|---|
| Terumi IIMJIMA | Team Leader |
| Tomoaki SHIMADA | Port Planning, Port Management and Operation |
| Iwane MIZUNO | Financial Analysis, Urban Planning |
| Osamu SASE | Cargo and Traffic Forecast |
| Takashi YAMAMOTO | Economic Analysis |
| Shoichi KITAJIMA | River Survey, Structural Design |
| Takeshi TOMIYASU | Traffic Survey |
| Takashi OHASHI | Structural Design, Construction Planning, Cost Estimation |
| Makoto YAMAMOTO | Soil Conditions, Topographic Survey |

### (2) BIWTA Counterparts

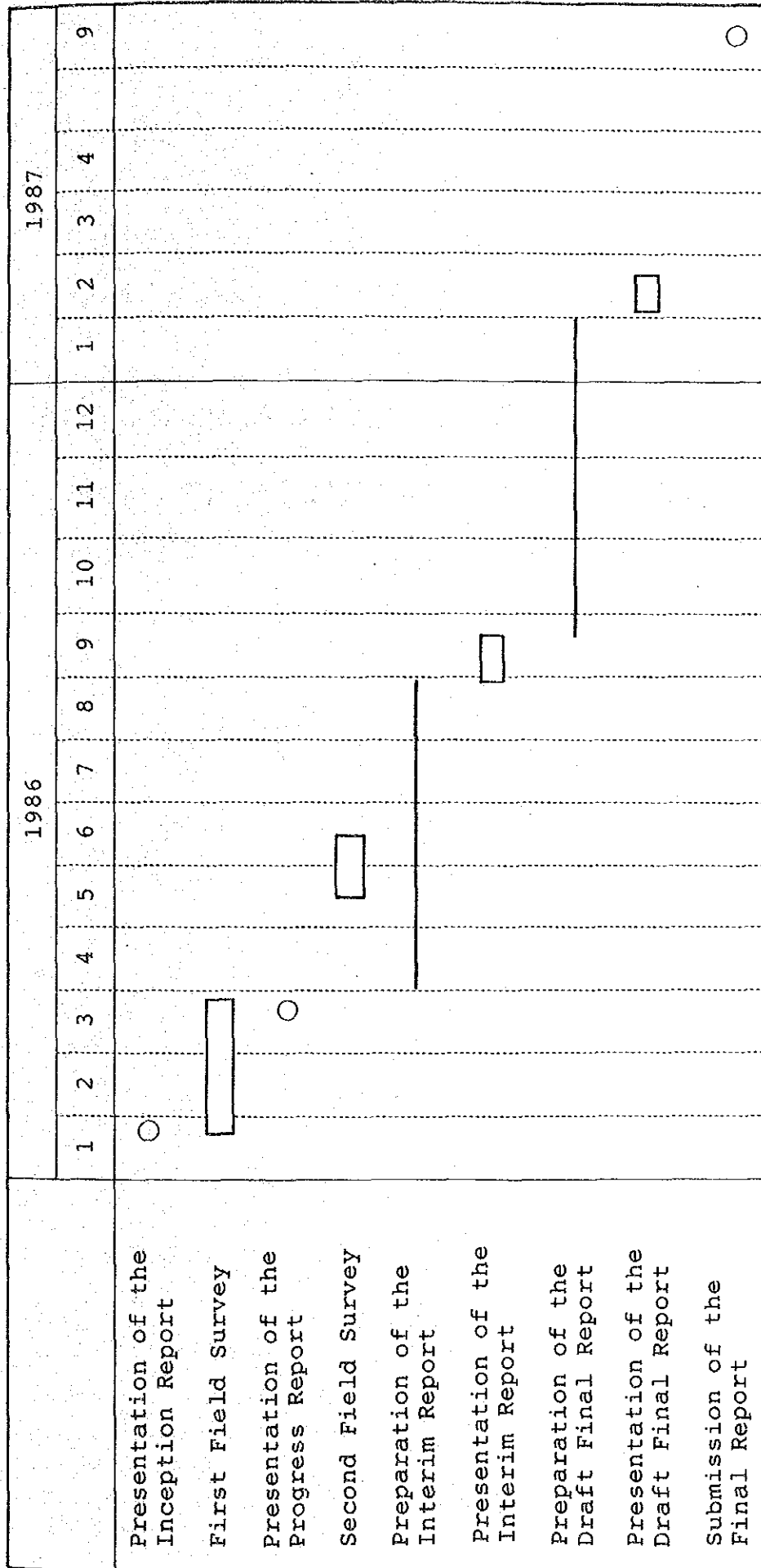| | |
|---|---|
| Salehuddin | Project Manager |
| Shamsher Ali | Urban Planning, Economic and Financial Analysis |
| Tajul Islam | Port Planning, Field Surveys |
| A.R. Choudhury | Traffic Survey |
| Rafiqul Alarm | Traffic Forecast |
| Khondakar Gini Ariful Islam | Engineering |
| Abul Mokarrom | River Surveys |

## 1.4 Schedule of the Study

The study was executed according to the following study schedule.

Table 1.1 Study Schedule



| Activity | 1986 | | | | | | | | | | | | 1987 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 9 |
| Presentation of the Inception Report | ○ | | | | | | | | | | | | | | | | |
| First Field Survey | □ | □ | □ | | | | | | | | | | | | | | |
| Presentation of the Progress Report | | | ○ | | | | | | | | | | | | | | |
| Second Field Survey | | | | | □ | □ | | | | | | | | | | | |
| Preparation of the Interim Report | | | | — | — | — | — | — | | | | | | | | | |
| Presentation of the Interim Report | | | | | | | | | □ | | | | | | | | |
| Preparation of the Draft Final Report | | | | | | | | | — | — | — | — | — | | | | |
| Presentation of the Draft Final Report | | | | | | | | | | | | | | □ | | | |
| Submission of the Final Report | | | | | | | | | | | | | | | | | ○ |

□ ...... Work in Bangladesh
— ...... Work in Japan

# CHAPTER 2
# OUTLINE OF BANGLADESH

# CHAPTER 2   OUTLINE OF BANGLADESH

## 2.1   Geography

### 2.1.1   Historical Background

Bangladesh appeared on the world map as a sovereign state on December 16, 1971 following the War of Liberation from March 25 to December 16.   The area which now comprises Bangladesh was under Muslim rule for five and a half centuries, 1201-1757 A.D., and passed into British hands after the defeat of the last sovereign ruler, Nowab Sirajuddowla, at the Battle of Plassey on June 23rd 1957.   The British ruled over Bangladesh for nearly 190 years when the country was a part of the British Indian provinces of Bengal and Assam.   With the termination of British rule in August 1947, Bangladesh constituted the eastern wing of Pakistan, and it remained with Pakistan for about 24 years until the conclusion of the War of Liberation in 1971.

The people of Bangladesh have a long history.   Prior to or at the same time the Aryans entered the Indian subcontinent, a section of the Dravidians came to this land and then groups of Aryans came and settled.   The Arab Muslims started coming here in the early ninth century A.D. followed by the Persians, the Turks, the Afghans and the Mughals.   Different races and nationalities from the neighboring areas came and settled in Bangladesh.   Over the centuries, these different groups have mixed together to become the Bangladeshi people.

### 2.1.2   Geographical Features

Bangladesh lies in the northeastern section of South Asia between 20 degrees 34' and 26 degrees 38' north latitude and 88 degrees 01' and 92 degrees 41' east longitude.   The country is bounded by India on the west and north and by Burma and India on the east.   To the south it opens onto the Bay of Bengal,

which is a part of the Indian Ocean. Bangladesh is predominantly a deltaic region formed by 3 major rivers, the Brahmaputra-Jamuna, the Padma and the Meghna. Most of the country excluding the Chittagong Hill Tracts, the Madhupur Tract (between Dhaka and Mymensingh) and the Barind Tract (mainly in Rajshahi District) is lowland, likely to suffer from floods.

The area of the country is 144,000 sq. km, which makes it twice as large as Sri Lanka but only half as big as Italy. Rivers account for 5.4 percent of the gross land area, leaving 136,167 sq. km as the actual land area, and about 12 percent of the actual land area is forested.

The climate of Bangladesh is a tropical climate, and it is classified into two distinct seasons: the dry season and the monsoon season. The annual rainfall varies from 1100 mm to 3500 mm, and about 80 percent of the total rainfall appears in the monsoon season, sometimes causing serious flooding over large areas of the country. The flooding caused by the monsoon damages houses and crops, and results in the loss of human lives. The major flooding which occurs once every three to five years hinders economic development both directly and indirectly. The problem has been aggravated in the last thirty years by the deforestation of catchment areas in India and Nepal which has increased the rate of run-off and soil erosion. The river beds have been raised, and dredging has become a continuous necessity. The Farakka Barrage on the Ganges, built by India close to the western border of Bangladesh, has also contributed to the problem, causing environmental problems affecting the inland water transport of Bangladesh.

Although the high rainfall and the enormous flow of the large rivers are often considered a hinderance to development, this abundant water, although only seasonal, enables Bangladesh to produce many crops. One-third of the land available for cultivation has good soils, an unusual proportion for any

Fig. 2.1.1  Mean Annual Rainfall

country, and very much higher than the average for tropical
countries. Large areas of tropical lowlands comprise poor
soils which severely restrict crop production, but Bangladesh
is an exception. Moreover, most of Bangladesh has nearly flat
terrain, with only a tenth of the land hilly or mountainous.
With sufficient investment, nearly four-fifths of the country
is potentially suitable for intensive agriculture.


