

2-2-9 Salt

Crude salt is produced only in District of Chittagong and some amount of crude salt is imported. There are salt manufacturing works in Chittagong, Comilla, Dacca, Barisal, etc., the first two of which have the greatest production in the country. The flow of salt forms two routes; one is from Chittagong to salt manufacturing works and the other from these works to consuming places. The movement in 1972/73 was mainly by country boat while in 1968/69 by country boat would have come to a considerable amount.

1) Chittagong

In 1968/69 more than 90% of the total movement originated from District of Chittagong. As stated above, with the absence of the data for 1968/69 the movement by destination is not available. There was approximately 70,000 tons movement to North Bengal in 1968/69, but no movement in 1972/73 has been recorded.

In 1972/73 a great amount of crude salt was transported to Comilla, Dacca, and Barisal by country boat, and manufactured salt was moved to Comilla and Noakhali by land transport.

2) Comilla

The production of salt manufacturing in Chandpur have gradually been increasing, and the movement in 1972/73 was to Pabna as well as to Dacca and Faridpur which are in near distance. The movement is mainly by IWT and country boat, which contrasts

with the case in Chittagong.

3) Dacca

Salt manufacturing in District of Dacca including Narayanganj, the production of which is not so great as that in the two described above, is considerably great. The movement is mainly to Mymensingh and North Bengal. The production of manufactured salt in Chandpur will increase in the future and Chandpur will become a main supplier.

However, the movement pattern of 1972/73 will not be changed greatly, as crude salt is considered not to be produced except in Chittagong.

Table 2-2-9-1 Production of Salt.

(Unit: 1,000 tons)

Year	1965/66	1966/67	1967/68	1968/69	1969/70
Salt	243	261	309	433	461

Table 2-2-9-2 Import of Salt by Port

(Unit: 1,000 tons)

Year	Chittagong	Chalna	Total
1959 - 64 (annual average)	62	14	76
1968/69	22	14	36
1971/72	7	8	15

Source: Port Statistics

Table 2-2-9-3 Interregional O-D Movement of Salt, 1968/69

(Unit: 1,000 tons)

O	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	TOTAL	
	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	TOTAL
① CHITTAGONG	8	1	7	3	16	2	2	25	3	4				2	19	31	15					122	122
② CHITTAGONG																							16
③ CHITTAGONG																							
④ CHITTAGONG																							
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⑲ CHITTAGONG																							
⑳ CHITTAGONG																							
* TOTAL	8	1	7	3	16	2	2	25	3	4				2	19	31	15					122	122
** TOTAL	8	1	7	3	16	2	2	25	3	4				2	19	31	15					122	122

Note:

\* Includes intra-regional movement

\*\* Excludes intra-regional movement

Legend:

Road Rail  
IWT Country  
Boat

Table 2-2-9-4 Interregional O-D Movement of Salt, 1972/73

(Unit: 1,000 tons)

O	CHATTAGHONJ		DURGAPUR		DURGAPUR		DURGAPUR		DURGAPUR		DURGAPUR		DURGAPUR		DURGAPUR		DURGAPUR		TOTAL	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
1	11	13	2	18	5	5	1	1	1	1	1	1	1	1	1	1	1	1	21	
2																			1	
3																			1	
4																			1	
5																			1	
6																			1	
7																			1	
8																			1	
9																			1	
10																			1	
11																			1	
12																			1	
13																			1	
14																			1	
15																			1	
16																			1	
17																			1	
18																			1	
TOTAL	11	13	2	18	5	5	1	1	1	1	1	1	1	1	1	1	1	1	21	
INTRA																				1

Note:

\* includes intra-regional movement

\*\* excludes intra-regional movement

Legend:

Road	Rail
Country	boat

2-2-10 Sugar

The production of sugar-cane in District of Rajshahi occupies one quarter of the total production and is followed by each district in North Bengal and Faridpur, Kushtia, Barisal, Mymensingh and Dacca. Before the war the production amounted to 7 million tons, but after the war it decreased to 5 million tons. Accordingly, the import in 1972/73 increased as shown in Tables 2-2-10-1 and 2-2-10-2.

The movement of imported sugar in 1972/73 amounted to more than 50 thousand tons via Chittagong, while in 1968/69 the domestic production of more than 100 thousand tons was distributed.

1) North Bengal

The movement from North Bengal was very great both in 1968/69 and 1972/73, and the distribution pattern was uniformed all over the country, among which the flow to Dacca was remarkable. Other flows to Khulna and Chittagong was to be noted, but their amount was not great and had decreased in 1972/73.

- 2) The movement from Faridpur, Kushtia and Jessore in Khulna Division to Dacca and Khulna was considerably great in 1968/69. The stuff is supposed to have been gur, special kind of sugar. Most of the movement in 1968/69 was handled by rail, while in 1972/73 the movement was mostly by IWT. However, rail transport was predominant over other modes of transport both in 1968/69 and 1972/73, as far as transport in North Bengal was concerned.

Not much change in the production of sugar-cane and refined sugar will be made and the same distribution pattern as in 1968/69 will be maintained in the future. The import of sugar in 1982/83 may not need be considered.

Table 2-2-10-1 Import of Sugar

(Unit: 1,000 tons)

1962/63	19
1964/65	--
1966/67	28
1968/69	81
1970/71	15
1972/73	75

Source: Food Department

Table 2-2-10-2 Production of Sugar-cane by District

Area	Year	1968/69 -- 1970/71		1972/73	
		(average) (1,000 tons)	Rate to total (%)	Amount (1,000 tons)	Rate to total (%)
Dacca		266	3.6	261	4.6
Kishoreganj		106	1.4	105	1.8
Mymensingh		378	5.1	328	5.8
Tangail		46	0.6	24	0.4
Faridpur		627	8.4	460	8.1
Chittagong		119	1.6	92	1.6
Chittagong H.T.		17	0.2	12	0.2
Noakhali		61	0.8	54	0.9
Comilla		54	0.7	16	0.3
Sylhet		105	1.4	87	1.5
Rajshahi		1,683	22.6	1,505	26.5
Dinajpur		903	12.1	323	5.7
Rangpur		556	7.5	529	9.3
Bogra		396	5.3	318	5.6
Pabna		356	4.8	267	4.7
Khulna		107	1.4	93	1.6
Barisal		254	3.4	183	3.2
Patuakhali		81	1.1	29	0.5
Jessore		376	5.1	323	5.7
Kushtia		946	12.7	677	11.9
Total		7,437	100.0	5,686	100.0

Source: Agricultural Directorate



Table 2-2-10-3 Interregional O-D Movement of Sugar, 1968/69

(Unit: 1,000 tons)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL	
	CHITTAGONG	CHITTAGONG	NOAMHATI	COMILLA	SYLHET	DACCA	MAHESWARI	RAJSHAHI	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	BARISAL	TOTAL
1	1																					1
2		1																				1
3			1																			1
4				1																		1
5					1																	1
6						1																1
7							1															1
8								1														1
9									1													1
10										1												1
11											1											1
12												1										1
13													1									1
14														1								1
15															1							1
16																1						1
17																	1					1
18																		1				1
19																			1			1
20																				1		1
TOTAL	13	1	4	2	42	4	19	1	11	2	11	1	3	5	4	1	1	128				
INDIA	13	1	4	2	42	2	19	1	7	1	13		3	3	2			112				

Note:

- \* includes intra-regional movement
- \*\* excludes intra-regional movement

Legend:

Road	Rail
Country	INTL

Table 2-2-10-4 Interregional O-D Movement of Sugar, 1972/73

(Unit: 1,000 tons)

O	D														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT	CHITTA GHAT
1	6	2	1	1	2	3	5	2							
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
TOTAL	6	2	1	1	2	3	5	2							
INT	6	2	1	1	2	3	5	2							
COUNTRY															
BOAT															

Note:

\* includes intra-regional movement

\*\* excludes intra-regional movement

Legend:

Road  
Rail  
INT  
Country  
boat

## 2-2-11 Stone

Very little stone is produced in the country. The stone produced by the Main Assembling Center, Chattak (Sylhet), was transported by country boat. The assembled stone is shown in Table 2-2-11-1. Postwar data are not available. Almost all stone is transported from within District of Sylhet and a very small amount of stone from Dinajpur is to be noted.

The movement in 1968/69 was mainly by rail, among which the flow to Chittagong was considerably great. The movement from Comilla which amounted to 25,000 tons is supposed to be a transfer of the stone at Comilla which had been carried from Sylhet by country boat.

The movement to Dacca was recorded at a very small amount in 1972/73, and the transport was mainly by country boat. On the contrary the movement from Dinajpur and Rangpur was for short distance, terminating within North Bengal.

The movement pattern in 1972/73 is not different from that in 1968/69, except that the movement to Chittagong decreased and the movement of long distance was not present, while the movement by IWT increased. The share by country boat from Sylhet to Dacca was greatest among the four modes of transport.

The flow from north Bengal is supposed to increase in the future and the demand in Dacca will increase. The movement from North Bengal to Dacca will be main flows although the overall movement pattern will not change greatly.

Table 2-2-11-1 Stone Arrived at Chattak

(Unit: 1,000 tons)

Year	1967/68	1968/69	1969/70
Shingle	215	221	260
Boulder	233	236	157
Total	448	457	417

Source: Forest Department

Table 2-2-11-2 Interregional O-D Movement of Stone, 1968/69

(Units: 1,000 tons)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL	
	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA	CHITLAGUDA
1	17	4																				25
2	90	15	2	23	5	6	7	1	1													144
3																						12
4																						2
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						
16																						
17																						
18																						
19																						
20																						
TOTAL*	107	19	2	23	5	10	7	1	1	3												200
TOTAL**	107	19	2	23	5	10	7	1	1	3												175

Note:

\* includes intra-regional movement

\*\* excludes intra-regional movement

Legend:

Road  
Rail  
Intr. Country  
boat

Table 2-2-11-3 Interregional O-D Movement of Stone, 1972/73

(Unit: 1,000 tons)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL	
	PATAJA SAKISAKO JESSO WEST EAST PASABONZA TAMPONDI **																					
1	6																				6	
2																						
3																						
4																						
5	38	9	50																		75	
6				12	42		6														135	
7																						75
8																						135
9							6															6
10																						
11																						
12																						
13																						
14																						
15																						
16																						
17																						
18																						
19																						
20																						
TOTAL	38	9	50	12	42	6	6															237
TOTAL																						237

Note:  
 \* includes intra-regional movement  
 \*\* excludes intra-regional movement

Legend:  
 Road Rail  
 Country  
 Int. boat

## 2-2-12 Pulse

The production in the four districts of Faridpur, Rushtia, Rajshahi and Pabna occupies more than 10% of the total and that in Dacca, Mymensingh and Jessore is considerably high. Tables 2-2-12-2 and 2-2-12-3 show the annual production and the district-wise production in 1969/71 (average) respectively. Table 2-2-12-1 shows the annual import of pulse which indicate much smaller amount compared with the domestic production.

The movement in 1968/69 is much smaller than that in 1972/73 which is due to the fact that much of the movement depended upon transport by country boat and truck. The movement of 37,000 tons from Comilla to Chittagong in 1968/69 was to be noted, though the production in Comilla was small as shown in Table 2-2-12-3. Comilla is supposed to be a transit terminal from the adjacent production areas.

The interregional movement in 1972/73 is variegated compared with the one in 1968/69 which concentrated greatly on the two districts of Comilla and Dacca, and the movement that had great concentration on other districts totaled more than 10,000 tons. On the other hand, districts from which the outflow was great were Dacca, Faridpur, Pabna, and Comilla totaling more than 40,000 tons. The heavy movements were from Pabna to Comilla, Faridpur to Comilla and Dacca to Comilla.

Table 2-2-12-1 Import and Export of Pulse

(Unit: 1,000 tons)

Year	Import	Export
1966	31.2	14.5
1967	13.8	9.4
1968	18.4	0.2
1969	10.4	20.9
1970	17.2	13.5
1971	11.9	5.6
1972	Not available	---

Source: Agricultural Marketing Directorate



Table 2-2-12-2 Pulse Production

(Unit: 1,000 tons)

Year	Production
1964/65	239
1967/68	274
1970/71	296
1972/73	223
1963 - 65 (average)	228
1961 - 71 (average)	276

Source: Agricultural Directorate

Table 2-2-12-3 Pulse Production by District

	1969-71 (average)	
	(1,000 tons)	Rate to total (%)
Dacca	24.6	8.9
Mymensingh	24.4	8.9
Tangail	7.6	2.7
Faridpur	35.3	12.8
Chittagong	2.1	0.8
Chittagong H.T.	0.5	0.2
Noakhali	3.8	1.4
Comilla	7.9	2.8
Sylhet	1.2	0.4
Rajshahi	33.5	12.2
Dinajpur	5.1	1.8
Rangpur	11.9	4.3
Bogra	8.1	2.9
Pabna	32.9	11.9
Khulna	3.8	1.4
Barisal	14.9	5.4
Patuakhali	5.1	1.9
Jessore	22.5	8.2
Kushtia	30.6	11.1
Total	275.8	100.0

Source: Agricultural Directorate

Table 2-2-12-4 Interregional O-D Movement of Pulse, 1968/69

(Unit: 1,000 tons)

O	D													TOTAL			
	1	2	3	4	5	6	7	8	9	10	11	12	13				
	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG
1 CHITTAGONG																	
2 CHITTAGONG																	
3 CHITTAGONG																	
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9 CHITTAGONG																	
10 CHITTAGONG																	
11 CHITTAGONG																	
12 CHITTAGONG																	
13 CHITTAGONG																	
TOTAL	37	1	1	8	2												47

Note:

\* includes intra-regional movement

\*\* excludes intra-regional movement

Legend:

Road	Rail
INT Country	boat

Table 2-2-12-5 Interregional O-D Movement of Pulse, 1972/73  
(Unit: 1,000 tons)

O	D																TOTAL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	CRISTALINA NOROCCIDENTAL	
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(100) CANTON																	

Note:  
\* includes intra-regional movement  
\*\* excludes intra-regional movement

Legend:  
Road  
Rail  
IWT  
County  
boat

2-2-13 Lumber

International movement in 1968/69 was to be noted in the flows from Chittagong to Dacca by rail and the flow within Khulna by IWT (from Sundarban to Khulna). The movement in 1968/69 which is recorded in small amount was mainly by country boat and truck.

The movement in 1972/73 mainly by country boat occupied more than 2/3 of the whole while the movement both by IWT and rail did not exceed 10%. The pattern of interregional movement in 1972/73 is very different from that in 1968/69 with a concentration in Districts of Dacca and Comilla, while the pattern of the outflow was uniformly distributed over the country except a part of North Bengal.

Table 2-2-13-1 Production of Lumber in National Forests

(Unit: 1,000 tons)

1964/65	1965/66	1966/67	1967/68	1968/69	1969/70
485	520	545	560	427	409

Source: Forestry Directorate; Annual Development Plan 1973/74

Table 2-2-13-2 Production of Commercial Lumber in Private Forests

(Unit: tons)

Area	1967/68	1968/69	1969/70	1970/71
Sylhet	10,903	11,052	11,276	7,245
Chittagong	24,206	2,928	19,960	15,960
Cox's Bazar	35,857	42,871	63,070	48,595
Hill Tracts North	28,559	37,508	25,066	29,660
Hill Tracts South	18,522	15,268	16,107	10,618
Total	118,047	109,627	137,479	114,078
Khulna (Sundarban)	351,800	264,200	222,600	212,478

Source: Forestry Directorate

Table 2-2-13-3 Import and Export of Lumber

(Unit: 1,000 tons)

	Export	Import
1966/67	20.3	2.1
1968/69	19.1	0.6
1970/71	12.6	2.4
1972/73	--	6.6

Source: Port Statistics, Forestry Directorate

Table 2-2-13-4 Interregional O-D Movement of Lumber, 1968/69

(Unit: 1,000 tons)

O \ D	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	TOTAL		
	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	CHITTAGONG	
① CHITTAGONG	1																					41	
② CHITTAGONG																							
③ CHITTAGONG																							
④ CHITTAGONG																							
⑤ CHITTAGONG																							
⑥ CHITTAGONG																							
⑦ CHITTAGONG																							
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⑮ CHITTAGONG																							
⑯ CHITTAGONG																							
⑰ CHITTAGONG																							
⑱ CHITTAGONG																							
TOTAL *	1				8	22	1															39	
TOTAL **																							40

Note:  
 \* includes intra-regional movement  
 \*\* excludes intra-regional movement

Legend:  
 Road  
 Rail  
 INT Country  
 BOAF

Table 2-2-13-5 Interregional O-D Movement of Lumber, 1972/73

(Unit: 1,000 tons)

O	(Unit: 1,000 tons)													TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	
D	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	6	5	4	3										
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
TOTAL	6	5	4	3										
INTL														
COUNTRY														
BOAT														

Note:

\* includes intra-regional movement

\*\* excludes intra-regional movement

Legend:

Road	Rail
INTL	COUNTRY
BOAT	

## 2-3 Traffic with India

### 2-3-1 Trade with India

Before 1965 there was annually more than one million tons of trade with India including transit movement. Since the 1965 Indo-Pakistan War, the official trade had ceased until the Independence of Bangladesh in 1972, and official data during that period are not available.