2.2  Demographic Profile


2.2.1  Transition of Population


    According to the second decennial census of Bangladesh
conducted in March 1981 by the Bangladesh Bureau of Statistics,
the population was 87.12 million in that year. However, when
the final results of the census giving detailed data on the
population of the country along with demographic, economic and
social characteristics were published in September 1984, the
total population of the country was estimated as 89.9 million.
The density of the population was 660 persons per sq. km in
1981. The past estimates of population and population density
are given in Table 2.2.1.


Table 2.2.1    Population of Bangladesh, 1901-1981

| Year | Population (millions) | P. Density** (persons/km$^2$) | Growth Rate (p.a.%) |
|------|------|------|------|
| 1901 | 28.9 | 212 | – |
| 1911 | 31.6 | 232 | 0.90 |
| 1921 | 33.3 | 244 | 0.53 |
| 1931 | 35.6 | 261 | 0.67 |
| 1941 | 42.0 | 308 | 1.67 |
| 1951 | 44.2* | 325 | 0.51 |
| 1961 | 55.2* | 405 | 2.25 |
| 1974 | 76.4* | 561 | 2.53 |
| 1981 | 89.9* | 660 | 2.35 |

Source:  Statistical Yearbook of Bangladesh (BBS, 1984/85)
    *:  Adjusted census population
   **:  Net land area deducting the area of rivers

The population of Bangladesh has trebled during this century, and the growth rate has sustained a high level over the last three decades. The reason for the remarkable increase in this period is the moderate decrease of the crude birth rate compared with the abrupt decrease of the crude death rate after the 1950's as shown in Table 2.2.2.

Table 2.2.2    Vital Rates of Population, 1911-1981

| Year | Crude Birth Rate (per 1000 pop) | Crude Death Rate (per 1000 pop) | Natural Increase (%) |
|------|---------------------------------|---------------------------------|----------------------|
| 1911 | 53.8 | 45.6 | 0.82 |
| 1921 | 52.9 | 46.3 | 0.66 |
| 1931 | 50.4 | 41.7 | 0.87 |
| 1941 | 52.7 | 37.8 | 1.49 |
| 1951 | 49.4 | 40.7 | 0.87 |
| 1961 | 51.3 | 29.7 | 2.16 |
| 1974 | 47.4 | 19.4 | 2.80 |
| 1981 | 34.6 | 11.5 | 2.31 |

Source:   Statistical Yearbook of Bangladesh (BBS, 1984/85)
          "Labour force and development" by C.E. Haque, 1985

The drastic reduction of the population growth rate is one of the policies of the Third Five Year Plan (TFYP), and the target population increase is set at 1.8 percent per year with a crude birth rate of 31/1000 and a crude death rate of 13.4/1000 in the year 1990. This represents a steep drop from the 2.4 percent growth rate in 1985.

During the period 1901-1981, the labor force in Bangladesh increased from 9.6 to 24.4 million, while the total population grew from 28.9 to 89.9 million as shown in Table 2.2.3.

Table 2.2.3 Participation Rates and Population, 1901-1981

| Year | Population (millions) | Labor Force (millions) | Participation Rate (%) *1 | Dependency Ratio *2 |
|------|----------------------|------------------------|---------------------------|---------------------|
| 1901 | 28.9 | 9.6 | 33.3 | 2.00 |
| 1911 | 31.6 | 10.0 | 31.6 | 2.16 |
| 1921 | 33.3 | 10.6 | 31.7 | 2.15 |
| 1931 | 35.6 | 9.0 | 25.2 | 2.97 |
| 1941 | 42.0 | – | n.a. | – |
| 1951 | 44.2 | 13.6 | 30.7 | 2.26 |
| 1961 | 55.2 | 18.9 | 34.3 | 1.92 |
| 1974 | 76.4 | 21.9 | 28.7 | 2.48 |
| 1981 | 89.9 | 24.4 | 27.1 | 2.69 |

Source: Statistical Yearbook of Bangladesh (BBS, 1984/85)
     : "Labor force and development" by C.E. Haque, 1985
  *1 : Crude participation rate
  *2 : Ratio of population excluding the labor force to the labor force itself

The average annual exponential growth rate of the labor force was 1.17 percent, which is lower than the 1.43 percent growth rate of the population during the same period. The higher population growth rate has thus pushed up the dependency ratio from 2.00 to 2.69.

However, the overall declining trend in the participation rate can be explained partly in terms of the youthful nature of the age structure and some population characteristics such as the high fertility rate and the lower marriage age. As a result of the high fertility rate together with the relatively closed conditions in terms of emigration, a younger population structure has gradually become dominant which is reflected in the decreased percentage of adults and of the economically active population in the total population.

## 2.2.2 Distribution of Population

The regional population distribution of Bangladesh in 1981 is shown in Table 2.2.4 comprising 20 regional districts. Dhaka shows the highest population density with 1491 persons per sq. km, more than two times the average density, Chittagong H.T. has the lowest density of 60 persons per sq. km, only one-tenth of the average. The regional distribution of population has changed mainly because of internal migration toward urban areas.

Table 2.2.4    Regional Population Distribution in 1981

| District | Population (thousands) | Density* (persons/km$^2$) | Labor Force (thousands) | (% pop) |
|---|---|---|---|---|
| Chittagong | 5664 | 852 | 1644 | 28.8 |
| C.H.T. | 782 | 60 | 242 | 31.0 |
| Comilla | 7103 | 1118 | 1821 | 25.7 |
| Noakhali | 3938 | 903 | 965 | 24.5 |
| Sylhet | 5835 | 469 | 1605 | 27.6 |
| Dhaka | 10340 | 1491 | 3090 | 29.6 |
| Faridpur | 4918 | 767 | 1289 | 26.4 |
| Jamalpur | 2530 | 784 | 666 | 26.1 |
| Mymensingh | 6776 | 717 | 1826 | 27.4 |
| Tangail | 2527 | 780 | 667 | 26.5 |
| Barisal | 4819 | 820 | 1290 | 26.8 |
| Jessore | 4145 | 646 | 1099 | 26.5 |
| Khulna | 4469 | 377 | 1261 | 28.1 |
| Kushtia | 2365 | 724 | 620 | 26.2 |
| Patuakhali | 1897 | 573 | 469 | 26.1 |
| Bogra | 2814 | 740 | 757 | 27.0 |
| Dinajpur | 3300 | 508 | 893 | 27.1 |
| Pabna | 3534 | 790 | 919 | 26.0 |
| Rajshahi | 5440 | 586 | 1465 | 27.0 |
| Rangpur | 6716 | 728 | 1766 | 26.3 |
| Bangladesh | 89912 | 660 | 24381 | 27.1 |

Source:  Statistical Yearbook of Bangladesh (BBS, 1984/85)
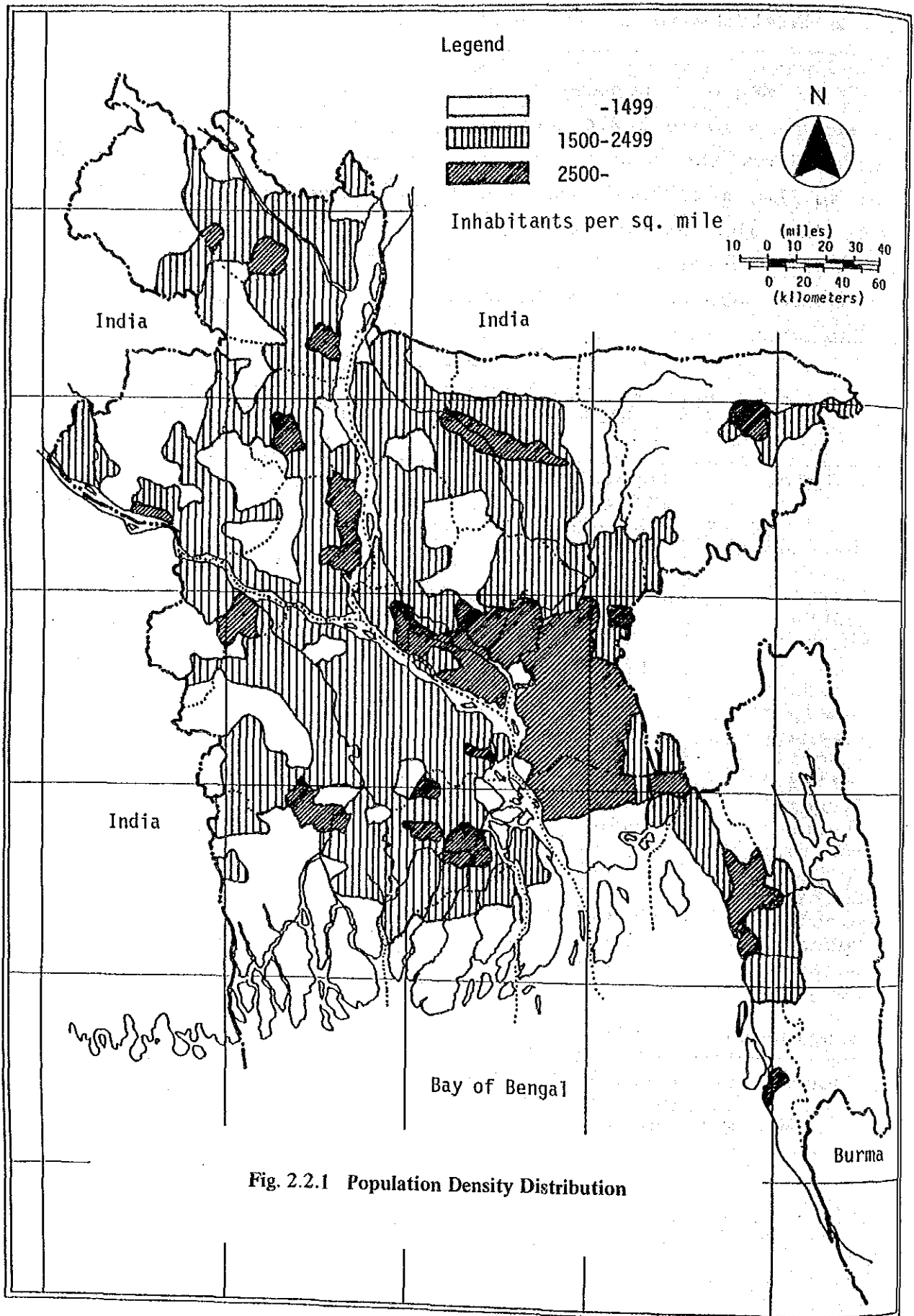        Outline National Physical Plan (M. of Works, 1985)
   *:  Net land area