The reopened trade with India after the war reached a considerable high level. Bangladesh has the excess of imports over the exports. The movement by rail is much less than that by IWT. The main routes of trade as follows:

- 1) Calcutta rail      Khulna rail      North Bengal
- 2) Calcutta sea      Chalna and Chittagong
- 3) Calcutta IWT      Dacca and others

The main import items are coal, refined petroleum, cement, etc., among which coal occupies a greater share, while jute is the only main export item.

#### A. Imports

##### (1) Coal

All the coal required in this country is imported. Before 1965 all the coal had been imported from India and after 1965 from Poland, China, Australia, etc. With the reopening of trade with India, 266.3 thousand tons of coal was imported



in 1972/73, and in 1973/74 an import of 660 thousand tons is scheduled.

The movement in 1972/73 amounted to 214.1 thousand tons by rail, 5.2 thousand tons by sea and 47.1 thousand tons by IWT. Main routes are as follows:

- (a) Rail: 1) directly to Khulna and North Bengal  
 2) to Khulna by rail and then to Dacca and Chittagong by IWT
- (b) IWT : directly to Dacca, Chittagong and Khulna
- (c) Sea : directly to port of Chittagong and then to Dacca, Sylhet, Tangail, etc.

Table 2-3-1-1 - Import of Coal from Calcutta, 1972/73

(Unit: 1,000 tons)

Mode Destination	Directly by IWT	Directly by Rail	To Khulna by Rail and then by IWT	Total
Chittagong	10*	-	75	85
Dacca	42	-	50	92
Khulna	-	41	-	41
Ishurdi	-	10	-	10
Santahar	-	5	-	5
Rangpur/ Dinajpur	-	17	-	17
Total	52	73	125	250

\* indicates 5,000 tons of transfer to Dacca.

Source: Bangladesh Transport Survey

In addition to the above routes there is a trial IWT route from Assam to Sylhet.

With the increasing demand in manufacturing, the problems arising from the systems of coal nationalization in Bangladesh, and with the possibility of shortage of coal and the unstability of supply of petroleum due to its rising price, there would occur a limitation to the coal supply from India. However, the import of coal from India will be increasing for the time being in the future.

## (2) Petroleum

Petroleum is not produced in Bangladesh, and crude oil comes all from coastal states of the Persian Gulf. The annual amount in 1969-72 average as much as 850 thousand tons. Almost all refined petroleum is imported through Chittagong and the annual amount in 1969-72 averages 220 thousand tons. After the war petroleum was imported from India approximately 100 thousand tons in the latter half of 1973. Main routes are as follows:

- 1) From Siliquri, Assam, to Partipur by rail and further by rail to North Bengal, especially Bogra, Dinajpur and Rangpur. In 1973, 37 thousand tons of petroleum was carried, and 19 thousand tons is schedule to be transported in the first half of 1974 under the contract with Indo Petroleum Company.
- 2) To Chittagong by sea: Some amount is shipped directly

from Budge-Budge to the west of Calcutta. Under the contract with Indo Oil Company 110 thousand tons of petroleum was imported in the latter half of 1973 and 123 thousand tons is scheduled to be shipped in the first half of 1974. (100 thousand tons by sea and 23 thousand tons by land).

Without the enlargement of the capacity of the existing oil refinery, the import of petroleum of approximately 200 thousand tons will be required for the full operation of the existing facilities.

### (3) Cement

Cement is produced in Chattak by only approximately 60 thousand tons annually and most of the demand is to be met by the import. The average annual import during the period 1967-71 amounted to approximately 650 thousand tons. The postwar import, for example, in 1972/73 amounted to approximately 400 thousand tons, out of which 50 thousand tons came from India and the remaining from South Korea. Main routes are as follows:

- 1) directly to Dinajpur/Rangpur and Khulna by rail, and
- 2) to Khulna by sea.

As shown in Table 2-14-2 the movement pattern of the cement, most of which must depend on the import will be maintained for the time being.

Table 2-3-1-2 Projection of Cement Supply

(Unit: 1,000 tons)

Year	1972/73 (actual)	1973/74	1974/75	1975/76	1976/77	1977/78
Chattak (existing)	29	100*	100*	100*	100*	100*
Chattak (planned)	-	-	-	-	-	-
Clinker plant	-	150	250	250	300	300
Import	374	400	500	650	800	850
Total	403	650	850	1,000	1,200	1,400

Source: B.T.S. estimated.

(4) Hard Rock

No hard rock had been imported before the independence. However, in 1972/73 a very small quantity was imported to Sirajganj and Rajshahi. In the future import will be continue from Bahar, Assam, etc.

(5) Lumber

Lumber had been exported mainly to West Pakistan before the independence. However, after the war the export decreased, and on the contrary in 1972 approximately 600 tons was imported from Assam. Approximately a six thousand ton import is scheduled in the first half of 1973

B. Exports

(1) Jute

The average annual production amounting to approximately 7 million bales (equivalent to 600 thousand tons) is exported. The export to India was reopened after the independence and in 1972/73 India became the biggest importer with 364 thousand bales.

Table 2-3-1-3 Trade of Raw Jute

(Unit: 1,000 tons)

	Total Imports (1967-71 average)	Export from Bangladesh		
		1967	1970	1973*
West Europe	445 ( 48% )	292 ( 46% )	320 ( 51% )	186 ( 41% )
Other advanced countries	167 ( 18% )	55 ( 9 )	56 ( 9 )	36 ( 8 )
India	69 ( 7 )	-	-	62 ( 14 )
Other under- developed countries	112 ( 13 )	150 ( 24 )	102 ( 16 )	107 ( 24 )
Communist countries	130 ( 14 )	135 ( 21 )	148 ( 24 )	59 ( 13 )
Total	924 (100%)	632 (100%)	626 (100%)	450 (100%)

Source: FAO and Bangladesh Jute Export Corporation

\* indicates the amount of 11 months.

Main routes are as follows:

- 1) From Narayanganj by IWT directly to Calcutta,
- 2) To Chalna by truck and flat-bottomed boat, and from there by sea to Calcutta, and
- 3) From North Bengal by rail freight to Calcutta.

In 1973, 15 thousand tons was transported by route 1), 40 thousand tons by route 2) and 10 thousand tons by route 3).

The First Five-Year Plan schedules to export 1.3 million bales of jute by 1977/78, while in 1973/74 600 thousand bales was

exported. More than 500 thousand bales of jute is estimated to be exported annually. As jute from Bangladesh is of good quality and low price, the export to India will continue in the future.

## (2) Fresh Fishes

In the past 10 years refrigerated shrimps, prawn, edible frog legs, etc, were exported to the U.S., Japan, Hong Kong, Kuwait, U.K., etc. The export of fresh fishes to India which has recovered after the war showed a considerable significance with 3,900 tons in 1973. Before 1965 fresh fishes of 12,000 - 30,000 tons had been exported to India.

Main routes are as follows:

Before 1965 fresh fishes were transported from Khulna and Goalundo by rail to Calcutta. At present fresh fishes are collected at Khulna, Goalundo, and Narayanganj, and from there transported to the national boundary (Benapole, etc.) by Bangladesh truck and there transhipped by Indian truck. In 1972/73 an export contract of 12,000 tons was concluded by the two countries, but the actual export amounted to only 15% of the contracted amount.

## 2-3-2 Transit Traffic of India

Bangladesh is adjacent to India at most of her border line. The north part of Bangladesh borders on the state of Assam which is located far from Calcutta. Therefore, in the traffic with India the transit traffic of India -- Bangladesh -- India (Assam) will be an important factor. The past transit traffic is tabulated in Table 2-3-2-1.

There are three main routes in transit as shown in Figure 2-3-1-1

- 1) Rail: Calcutta -- Darsana -- Santahar\* -- Kaunia -- New Gitaldaha -- Goliakganj -- Fakiragram -- New Bongaigaon -- Gauhati (to Assam)
- 2) IWT: Calcutta -- Raimangal -- Chalna -- Barisal -- Chandpur -- Goalundo/Aricha -- Sirajganj -- Bahadurabad -- Chilmari -- Dhubri (to Assam)
- 3) IWT: Calcutta -- Raimangal -- Barisal -- Chandpur -- Narayanganj -- Bhairab Bazar -- Azmiriganj -- Sherpur\*\* -- Fenchuganj -- Zakiganj -- Karimganj (to Cachar/Tripura)

Note: \* indicates a transshipment station of broad to meter gauge

\*\* indicates a transshipment station of vessels 6 feet draught to 2.5 - 2.75 feet in the lowest water season.



Table 2-3-2-1 Transit Traffic in Two Ways

(Unit: 1,000 tons)

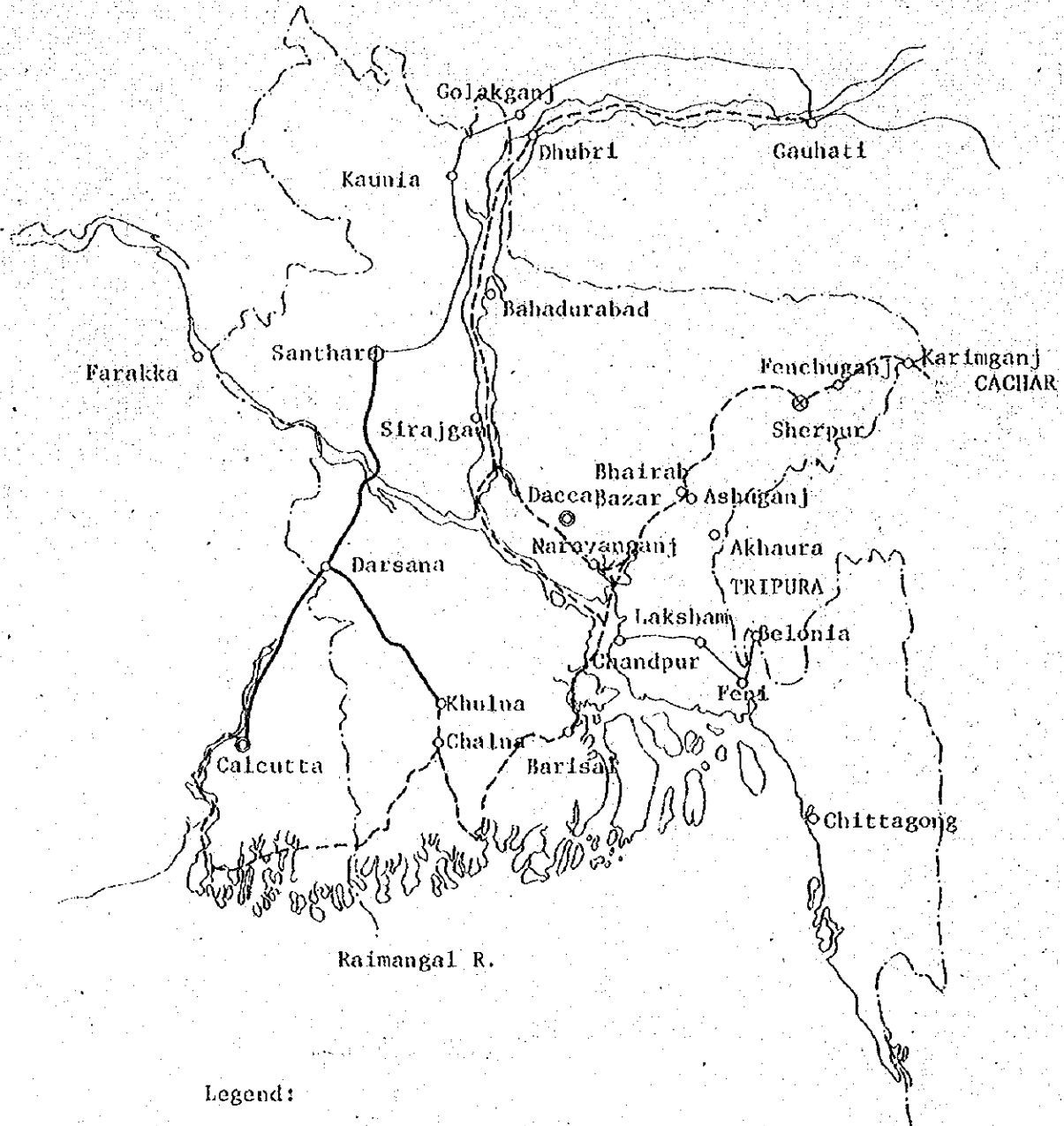
Rail		Inland Water		
Year	Calcutta -- Assam	Year	Calcutta -- Assam	Calcutta -- Tripura/Cachar*
1955/56	337	1956	666	106
1956/57	658	1957	743	104
1957/58	641	1958	741	98
1968/59	736	1959	614	99
1959/60	638	1960	594	87
1960/61	729	1961	625	89
1961/62	668	1962	515	78
1962/63	580	1963	554	93
1963/64	401	1964	494	90
1964/65	298	1965	301	56

Source: Bangladesh Railway Board and Indian River Utilization committee.

\* Indicates traffic mainly by IWT, but from Chandpur to Tripura by railway.

During the period 1965 - 1972 when India was unable to use the rail transit network in East Pakistan she tried to develop her domestic rail network connecting Calcutta to Assam and Tripura. As a result the broad gage railway which was connected to Sakrigari and Bhagalpur or the southern bank of the Ganges was extended as far as New Bongaigaon. The route saves a ferry facility, crossing the Ganges at Farakka, and including a branch line to the inland port of Coghigopa on the bank of the Brahmaputra.

Figure 2-3-1-1. Main Transit Routes



2-3-3 Transit Traffic After 1972

(1) Calcutta -- Assam

(a) Railway

The Fifth Five-Year Plan (1974-79) schedules a rail extension of broad gage from New Bongaigaon/Gogighopa to Gauhati, the capital of Assam. With the completion of this railway line India will connect Calcutta with Gauhati with broad gage. For the use of the Bangladesh railway by the Indian for the trip up to Assam, two problems would arise: necessity of transshipment at Santahar from broad gage to meter, and border customs levy at two points. This route will have shorter in length for India than the route all through India territory: Calcutta - Farakka - Old Malda - Mukuria - New Jarpiguri - Raminagar - New Bongaigaon - Bangladesh. The merit of a shorter length is to be offset by the above two demerits, and there would be no justification to enlarge railway systems for the traffic with India.

(b) Inland Water Transport

On November 1, 1972 an agreement for inland water transport was signed between Bangladesh and India, and the Central Indian Water Transport Corporation reopened their operations.

In January 1972 the River Service Committee of India

published the predicted traffic by IWT around Assam, which value was much larger than the actual traffic during the period November 1972 - December 1973 as shown in Table 2-3-3-1.

This may be for some reasons: during the 7 year cessation the movement of each item of goods settled down to rail transportation, it would take some time to recover the goods-holders' trust to the 1965 level, and there would be a limitation in the IWT capacity.

India has so high an interest in the above route together with the route of Calcutta - Cachar/Tripura that she would pay out 260 million rupee for the development of CIWTC in the Five-Year-plan period. However, with the completion of the rail connection between Calcutta and Gauhati, the competition between railway and IWT would become keen. The CIWTC, taking into account the small amount of the actual traffic in 1973 and the timing of enlarging the IWT capacity has restudied the traffic projection as in Table 2-3-3-2.

## (2) Calcutta --- Cachar/Tripura

### (a) Railway

During the period 1965 - 72 the freight movement to Cachar/Tripura was all by Indian railway. This route makes a very big detour, resulting in high operation cost. After the independence the reopening of the IWT traffic has recovered the use of the railway from the Chandpur to Cachar/Tripura.

(b) Inland Water Transport

The trouble with the IWT is that at Sherpur transshipment is required from 6 feet draught boat to a 2.5 - 2.75 feet in the low water season. The capacity and operation of a light draught boat will determine the IWT capacity. The CIWTC which has not yet started its operation with the difficulty of increasing the IWT capacity schedules to reopen the operation in the succeeding highwater season (June and July 1974).

At the beginning of 1972 the River Service Committee predicated the traffic on this route as shown in Table 2-3-3-3, which is revised under various circumstances as in Table 2-3-3-4.

The only one transshipment terminal on this route is located at Chandpur, and the Indian Government has made two proposals as below for two terminals and approaches thereto both by railway and highway to Bangladesh which are nearest to the state of Tripura (India).

1) Development of Ashuganj Inland Port

- Ashuganj river port which is to be dredged, provided with loading and unloading facilities and warehouse.
- Road between Akhaura and Agartala to be graded up.

2) Railway line extension

- Railway between Akhaura and Agartala to be constructed.
- Railway between Belonia Station and Belonia Town to be constructed.

The completion of the above two projects would produce a great saving in transport cost compared with the route via Gauhati by Indian rail.

Table 2-3-3-1 Traffic between Calcutta and Assam

(Unit: tons)

Item	Traffic to Assam		Item	Traffic to Calcutta	
	Predicted *	Actual **		Predicted	Actual
Food grain, pulse & sugar	10,000	497	Tea	40,000	4,735
Fertilizer	15,000	-	Jute	150,000	5,244
Iron, steel & machinery	30,000	368	Wax	30,000	-
Salt	2,000	-	Crude oil	30,000	-
Cement	100,000	-	Processed bamboo	1,000	-
Tea container	4,000	-	Seeds	2,000	-
Edible oil	1,000	-	Lumber	7,000	-
Stationary & pater	2,000	-	Match	-	54
Clothing	3,000	-	Others	8,000	-
Others	40,000	-	Total	268,000	10,033 <sup>2)</sup>
Total	407,000	865 <sup>1)</sup>			

Source: The River Services Committee of India and CIWTC  
 \* indicates the average figure of the Fifth Five-Year Plan  
 \*\* figures from November 1972 through December 1973.

- 1) all movement to Gauhati.
- 2) from Gauhati, Dhubri and Gogighopa.

Table 2-3-3-2 Revised Traffic Projection between Calcutta and Assam

(Unit: 1,000 tons)

From Calcutta to Assam		From Assam to Calcutta	
Cement	60	Tea and Jute	60
Iron & steel and general cargo	40	Millet, petroleum, coke, etc.	30
Total	100	Total	90

Table 2-3-3-3 Prediction of IWT Traffic between Calcutta and Cachar/Tripura

(Unit: 1,000 tons)

From Calcutta to Cachar/Tripura		From Cachar/Tripura to Calcutta	
Food grains, pulse and sugar	40	Tea	10
Fertilizer	5	Jute	15
Iron & Steel and machinery	5	Processed bamboo	3
Salt	8	Seeds	1
Cement	25	Lumber	1
Tea container	1	Others	2
Edible oil	2	Total	32
Stationary and paper	1		
Clothing	1	Source: The River Service Committee, India, 1972	
Others	5		
Total	93		

Table 2-3-3-4 Revised Prediction of Traffic

(Unit: 1,000 tons)

From Calcutta to Cachar/Tripura	General cargo	40
From Cachar/Tripura to Calcutta	Tea, Jute and others	30

Source: ITWTC (India)



## 2-3-4 Lurking Factors of Transit Traffic

### A. Industrial Development Programmes in Indian Side

India has some industrial development programmes that would have a great influence on the transit traffic:

#### 1) Cement manufacturing

- The annual production capacity of Cherrapunj cement factory in Meghalaya will be increased from 83,810 to 200,000 tons during the five year plan period.
- A new cement factory will be constructed at Bokjan in Assam. Cement will be moved from Calcutta to Assam and to Cachar/Tripura until the above plants can gain enough production capacity to meet the local demand.

#### 2) Industrial programmes of the Five Year Plan

- Oil refinery at Bongaigaon: annual production of one million (metric) tons out of Assam crude oil moved through the existing pipe line.
- Chemical engineering industry at Bongaigaon: annual production of 30,000 tons.
- Cement manufacturing at Bokajan: annual production of 200,000 tons.
- Paper manufacturing: annual productions of 27,000 tons, 80,000 tons, and 80,000 tons at Gogighopa, Cachar and Nowgong, respectively.
- Urea fertilizer manufacturing: enlargement of the annual production capacity of Namrup factory from 45,000 to 90,000 tons.

The data with which comparison of transit cost is to be studied are not available. However, as the Indian Planning Committee has a full staff to make the economic study of various transport modes for the present and future transit traffic, the results will be utilized very soon.

B. Capacity Limit of CIWTC

The CIWTC is in charge of the transit traffic in Indian territory. As of December 1973 it has 11 tug boats and steamers and 32 flat-bottomed barges, and their capacity amounted to: 2,400 tons for mechanized boats or steamers, and 16,000 tons for unmechanized boats.

The annual transport capacity amounted to 150,000 tons in 1973 and the share of the main three routes were as follows:

Calcutta	-----	Assam:	96,000 tons (63%)
Calcutta	-----	Cachar/Tripur:	24,000 tons (16%)
Calcutta	-----	Bangladesh:	33,000 tons (21%)

The greatest frequency of movement by CIWTC was between Calcutta and Bangladesh (especially Narayanganj). The trip duration between Calcutta and Narayanganj is about 18 days for a round trip, while the one between Calcutta and Dhubri about 34 days for a round trip.

The movement by CIWTC during the period from November 1972 through December 1973 is tabulated in Table 2-3-4-1. With the four steamers and 35 flat-bottomed boats out of operation

Table 2-3-4-1 Movement by CIWTC, November 1972 - December 1973

(Unit: tons)

1. Calcutta → Bangladesh (mainly to Narayanganj, partly to Khulna)	
Coal :	69,544 1)
Iron and Steel :	949
Machinery :	699
Others :	5,890
Total	77,082
2. Bangladesh → Calcutta (mainly from Narayanganj)	
Jute :	16,323
Others :	146
Total	16,469 2)
3. Calcutta → Assam	
(unknown)	865
4. Assam → Calcutta	
(unknown)	10,033
5. Assam → Bangladesh	
Lumber	2,511
Grand Total	106,960

Source: CIWTC (India)

Note: 1) 54,546 tons (78%) out of the amount was transported by the end of July 1973.

at present, the transport capacity will amount to: 1,600 tons and 17,000 tons for mechanized freighters and unmechanized flat-bottomed boats, respectively. In addition the CIWTC would have an annual transport capacity of 230,000 tons with the existing repairable vessels.

The route from Calcutta to Cachar has a limit of light draught at Sherpur and the existing capacity is of as much as 2,000 tons per day (approximately 40,000 per year), while the revised projection of traffic is to be 70,000 tons annually. The maximum possible capacity of the CIWTC will be 230,000 tons, while their revised projection of traffic is estimated as 420,000 tons per year, for a 190,000 tons capacity shortage.

In order to supplement the capacity shortage the CIWTC will outlay 260 million rupee during the Fifth Five Year Plan period to increase the tonnage and to modernize their dock facilities. It is supposed that the shortage of the CIWTC capacity will last for a long period.

## CHAPTER 3 FORECAST OF GOODS MOVEMENT

### 3-1 Method of Forecast and Assumption

In this chapter the origin-destination of the interdistrict movement of goods by item is estimated for the whole country. The first target year of the forecast is 1982/83, up to which a forecast can be done as an extension of the First Five-Year-Plan period although with difficulty. The balance at the year of 1982/83 is calculated from the estimated regional supply and demand by item, and with characteristics and future change of each of goods flows studied the goods flows are allocated on the least cost basis.

There are many factors that would influence the future goods flow and the ratio of port handling exports and imports between Chalna and Chittagong is assumed to be fifty-fifty.

The movement resulting from the development projects in the North-west such as cement manufacturing and coal mining is studied from the points of supply-demand balance and origin-destination, and also presence and absence of these projects.

### 3-2 Future Goods Movement by Item

#### 3-2-1 Raw Jute and Jute Goods

##### A. Raw Jute

The production of raw jute has been stagnant or in the decrease with the year 1970 as a peak, although the farming area has been increasing.

The Five-Year-Plan shows the target production as in Table 3-2-1-1 which is 50% more than the present production.

Jute production will be affected by international demand. Judging from the production of jute in the world no great change will occur.

However, in this study it is assumed that the target production will be attained in 1977/78 and subsequently almost the same amount of production and export is maintained. With the falling productivity of raw jute and the almost unchanged rate of regional production, the rate in 1982/83 would be almost same as in the present. Table 3-2-1-2 shows the estimated production of raw jute by district. The movement of raw jute can be divided into two parts, primary and secondary: the former flow is from production area to collection terminal or port for export. The main collection terminals are located in the four districts of Dacca, Khulna, Chittagong, and Comilla (Chandpur). The present ratios between primary and secondary flows are approximately 4 for Dacca, 3 for Khulna, 1 for Chittagong, 2/3 for Chandpur and 4/3 for others. The future ratios are considered not to change greatly.

Raw jute for export is transported from the above collection terminals to the respective ports, Chalna and Chittagong.

Table 3-2-1-3 shows the estimated origin-destination of raw jute in 1982/83.

B. Jute Goods

The Five-Year-Plan estimates the target production of 766,000 tons in 1977/78, while the present production amounts to 450 - 600,000 tons. As in the case of raw jute an increase of productivity of jute goods is not to be expected. The estimated production is 766,000 tons in 1982/83. The movement of jute goods is assumed to be of the same pattern as the secondary movement of raw jute with Dacca being the only originating terminal. The movement from the other districts is so small as to be negligible.

Table 3-2-1-1. Production of Raw Jute in the Five Year Plan

	1973-74	1974-75	1975-76	1976-77	1977-78
Farming area (1,000 acres)	2,100	2,200	2,200	2,200	2,200
Production (1,000 bales)	7,390	7,840	8,320	8,740	9,100

Table 3-2-1-2. Estimated Production of Raw Jute and Jute Goods in 1982/83

	Raw Jute			Jute Goods	
	Rate of Allocation(%) <sup>1)</sup>	1,000 bales	1,000 tons	Rate of prod. capacity (%)	1,000 tons
Chittagong	0	0		22.7	174
Chittagong H.T.	0	0			
Noakhali	1.2	118	21	1.3	10
Comilla	7.6	745	135	1.2	9
Sylhet	1.0	98	18		
Dacca	9.2	902	164	41.9	320
Mymensingh	25.9	2,538	460	1.5	12
Tangail					
Khulna	1.8	176	32	28.4	217
Patuakhali	1.4	137	25		
Barisal					
Faridpur	11.2	1,098	199	0.9	7
Jessore	7.1	696	126		
Kushtia	2.8	274	50		
Rajshahi	3.1	304	55		
Pabna	5.1	500	91	2.2	17
Bogra	2.5	245	44		
Rangpur	16.5	1,017	293		
Dinajpur	3.6	353	64		
<b>Total</b>	<b>100.0</b>	<b>9,800</b>	<b>1,778</b>		<b>766</b>

Source: Agriculture Directorate (BJMC)

Note 1): the average of the rates in 1968/71 and 1972/73



Table 3-2-1-3 Estimated Origin-Destination of Raw Jute Movement in 1982/83

Origin	Destination	Movement (1,000 tons)	
		(primary)	(Secondary)
Noakhali	Chittagong	21	0
Comilla	Chittagong	45	50
	Comilla	60	0
	Dacca	30	0
	Khulna	0	50
Sylhet	Dacca	9	0
	Mymensingh	9	0
Dacca	Chittagong	50	100
	Dacca	114	0
	Khulna	6	280
Mymensingh	Chittagong	50	39
	Dacca	340	0
	Mymensingh	70	0
	Khulna	0	40
Khulna	Khulna	32	0
Patuakhali	Chittagong	5	0
	Comilla	5	0
	Khulna	15	0
Faridpur	Comilla	50	0
	Dacca	50	0
	Khulna	99	0
Jessore	Khulna	126	0
Kushtia	Khulna	50	0
Rajshahi, Pabna	Chittagong	0	20
	Dacca	45	0
	Khulna	50	60
	Rajshahi, Pabna	50	0
Bogra, Rangpur Dinajpur	Chittagong	40	0
	Dacca	124	0
	Khulna	193	0
	Rajshahi, Pabna	30	0
	Bogra, Rangpur, Dinajpur	80	0

Table 3-2-1-4 Estimated Origin-Destination of Jute Goods Movement in 1982/83

Origin	Destination	Movement (1,000 tons)
Comilla	Chittagong	10
Dacca	Chittagong	100
	Khulna	200
Pabna	Khulna	17

### 3-2-2 Foodgrains

#### (a) Demand

The demand forecast of foodgrains in 1982/83 is based on the per capita consumption. The balance of supply and demand of foodgrains in 1982/83 is estimated in Table 3-2-2-1 by using the unit of 16 ounces per capita per day, amounting to 16,723 thousand tons.

#### (b) Supply

The Five-Year-Plan indicates the attainment of self-supply of foodgrains in 1977/78, which is thought to be a very difficult target. Its success is shifted to the end of the next Five-Year-Plan period. The total necessary supply in 1982/83 should be 18,575 thousand tons including an additional 10% for loss and seed sowing.

#### (c) Movement

The movement of foodgrains from surplus area to deficit is allocated on the least distance basis: the production in the northwest which is the greatest producer in the country will fill up the shortage of the Khulna region, and the one in Sylhet and Mymensingh will be supplied to Dacca and Chittagong and part of the surplus in Patuakhali and Brisal to Chittagong.

Table 3-2-2-1 Estimated Balance of Supply and Demand in 1982/83

District	Population (1,000 persons)	Supply (1,000 tons)	Demand (1,000 tons)	Balance (1,000 tons)
Chittagong	6,197	865	1,026	-161
Chittagong H.T.	681	156	113	43
Noakhali	4,409	772	730	42
Comilla	7,809	1,266	1,293	-27
Subtotal	19,096	3,059	3,162	-103
Sylhet	6,402	1,767	1,060	707
Dacca	12,008	905	1,988	-1,083
Mymensingh	10,390	2,585	1,720	387
Tangail	2,887		478	
Subtotal	31,687	5,257	5,246	11
Khulna	5,107	653	846	-193
Patuakhali	1,919	1,462	318	296
Barisal	5,119		848	
Faridpur	5,315	640	880	-240
Jessore	4,917	672	814	-142
Kushtia	2,905	257	481	-224
Subtotal	25,282	3,684	4,187	-503
Rajshahi	6,314	1,145	1,045	100
Pabna	3,995	486	661	-175
Bogra	3,148	640	521	119
Rangpur	7,698	1,549	1,275	274
Dinajpur	3,780	903	626	277
Subtotal	24,935	4,723	4,128	595
T O T A L	101,000	16,723	16,723	±0

Table 3-2-2-2 Estimated Origin Destination of Foodgrains  
Movement in 1982/83

<u>Origin</u>	<u>Destination</u>	<u>Movement (1,000 tons)</u>
Chittagong H.T.	Chittagong	43
Noakhali	Chittagong	26
	Comilla	16
Sylhet	Comilla	11
	Dacca	196
Mymensingh, Tangail	Dacca	387
Patuakhali, Barisal	Chittagong	92
	Khulna	53
	Faridpur	60
	Jessore	41
	Kushtia	50
Rajshahi	Khulna	20
	Faridpur	25
	Jessore	15
	Kushtia	20
	Pabna	20
Bogra	Khulna	20
	Faridpur	25
	Jessore	15
	Kushtia	20
	Pabna	39
Rangpur	Khulna	50
	Faridpur	65
	Jessore	35
	Kushtia	67
	Pabna	57
Dinajpur	Khulna	50
	Faridpur	65
	Jessore	36
	Kushtia	67
	Pabna	59

### 3-2-3 Cement

#### (a) Demand

The Five-Year-Plan estimates the production of cement of 1,280 thousand tons in 1973/74 with an annual rate of increase of approximately 6% from then on, while the Bangladesh Transport Survey predicts that the rate would be about 8% until 1982/83. In this study the rate of 8% is used for cement consumption until 1982/83 and a lower rate of 6% after 1982/83 as shown in Table 3-2-3-1.