Legend

| | |
|---|---|
| ▱ | -1499 |
| ▥ | 1500-2499 |
| ▨ | 2500- |

Inhabitants per sq. mile

N

(miles)
10 0 10 20 30 40

0 20 40 60
(kilometers)

India

India

India

Bay of Bengal

Burma

**Fig. 2.2.1  Population Density Distribution**

## 2.3 Economic Profile

### 2.3.1 Economic Activity

The Gross Domestic Product (GDP) of Bangladesh in 1983/84 is 349,922 million Taka, and GDP per capita is estimated as 3,606 Taka (US$ 144). According to the World Bank Annual Report, Bangladesh belongs to the group of low income countries including Chad, Ethiopia, Nepal and Mali. The annual sectoral GDP at constant 1983/84 prices is shown in Table 2.3.1, the sectoral shares of GDP are shown in Table 2.3.2, and the growth rates are presented in Table 2.3.3.

The economy of Bangladesh is dominated by the agricultural sector, although the share of the agricultural sector in GDP has steadily declined from some 60 percent in 1972/73 to an estimated 48 percent in 1984/85. Other sectors have gradually increased, and the increased share of the service sector in GDP reflects the movement of the population into urban areas. The industrial sector showed a sharp increase in the short period after Bangladesh gained independence because of the emphasis which was placed on the rehabilitation and the reconstruction of the national economy. The share of the industrial sector expanded to over 9 percent in 1978/79 and this share was sustained during the early 1980's. However, the industrial share decreased slightly after 1983/84. The construction and the transport sectors increased their shares in the late 1970's, and have since remained near the same level, fluctuating slightly.

Table 2.3.1  Sectoral GDP at Constant 1983/84 Prices

(million Taka)

| Sector | 1972/73 | 73/74 | 74/75 | 75/76 | 76/77 | 77/78 | 78/79 | 79/80 | 80/81 | 81/82 | 82/83 | 83/84 | 84/85 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Agriculture | 117040 | 131332 | 143998 | 138500 | 133622 | 152292 | 157232 | 151449 | 150073 | 149130 | 158543 | 169328 | 174978 |
| 2 Mining | 4 | 6 | 4 | 5 | 5 | 5 | 17 | 14 | 4 | 7 | 4 | 4 | 4 |
| 3 Industry | 12982 | 13497 | 15341 | 19742 | 21704 | 22172 | 27248 | 29769 | 31489 | 31459 | 32754 | 30945 | 31260 |
| 4 Construction | 6857 | 9174 | 10376 | 13319 | 14554 | 14867 | 16623 | 14169 | 18028 | 19416 | 17536 | 18095 | 19036 |
| 5 Power | 583 | 377 | 240 | 457 | 579 | 592 | 821 | 932 | 1025 | 1174 | 1681 | 1939 | 2204 |
| 6 Transport | 9650 | 9816 | 8154 | 15227 | 18223 | 18126 | 16432 | 17536 | 25249 | 27978 | 29228 | 26013 | 24687 |
| 7 Trade | 17170 | 20595 | 20114 | 25959 | 26025 | 26812 | 26909 | 28992 | 28661 | 27029 | 27018 | 28513 | 31859 |
| 8 Housing | 11005 | 12943 | 13484 | 21606 | 20110 | 19925 | 22102 | 23956 | 24415 | 23960 | 22768 | 24867 | 24850 |
| 9 Public Adm. | 4256 | 5706 | 4507 | 6812 | 8396 | 8350 | 6139 | 6440 | 11209 | 11557 | 12048 | 13984 | 16086 |
| 10 Banking | 2507 | 2066 | 1852 | 2353 | 2511 | 2498 | 3921 | 4720 | 5966 | 5130 | 5065 | 5152 | 5391 |
| 11 Others | 14798 | 15437 | 10048 | 14787 | 17283 | 18952 | 20007 | 23371 | 25456 | 27694 | 29707 | 31082 | 31234 |
| Bangladesh | 196852 | 220949 | 228115 | 258766 | 263013 | 284589 | 297451 | 301347 | 321574 | 324534 | 336550 | 349922 | 361587 |

Source : Statistical Yearbook of Bangladesh (BBS. 1979 and 1984/85)


Table 2.3.2  Sectoral Share of GDP (in percent) at Constant 1983/84 Prices

| Sector | 1972/73 | 73/74 | 74/75 | 75/76 | 76/77 | 77/78 | 78/79 | 79/80 | 80/81 | 81/82 | 82/83 | 83/84 | 84/85 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Agriculture | 59.5 | 59.4 | 63.1 | 53.5 | 50.8 | 53.5 | 52.9 | 50.3 | 46.7 | 46.0 | 47.1 | 48.4 | 48.4 |
| 2 Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 Industry | 6.6 | 6.1 | 6.7 | 7.6 | 8.3 | 7.8 | 9.2 | 9.9 | 9.8 | 9.7 | 9.7 | 8.8 | 8.6 |
| 4 Construction | 3.5 | 4.2 | 4.5 | 5.1 | 5.5 | 5.2 | 5.6 | 4.7 | 5.6 | 6.0 | 5.2 | 5.2 | 5.3 |
| 5 Power | 0.3 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.4 | 0.6 | 0.6 | 0.6 |
| 6 Transport | 4.9 | 4.4 | 3.6 | 5.9 | 6.9 | 6.4 | 5.5 | 5.8 | 7.9 | 8.6 | 8.7 | 7.4 | 6.8 |
| 7 Trade | 8.7 | 9.3 | 8.8 | 10.0 | 9.9 | 9.4 | 9.0 | 9.6 | 8.9 | 8.3 | 8.0 | 8.1 | 8.8 |
| 8 Housing | 5.6 | 5.9 | 5.9 | 8.3 | 7.6 | 7.0 | 7.4 | 7.9 | 7.6 | 7.4 | 6.8 | 7.1 | 6.9 |
| 9 Public Adm. | 2.2 | 2.6 | 2.0 | 2.6 | 3.2 | 2.9 | 2.1 | 2.1 | 3.5 | 3.6 | 3.6 | 4.0 | 4.4 |
| 10 Banking | 1.3 | 0.9 | 0.8 | 0.9 | 1.0 | 0.9 | 1.3 | 1.6 | 1.9 | 1.6 | 1.5 | 1.5 | 1.5 |
| 11 Others | 7.5 | 7.0 | 4.4 | 5.7 | 6.6 | 6.7 | 6.7 | 7.8 | 7.9 | 8.5 | 8.8 | 8.9 | 8.6 |
| Bangladesh | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source : Statistical Yearbook of Bangladesh (BBS. 1979 and 1984/85)