Table 3-2-3-1 Forecast of Cement Consumption

(Unit: 1,000 tons)

Year	1973/74	1982/83	1992/93
Cement	829	1,655	2,964

The regional demand is estimated by the use of the consumption pattern during the period January - March 1973.

#### (b) Supply

The cement factories which on the basis of the Five-Year-Plan and other plans are supposed to be in operation in 1982/83 are in Chittagong and Joypurhat with a production of 300,000 and 660,000 tons respectively. In addition the production capacity will be increased from 100,000 to 250,000 tons in 1982/83. The resulting domestic production in 1982/83 amounts to over one million tons, covering two-thirds of the domestic

demand. In the absence of cement projects in Joypurhat the domestic production will be reduced to 550 thousand tons, while the import rises up to well over one million tons.

Table 3-2-3-2 Estimated Supply and Demand of Cement in 1982/83

(Unit: 1,000 tons)

<u>District</u>	<u>Supply</u>	<u>Demand</u>	<u>Balance</u>
Chittagong	300	232	68
Chittagong H.T.		33	-33
Noakhali		33	-33
Comilla		33	-33
Subtotal	300	331	-33
Sylhet	250	83	167
Dacca		646	-646
Mymensingh		66	-66
Tangail			
Subtotal	250	795	-545
Khulna		116	-116
Patuakhali		66	-66
Barisal			
Faridpur		33	-33
Jessore		33	-33
Kushtia		33	-33
Subtotal		281	-281
Rajshahi		149	-149
Pabna	660 <sup>1)</sup>	53	607
Bogra			
Rangpur		66	-66
Dinajpur			
Subtotal	660	268	392
T O T A L	1,210 <sup>2)</sup>	1,675	-465

## Note:

- 1) Figure indicates the amount in the absence of Joypurhat project.
- 2) Imported cement of 465,000 tons be added in the presence of Joypurhat project.

Table 3-2-3-3  
 Estimated Origin Destination of  
 Cement Movement  
 in 1982/83 -- in the absence of  
 Joypurhat Project -- (Unit: 1,000 tons)

<u>Origin</u>	<u>Destination</u>	<u>Movement</u>
Chittagong	Chittagong	232
	Chittagong H.T.	33
	Noakhali	17
	Comilla	18
	Dacca	488
	Mymensingh	20
	Bogra	16
Sylhet	Rangpur/Dinajpur	33
	Noakhali	16
Sylhet	Comilla	15
	Sylhet	83
	Dacca	90
	Mymensingh	46
	Khulna	68
Khulna	Khulna	116
	Patuakhali/Barisal	66
	Faridpur	33
	Jessore	33
	Kushtia	33
	Rajshahi/Pabna	149
	Bogra	17
	Rangpur/Dinajpur	33
	Dacca	68
	Khulna	116

Table 3-2-3-4  
 Estimated Origin Destination of  
 Cement Movement  
 in 1982/83 -- in the presence of Joypurhat  
 Project -- (Unit: 1,000 tons)

<u>Origin</u>	<u>Destination</u>	<u>Movement</u>
Chittagong	Chittagong	232
	Chittagong H.T.	33
	Noakhali	17
	Comilla	18
	Dacca	257
Sylhet	Noakhali	16
	Comilla	15
	Sylhet	83
	Dacca	90
	Mymensingh	46
Khulna	Dacca	66
	Khulna	116
	Patuakhali/Barisal	66
Bogra	Dacca	233
	Mymensingh	20
	Faridpur	33
	Jessore	33
	Kushtia	33
	Rajshahi/Pabna	149
	Bogra	33
	Rangpur/Dinajpur	66
	Dacca	233
	Mymensingh	20



### 3-2-4 Coal

The past consumption of coal has been in the decrease. The Five-Year-Plan estimates the consumption of 760,000 tons in 1977/78, which figure is equivalent to the amount in 1961/62 and 1962/63. Taking into account the industrialization in this country, the coal consumption will increase at an annual rate of increase of 8%: the estimated consumption is 1,102 thousand tons in 1972/83. With the assumed commencement of operation of Joypurhat cement plant, which is planned to consume 130,000 tons of coal annually the consumption amounts to over one million tons in 1982/83.

The import of coal during the period 1960/61 - 64/65 averaged 322 thousand tons from India and 375 thousand tons from other foreign countries, which ratio is 46% to 54%. If this ratio is maintained the import in 1982/83 consists of 506 thousand tons from India and 596 thousand tons from the others.

The coal imported from India is allocated in the west area which is convenient locationally, and the handling ratio of coal at the ports of Chittagong and Chalna is fifty-fifty. In the distant future the whole demand of coal will be covered by the coal mining development in Bogra District.

Table 3-2-4-1 Estimated Demand of Coal in 1982/83

District	Present Rate to total Demand (%)	Demand (1,000 tons)
Chittagong	25.8	250
Chittagong H.T.		
Noakhali	2.7	28
Comilla		
Subtotal	28.5	278
Sylhet	6.7	65
Dacca	28.3	274
Mymensingh	3.8	37
Tangail		
Subtotal	38.8	376
Khulna	8.0	78
Patuakhali	5.4	52
Barisal		
Faridpur	3.1	31
Jessore		
Kushitia		
Subtotal	16.5	161
Rajshahi	8.2	79
Pabna		
Bogra	8.0	208 <sup>1)</sup>
Rangpur		
Dinajpur		
Subtotal	16.2	287
T O T A L	100.0	1,101

Note: 1) Figure includes 13,000 tons to be consumed by cement manufacturing.

Table 3-2-4-2 Estimated Origin-Destination of Coal Movement in 1982/83

- in the absence of coal production in Bogra - (Unit: 1000 tons)

<u>Origin</u>	<u>Destination</u>	<u>Movement</u>
Chittagong	Chittagong	205
	Noakhali/Comilla	28
	Sylhet	65
Dacca	Mymensingh	37
Khulna	Dacca	178
	Khulna	68
	Patuakhali/Barisal/Faridpur	52
India	Chittagong	45
	Dacca	133
	Khulna	10
	Jessore/Kushtia	31
	Rajshahi/Pabna	79
	Bogra/Rangpur/Dinajpur	208

Table 3-2-4-3 Estimated Origin-Destination of Coal Movement in 1992/93

- in the presence of coal production in Bogra - (Unit: 1000 tons)

<u>Origin</u>	<u>Destination</u>	<u>Movement</u>
Bogra	Chittagong	125
	Noakhali/Comilla	14
	Sylhet	33
	Dacca	137
	Mymensingh/Tangail	18
	Khulna	39
	Patuakhali/Barisal/Faridpur	26
	Jessore/Kushtia	15
	Rajshahi/Pabna	40
	Bogra/Rangpur/Dinajpur	104

### 3-2-5 Petroleum

#### (a) Demand

There was a petroleum demand of approximately 1,280 thousand tons in 1970. The Five-Year-Plan estimates a demand of 1,630 tons in 1973 with an annual rate of increase of approximately 10%, amounting to 2,590 thousand tons in 1983. The Bangladesh Transport Survey predicts that the annual rate of increase would be 5% before 1977/78. In this study the rate of 10% is used until 1983 and a lower rate of 5% after 1983 as shown in Table 3-2-5-1.

Table 3-2-5-1 Forecast of Petroleum Demand

(Unit: 1,000 tons)

Year	1973	1983	1993
Petroleum	1,630	3,304	5,382

Table 3-2-5-2 shows the rates of the regional consumption in 1969 and 1972 respectively, the latter of which is unsuitable due to the aftermath of the war. The regional demand in 1983 is estimated on the basis of the pattern in 1969, assuming that the pattern in 1983 would not be different from the 1969.

#### (b) Supply

An assumption is made that petroleum will not be produced in 1982/83. All petroleum is imported through the port of

Chittagong, where refinery facilities are located.

(c) Movement

The movement of petroleum is allocated on the least distance basis as shown in Table 3-2-5-4. The demand in North Bengal is covered with the supply from Khuina.

Table 3-2-5-2 Rates of Regional Consumption of Petroleum

(Unit: %)

<u>Area</u>	<u>1969</u>	<u>1972</u>
Chittagong, Chittagong H.T.	23.4	23.5
Noakhali, Comilla	8.3	9.8
Sylhet	6.7	8.3
Dacca, Mymensingh, Tangail	29.0	36.3
Barisal, Patuakhali	3.4	1.5
Kushtia, Faridpur	] 23.3	18.6
Khulna, Jessore		
Rajshahi, Pabna	2.3	1.2
Bogra, Rangpur, Dinajpur	3.4	0.7
	100.0	100.0

Source: Bangladesh Transport Survey

Table 3-2-5-4 Estimated Origin-Destination of Petroleum Movement in 1982/83

(Unit: 1,000 tons)

<u>Origin</u>	<u>Destination</u>	<u>Movement</u>
Chittagong	Chittagong/Chittagong H.T.	773
	Noakhali/Comilla	274
	Sylhet	221
	Dacca	598
	Mymensingh	195
	Patuakhali/Barisal	43
Khulna	Dacca	172
	Khulna/Jessore/Kushtia	687
	Patuakhali/Barisal	69
	Faridpur	83
	Rajshahi/Pabna	77
	Bogra/Rangpur/Dinajpur	112

Table 3-2-5-3 Estimated Demand and Supply of Petroleum in 1982/83

(Unit: 1,000 tons)

District	Rate of Demand in 1969 (%)	Demand	Refining Production	Refining Capacity	Import
Chitagong Chitagong H.T.]	23.4	773	1,760	2,200	344
Noakhali Comilla ]	8.3	274			
Subtotal	31.7	1,047	1,760	2,200	344
Sylhet	6.7	221			
Dacca	23.3	770			
Mymensingh Tangail ]	5.9	195			
Subtotal	35.9	1,186	0	0	0
Khulna	20.8	687	1,200	1,500	
Patuakhali ]	3.4	112			
Barisal					
Faridpur	2.5	83			
Jessore Kushtia ]	*	*			
Subtotal	26.7	882	1,200	1,500	0
Rajshahi ]	2.3	77			
Pabna					
Bogra ]	3.4	112			
Rangpur					
Dinajpur					
Subtotal	5.7	189	0	0	0
T O T A L	100.0	3,304	2,960	3,700	344

\* included in Khulna

### 3-2-6 Iron and Steel

#### (a) Demand

The demand before the war ranged between 325,000 and 350,000 tons. The Five-Year-Plan estimates the annual rate of increase of 17-20% for a demand of 776,000 tons in 1977/78. However, the demand in 1972/73 is assumed to occupy only two-thirds of the above amount for a volume of 200,000 - 250,000 tons. Compared with the other manufacturing items the increase rate of over 10% is an overestimation. In this study the demand for 1977/78 is shifted to the year 1982/83 with an increase rate of 10%. The regional demand pattern in 1972/73 is adopted for 1982/83. In this item only blister steel is treated due to the absence of data on iron and steel products.

#### (b) Supply

The Chittagong steel mill has an annual capacity of 200,000 - 250,000 tons, amounting to an actual production of 43,000 tons in 1969/70 and 52,000 tons in 1972/73. The Five-Year-Plan estimates a production of 450,000 tons in 1977/78 with the operation of new facilities. As this seems to be difficult, in this study the target production for 1977/78 is shifted to 1982/83. The new facilities are provided in Chittagong and the iron and steel except from Chittagong Steel Mill is imported from abroad with the import rate of fifty-fifty between the two ports of Chittagong and Chalna.



(c) Movement

The movement to Dacca is wholly from Chittagong while half of the demand in North Bengal is covered with the supply from Chittagong as the import at Khulna is not sufficient.

Table 3-2-6-1 Estimated Demand and Supply of Iron and Steel in 1982/83

(Unit: 1,000 tons)

District	Demand	Rate of allot,	Supply	Import
Chittagong	232	30	450	163
Chittagong H.T.				
Noakhali	28	3.6		
Comilla				
Subtotal	260	33.6	450	163
Sylhet	28	3.6		
Dacca	271	35		
Mymensingh	28	3.6		
Tangail				
Subtotal	327	42.2		
Khulna	77	10		163
Patuakhali	28	3.6		
Barisal				
Faridpur	28	3.6		
Jessore				
Kushtia				
Subtotal	133	17.2		163
Rajshahi	28	3.6		
Pabna				
Bogra	28	3.6		
Rangpur				
Dinajpur				
Subtotal	56	7.2		
T O T A L	776	100.0	450	326

Table 3-3-6-2 Estimated Origin-Destination of Iron and Steel Movement in 1982/83

(Unit: 1,000 tons)

Origin	Destination	Movement
Chittagong	Chittagong	232
	Noakhali/Comilla	28
	Sylhet	28
	Dacca	299
	Rajshahi/Pabna	7
	Bogra/Rangpur/Dinajpur	18
Dacca	Mymensingh/Tangail	28
Khulna	Khulna	77
	Patuakhali/Barisal	28
	Faridpur/Jessore/Kushtia	28
	Rajshahi/Comilla	21
	Bogra/Rangpur/Dinajpur	10

### 3-2-7 Fertilizer

#### (a) Demand

The regional consumption of fertilizer in 1972/73 is considerably unbalanced as shown in Table 3-2-7-1. The consumption pattern in 1982/83 is considered to be much different from that in 1972/73. Judging from the past trend, the Five-Year-Plan and the Bangladesh Transport Survey, and annual rate of increase of 15-25% in total consumption is to be assumed for the time being. Table 3-2-7-2 shows the estimated consumption of the Five-Year-Plan which indicates an annual rate of increase of 25% after 1975. This may be accounted for by the fact that self-supply of foodgrains in 1977/78 necessitates such an increase rate of fertilizer. As in the case of foodgrains, in this study the consumption in 1977/78 is estimated to be less by 10% of the amount in the Five-Year-Plan, amounting to 1,025 thousand tons.

The annual rate of increase during these five years is more than 10%, while the Bangladesh Transport Survey predicts the rate as approximately 7.5% after 1970/80. With the increasing agricultural production required after 1977/78 the rate of 12.5% is assumed in this study, the total consumption of fertilizer in 1982/83 amounting to 1,851 thousand tons. The rate of fertilizer by kind, (urea, TSP, and MP) shown in the Five-Year-Plan is used for the consumption in 1982/83 as there is no agronomical data available. The district-wise demand of fertilizer is allocated on the basis of the rate of farming area as the pattern shown in Table 3-2-7-1 is considered unsuitable for the 1982/83

pattern. The estimated district-wise demand in 1982/83 is shown in Table 3-2-7-4.

(b) Supply

The present annual production capacity of the two existing fertilizer factories, Fenchuganj (Sylhet) and Ghorasal (Dacca) amounts to approximately 150,000 and 340,000 tons respectively, both of which are Urea. The other three factories that are supposed to be in operation during the Five-Year-Plan period are Chittagong (TSP), Ashuganj (Urea) and Mongla (TSP), the capacity of which is estimated at 120,000, 450,000 and 120,000 tons, respectively. The balance between supply and demand in 1982/83 is assumed to be covered with the imports of Urea of 176 thousand tons, TSP of 318 thousand tons and MP of 300 thousand tons, and the rate of the port handling of exported fertilizer between Chittagong and Chalna is fifty-fifty.

(c) Movement

The production of Urea in Sylhet covers almost all the domestic demand. The movement from Sylhet is mainly by rail, and the great demand in North Bengal is supplied by the movement from Comilla which is the greatest producer of the country. The supplier of TSP and MP is limited to the two districts of Chittagong and Khulna mainly with the movement from Khulna to districts in the west and from Chittagong to districts in the east and the central. Their demand in North Bengal like Urea, is so great that the movement from Chittagong to North Bengal is also considered.