Table 2.3.3   Annual Growth Rates at Constant 1983/84 Prices

| Sector | 1972/73 | 73/74 | 74/75 | 75/76 | 76/77 | 77/78 | 78/79 | 79/80 | 80/81 | 81/82 | 82/83 | 83/84 | 84/85 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Agriculture | ---- | 12.2 | 9.6 | -3.8 | -3.5 | 14.0 | 3.2 | -3.7 | -0.9 | -0.6 | 6.3 | 6.8 | 3.3 |
| 2 Mining | ---- | 41.1 | -42.1 | 31.9 | 3.8 | -3.6 | 256.3 | -20.4 | -69.8 | 77.7 | -52.3 | 14.3 | -9.1 |
| 3 Industry | ---- | 4.0 | 13.7 | 28.7 | 9.9 | 2.2 | 22.9 | 9.3 | 5.8 | -0.1 | 4.1 | -5.5 | -1.0 |
| 4 Construction | ---- | 33.8 | 13.1 | 28.4 | 9.3 | 2.2 | 11.8 | -14.8 | 27.2 | 7.7 | -9.7 | 3.2 | 5.2 |
| 5 Power | ---- | -35.4 | -36.3 | 90.3 | 26.8 | -0.5 | 38.7 | 13.5 | 10.0 | 14.5 | 60.2 | 3.1 | 13.6 |
| 6 Transport | ---- | 1.7 | -16.9 | 86.7 | 19.7 | -0.5 | -9.3 | 6.7 | 44.0 | 10.8 | 4.5 | -11.0 | -5.1 |
| 7 Trade | ---- | 19.9 | -2.3 | 29.1 | 0.3 | -3.0 | 0.4 | 7.7 | -1.1 | -5.7 | -0.0 | 5.5 | 11.7 |
| 8 Housing | ---- | 17.6 | 4.2 | 60.2 | -6.9 | -0.9 | 10.9 | 8.4 | -1.9 | -1.9 | -5.0 | 9.2 | -0.1 |
| 9 Public Adml. | ---- | 34.1 | -21.0 | 51.1 | 23.3 | -0.5 | -26.5 | 4.9 | 74.1 | 3.1 | 4.2 | 16.1 | 15.0 |
| 10 Banking | ---- | -17.6 | -10.4 | 27.1 | 6.7 | -0.5 | 57.0 | 20.4 | 26.4 | -14.0 | -1.3 | 1.7 | 4.6 |
| 11 Others | ---- | 4.3 | -34.9 | 47.2 | 16.9 | 9.7 | 5.6 | 16.8 | 8.9 | 8.8 | 7.3 | 4.6 | 0.5 |
| Bangladesh | ---- | 12.2 | 3.2 | 13.4 | 1.6 | 8.2 | 4.5 | 1.3 | 6.7 | 0.9 | 3.7 | 4.0 | 3.3 |

Source : Statistical Yearbook of Bangladesh (BBS, 1979 and 1984/85)


Table 2.3.4   Average Growth Rates at Constant 1983/84 Prices

| Sector | 1972/73 | 77/78 | 79/80 | 84/85 |
|---|---|---|---|---|
| 1 Agriculture | | 5.4 | -0.3 | 2.9 |
| 2 Mining | | 1.5 | 68.4 | -23.3 |
| 3 Industry | | 11.3 | 15.9 | 1.0 |
| 4 Construction | | 16.7 | -2.4 | 6.1 |
| 5 Power | | 0.3 | 25.5 | 18.8 |
| 6 Transport | | 13.4 | -1.6 | 7.1 |
| 7 Trade | | 9.3 | 4.0 | 1.9 |
| 8 Housing | | 12.6 | 9.6 | 0.7 |
| 9 Public Adml. | | 14.4 | -12.2 | 20.1 |
| 10 Banking | | -0.1 | 37.5 | 2.7 |
| 11 Others | | 5.1 | 11.0 | 6.0 |
| Bangladesh | | 7.7 | 2.9 | 3.7 |

Source : Statistical Yearbook of Bangladesh (BBS, 1979 and 1984/85)

## 2.3.2 Industrial Structure

The agricultural sector accounts for 48 percent of the GDP (1984/85). However, more than 58 percent of the total employees are engaged in this sector. This obviously means that the productivity of the agricultural sector is much lower than the average productivity. The main agricultural products are rice, with 3 growing seasons called Aman, Aus and Boro, and jute as a cash crop. These crops sometimes suffer from poor weather conditions. The planted area of these two crops varies somewhat depending on relative market prices. Despite making efforts to introduce fertilizer, irrigation systems and high yield seeds for increasing food production, Bangladesh does not produce enough cereal crops to feed the population, and is obliged to import staple cereals.

The industrial sector accounts for about 9 percent of the GDP and employs some 8 percent of the total employed population. In the period following independence, some nationalized large-scale corporations led the industrial sector. However, after the inauguration of the New Industry Policy in 1982, a large number of nationalized enterprises have been turned over to the private sector, and private investment has been emphasized.

The three major manufacturing industries of Bangladesh are food manufacturing, textiles, and chemicals and chemical products, and these three industries account for 82 percent of the total manufacturing industry employment and 50 percent of the total manufacturing gross value added. The leading industrial products are jute goods, of which Bangladesh is the world's largest exporter. However, jute goods have been facing increasing competition from synthetics and other substitutes on the world market. The main chemical product, fertilizer, has become a major product with the assistance of the government in an effort to improve the productivity of the agricultural sector.

## 2.3.3 Foreign Trade

The export structure of Bangladesh is mainly based on agriculture. Raw jute, jute goods, teas, leather and fish are the principal export items which contribute most of the export earnings of Bangladesh. On the other hand, because of rapid population growth, the country is forced to import food, and for industrial development it is mostly dependent on imports for capital goods and for materials for capital goods.

The balance of trade of Bangladesh has shown a rapidly growing deficit for more than a decade as shown in Table 2.3.5. Raw jute and jute goods, the principal export earners, are suffering a serious setback on the international market due to the relatively low prices of their synthetic substitutes. The reduced demand for these goods has resulted in reduced export earnings. On the other hand, the higher prices of machinery and other capital goods have also contributed to the trade gap. Furthermore, the increased food deficit and the high price of food on the international market make the balance of payments still worse.

Table 2.3.5    Balance of Trade of Bangladesh (in mill. TK)

| Year | Exports | Imports | Balance |
|------|---------|---------|---------|
| 1960/61 | 1259 | 1014 | 245 |
| 1961/62 | 1031 | 873 | 428 |
| 1962/63 | 1249 | 1019 | 230 |
| 1963/64 | 1224 | 1449 | -225 |
| 1964/65 | 1268 | 1702 | -434 |
| 1965/66 | 1514 | 1328 | 186 |
| 1966/67 | 1575 | 1567 | 8 |
| 1967/68 | 1484 | 1328 | 156 |
| 1968/69 | 1543 | 1945 | -402 |
| 1969/70 | 1670 | 1813 | -143 |
| 1970/71 | 1251 | 1575 | -324 |
| 1971/72 | - | - | - |
| 1972/73 | - | - | - |
| 1973/74 | 2983 | 7320 | -4337 |
| 1974/75 | 3136 | 10842 | -7706 |
| 1975/76 | 5552 | 14703 | -9151 |
| 1976/77 | 6670 | 13993 | -7323 |
| 1977/78 | 7178 | 18216 | -11038 |
| 1978/79 | 9632 | 22073 | -12441 |
| 1979/80 | 10997 | 30525 | -19528 |
| 1980/81 | 11484 | 37288 | -25804 |
| 1981/82 | 12387 | 38729 | -26342 |
| 1982/83 | 18016 | 45265 | -27249 |
| 1983/84 | 20136 | 50874 | -30738 |
| 1984/85 | 26005 | 63033 | -37028 |

Source:   Foreign Trade Statistics of Bangladesh (BBS, 1985)
          Statistical Yearbook of Bangladesh (BBS, 1984/85)

## 2.4  Inland Transportation Network

The transport system of Bangladesh comprises railways, roads and inland water transport. During British rule, the main base of transport was the port of Calcutta, and the inland water transport system played an important role in the regional transportation. The railway network has been developed since the latter half of the 1800's. However, the road network is still insufficient.

The inland transportation system was developed prior to the War of Liberation through efforts to expand the road network, to build bridges, river ports and railway stations, and to link these different transport modes. However, the war damaged the bridges, rail track, rolling stock, ships and ports. Thereafter, the new government made efforts to rebuild the transportation system with massive investment resulting in transportation infrastructures which greatly contribute to economic development. At the same time, major efforts were made to improve the operations and financial performance of public transport agencies.

Although there is a lack of data concerning transport, Bangladesh Bureau of Statistics does provide cargo movement statistics in its Yearbook. A summary of the value added in the major transportation sectors is shown in Table 2.4.1, and the total movement of goods is shown in Table 2.4.2.

Table 2.4.1    Value Added by Transport Mode at Current Prices

(in million Taka)

| Sector | 1980/81 | 1981/82 | 1982/83 | 1983/84 | 1984/85* |
|---|---|---|---|---|---|
| Railway | 442 (2.5) | 508 (2.3) | 587 (2.4) | 632 (2.6) | 777 (3.0) |
| Organized Road Trans. | 2343 (13.2) | 2979 (13.5) | 3637 (15.0) | 3726 (15.0) | 4092 (15.9) |
| Unorganized Road Trans. | 8189 (46.2) | 10492 (47.5) | 10985 (45.5) | 11227 (45.2) | 11473 (44.7) |
| Organized Water Trans. | 1179 (6.7) | 1268 (5.7) | 1430 (5.9) | 1449 (5.8) | 1505 (5.9) |
| Unorganized Water Trans. | 5566 (31.4) | 4849 (31.0) | 7533 (31.2) | 7740 (31.3) | 7812 (30.5) |
| Total | 17724 | 22096 | 24172 | 24774 | 25659 |

Source:  Statistical Yearbook of Bangladesh (BBS, 1984/85)
  Note:  Figures in parentheses show percentages
    *:  Provisional


Table 2.4.2   The Movement of Goods by Mode (thousand tons)

| Sector | 1980/81 | 1981/82 | 1982/83 | 1983/84 | 1984/85* |
|---|---|---|---|---|---|
| Railway | 2937 (3.8) | 3179 (3.9) | 2998 (3.6) | 2939 (3.4) | 2961 (3.3) |
| Organized Road Trans. | 15017 (19.9) | 15955 (19.5) | 16018 (19.1) | 16479 (19.1) | 16908 (19.0) |
| Unorganized Road Trans. | 45673 (58.2) | 47406 (57.8) | 49288 (58.6) | 49831 (57.8) | 51843 (58.4) |
| Organized Water Trans. | 4095 (5.2) | 4590 (5.6) | 4791 (5.7) | 4652 (5.4) | 4700 (5.3) |
| Unorganized Water Trans. | 10780 (13.7) | 10848 (13.2) | 10964 (13.0) | 12306 (14.3) | 12443 (14.0) |
| Total | 78502 | 81978 | 84059 | 86207 | 88855 |

Source:  Statistical Yearbook of Bangladesh (BBS, 1984/85)
  Note:  Figures in parentheses show percentages
    *:  Provisional

The total foreign trade cargo handled at the two major seaports, Chittagong and Chalna, was 7.9 million tonnes in 1983/84, of which Chittagong handled 6.1 million tonnes including 5.7 million tonnes of imports and 0.4 million tonnes of exports, and Chalna handled 1.8 million tonnes including 1.1 and 0.7 million tonnes of imports and exports, respectively.