Table 3-2-7-1: Regional Consumption of Fertilizer in 1972/73

	(Unit: 1,000 tons)					Rate of Farm.
	Urea	TSP	MP	Total	(%)	Area (%)
Chittagong	41.9	14.8	1.3	58.0	(15.3)	2.8
Chittagong H.T.	1.1	0.6	0.1	1.8	(0.5)	0.9
Comilla	35.1	13.5	2.8	51.4	(13.6)	5.1
Noakhali	14.1	4.9	0.8	19.9	(5.3)	3.1
Sylhet	15.0	5.6	0.4	21.0	(5.5)	7.1
Dacca	33.6	7.3	1.2	42.1	(11.1)	6.3
Faridpur	5.1	1.4	0.5	7.0	(1.9)	5.7
Mymensingh (except Kisyoreganj)	16.0	2.8	0.7	19.5	(5.2)	14.9
Kisyoreganj	25.2	3.6	0.7	29.5	(7.8)	
Tangail	5.3	1.7	0.7	7.7	(2.0)	8.7
Barisal	16.8	5.9	0.8	23.5	(6.2)	
Jessore	5.7	1.9	0.4	7.9	(2.1)	6.4
Khulna	4.8	1.6	0.2	6.7	(1.8)	5.4
Kushtia	6.9	2.8	0.9	10.6	(2.8)	2.9
Patuakhali	3.3	1.4	0.1	4.8	(1.3)	-
Bogra	9.6	3.4	1.2	14.2	(3.8)	3.6
Dinajpur	7.4	4.8	1.5	13.6	(3.6)	5.5
Pabna	7.4	3.2	0.9	11.5	(3.0)	4.1
Rajshahi	9.0	3.3	1.4	13.7	(3.6)	8.5
Rangpur	8.9	3.5	1.2	13.6	(3.6)	9.0
<b>T O T A L</b>	<b>272.0</b>	<b>87.9</b>	<b>18.0</b>	<b>378.0</b>	<b>100.0</b>	<b>100.0</b>

Source: Bangladesh Agriculture Development Corporation

Table 3-2-7-2 Estimated Consumption of Fertilizer

Year	(Unit: 1,000 tons)			
	Urea	T.S.P.	M.P.	Total
1973 - 74	301	158	61	520
1974 - 75	342	173	74	589
1975 - 76	423	207	104	734
1976 - 77	518	254	134	906
1977 - 78	616	332	187	135

Source: The First Five Year Plan

Table 3-2-7-3 Estimated Domestic Production of Fertilizer in 1982/83

Factory	Kind	(Unit: 1,000 tons)	
		Annual Produc. capacity	Annual Production (80% of capacity)
Chittagong	T.S.P.	150	120
Comilla (Ashuganj)	Urea	450	360
Sylhet (Fenchuganj)	Urea	250	200
Dacca (Ghorasal)	Urea	340	270
Khulna (Mongla)	T.S.P.	120	100
T O T A L	Urea	1,040	830
	T.S.P.	270	220
	M.P.	0	0

Table 3-2-7-4 Estimated Supply and Demand of Fertilizer in 1982/83

(Unit: 1,000 tons)

District	Supply	Import	Rate of Farm Area (%)	Demand	UREA	TSP	MP
Chittagong	120 TSP	88 UREA 159 TSP 150 MP	2.8	65	42	15	8
Chittagong H.T.			0.9	17	9	5	3
Noakhali			3.1	57	31	17	9
Comilla	360 UREA		5.1	93	51	27	15
Subtotal	360 UREA 120 TSP	88 UREA 159 TSP 150 MP	11.9	232	133	64	35
Sylhet	200 UREA		7.1	131	71	38	22
Dacca	270 UREA		6.3	116	63	34	19
Mymensingh Tangail			14.9	273	148	81	44
Subtotal	470 UREA		28.3	520	282	153	85
Khulna	100 TSP	88 UREA 159 TSP 150 MP	5.4	99	54	29	16
Patuakhali			8.7	160	87	47	26
Barisal			5.7	105	57	31	17
Faridpur			6.4	117	64	34	19
Jessore			2.9	54	29	16	9
Kushtia							
Subtotal	100 TSP	88 UREA 159 TSP 150 MP	29.1	535	291	157	87
Rajshahi			8.5	157	85	46	26
Pabna			4.1	75	41	22	12
Bogra			3.6	66	36	19	11
Rangpur			5.5	101	55	29	17
Dinajpur			9.0	165	90	48	27
Subtotal			30.7	564	307	164	93
T O T A L	830 UREA 220 TSP	176 UREA 318 TSP 300 MP	100.0	1,851	1,013	538	300

Table 3-2-7-5 Estimated Origin-Destination of Fertilizer Movement  
in 1982/83

<u>Origin</u>	<u>Destination</u>	<u>Movement (1,000 tons)</u>
Chittagong	Chittagong	65
	Chittagong H.T.	17
	Noakhali	57
	Comilla	32
	Sylhet	60
	Dacca	53
	Mymensingh	131
	Bogra	18
	Rangpur	28
	Dinajpur	46
Comilla	Comilla	51
	Mymensingh	40
	Patuakhali/Barisal	29
	Faridpur	29
	Jessore	28
	Kushtia	11
	Rajshahi	47
	Pabna	23
	Bogra	21
	Rangpur	31
Dinajpur	50	
Sylhet	Sylhet	71
	Mymensingh	62
	Rajshahi	19
	Pabna	9
	Bogra	8
	Rangpur	12
	Dinajpur	19
Dacca	Dacca	63
	Mymensingh	40
	Patuakhali/Barisal	29
	Faridpur	28
	Jessore	27
	Kushtia	10
	Rajshahi	19
	Pabna	9
	Bogra	7
	Rangpur	12
Dinajpur	20	
Khulna	Khulna	98
	Patuakhali/Barisal	92
	Faridpur	48
	Jessore	62
	Kushtia	33
	Rajshahi	72
	Pabna	34
	Bogra	12
	Rangpur	18
	Dinajpur	29



### 3-2-8 Salt

#### (a) Demand

The consumption of salt in 1972/73 was approximately 350,000 tons for an annual per capita consumption of 4.5 kg. The consumption in 1982/83 is estimated in proportion to the population: the total demand will be approximately 480,000 tons at an annual per capita consumption of 4.6 kg.

Subsequently the demand of crude salt is estimated from the above required common salt with 14% of loss in the refining process, amounting to 558,000 tons.

The Five-Year-Plan estimates the demand of industrial salt of 175,000 tons in 1977/78 with an annual rate of increase of 5-10% thenceforth. Like other allied manufactured products, the demand of industrial salt amounts to 275,000 tons with the annual rate of increase of 8% in this study.

The demand of crude salt for refining is estimated in proportion to the production of refined salt of each works and the regional demand of industrial salt is allocated to Chittagong and Dacca at a ratio of 75% and 25% respectively, the results of which are tabulated in Table 3-2-8-4.

#### (b) Supply

The total supply of refined salt is equal to the total demand with the production of 480,000 tons in 1982/83.

The crude salt of 915,000 tons which equals the total demand in 1982/83 is produced in Chittagong District as in the present situation.

(c) Movement

The movement of crude salt is all from Chittagong, out of which the crude salt for refining is moved to the districts having refining works, and the industrial salt is transported to the two districts of Dacca and Chittagong that have industries requiring industrial salt.

The movement of refined salt is from each works directly to consumption areas. The priority is given to the allocation on the least distance basis.

Table 3-2-8-1 Estimated Supply and Demand of Salt in 1982/83  
Refined Salt

District	Population Demand		Production			Crude Salt		Total
	(1000 persons)	(1000 tons)	No. of Works	(1000 tons)	(%)	refining	Industrial	
Chittagong	6,197	30	79	183	38	212	193	405
Chittagong H.T.	681	3						
Noakhali	4,409	21						
Comilla	7,809	37	30	183	38	212		212
Subtotal	19,096	91	109	366	76	424	193	617
Sylhet	6,402	31						
Dacca	12,008	57	15	50	10	58	64	122
Mymensingh	10,390	50	1	5	1	6		6
Tangail	2,887	14						
Subtotal	31,678	152	16	55	11	64	64	128
Khulna	5,107	24						
Patuakhali	1,919	9						
Barisal	5,119	24	18	60	13	70		70
Faridpur	5,315	25						
Jessore	4,917	23						
Kushia	2,905	14						
Subtotal	25,282	119	18	60	13	70		70
Rajshahi	6,314	30						
Pabna	3,995	19						
Bogra	3,148	15						
Rangpur	7,698	37						
Dinaipur	3,780	18						
Subtotal	24,935	119						
T O T A L	101,000	481	143	481	100	558	257	815

Table 3-2-8-2 Estimated Origin-Destination of Salt Movement in 1982/83

<u>Origin</u>	<u>Destination</u>	<u>Movement (1,000 tons)</u>
Chittagong	Chittagong	405
	Comilla	212
	Dacca	122
	Mymensingh	6
	Barisal	70
Chittagong		-Refined Salt -
	Chittagong	30
	Chittagong H.T.	3
	Noakhali	9
	Sylhet	10
	Dacca	2
	Mymensingh	22
	Tangail	7
	Faridpur	12
	Jessore	11
	Kushtia	7
	Rajshahi/Pabna	24
Bogra/Rangpur/Dinajpur	46	
Comilla	Noakhali	12
	Comilla	37
	Sylhet	21
	Dacca	2
	Mymensingh	23
	Tangail	7
	Faridpur	13
	Jessore	12
	Kushtia	7
	Rajshahi/Pabna	25
Bogra/Rangpur/Dinajpur	24	
Dacca	Dacca	50
Mymensingh	Mymensingh	5
Barisal	Dacca	3
	Khuina	24
	Patuakhali	9
	Barisal	24

### 3-2-9 Sugar

The movement of gur which comes into general use in the rural area with a considerable amount of production is very small in commercial value compared with the movement of sugar. Only normal sugar is treated in the movement study.

#### (a) Demand

The annual per capita consumption of sugar (with gur) amounted to 12.9 pounds in 1968/69 as a peak and it decreased to approximately 10 pounds in 1972/73. As in the case of foodgrains and salt the future demand is estimated on the basis of the population. The ratio of consumption between sugar and gur is 1 to 1. Therefore, the per capita consumption in 1982/83 is 6.45 pounds per year.

#### (b) Supply

The present production of both sugar and gur is great in North Bengal and Khulna. The Five-Year-Plan estimates the production of sugar of 160 thousand tons and gur of 260 thousand tons in 1977/78 which are equivalent to 1.6 times and 1.13 times the present production, respectively. At the same rate of increase as in the Five-Year-Plan the production in 1982/83 will amount to 256 thousand tons of sugar and 294 thousand tons of gur. The regional production of sugar is estimated in proportion to the production capacity of the existing sugar mills.

(c) Balance

Table 3-2-9-1 shows the supply and demand of sugar in 1982/83 tabulated from the above estimates. With the derivative demand of 10,000 tons in Dacca, the estimated import of sugar amounts to 51,000 tons which is handled at Chittagong Port.

(d) Movement

The estimated interregional movement is tabulated in Table 3-2-9-2 on the basis of least distance. Except the intra-regional movement a considerable amount of sugar is to be transported from North Bengal to Dacca areas.

Table 3-2-9-1 Estimated Supply and Demand of Sugar in 1982/83

District	Population (1000 persons)	Demand (1000 tons)	Production		Supply (1000 tons)
			capacity (1000 tons)	(district rate %)	
Chittagong	6,197	18			51*
Chittagong H.T.	681	2			
Noakhali	4,409	13			
Comilla	7,809	23			
Subtotal	19,096	56			51*
Sylhet	6,402	19			
Dacca	12,008	45**	2 (1.1)		3
Mymensingh	10,390	39	23 (12.8)		33
Tangail	2,887				
Subtotal	31,678	103	25 (13.9)		36
Khulna	5,107	15			
Patuakhali	1,919	21			
Barisal	5,119				
Faridpur	5,315	15	10 (5.6)		14
Jessore	4,917	14	10 (5.6)		14
Kushtia	2,905	8	27 (15.1)		39
Subtotal	25,282	73	47 (26.3)		67
Rajshahi	6,314	19	29 (16.2)		41
Pabna	3,995	12			
Bogra	3,148	10	20 (11.2)		29
Rangpur	7,698	23	25 (14.0)		36
Dinajpur	3,780	11	33 (18.4)		37
Subtotal	24,935	75	107 (60.8)		153
T O T A L	101,000	307	179 (100.0)	Domestic Import	256 51

\* Sugar to be imported.

\*\* includes derivative demand of 10,000 tons

Table 3-2-9-2 Estimated Origin-Destination of Sugar Movement in 1982/83

<u>Origin</u>	<u>Destination</u>	<u>Movement (1000 tons)</u>
Chittagong	Chittagong	18
	Chittagong H.T.	2
	Noakhali	13
	Comilla	10
	Sylhet	8
Dacca	Dacca	3
Mymensingh	Comilla	5
	Sylhet	5
	Dacca	5
	Mymensingh	18
Faridpur	Faridpur	14
Jessore	Jessore	14
Kushtia	Comilla	4
	Khulna	5
	Patuakhali/Barisal	21
	Faridpur	1
	Kushtia	8
Rajshahi	Comilla	4
	Dacca	5
	Mymensingh	2
	Khulna	5
	Rajshahi	19
	Pabna	6
Bogra	Dacca	8
	Mymensingh	5
	Pabna	6
	Bogra	10
Rangpur	Dacca	8
	Mymensingh	5
	Rangpur	23
Dinajpur	Sylhet	6
	Dacca	15
	Mymensingh	10
	Khulna	5
	Dinajpur	11



3-2-10 Hard Rock

(a) Demand

The demand in 1972/73 amounted to approximately 900,000 tons, and the Bangladesh Transport Survey estimates the demand in 1977/78 to increase by approximately 50%. The annual rate of increase of 8% which is adequate in the light of the indices of other industries is assumed to last until 1982/83 for a total demand of approximately 2 million tons.

The rates of regional demand derived from the inter-district movement both in 1968/69 and in 1972/73 are 5% for Mymensingh, 40% for Dacca, 25% for Chittagong, 10% for Naokhali and Comilla, 10% for Bogra, and 10% for Khulna, Faridpur, Jessore, Kushtia, Barisal, and Patuakhali.

(b) Supply

Hard rock is produced in the three districts of Sylhet, Dinajpur and Rangpur, the first of which is the greatest supplier with 80% of the total production. The Five-Year-Plan estimates a considerable increase of production in Dinajpur and Rangpur for a total amount of approximately 2 million tons in 1977/78.

The ratios of production of the above three are assumed: 2 for Sylhet and 1 for Rangpur and Dinajpur, respectively. The interregional movement in 1972/73 totaled approximately 400,000 tons which is equivalent to about 40% of the whole production.

This rate is adopted for the estimation of the interregional movement in 1982/83. The results are tabulated in Table 3-2-10-1.

(c) Movement

Like the other items, the origin-destination movement of hard rock is allocated on the least distance basis: the movement from Sylhet to the districts in the east and the central including Dacca and Chittagong, and that from Rangpur/Dinajpur to the districts in the west. The movement to Dacca which is the greatest consumer is assumed to consist of the supplies from North Bengal as well as Sylhet.

Table 3-2-10-1 Estimated Supply and Demand of Hard Rock in 1982/83

<u>District</u>	<u>Average rate of demand in 1968/69 and 1972/73 (%)</u>	<u>Demand (1000 tons)</u>	<u>Supply (1000 tons)</u>
Chittagong Chittagong H.T.	25	200	-
Noakhali Comilla ]	10	80	-
<b>Subtotal</b>	<b>35</b>	<b>280</b>	<b>0</b>
Sylhet	-	-	520
Dacca	40	320	-
Mymensingh Tangail ]	5	40	-
<b>Subtotal</b>	<b>45</b>	<b>360</b>	<b>520</b>
Khulna Patuakhali Barisal Faridpur Jessore Kushtia ]	10	80	0
<b>Subtotal</b>	<b>10</b>	<b>80</b>	<b>0</b>
Rajshahi Pabna ] Bogra ]	10	80	-
Rangpur Dinajpur ]	-	-	280
<b>Subtotal</b>	<b>10</b>	<b>80</b>	<b>280</b>
<b>T O T A L</b>	<b>100</b>	<b>800</b>	<b>800</b>

Table 3-2-10-2 Estimated Origin-Destination of Hard Rock Movement in 1982/83

<u>Origin</u>	<u>Destination</u>	<u>Movement (1,000 tons)</u>
Sylhet	Chittagong	200
	Noakhali/Comilla	80
	Dacca	220
	Mymensingh	20
Rangpur/Dinajpur	Dacca	100
	Mymensingh	20
	Khulna Division	80
	Rajshahi/Pabna	80

CHAPTER 4  
PASSENGER MOVEMENT

4-1 General Movement

4-1-1 Study Data

It is very difficult to analyse the present movement of passenger without the presence of systematic data and information. As far as the passenger movement by rail is concerned, its statistic data which is based on the ticket passengers will not indicate the ticketless passengers, the number of which is estimated be considerable. No data are available for making comparisor of the passenger movement by mode of transport, railway, IWT, country boat, and highway.