There is not much data available concerning the relation between domestic overland transportation modes and the foreign trade cargo handled at these two seaports. According to BIWTA's annual reports, the share of imported dry cargo carried from these ports to the hinterland by transportation mode is estimated as follows:

| Port | Road | Water | Rail | Total |
|------|------|-------|------|-------|
| Chittagong | 1855 (57%) | 776 (24%) | 607 (19%) | 3238 |
| Chalna | 327 (29%) | 640 (58%) | 149 (13%) | 1116 |
| Total | 2182 (50%) | 1416 (33%) | 756 (17%) | 4354 |

Source: Annual Ports and Traffic Report (BIWTA, 1982/83)
Note: Figures in thousand tons

2.4.1 Inland Water Transportation

The inland waterways play an important role in the transportation of goods and passengers along the 13,623 km national river network. The total navigable length of inland waterways is 8,384 km: 5,192 km can be used year-round and an additional 2,993 km can be used in certain seasons as of 1982. The main routes are shown in Fig. 2.4.1.

Although the country has a great many rivers, the total length of navigable waterways in the dry season has been

decreasiang due to siltation and to the withdrawal of water from the inland waterways for irrigation. The total length of waterways more than 6 feet in depth declined from 3,638 km in 1973 to 1,340 km in 1979.

The dependency on inland water transport historically has been high, and it is estimated that about 65 percent of the total transportation of cargo and 38 percent of the passenger traffic in the country are carried by the inland waterways (Bangladesh Economic Survey, 1984/85). The main artery of the export goods which are mainly raw jute and jute goods is the Narayanganj to Chalna, and the main artery for import goods including food grains, cement, petroleum products and general cargo is the Chittagong to Dhaka.

The organized and unorganized parts of water transport together account for 37 percent of the value added in the transport sector. The organized part contributes 6 percent and the unorganized part 31 percent. The total number of registered vessels in the organized part is 3161 in 1982/83 including 2270 mechanized and 891 non-mechanized with a carrying capacity of 478,152 tonnes of cargo and 142,904 passengers. These vessels carried 48.7 million passengers and 3.8 million tonnes of cargo in 1982/83 (Annual Ports & Traffic Reports, 1982/83). The mechanized portion of the private sector carried 64 percent of the total dry cargo and 77 percent of the petroleum products in the same period. Bangladesh Inland Water Transport Corporation (BIWTC), which is the public inland water transport sector, operated 535 vessels including passenger vessels, and carried an estimated 1.4 million tons of cargo and 4.7 million passengers in 1984/85. As for the unorganized water transport fleet comprised of country boats, there were an estimated 100,000 cargo boats and 186,000 passenger boats in 1983/84 (Statistical Yearbook, 1984/85), providing a livelihood for a great number of small-scale, local operators.
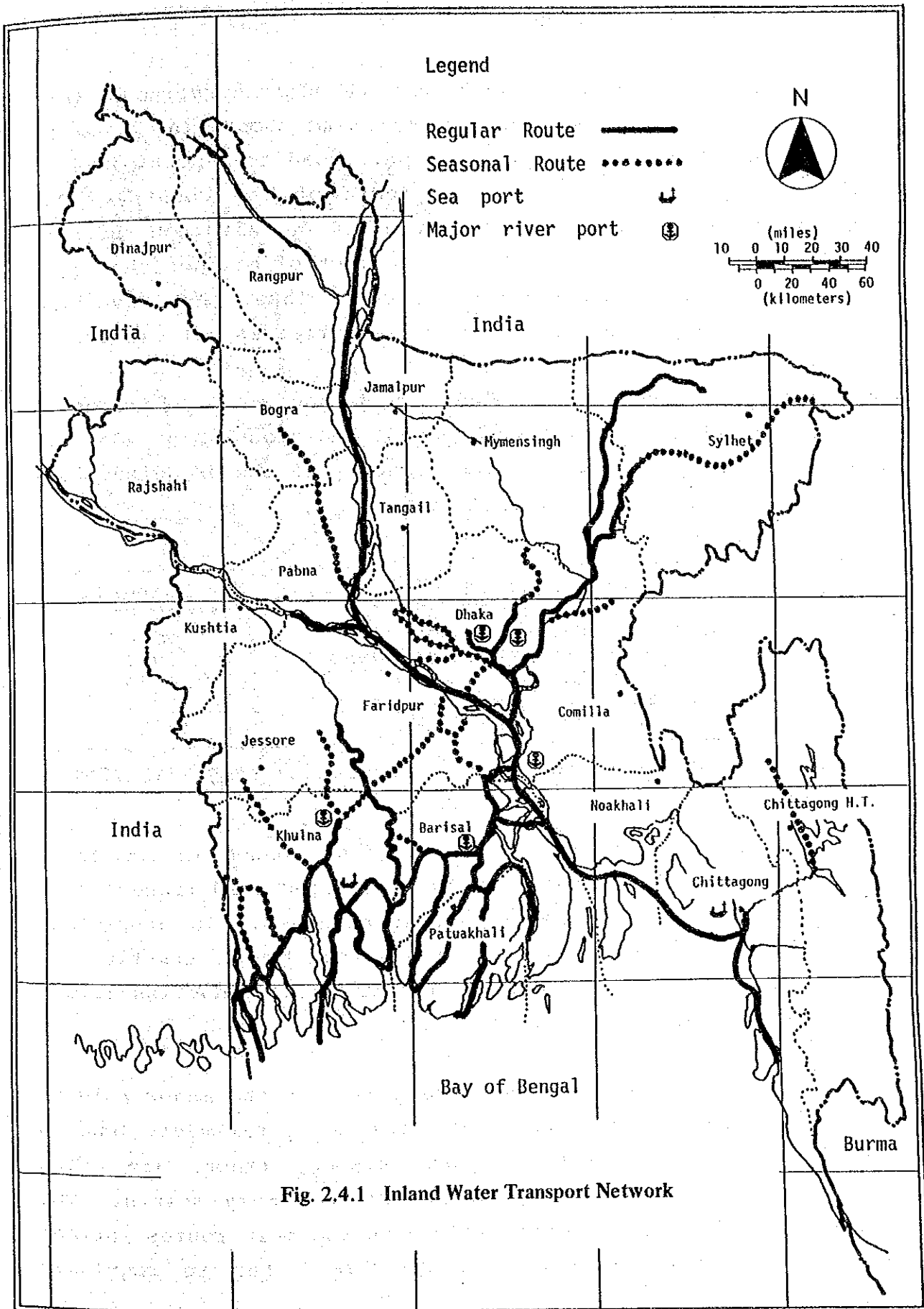
**Fig. 2.4.1 Inland Water Transport Network**

Legend

Regular Route ━━━━━
Seasonal Route ●●●●●●
Sea port
Major river port

N

(miles)
10 0 10 20 30 40
0 20 40 60
(kilometers)

Dinajpur
Rangpur
India
India
Jamalpur
Bogra
Mymensingh
Sylhet
Rajshahi
Tangail
Pabna
Dhaka
Kushtia
Faridpur
Comilla
Jessore
India
Khulna
Barisal
Noakhali
Chittagong H.T.
Patuakhali
Chittagong
Bay of Bengal
Burma

## 2.4.2   Road Transportation

The total length of roads under the administration of the Roads and Highways Department is 8,515 km comprising 5,494 km of high type and 3,112 km of low type.  Road transport plays an important role in the economic growth of the country.  The major road network is shown in Figure 2.4.2.  Although the road network is well distributed, due to a lack of bridges the roads are often discontinuous in river areas.  Thus, the travelling time is too long, and the flow of commodities is not smooth.

Together, the organized and the unorganized road transport sectors contribute about 60 percent of the gross value added in the total transport sector.  The capacity of the organized road transport in 1983/84 is as follows:

| Classification | Numbers |
|---|---|
| Public and Private buses | 7918 |
| Small buses and station wagons | 3911 |
| Taxis | 1226 |
| Auto-rickshaws | 13217 |
| Public and Private trucks | 14738 |

Source:   Statistical Yearbook of Bangladesh (BBS, 1984/85)

The majority of trucks and buses are based in the large cities, and the main artery for the organized road transport is Dhaka-Chittagong with some important branches.   In accordance with the development of industry, the truck traffic has increased on the routes passing through main production areas, consumer areas and the trade ports.

The major routes and their branches play the major role in inland transportation, partly supplemented by railways.  Due to the difficulty of getting return cargoes, trucks are often overloaded in order to compensate for the empty return.  The increase of the total traffic volume on the main routes further exacerbates this problem.  The Department has to regularly
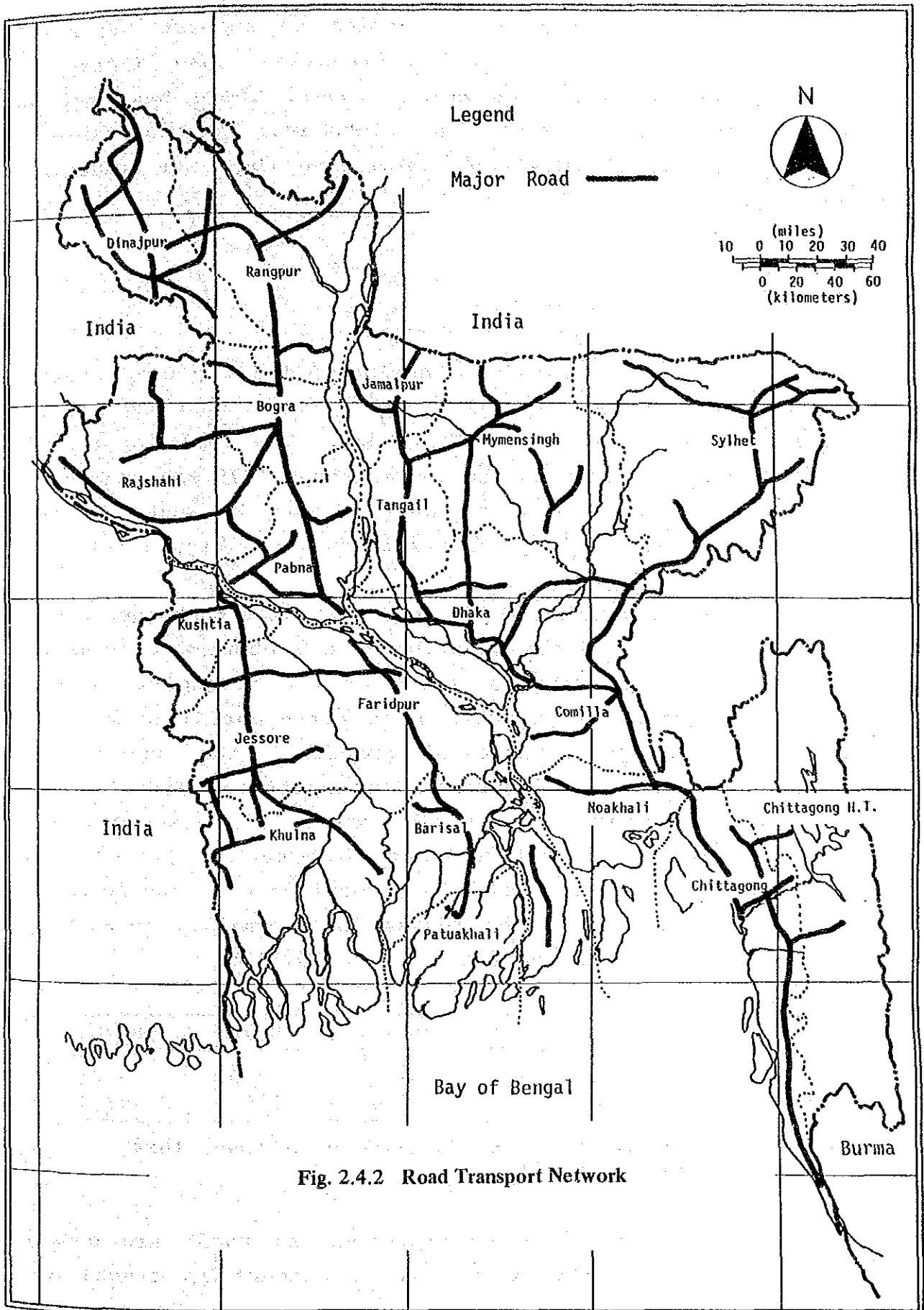
**Fig. 2.4.2 Road Transport Network**

improve and maintain the road arteries to support the road transportation. The so-called unorganized road transport sector depends on human and animal power. There has been a large increase in the number of rickshaws, causing further congestion in urban areas and diminishing the road transport efficiency.


2.4.3  Railway Transportation

As of the end of 1983/84, Bangladesh Railway has a total of 517 stations comprising 259 in the eastern zone and 258 in the western zone, spread over 2,892 km. The railways are of two gauges: broad gauge in the western zone (979 km) and meter gauge in the east and west zones (1,367 km and 546 km, respectively). The railway network is shown in Figure 2.4.3.

The railway network has remained virtually unchanged since 1973. Though the railways contribute only about 3 percent of the value added and cargo movement of the transport sector, they are an indispensible part of the transport system. The railways are the major arteries of commerce in the non-riverine areas, and are also an important transportation link between Dhaka and Chittagong. The total number of passengers and freight carried by the railways was 98.9 million persons and 2.9 million tonnes in 1983/84. In comparison with the increase of passengers, total freight tonnage has remained relatively constant at about 3 million tonnes since 1975/76.

|  | 1880/81 | 1981/82 | 1982/83 | 1983/84 |
|---|---|---|---|---|
| Freight (tons) | 2.98 | 3.23 | 3.00 | 2.94 |
| Passengers | 89.3 | 90.4 | 105.6 | 98.9 |

Source:  Information Book (Bangladesh Railway, 1984)
Note:  Figures in millions

Lacking a good river network, and as roads are poorly utilized due to a lack of private investment in trucks and
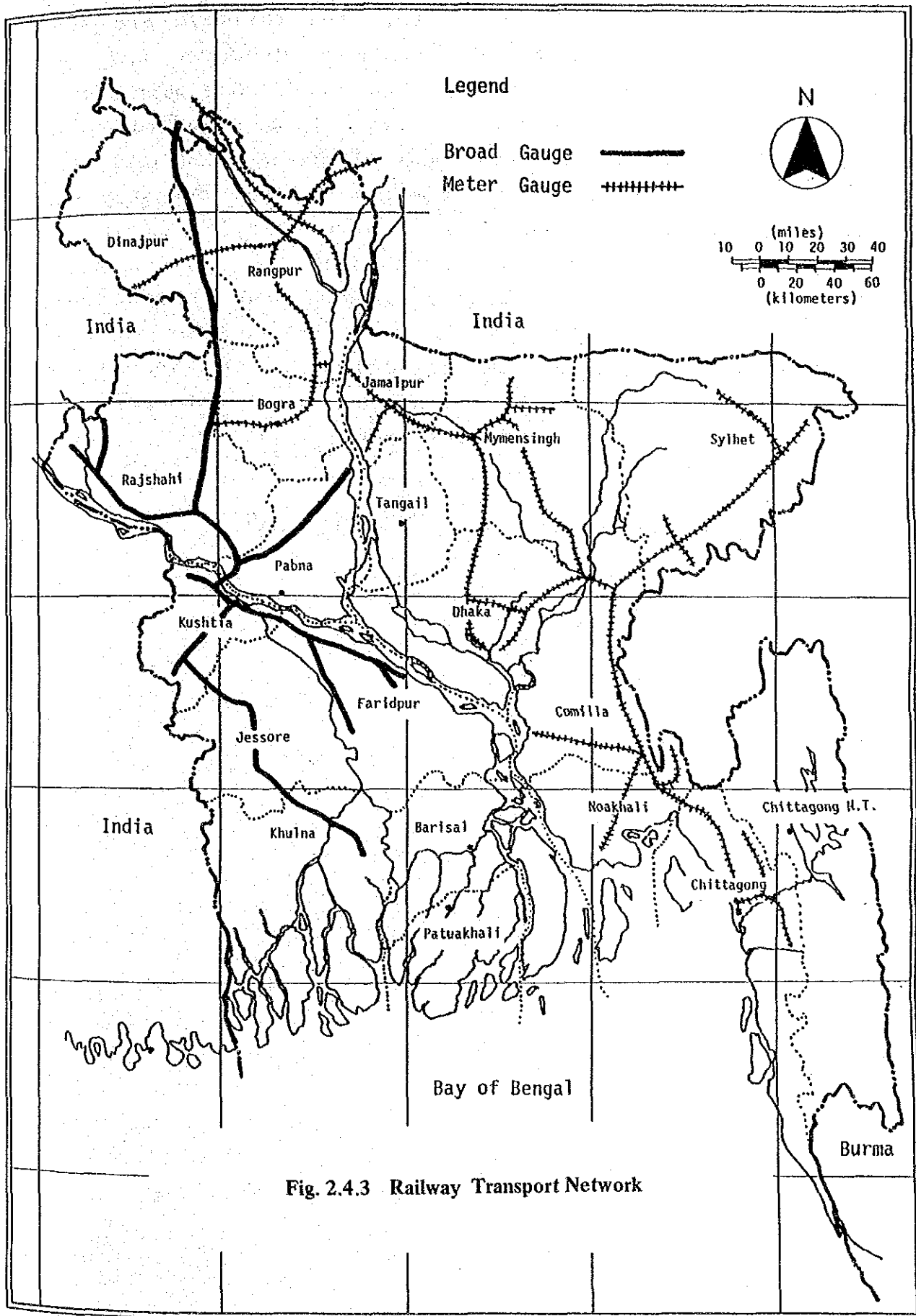
Fig. 2.4.3 Railway Transport Network

buses in some parts of the country, the railways are major lifelines of the economy. Bangladesh Railways has been suffering from various operating bottlenecks. One main problem is that the railway system is not of a standard gauge, necessitating frequent transshipment of goods, Similarly, due to a lack of bridges, transshipment is also necessary when crossing rivers. Passenger and wagon ferry services are operated between Bahadurabad and Tistamukhghat, and passenger service is operated between Jagannathganj and Sirajganjghat. These ghat stations are occasionally shifed due to heavy siltation and erosion of the river banks. The increase of ticketless passengers also hinders the improvement of operations from the financial viewpoint.