Under these circumstances the economy and traffic team of the Jamuna Bridge Survey conducted on Origin-Destination interview survey of each passenger crossing Jamuna River in December 1973 and June 1974. The results of the survey are found to be different from the overall passenger movement patterns before and after the war as far as their crossing pattern of Jamuna River is concerned. Therefore, the discussions below by mode of transport are to be very fragmentary. At present the Bangladesh Transport Survey is getting near to its end, the results of which are expected to reveal the characteristics of the overall pattern of the latest passenger movements.

#### 4-1-2 Outline of O-D Survey of Passengers Crossing Jamuna River

The O-D Survey of passengers crossing Jamuna River was conducted in December 1973 and June 1974, the former was to find the passenger movement pattern for the dry season and the latter that for the rainy season. The two surveys were for the same duration (2 day period) and of the same fashion as shown on the survey sheets.

##### 1) Railway Passengers

The O-D interview survey was conducted for all the railway passengers on board the ferry boats plying between Bahadurabad and Tistamuka and between Jagannathganj and Sirajganj respectively to the scheduled arrival times of the railway passenger trains. One ferry boat made two return trips a day starting from the east bank (Bahadurabad, and Jagannathganj respectively) in the morning and terminating at the starting point late at night.

##### 2) Highway Passengers

The survey team was divided into five groups for the 5 ferry operations: Aricha - Nagarbari, Nagarbari - Aricha, Aricha - Goalundo, Goalundo - Aricha and Paksey - Bherama (near Hardinge Bridge). Each group was stationed on the side from which each ferry boat started its operation in the morning. The survey groups conducted on board their ferry boats the O-D survey on all the persons and all types of vehicles that were transported by the ferry boats. The ferry boat plying between Paksey and Bheramara was operated as long as the vehicle traffic

requested to cross, however, the ferry boats departing from and arriving at Aricha made four return trips a day, sometime with less number of scheduled trips due to the conditions of the boats.

#### 4-1-3 Railway Passenger Movement

The railway passenger movement had not varied greatly during the past 10 years from the annual passenger of 70 million as shown in Table 4-1-3-1. However, the average trip length made a slight increase of 10% in terms of man-mile. Table 4-1-3-2 and 4-1-3-3 show the number of passengers and the average trip length by coach class respectively. The passengers of 3rd class accounted for more than 90%, those of 1st class and Air-conditioned class totalled less than 1%. The average trip length was greater for the higher class passengers.

The number of railway users was greatest for Chittagong Station and Dacca Station with an annual passengers of over 2 million respectively. On the contrary in Khulna which has one of the key cities in Bangladesh there were no railway stations used by a great number of users. This might be because in Khulna areas IWT and vehicle transport networks were comparatively developed, while the rail system were poor. Stations of Mymensingh and Comilla handled more than 1 million passengers annually. The district capitals which have railway stations handled more than 500 thousand passengers and the stations which have railway junctions also handled more than 500 thousand passengers. The stations which connect to big IWT

terminals such as Narayanganj and Chandpur did not handle so many railway passengers. Table 4-1-3-4 shows the number of stations classified by area and number of passengers. The areas which have a great number of railway passenger movement are Comilla, Mymensingh, Dacca and Chittagong, and the ones which have a comparative large number of passengers are Sylhet, Rajshahi and Dinajpur. Jessore and Khulna areas have few railway users.

Table 4-1-3-1 Railway Passenger Movement

Year	Persons (1000)	Man-miles (1000)	Average Trip Length (miles)
1959 - 60	70,091	1,816,381	25.9
1960 - 61	71,175	1,881,881	26.4
1961 - 62	72,799	1,916,555	26.3
1962 - 63	70,002	1,935,535	26.9
1963 - 64	73,145	2,003,397	27.4
1964 - 65	71,326	1,921,791	26.9
1965 - 66	67,191	1,787,490	26.6
1966 - 67	73,017	2,004,532	27.5
1967 - 68	70,806	2,078,707	29.4
1968 - 69	72,836	2,205,212	30.3
1969 - 70	72,885	2,061,084	28.3

Source: Bangladesh Railway Board Year Book 1970

Table 4-1-3-2 Number of Railway Passengers by Class

(Unit: 1,000 persons)

Year	Class		1st		2nd		Inter- mediate		3rd		Total No.
	Air-con- ditioned No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
1959 - 60	---	---	58	0.08	342	0.49	3,892	5.55	65,799	93.9	70,091
1960 - 61	---	---	62	0.09	379	0.53	4,453	6.26	66,281	93.1	71,175
1961 - 62	---	---	61	0.08	420	0.58	4,956	6.81	67,362	92.5	72,799
1962 - 63	---	---	63	0.09	442	0.61	5,063	7.03	66,434	92.3	72,002
1963 - 64	---	---	68	0.09	479	0.65	5,433	7.43	67,165	91.8	73,145
1964 - 65	---	---	69	0.10	422	0.59	4,958	6.95	65,877	92.4	71,326
1965 - 66	---	---	71	0.11	347	0.52	4,660	6.94	62,113	92.4	67,191
1966 - 67	---	---	74	0.10	346	0.47	5,197	7.12	67,400	92.3	73,017
1967 - 68	29	0.04	384	0.54	5,424	7.66	---	---	64,969	91.8	70,806
1968 - 69	38	0.05	314	0.43	5,590	7.67	---	---	66,894	91.8	72,836
1969 - 70	42	0.06	334	0.45	5,714	7.84	---	---	66,795	91.6	72,885

Source: Bangladesh Railway Board Year Book 1970



Table 4-1-3-3 Average Trip Length by Class

(Unit: miles)

Year	Class	Air-conditioned	1st	2nd	Inter-mediate	3rd	Total
1959 - 60		---	108.2	57.7	34.7	25.2	25.9
1960 - 61		---	108.9	57.2	25.7	25.6	26.4
1961 - 62		---	105.5	57.9	34.8	25.4	26.3
1962 - 63		---	107.1	57.8	36.8	35.9	26.9
1963 - 64		---	108.4	59.5	36.9	26.3	27.4
1964 - 65		---	107.1	59.5	40.3	25.6	26.9
1965 - 66		---	115.0	61.1	42.8	25.1	26.6
1966 - 67		---	118.0	62.9	43.4	25.9	27.5
1967 - 68		160.8	72.5	45.8	---	27.7	29.4
1968 - 69		138.2	83.3	49.8	---	28.3	30.3
1969 - 70		133.8	81.5	45.7	---	26.4	28.3

Source: Bangladesh Railway Board Year Book 1970

Table 4-1-3-4 Number of Stations Classified by Area and Number of Passengers

Area	Annual users 10,000 persons	(Unit: Stations)				
		200 -	100-200	50-100	30-50	10-30
Chittagong	1	0	3	5	11	17
Comilla	0	1	6	3	25	17
Sylhet	0	0	1	3	14	28
Dacca	1	0	1	4	13	7
Mymensingh	0	1	2	2	28	21
Khulna	0	0	0	2	4	6
Jessore	0	0	0	5	14	42
Rajshahi	0	0	3	3	18	21
Dinajpur	0	0	4	5	31	45

#### 4-1-4 Inland Water Passenger

The passengers by inland water can be divided into the ones by Inland Water Transport Authority (IWTA) and the ones by country boat. The passengers by IWTA are shown in Table 4-1-4-1, the number of which, unlike railway, almost doubled during the decade 1959/60 - 69/70. However the number of passengers by IWTA in 1968/69 was only approximately 30% of the railway passengers in the same year. Land transport still played a greater role in passenger movement.

The man-miles by IWTA amounted to 649 million in 1967/68 and 702 million in 1968/69 respectively, both of which were equivalent to one-third of the man-miles by railway. The average trip length of passengers by IWTA came to 26 miles in 1967/68 and 26.5 miles in 1968/69, which were a little shorter than that by rail.

Both in railway and IWTA the average trip length of passengers ranges from 25 to 30 miles which is much smaller than that of goods. Most of these modes of transport is supposed to be for such short distance trips as intra-district.

The average trip length of passengers by country boat that amounted to 17 miles is supposed to be for intra-district distance. According to the survey of passenger movement by country boat which was conducted by Dr. M.A. Rahman in 1963/64 based on 1003 samples boats, the volume amounted to 437 thousand passenger's and 7,435 thousand man-miles.

Table 4-1-4-1. Passenger Movement by IWTA

(Unit: one million persons)

<u>1959/60</u>	<u>60/61</u>	<u>61/62</u>	<u>62/63</u>	<u>63/64</u>	<u>64/65</u>	<u>65/66</u>	<u>66/67</u>	<u>67/68</u>	<u>68/69</u>	<u>69/70</u>
14	16	20	21	22	22	23.6	25.4	24.7	25.6	26.4

#### 4-1-5 Highway Passengers

From October 1968 through February 1969 the national highway traffic survey was conducted by Roads & Highways Directorate with 13 survey stations in the country. The fundamental trip pattern of passenger cars shows, like these of trucks and buses, more traffic around the adjacent areas of cities such as Chittagong, Dacca, Khulna, Jessore, etc.

Table 4-1-5-1 shows the O-D trips of passenger cars and jeeps, in which the number of intra-district trips were very great. The number of interregional trips in Khulna Division occupied approximately half of the whole number of interregional trips. The O-D shows the most trips between Khulna and Jessore. There were some trips that were for comparatively long distance such as between Dacca and Chittagong and between Dacca and Khulna.

The bus traffic was great on the routes that connected to large cities, Chittagong-Feni, Chittagong-Kaptai, routes to/from Dacca, Khulna-Jessore, etc. as noted in Table 4-1-5-2 which shows the O-D of bus passenger trips in 1968/69. The characteristics of the bus traffic was such that its O-Ds were limited to the traffic for very short distance: the traffic between Khulna and Jessore (including Kushtia)

occupied approximately half of the total traffic, while no bus O-D traffic was found between the districts, Barisal, Patuakhali, Faridpur, etc. and the other districts in Khulna Division.

Table 4-1-3-1 Origin-Destination of Passenger Cars and Jeeps in 1968/69  
(unit: vehicles)

D	D		D		D		D		D		D		D		TOTAL	
	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA			
DELHI	72	8	6	13										99	27	
DELHI																
DELHI	6													6	6	
DELHI	5	93	19											117	24	
DELHI	1	1												2	2	
DELHI	8	19	14	14	1	4	3	1	2	3	1	1	1	119	18	
DELHI														2	2	
DELHI		18												18	18	
DELHI	1													286	101	
DELHI																
DELHI														3	3	
DELHI		4												31	6	
DELHI		5												122	107	
DELHI		2												12	12	
DELHI														15	15	
DELHI		4												37	26	
DELHI		2												30	12	
DELHI		1												25	25	
DELHI		1												51	3	
TOTAL *	93	2	118	124	6	15	302	1	34	113	11	15	36	27	8	69
**	21	8	26	83	6	15	117	1	9	92	11	15	15	9	8	21
INDIA (CALCUTTA)																

Source: Roads & Highways Directorate  
\* includes intra-district traffic. \*\* excludes intra-district traffic.

Table 4-1-3-2 Origin-Destination of Bus Passengers in 1963/69  
(Unit: persons)

District	District														TOTAL				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14					
1	1201	1400	30														262	1480	
2		1470																1570	1451
3			1604	6	474													2111	484
4					462	1207	422	1262										2794	2784
5																		82	82
6																		197	197
7																		121	121
8																		2070	2070
9																		253	253
10																		2217	4004
11																		1786	2306
12																		459	459
13																		597	808
14																		121	886
15																		96	1711
TOTAL	2772	1400	2166	6	2246	422	1262	5174										2775	1405
INDIA (CALCUTTA)	1571	1400	542	6	269	422	1262	3953										2275	2275

Source: Roads & Highways Directorate  
\* includes intra-district traffic. \*\* excludes intra-district traffic.

## 4-2 Present Traffic Crossing Jamuna River

### 4-2-1 Highway Traffic

#### 1) Traffic Crossing Jamuna River

The number of the users of the Aricha Ferry in 1973/74 is estimated to amount to 730 thousand, as shown in Table 4-2-1-1. The two surveys in 1973 and 1974 which had a constraint of a two day survey period each reveal a greatly different result as shown in Table 4-2-1-2. This may be accounted for by the fact that the number of ferry boats was increased from 4 to 6 to cope with the increasing traffic. Compared with the survey results by the Roads and Highways Directorate in 1968, the increase in number of ferry users is remarkable. Judging from the crowded situation of vehicles waiting on the line, the potential demand would be tremendously great.

#### 2) Modes of Transferred Transport

The number of ferry users who came to the ferry by bus and/or who left the ferry by bus and who crossed the river through bus was great among the modes, occupying more than half of the total ferry users, and followed by the ones by passenger car and taxi as shown in Table 4-2-1-3. Table 4-2-1-4 shows the average daily vehicular traffic crossing Jamuna River in two ways.

#### 3) Origin-Destination

More than 90% of the passenger movement crossing by the

Table 4-2-1-1 Road Passenger Movement Crossing by Airich Ferry 1973/74 (AADI) (Unit: passengers)

Origin	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	TOTAL	
	CHITTAGONG	CHITTAGONG	NOAKH	COMIL	SYL	DACCA	MYAENTANG	BARIS	PATUA	BARIS	FARID	JESSO	KUSHI	RAJSH	PAHNA	BOGRA	RAJSH	BOGRA	IPUR	TOTAL	
	CHITTAGONG	CHITTAGONG	NOAKH	COMIL	NET	DACCA	SINGH	TANGA	KHALI	AL	IPUR	IPUR	IA	IA	ASH	PABNA	BOGRA	IPUR	IPUR	TOTAL	
① CHITTAGONG																				11	
② CHITTAGONG H.I.																					2
③ NOAKHALI																					
④ COMILLA																					6
⑤ SYLHET																					3
⑥ DACCA																					880
⑦ RAYMENSINGH																					21
⑧ YANGAIL																					16
⑨ KHULNA																					52
⑩ PATUAKHALI																					2
⑪ BARISAL																					15
⑫ FARIDPUR																					296
⑬ JESSORE																					55
⑭ KUSHTIA																					32
⑮ RAJSHAH																					152
⑯ PABNA																					268
⑰ BOGRA																					56
⑱ RANGPUR																					76
⑳ DINAJPUR																					19
TOTAL	14	4	8	5	5	971	5	8	37	5	247	77	125	289	78	46	33	2009			



Table 4-2-1-2 Number of Passengers Crossed by the Aricha Ferry

<u>Time of Survey</u>	<u>Duration</u>	<u>No. of Passengers (persons)</u>
December 1973	2 days	3,594
June 1974	2 days	5,076

Table 4-2-1-3 Number of Ferry Passengers by Mode of Transport

<u>Mode of Transport</u>	<u>Destined for the Ferry by</u>		<u>Left the Ferry by</u>	
	<u>(persons)</u>	<u>(percent)</u>	<u>(persons)</u>	<u>(percent)</u>
Passenger car, jeep, Station wagon, Micro-bus	303	8.4	229	6.3
Bus	2,138	59.3	2,159	58.9
Taxi	296	8.2	332	9.1
Rickshaw	126	3.5	125	3.4
Auto-rickshaw	22	0.6	10	0.3
Walk	301	8.4	396	10.8
Other	417	11.6	411	11.2
Total	3,603	100	3,662	100

Source: Survey result in December 1973 (2 days)

Table 4-2-1-4 Average Daily Vehicular Traffic Crossing by the Arich Ferry by Two Ways

(Unit: Vehicles)

<u>Ferry Terminals</u>	<u>Truck</u>			<u>Bus</u>			<u>Passenger car Jeep, Mini-bus</u>		
	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>
Aricha- Nagarbari	47	30	23	3	9	7	57	35	26
Aricha- Goalundo	22	36	24	2	10	7	27	15	14

Source: (1) Bangladesh Transport Survey

(2) Jamuna Bridge Survey, December 1973

(3) Jamuna Bridge Survey, June 1974

Aricha Ferry is for the movement of passengers departing from and destined for Dacca as shown in Table 4-2-1-1 which indicates the connections of Dacca-Khulna Divisions and Dacca-Rajshahi Divisions with 39% and 53% to the total respectively. District-wise the connections of Dacca-Paridpur and Jessore, and Dacca-Pabna and Rajshahi are stronger. The O-D flows by vehicle show that almost all the buses and passenger cars crossing by the Aricha Ferry have departed from and/or been destined for Dacca.