# CHAPTER 3

## OUTLINE OF THE

## DHAKA-NARAYANGANJ

## METROPOLITAN AREA

# CHAPTER 3 OUTLINE OF THE DHAKA-NARAYANGANJ METROPOLITAN AREA

## 3.1 General Features

### 3.1.1 Location and Area

The Dhaka-Narayanganj Metropolitan Area (hereinafter referred to as "DNMA") is located at the center of the Dhaka Region, and its area is about 900 sq. km. This area comprises the Dhaka Statistical Metropolitan Area, which was demarcated by the BBS in connection with the 1981 population census, and the adjoining rural areas where urbanization will progress over the next twenty years. From the standpoint of the administrative structure, DNMA includes the Dhaka Municipal Corporation (hereinafter referred to as "DMC"), the Dhaka Cantonment Board, the Municipalities of Narayanganj and Tongi, the Thanas of Demra, Gulshan, Keraniganj (part), Lalbag, Mirpur, Tongi, Narayanganj and Siddhirganj, and the Upazilas of Joydebpur (part), Savar (part), Bandar, Fatulla, Sonargaon (part) and Rupganj (part) (see Fig. 3.1.1).

### 3.1.2 Background

As an administrative center, Dhaka dates back to the 7th century when Bikranpur, located near the present Dhaka, was the capital of Bengal. After the reign of the Moghul dynasty, Dhaka was made the capital of East Bengal and Assam in 1906 under the British rule. In 1947 when India was partitioned, Dhaka became the second capital of Pakistan. After independence in 1971, Dhaka became the capital of the People's Republic of Bangladesh.

Since 1971, Dhaka has experienced a tremendous growth of population, business and industry, and the entire area from Narayanganj in the southeast to Tongi and Savar in the north and northwest has become urbanized.
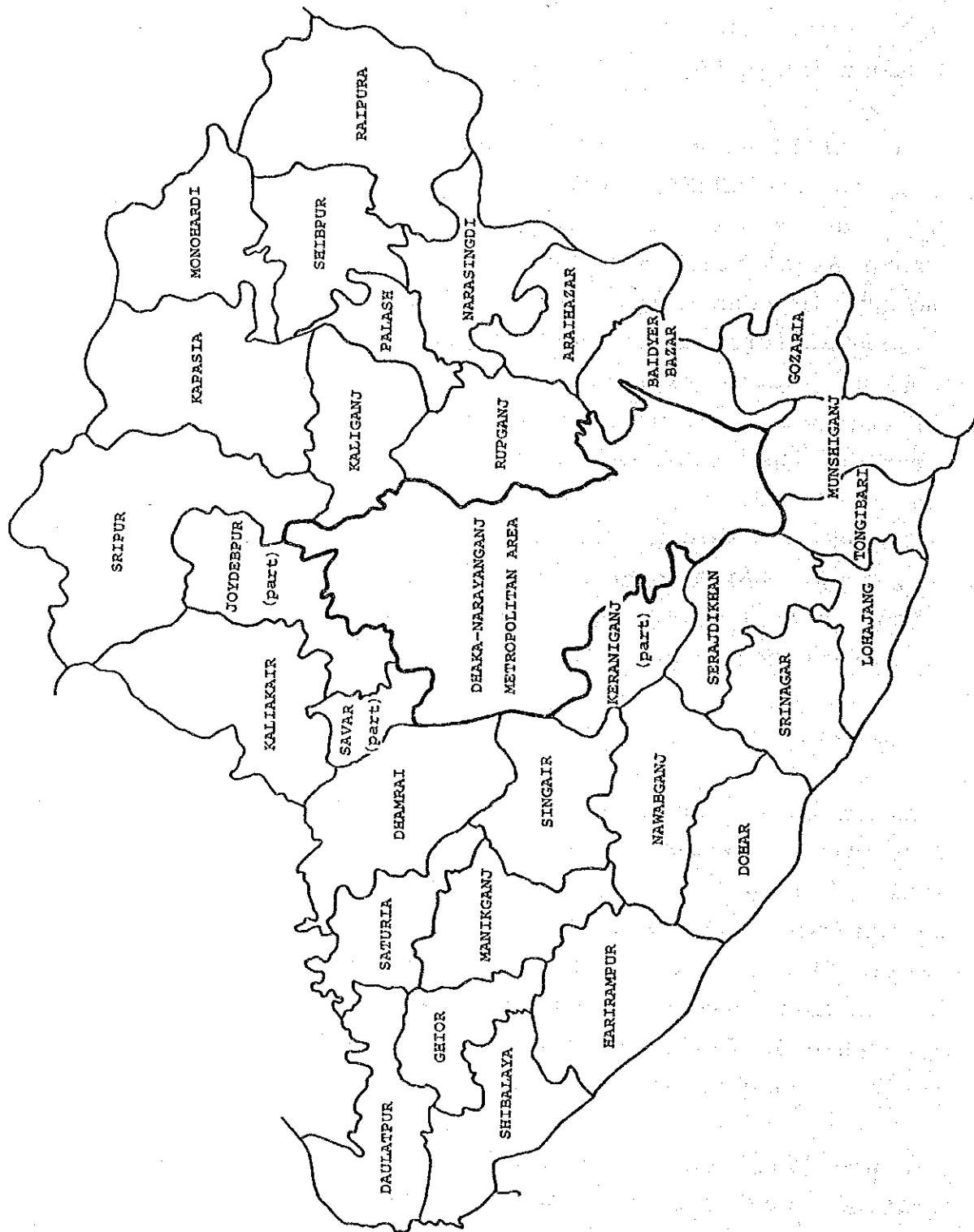
Fig. 3.1.1 Location of DNMA

## 3.1.3 Natural Conditions

The urbanized area in DNMA is situated on a slightly elevated area between the Buriganga/Turag rivers on the west and the Lakhya/Balu rivers on the east. On the whole, the land elevation of DNMA is higher in the north and lower in the south.

The so-called DND Triangle which is located between Dhaka, Narayanganj, and Keraniganj and extends over the west bank of the Buriganga is a vast lowlying area frequently inundated by flooding during the rainy season.

This area is located in the tropical belt. The maximum and minimum temperatures recorded at Dhaka Airport are 43 degrees C and 5 degrees C, respectively, with an average of 26 degrees C. The climate is fairly pleasant from November to February. The annual maximum and minimum rainfall recorded are 2,633 mm and 1,197 mm, and the average annual rainfall is 1,884 mm.

## 3.2 Population

### 3.2.1 Population Growth

Since Bangladesh became independent, two population censuses have been conducted: one in 1974 and the other in 1981. Successful census taking in Bangladesh is a rather difficult task because of the high population density and low literacy rate. The population as presented in Table 3.2.1 is adjusted for under-count: 6.9% for 1974 and 3.2% for 1981.

Table 3.2.1  Population and Population Growth Rate of
Bangladesh, Dhaka Region and DNMA,
1974 and 1981

(thousand persons)

|  | 1974 | 1981 | Annual Growth Rate (%) |
|---|---|---|---|
| Bangladesh | 76,398 | 89,912 | 2.35 |
| Dhaka Region | 8,135 | 10,340 | 3.49 |
| DNMA | 2,870 | 4,206 | 5.61 |
| Rest of D.R. | 5,265 | 6,134 | 2.21 |
| DNMA as a % of BD | 3.8 | 4.7 | |
| DNMA as a % of D.R. | 35.3 | 40.7 | |

Source:  BBS

The population of DNMA increased from 2.9 million in 1974 to 4.2 million in 1981 at an annual growth rate of 5.61%. As a result, the share of the population of DNMA rose from 35.3% to 40.7 of the Dhaka Region, and from 3.8% to 4.7% of the nation. The population growth rate of the Dhaka Region outside DNMA was 2.21%, less than the national average. Considering that the national growth rate is almost the same as the natural increase rate, this growth rate lower than the national average implies a substantial net out-migration.

On the other hand, the population of DNMA recorded a high growth due to the migration of many persons into Dhaka and Narayanganj. These persons moved into DNMA from the outlying areas of the Dhaka region and from other regions throughout the nation.

3.2.2  Age-Sex Composition

Comparing the age-sex composition of Bangladesh with those of other countries, both the sex ratio (the number of males to 100 females) and the dependency ratio (the ratio of children and elderly to working age population) are high.

The sex ratio of Bangladesh is 106.  India, Pakistan and

Sri Lanka also have high sex ratios. The low status of females in these nations may contribute to their under-reporting resulting in statistically high sex ratios. Higher female mortality rates may also contribute to the high sex ratios. In Bangladesh, in the age group 65 years and over, there are many more males than females. In most other countries, there are more elderly females than males due to higher male mortality rates. The Bangladesh statistics may indicate higher female mortality rates, under-reporting of older females, misreporting of women who are actually 65 years old or older as being below 65, or any combination of these factors.

The dependency ratio in Bangladesh is 100. Both Bangladesh and Pakistan have high dependency ratios due to the high composition of child age population.

The age-sex composition of DNMA varies somewhat from the national average. This is because many single working-age males migrate into DNMA to seek better educational and employment opportunities, and because the birth rate in DNMA is relatively low. Specifically:

a) The ratio of children and elderly people is relatively low and the ratio of working age people is relatively high compared with the national average. Hence the dependency ratio is only 71 compared with the national average of 100. However, compared with other countries the ratio of 71 is quite high - basically equal to the national average dependency ratio in India. Furthermore, as many of the workers in DNMA actually send a substantial part of their earnings to their families who reside in villages outside DNMA, the dependency burden on the working age population is quite heavy.

b) Within DNMA, due to the large number of working-age males, the sex ratio is 139 compared with the national

average of 106.  Again, it seems that single men are concentrating in DNMA due to the perceived educational and employment opportunities.

The age-sex composition of Bangladesh and of DNMA are summarized in Table 3.2.2.

Table 3.2.2  Age-Sex Composition of Bangladesh and DNMA, 1981

(percent)

| | Bangladesh | | | DNMA | | |
|---|---|---|---|---|---|---|
| | Both Sexes | Male | Female | Both Sexes | Male | Female |
| 0 - 14 | 46.6 | 23.9 | 22.7 | 39.4 | 20.3 | 19.1 |
| 15 - 64 | 50.0 | 25.7 | 24.3 | 58.6 | 36.7 | 21.9 |
| 65+ | 3.4 | 2.0 | 1.4 | 2.0 | 1.2 | 0.8 |
| Total | 100.0 | 51.6 | 48.4 | 100.0 | 58.2 | 41.8 |
| Sex Ratio | 106 | | | 139 | | |
| Dependency Ratio | 100 | | | 71 | | |

Source:  1981 Population Census

3.2.3  Literacy

The literacy rate of the population 5 years old and over by sex is shown in Table 3.2.3.  Nationwide, about one-third of the males and one-sixth of the females are literate.

In DNMA nearly 50% of the population is literate. More than  one-third of the females in DNMA are able to read and write.

The high literacy rate in DNMA is partially due to the migration of literate persons into the area due to the better educational facilities, and partially due to the traditionally high rate of literacy in the capital region.

Table 3.2.3 Literacy Rate of Population 5 Years
and over by Sex, 1981

(percent)

|  | Bangladesh | DNMA |
|---|---|---|
| Both Sexes | 23.8 | 48.1 |
| Male | 31.0 | 55.3 |
| Female | 16.0 | 37.5 |

Source: 1981 Population Census

## 3.3 Economic Activity

### 3.3.1 Labour Force Participation

In the 1981 census, both males and females engaged in household work (not outside the home) were excluded from the labour force. Persons looking for jobs, i.e. unemployed persons, were not identified in the census. Persons 10 years old and over were classified as follows: (1) not working; (2) household work; (3) cultivation; (4) forestry, fishing and livestock work; (5) manufacturing work; (6) business; (7) others. Based on the census data it is impossible to distinguish unemployed persons looking for jobs from persons who are not looking for jobs.

Table 3.3.1 shows the economic participation rates for Bangladesh and DNMA. The female labor force participation rate is extremely low in Bangladesh, and that may be mainly due to the cultural bias in traditional Muslim society against the participation of females in economic activities outside the home. The crude activity rate (percentage of the labour force population to the total population) and the refined activity rate (percentage of the labour force population to the population 10 years and over) in DNMA are higher than the national figures, but the refined activity rate of males in DNMA is lower than the national level, possibly due to the higher rate

of school attendance and the difficulty of absorbing marginal employees in the non agricultural sector. On the other hand, rural communities have difficulties in providing educational opportunities, but can afford to absorb the marginal labour force into agricultural activities. Another remarkable fact in DNMA is the relatively high activity rate of females, which could be connected with the high literacy rate of females, and the work opportunities for educated females in DNMA. The high female labor participation may also reflect the difference in customs between rural and urban areas.

Table 3.3.1  Economic Participation Rates by Sex, 1981

(percent)

|  | Bangladesh | DNMA |
|---|---|---|
| Crude Activity Rate |  |  |
| Both Sexes | 27.1 | 34.0 |
| Male | 49.9 | 55.8 |
| Female | 2.8 | 4.7 |
| Refined Activity Rate |  |  |
| Both Sexes | 40.6 | 46.8 |
| Male | 74.1 | 73.5 |
| Female | 4.3 | 6.9 |

Source:  1981 Population Census


3.3.2  Sectoral Employment

A comparison of the sectoral employment by sex in Bangladesh and in DNMA is shown in Table 3.3.2. In Bangladesh, 61% of the total labour force is engaged in agricultural work (including foresty, fishing and livestock work) whereas in DNMA only 7% of the labor force is employed in this sector. In DNMA, 16% of the total labour force is engaged in manufacturing work and 77% is engaged in business and other tertiary sector

work.  The female labour force is mainly engaged in the tertiary sector.

Table 3.3.2   Sectoral Employment by Sex, 1981

(percent)

| Sector | Bangladesh | | | DNMA | | |
|---|---|---|---|---|---|---|
| | Both Sexes | Male | Female | Both Sexes | Male | Female |
| Agriculture | 61.3 | 63.1 | 28.0 | 7.3 | 7.6 | 3.2 |
| Manufacturing | 4.3 | 4.2 | 5.1 | 15.7 | 16.3 | 5.7 |
| Others | 34.4 | 32.7 | 66.9 | 77.0 | 76.1 | 91.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source:   1981 Population Census


3.3.3  Gross Regional Product

There is no data available concerning the gross regional product in DNMA.   Table 3.3.3 shows the gross domestic product of Bangladesh and the gross regional product of the Dhaka Region.  Bangladesh is an agricultural country as the agricultural sector accounts for almost half of the GDP and the industrial sector accounts for less than 10%.  The agricultural

Table 3.3.3   GDP and GRP of Dhaka Region at Current Prices
(1983/84)

(million Taka)

| | GDP | GRP of Dhaka Region | Ratio to GDP(%) |
|---|---|---|---|
| Agriculture | 169,328 (48.4) | 11,516 (26.9) | 6.8 |
| Manufacturing | 30,949 (8.8) | 10,400 (24.3) | 33.6 |
| Others | 149,645 (42.8) | 20,848 (48.8) | 13.9 |
| Total | 349,922(100.0) | 42.764(100.0) | 12.2 |

Source:   BBS

sector is still substantial in the Dhaka Region, but the industrial production of the Dhaka Region accounts for one-third of the national industrial production and almost one-fourth of the gross regional product.

The GRP of DNMA is roughly estimated as follows:

a. The number of employed persons in the agricultural sector in DNMA equals 9.6% of the agricultural workers in the entire Dhaka Region as of the population census in 1981. Urbanization is proceeding, and it seems that this percentage is going down. So the GRP of the agricultural sector in DNMA might occupy about 9% of the agricultural GRP of the Dhaka Region in 1983/84, or about Tk 1000 million.

b. The number of employed persons in the formal manufacturing sector in DNMA accounts for 80.3% of the Dhaka Region manufactuing employment in 1985. It seems that most of the manufacturing products are produced by the formal sector, so the GRP of the manufacturing sector in DNMA is assumed to equal about 80% of the Dhaka Region manufacturing production in 1983/84, or about Tk 8000 million.

c. The number of employed persons in the "other" sector in DNMA equals 68% of the "other" Dhaka Region employment in the population census in 1981. It seems that the productivity of DNMA in this sector is higher than the average in the Dhaka Region. Hence the percentage of the GRP is higher than that of the employed persons.

As the current percentage of the "other" employed persons might be over 70% of the Dhaka Region "other" employment due to the recent urbanization, the GRP of the "other" sector in DNMA is assumed to occupy about

75 - 80% of the Dhaka region "other" production, or about Tk 16,000 million.

Table 3.3.4   Estimated GRP of DNMA, 1983/84

(million Taka)

|  | Amount | Percent |
|---|---|---|
| Agriculture | 1,000 | 4 |
| Manufacturing | 8,000 | 32 |
| Others | 16,000 | 64 |
| Total | 25,000 | 100 |

Source: Study Team Estimates

Thus, the GRP of DNMA is about Tk 25,000 million in total, and accounts for 60% of the total Dhaka Region GRP. The industrial production accounts for about one-third of the total DNMA GRP, and the other non-agricultural production accounts for about two-thirds.

Estimating the GDP per capita and the GRP per capita by the estimated population in 1983/84 which is 97 million persons in the nation and 4.9 million persons in DNMA, the GDP per capita is 3,600 taka and the GRP per capita is 5,100 taka.

This difference draws people into DNMA from all over the country.