#### 4-2-2 Railway Traffic

No data concerning railway passengers who crossed Jamuna River were available. The Jamuna Bridge Survey Team conducted the two interview surveys of the railway passengers who crossed Jamuna River by the Ferrys of Bahadurabad-Pistanukh and Jagannathganj-Sirajganj in December 1973 and June 1974 respectively.

##### 1) Traffic Crossing Jamuna River

Unlike the survey by the Aricha Ferry which was for the highway traffic, only a slight increase in the number of passengers was found at each of the ferries, as shown in Table 4-2-2-1. The number of the annual railway passengers who crossed Jamuna River is assumed to be 1,770 thousand by both ferries.

##### 2) Origin-Destination

Approximately 85% of the originating passengers by railway are from Dacca and Nymensingh by each ferry, although

their O-D patterns vary greatly with each ferry, as shown in table 4-2-2-4 and 4-2-2-5.

#### Bahadurabad-Tistamukh Ferry

The passenger movements of Dacca-Bogra, -Dinajpur and -Rajshahi and Mymensingh-Bogra, -Dinajpur and -Rajshahi are greatest with 44% for the former and 42% for the latter to the total. Table 4-2-2-2 shows the major movements of these districts. Subdivision-wide the movements are scattered uniformly in the three districts in the northwest, while the movements in Dacca and Mymensingh Districts are concentrated in Dacca Subdivision, Mymensingh Subdivision and Jampur Subdivision. Among the three districts the movement from and to Rangpur occupies 65% of the total movement.

#### Jagannathganj-Sirajganj Ferry

In the east the movements to and from Dacca and Mymensingh, like the Bahadurabad-Tistamukh Ferry, are greatest with 36% for the former and 48% for the latter to the total. Table 4-2-2-3 shows the major movements of the districts concerned. Likewise the movements to and from Dacca Subdivision, Mymensingh Subdivision and Jamurpur Subdivision are greatest. On the contrary the movement in the west makes a clear contrast to that by the Bahadurabad-Tistamukh Ferry with a considerable amount of the O-D movement to and from Khulna Division, in which the O-D between Jessore District and Kushtia District is predominant. Subdivisionally the movement to and from Sirajganj Subdivision in Pabna District is remarkable.

Table 4-2-2-1 Number of Railway Passengers Crossed Jamuna River

<u>Time of Survey</u>	<u>Duration</u>	<u>Jagannathganj - Sirajganj</u>	<u>Bahadurabad - Tistamukh</u>	<u>Total</u>
December 1973	2 days	4,864	6,473	11,337
June 1974	2 days	5,505	6,769	12,274

Table 4-2-2-2 Major Passenger O-D by Bahadurabad-Tistamukh Ferry

Unit: persons (average daily)

	<u>Bogra</u>	<u>Rangpur</u>	<u>Dinajpur</u>
Dacca	175	762	253
Mymensingh	120	782	230

Table 4-2-2-3 Major Passenger O-D by Jagannathganj-Sirajganj Ferry

Unit: persons (average daily)

	<u>Jessore</u>	<u>Kushtia</u>	<u>Rajshahi</u>	<u>Pabna</u>
Dacca	77	97	182	292
Mymensingh	60	56	98	731

Table 4-2-2-4: Railway Passenger Movement Crossing by Bahadurabad-Tistamukh Ferry 1973-74 (A.A.D.T) (Unit: passengers)

Origin	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	TOTAL		
Destination	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	
	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	CHITTA GONG	
① CHITTAGONG																						
② CHITTAGONG H.I.																						
③ NOAKHALI																						
④ COMILLA																						
⑤ SYLHET																						
⑥ DACCA																						
⑦ RAMMENSINGH																						
⑧ TANGAIL																						
⑨ KHULNA																						
⑩ PATUAKHALI																						
⑪ BARISAL																						
⑫ FARIDPUR																						
⑬ JESSORE																						
⑭ KUSHTIA																						
⑮ RAJSHAHI																						
⑯ PABNA																						
⑰ SOGRA																						
⑱ RANGPUR																						
⑲ DINAJPUR																						
TOTAL	46	25	66	25	66	19	642	602	8	2	642	602	8	2	1	2	1	38	6	168	847	2655

Table 4-2-2-5 Railway Passenger Movement Crossing by Jagannathganj-Sirajganj Ferry 1973-74 (AADT) (Unit: passengers)

Destination Origin	(1) CHITTAGONG	(2) CHITTAGONG H.T.	(3) NOAKHALI	(4) COMLA	(5) SYLHET	(6) DACCA	(7) MYMENSINGH	(8) TANGAIL	(9) KUSHTIA	(10) RAJSHAHI	(11) PABNA	(12) BOGRA	(13) RAJSHAHI	(14) DINAJPUR	(15) TOTAL	
CHITTAGONG	1								1							1
CHITTAGONG H.T.																
NOAKHALI			1													
COMILLA																
SYLHET					7											7
DACCA						2	29									31
MYMENSINGH							1									1
TANGAIL																
KHULNA	2		1	2	5	20	15									25
PATUAKHALI																
BARISAL																
FARIDPUR										2						2
JESSORE	6		2	4	6	33	29	4								54
KUSHTIA	2		5	3	3	25	18	7								55
RAJSHAHI	14		2	7	2	79	48	5								157
PABNA	20		6	20	10	137	357	16								566
BOGRA										5						5
RAJSHAHI	3		1	2	4	12	20	1								33
DINAJPUR	1		1	2	1	7	2	1								15
TOTAL	48		18	40	31	320	464	38	48				14	71	12	2104

## CHAPTER 5

### TRAFFIC FLOW ACROSS JAMUNA RIVER

#### 5-1 Goods Flow

##### 5-1-1 Traffic Volume

Goods traffic across Jamuna River composes the following movements:

- 1) All movements between Rajshahi Division and the east part of Jamuna;
- 2) Railway movement between Khulna Division and the east part of Jamuna; and
- 3) Traffic with India between Calcutta and the east part of Jamuna.

Highway, railway and inland water are the available modes of transport. However, there are only two ferry connections catering to goods traffic; one is the railway ferry in Bahadurabad-Tistamukh and the other is the road ferry in Aricha-Nagarbari, -- (Sirajganj Ferry is for railway passengers only).

Table 5-1-1-1 and 5-1-1-2 show the total tonnage of goods crossing the river. Traffic between Rajshahi Division and Divisions of Dacca and Chittagong relates directly to the proposed bridge over Jamuna River and inland water traffic will be affected by the construction of the bridge.

The tables show that 620,000 tons of goods excluding traffic by country boat and 6/2,000 tons of goods including 198,000 tons traffic by country boat crossed Jamuna River in 1968/69 and 1972/73 respectively.

Considering that the figures for 1968/69 are composed of only major goods, additional 10-20% will be added. Thus the total tonnage for 1968/69 that crossed Jamuna River is estimated to be as much as 700,000 - 800,000 tons. Of the total tonnage of 612,000 tons in 1972/73, railway traffic was only 192,000 tons. The considerable difference between the two years was caused by damage to the railways. This can be accounted for by the fact that the number of freight wagons handled in 1972/73 at the Bahadurabad ferry decreased to as little as one fourth of that in 1968/69.

Other changes and characteristics of goods traffic between Rajshahi Division and the east part of Jamuna River in the pre- and post-war days are as follows:

- 1) Cross river traffic has decreased by 40-50%, mainly because of damage to railway facilities;
- 2) Although railways were a main method of transportation between east and west, the share of traffic by road and inland water has become larger;
- 3) In 1968/69 oil, salt, cement, sugar, fertilizer, iron and steel, coal, etc. other than the two major goods of raw jute and food-grains were also carried. However, in 1972/73 there was little movement of cement, oil, coal, fertilizer, iron, etc. but pulse and timber were included in the amount; and
- 4) There has been a significant decrease of traffic between Chittagong Division and Rajshahi Division. This occurred mainly because of the traffic decrease between Chittagong District and the districts of Bogra and Rangpur. The main goods were food-grain, cement, oil, salt, etc.



The following two movements other than movement between Rajshahi Division and the east of Jamuna River are to be noted in studying the future cross river traffic:

- 1) Movement by railway or highway between Khulna Division and the east:

The movement by road by the Aricha-Goalundo ferry amounted to approximately 10,000 tons in 1968/69. If the bridge should be constructed near the ferry terminal, the movement by road would be transferred to the one by railway. The movement by railway, in spite of its long detour, is composed of goods suitable for railway transportation, and the total tonnage in 1968/69 amounted to 47,000 tons including 11,000 tons of sugar, 11,000 tons of fertilizer, 10,000 tons of cement, 4,000 tons of salt, 1,000 tons of raw jute, etc. With the location of the bridge, these movements will have a merit of shorter distance and result in a great increase of transportation demand.

- 2) Movement by inland water transport (IWT) between Khulna Division and the east:

The IWT movement will play a major role having amounted to 573,000 tons in 1968/69 and to 1,522,000 tons in 1972/73 when the overland transport facilities were not restored completely. However, the location of the bridge would produce a considerable saving of the interregional distances compared with the route distance by IWT.

Table 5-1-1-1 Inter-District Goods Movement Across Jamuna River (1968/69)

(Unit: 1,000 tons)

<u>Division</u>		<u>Rail</u>	<u>Road</u>	<u>IWT</u>	<u>C.B.</u>	<u>Total</u>
<u>Origin</u>	<u>Destination</u>					
Rajshahi	Chittagong	63	0	0	N.A.	63
Chittagong	Rajshahi	261	3	0	N.A.	264
Rajshahi	Dacca	157	3	0	N.A.	160
Dacca	Rajshahi	61	16	0	N.A.	77
Sub-total		542	22	0	N.A.	564
Khulna	Chittagong	3	0	26	N.A.	29
Chittagong	Khulna	20	1	146	N.A.	167
Khulna	Dacca	8	5	52	N.A.	65
Dacca	Khulna	15	4	349	N.A.	368
Total		588	32	573	N.A.	1,193

Note: Tonnage by rail and inland water is limited to that of main goods only.

Table 5-1-1-2 Inter-District Goods Movement Across Jamuna River (1972/73)

(Unit: 1,000 tons)

<u>Division</u>		<u>Rail</u>	<u>Road</u>	<u>IWT</u>	<u>C.B.</u>	<u>Total</u>
<u>Origin</u>	<u>Destination</u>					
Rajshahi	Chittagong	25	0	30	10	65
Chittagong	Rajshahi	13	2	65	38	118
Rajshahi	Dacca	80	42	35	114	271
Dacca	Rajshahi	66	15	29	36	146
Sub-total		184	59	159	198	600
Khulna	Chittagong	1	0	128	72	201
Chittagong	Khulna	0	0	615	135	750
Khulna	Dacca	7	3	285	258	553
Dacca	Khulna	0	1	495	52	547
Total		192	63	1,681	751	2,651
India	Chittagong	0	0	10	0	10
India	Dacca	0	0	42	1,164	1,206

Note: Tonnage by rail and inland water is limited to that of main goods only.

## 5-1-2 Characteristics of Goods Traffic Crossing Jamuna River

### (1) Jute and Jute Products

Jute is mostly exported and its main destinations are Chittagong, Khulna and Dacca as is seen in Table 5-1-2-1. Roughly 270,000 tons was shipped from Rajshahi Division, mostly by railway. Although the table shows some diversification of the traffic from Chittagong and Dacca to Khulna, it is difficult to say that the tendency will continue, because of the damage to the railway facilities during the Liberation War.

However, it should be noticed that the jute traffic crossing Jamuna River will not increase much in future. Even considering the development of port facilities and increased industrial functions in Khulna and the reduction of railway route mileage between the Dacca-Chittagong area and Rajshahi Division, the production of raw jute will not be greatly effected in the case of the bridge construction.

Movement of jute manufactured products crossing Jamuna River is negligible. However, 300,000 to 400,000 tons of raw jute and jute products by IWT, mostly from Dacca to Khulna is not to be ignored. In the case of bridge construction in Nagarbari, possible diversion of traffic from IWT to rail will occur with considerable reduction of mileage by railway.

Table 5-1-2-1 Jute Movement from Rajshahi Division

(Unit: 1,000 tons)

Destination (District)	1968/69			1972/73		
	Road	Rail	IW	Road	Rail	IW
Chittagong	NA	46	0	0	20	5
Dacca	NA	89	0	7	45	3 (61)
Khulna	NA	114	2	19	94	0 (3)

Note: ( ) indicates tonnage by country boat.

Table 5-1-2-2 Inter-District Movement of Raw Jute Crossing Jamuna River

(Unit: 1,000 tons)

Division	Destination	Rail		Road		IWT		Total	
		68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	46	20	N.A.	0	0	5	46	25
Chittagong	Rajshahi	0	0	N.A.	0	0	0 <sup>1)</sup>	0	0
Rajshahi	Dacca	89	45	N.A.	7	0	8(69)	89	60(69)
Dacca	Rajshahi	0	0	N.A.	0	0	0	0	0
Sub-total		135	65	N.A.	7	0	13(60)	135	85(69)
Khulna	Chittagong	0	0	N.A.	0	3	1(10)	3	1(10)
Chittagong	Khulna	0	0	N.A.	0	8	14	8	14
Khulna	Dacca	0	0	N.A.	0	3	1(53)	3	1(53)
Dacca	Khulna	1	0	N.A.	0	248	245	249	245
Total		136	65	N.A.	7	262	274(132)	398	346(132)

Note: 1) Figure in ( ) indicates tonnage by country boat.

2) Tonnage by country boat in 1968-69 is not available.

Table 5-1-2-3 Inter-District Movement of Jute Products Crossing  
Jamuna River

(Unit: 1,000 tons)

<u>Division</u>		<u>Rail</u>		<u>Road</u>		<u>IWT</u>		<u>Total</u>	
<u>Origin</u>	<u>Destination</u>	<u>68/69</u>	<u>72/73</u>	<u>68/69</u>	<u>72/73</u>	<u>68/69</u>	<u>72/73</u>	<u>68/69</u>	<u>72/73</u>
Rajshahi	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Rajshahi	1	0	NA	0	0	0	1	0
Rajshahi	Dacca	0	0	NA	0	0	0	0	0
Dacca	Rajshahi	0	0	NA	0	0	0	0	0
Sub-total		1	0	NA	0	0	0	1	0
Khulna	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Khulna	0	0	NA	0	13	9	13	9
Khulna	Dacca	0	0	NA	0	0	0	0	0
Dacca	Khulna	0	0	NA	0	88	154	88	154
Total		1	0	NA	0	101	163	102	163

(2) Foodgrains

The foodgrains movement to and from Rajshahi Division was as shown in Tables 5-1-2-4 and 5-1-2-5. Rajshahi Division as a whole was an area of deficit in foodgrains both in 1968/69 and 1972/73. The tables also show that considerable amount of foodgrains moving in both directions. This is because there is a disparity of supply/demand balance by district, and foodgrains is handled by both the private and public sector. The Government sector handles mostly imported foodgrains and distributes it to the low-income-level people who are scattered throughout the country.

Foodgrains to Rajshahi Division is mostly imported and is supplied by Chittagong, Khulna and Dacca. On the other hand, foodgrains from Rajshahi Division is transported mainly to Khulna Division rather than to Dacca.

It is expected that Rajshahi Division will be a surplus area in the future resulting in a decrease in the traffic to Rajshahi Division and an increase in the traffic from Rajshahi, most probably directed to Khulna Division.

Table 5-1-2-4 Foodgrains Movement to Rajshahi Division

(Unit: 1,000 tons)

Origin (District)	1968/69			1972/73		
	Road	Rail	IW	Road	Rail	IW
Chittagong	NA	56	0	2	4	13
Comilla	NA	0	0	0	0	48
Dacca	NA	2	0	0	52	24 (10)
Khulna	NA	103	0	0	113	9 (0)

Note: ( ) indicates tonnage by country boat.

Table 5-1-2-5 Foodgrains Movement from Rajshahi Division

(Unit: 1,000 tons)

Destination (District)	1968/69			1972/73		
	Road	Rail	IW	Road	Rail	IW
Dacca	NA	32	0	14	15	18
Khulna	NA	20	0	19	56	2
Faridpur	NA	35	0	0	15	2
Jessore	NA	11	0	0	7	0
Kushtia	NA	26	0	10	18	0

Table 5-1-2-6 Inter-District Movement of Foodgrains Crossing Jamuna River

(Unit: 1,000 tons)

Division		Rail		Road		WT		Total	
Origin	Destination	68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	6	3	NA	0	0	0	6	3
Chittagong	Rajshahi	56	4	NA	2	0	61	56	67
Rajshahi	Dacca	37	15	NA	14	0	0(18)	37	29(18)
Dacca	Rajshahi	6	52	NA	0	0	24(10)	6	76(10)
Sub-Total		105	74	NA	16	0	85(28)	105	175(28)
Khulna	Chittagong	0	1	NA	0	5	26	5	27
Chittagong	Khulna	1	0	NA	0	21	215	22	215
Khulna	Dacca	0	2	NA	0	22	14(74)	22	16(74)
Dacca	Khulna	1	0	NA	0	2	13(17)	3	13(17)
Total		143	77	NA	16	50	353(119)	157	446(119)

Note: 1) Figure in ( ) indicates tonnage by country boat.

2) Tonnage by country boat in 1968-69 is not available.



(3) Cement

There is no cement production in Rajshahi Division. It is either imported or supplied from Sylhet District. Table 5-1-2-7 shows the cement movement to Rajshahi Division. Although cement was transported mainly from Chittagong and Khulna in 1968/69, Khulna was the only cement supplier in 1972/73.

(4) Oil

Oil consumption is expected to increase significantly in the future. Oil is totally imported through the Chittagong port, but the origins of oil supply are not only Chittagong but are also Comilla, Khulna and Dacca, because oil is distributed through main depots in these districts. Table 5-1-2-9 shows the oil movement to Rajshahi Division.

In estimating the future movement of oil, two main routes are to be noticed; one is from Chittagong to Rajshahi Division, and the other from Chittagong to Khulna by IWT and then to Rajshahi Division by railway. The movement from Chittagong to Rajshahi by railway will benefit from the bridge.

Table 5-1-2-7 Cement Movement to Rajshahi Division

(Unit: 1,000 tons)

Origin (District)	1968/69			1972/73		
	Road	Rail	IWT	Road	Rail	IWT
Chittatong	NA	45	0	0	0	0
Sylhet	NA	3	0	0	0	0
Khulna	NA	30	0	15	13	0

Table 5-1-2-8 Inter-District Movement of Cement Crossing Jamuna River

(Unit: 1,000 tons)

Division		Rail		Road		IWT		Total	
Origin	Destination	68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Rajshahi	45	0	NA	0	0	0	45	0
Rajshahi	Dacca	0	0	NA	0	0	0	0	0
Dacca	Rajshahi	3	0	NA	0	0	0	3	0
Sub-Total		48	0	NA	0	0	0	48	0
Khulna	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Khulna	10	0	NA	0	16	0(10)	26	0(10)
Khulna	Dacca	0	0	NA	0	1	55	1	55
Dacca	Khulna	0	0	NA	0	0	0	0	0
Total		58	0	NA	0	17	55(10)	75	55(10)

Note: 1) Figure in ( ) indicates tonnage by country boat.

2) Tonnage by country boat in 1968/69 is not available.

Table 5-1-2-9 Oil Movement to Rajshahi Division

(Unit: 1,000 tons)

Origin (District)	1968/69			1972/73		
	Road	Rail	IWT	Road	Rail	IWT
Chittagong	NA	69	0	0	9	0
Comilla	NA	0	0	0	0	4 (3) <sup>1)</sup>
Dacca	NA	1	0	3	0	0 (2)
Khulna	NA	54	0	8	22	0

Table 5-1-2-10 Inter-District Movement of Oil Crossing Jamuna River

(Unit: 1,000 tons)

Division		Rail		Road		IWT		Total	
Origin	Destination	68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Rajshahi	69	9	NA	0	0	4(3)	69	13(3)
Rajshahi	Dacca	0	0	NA	0	0	0	0	0
Dacca	Rajshahi	1	0	NA	3	0	0(2)	1	3(2)
Sub-Total		70	9	NA	3	0	4(5)	70	16(5)
Khulna	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Khulna	0	0	NA	0	163	262(8)	163	262(8)
Khulna	Dacca	0	0	NA	0	0	0	0	0
Dacca	Khulna	0	0	NA	0	0	4(2)	0	4(2)
Total		70	9	NA	3	163	270(15)	233	282(15)

Note: 1) Figure in ( ) indicates tonnage by country boat.

2) Tonnage by country boat in 1968/69 is not available.

(5) Coal

Coal had been imported mostly from India until 1965 when it was suspended. Since being suspended, coal was transported from Dacca and Khulna by railway, as seen in Table 5-1-2-11. The last Liberation War opened the Indian Channel again, thus changing the coal movement pattern completely. Now coal is being imported directly by railway from Calcutta to Rajshahi Division as shown in Table 5-1-2-13. Dacca and Chittagong are the greatest consumers of coal. The movement from Calcutta directly to Dacca and Chittagong by railway will benefit from the provision of the bridge.

(6) Fertilizer

There is no fertilizer production in Rajshahi Division. The tonnage of fertilizer carried across Jamuna River was respectively 39,000 tons and 5,000 tons in 1968/69 and 1972/73. The significant change of the distribution pattern had undoubtedly resulted from the war. Considering that the major fertilizer factories are located in Dacca Division, the 1968/69 pattern was a normal one. The movement from Dacca and Sylhet was of domestic production, but Khulna remains as an important supplier of imported fertilizer.

Table 5-1-2-11 Coal Movement to Rajshahi Division

(Unit: 1,000 tons)

Origin (District)	1968/69			1972/73		
	Road	Rail	IWT	Road	Rail	IWT
Dacca	NA	21	0	0	0	0
Khulna	NA	70	0	0	0	0

Table 5-1-2-12 Inter-District Movement of Coal Crossing Jamuna River

(Unit: 1,000 tons)

Origin	Destination	Rail		Road		IWT		Total	
		68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Rajshahi	0	0	NA	0	0	0	0	0
Rajshahi	Dacca	0	0	NA	0	0	0	0	0
Dacca	Rajshahi	21	0	NA	0	0	0	21	0
Sub-Total		21	0	NA	0	0	0	21	0
Khulna	Chittagong	0	0	NA	0	18	77	18	77
Chittagong	Khulna	0	0	NA	0	4	0	4	0
Khulna	Dacca	0	0	NA	0	23	54	23	54
Dacca	Khulna	0	0	NA	0	0	0	0	0
Total		21	0	NA	0	45	131	66	131
India	Chittagong						10		10
(Calcutta)									
India	Dacca						42		83
(Calcutta)									

Table 5-1-2-13 Movement of Imported Coal from Calcutta in 1972/73

(Unit: 1,000 tons)

Destination (District)	Inland Water	Rail Direct	Rail to Khulna then IWT	Total
Chittagong	10	-	75	85
Dacca	42	-	50	92
Khulna	-	41	-	41
Pabna	-	10	-	10
Bogra	-	5	-	5
Rangpur/Dinajpur	-	17	-	17
Total	52	73	125	250

Table 5-1-2-14 Fertilizer Movement to Rajshahi Division

(Unit: 1,000 tons)

Origin (District)	1968/69			1972/73		
	Road	Rail	IWT	Road	Rail	IWT
Chittagong	NA	2	0	0	0	0
Sylhet	NA	26	0	0	0	0
Dacca	NA	0	0	0	3	2
Khulna	NA	3	0	0	39	0

Table 5-1-2-15 Inter-District Movement of Fertilizer Crossing Jamma River

(Unit: 1,000 tons)

Origin	Division Destination	Rail		Road		IWT		Total	
		68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Rajshahi	2	0	NA	0	0	0	2	0
Rajshahi	Dacca	0	0	NA	0	0	0	0	0
Dacca	Rajshahi	26	3	NA	0	0	2	26	5
Sub-Total		28	3	NA	0	0	2	28	5
Khulna	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Khulna	0	0	NA	0	9	35	9	35
Khulna	Dacca	0	0	NA	0	3	0	3	0
Dacca	Khulna	11	0	NA	0	0	76	11	76
Total		39	3	NA	0	12	113	51	116

(7) Salt

Salt is mainly produced in Chittagong District and refined in the districts of Comilla, Barisal, etc. Table 5-1-2-16 shows the salt movement to Rajshahi Division. Chittagong was the single major origin in 1968/69, while in 1972/73 Comilla and Dacca were supplying areas. However, in both years the salt movement was a traffic across Jamuna River and it is expected that this basic pattern will not change much in the future.

(8) Sugar

Rajshahi Division is a supplying area of sugar, and as shown in Table 5-1-2-18 destinations of the sugar movement are spread widely but mainly in the east part of Jamuna. Dacca and Chittagong were the two major destinations in 1968/69 and Dacca was the sole destination in 1972/73. The total tonnage carried decreased from 530,000 tons in 1968/69 to 20,000 tons in 1972/74, because of a reduction in production.

It is to be noticed that there is another movement by railway from Khulna to Dacca and Chittagong as far as the cross river traffic across Jamuna River is concerned.

Table 5-1-2-16 Salt Movement to Rajshahi Division

(Unit: 1,000 tons)

Origin (District)	1968/69			1972/73		
	Road	Rail	IWT	Road	Rail	IWT
Chittagong	NA	67	0	0	0	0
Comilla	NA	0	0	0	0	0 (35)
Dacca	NA	0	0	0	11	14 (1)

Note: Figure in ( ) indicates tonnage by country boat.

Table 5-1-2-17 Inter-District Movement of Salt Crossing Jamuna River

(Unit: 1,000 tons)

Origin	Division Destination	Rail		Road		IWT		Total	
		68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Rajshahi	67	0	NA	0	0	0(35)	67	0(35)
Rajshahi	Dacca	0	0	NA	0	0	0	0	0
Dacca	Rajshahi	0	11	NA	0	0	3(12)	0	14(12)
Sub-Total		67	11	NA	0	0	3(47)	67	14(47)
Khulna	Chittagong	0	0	NA	0	0	0	0	0
Chittagong	Khulna	4	0	NA	0	3	3(82)	7	13(82)
Khulna	Dacca	0	0	NA	0	0	0	0	0
Dacca	Khulna	0	0	NA	0	0	0	0	0
Total		71	11	NA	0	3	16(129)	74	27(129)

Note: 1) Figure in ( ) indicates tonnage by country boat.

2) Tonnage by country boat in 1968/69 is not available.



Table 5-1-2-18 Movement of Sugar from Rajshahi Division

(Unit: 1,000 tons)

Destination (District)	1968/69			1972/73		
	Road	Rail	IWT	Road	Rail	IWT
Chittagong	NA	8	0	0	2	0
Noakhali	NA	0	0	0	0	0
Comilla	NA	3	0	0	0	0
Sylhet	NA	1	0	0	2	0
Dacca	NA	28	0	2	12	0
Mymensingh	NA	2	0	0	2	0
Khulna	NA	9	0	0	3	0
Faridpur	NA	4	0	0	2	0
Jessore	NA	0	0	0	1	0

Table 5-1-2-19 Inter-District Movement of Sugar Crossing Jamuna River

(Unit: 1,000 tons)

Origin	Division Destination	Rail		Road		IWT		Total	
		68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	11	2	NA	0	0	0	11	0
Chittagong	Rajshahi	0	0	NA	0	0	0	0	0
Rajshahi	Dacca	31	16	NA	2	0	0	31	18
Dacca	Rajshahi	0	0	NA	0	0	0	0	0
Sub-Total		42	18	NA	2	0	0	42	20
Khulna	Chittagong	3	0	NA	0	0	0	3	0
Chittagong	Khulna	0	0	NA	0	0	14	0	14
Khulna	Dacca	8	0	NA	0	0	0	8	0
Dacca	Khulna	0	0	NA	0	0	1	0	1
Total		53	18	NA	2	0	15	53	35

(9) Pulse

Pulse is one of the few products that has moved after the war. The main production area of pulse in Rajshahi Division is Pabna District, and pulse is transported to Comilla and Dacca mainly by inland water.

Table 5-1-2-20 Pulse Movement from Rajshahi Division

(Unit: 1,000 tons)

Destination (District)	1968/69			1972/73		
	Road	Rail	IWT	Road	Rail	IWT
Comilla	NA	0	0	0	0	24 (5)
Dacca	NA	0	0	0	0	15 (5)
Mymensingh	NA	0	0	0	1	1
Khulna	NA	0	0	2	1	0

Note: Figure in ( ) indicates tonnage by country boat.

Table 5-1-2-21 Inter-District Movement of Pulse Crossing Jamuna River

(Unit: 1,000 tons)

Origin	Division Destination	Rail		Road		IWT		Total	
		68/69	72/73	68/69	72/73	68/69	72/73	68/69	72/73
Rajshahi	Chittagong	0	0	NA	0	0	24(5)	0	24(5)
Chittagong	Rajshahi	0	0	NA	0	0	0	0	0
Rajshahi	Dacca	0	1	NA	0	0	16(5)	0	17(5)
Dacca	Rajshahi	0	0	NA	2	0	0	0	2
Sub-Total		0	1	NA	2	0	40(10)	0	43(10)
Khulna	Chittagong	0	0	NA	0	0	7(30)	0	7(30)
Chittagong	Khulna	0	0	NA	0	0	9	0	9
Khulna	Dacca	0	0	NA	1	0	7(29)	0	8(29)
Dacca	Khulna	0	0	NA	0	0	1	0	1
Total		0	1	NA	3	0	64(69)	0	68(69)

Note: 1) Figure in ( ) indicates tonnage by country boat.

2) Tonnage by country boat in 1968/69 is not available.

### 5-1-3 Future Goods Traffic Across Jamuna River

#### (1) O-D of Goods Movement in 1982/83

With the results discussed in Chapter 2 and Chapter 3, future goods movement across Jamuna River and goods traffic influenced by the bridge construction are summarized as shown in Table 5-1-3-1. The total movement of the 11 main items of goods between Rajshahi Division and the east of Jamuna River is estimated to be 1,000 thousand tons. Similarly, the total movement between Khulna Division and the east of Jamuna River is estimated to be 1,563 thousand tons. Besides, the movements of coal from Calcutta to Dacca and Chittagong is estimated to amount to 133 thousand and 45 thousand tons respectively, the total of which is assumed to cross Jamuna River.

Main characteristics arising from Table 5-1-3-1 are as follows:

- 1) a great change of movement by item of goods that would cross Jamuna River: a great decrease in the movement of foodgrains under the self-supply of foodgrains with a great increase in the movement of fertilizer necessary to produce surplus foodgrains;
- 2) a decrease in cross river traffic over Jamuna River between Khulna Division and the east are with the future increased function of Chalna Port which would handle the imports to the west areas; and

Table 5-1-3-1 Estimated Goods Movement Crossing Jamuna River in 1982/83

(Unit: 1,000 tons)

Origin	Destination	Raw jute	Jute products	Food grain	Cement	Coal	Oil	Iron & steel	Fertilizer	Salt	Sugar	Hard rock	Total
Rajshahi	Chittagong	60	0	0	0	0	0	0	0	0	4	0	64
Chittagong	Rajshahi	0	0	0	49	0	0	25	264	119	0	0	457
Rajshahi	Dacca	169	0	0	0	0	0	0	0	0	64	120	353
Dacca	Rajshahi	0	0	0	0	0	0	0	134	0	0	0	134
	Total	229	0	0	49	0	0	25	398	119	0	120	1,008
Khulna	Chittagong	60	0	92	0	0	0	0	0	0	4	0	156
Chittagong	Khulna	50	0	0	0	0	43	0	97	132	0	0	322
Khulna	Dacca	50	0	0	68	178	172	0	0	3	0	0	471
Dacca	Khulna	320	200	0	0	0	0	0	94	0	0	0	614
	Total	709	200	92	117	178	215	25	589	254	72	120	2,571

- 3) the presence or absence of cement development project in Bogra District would influence the cross river traffic of Jamuna River.

(2) O-D of Goods Movement by Mode by Transport

(a) Modal Allocation

It is very difficult in the present stage to estimate the movement in 1982/83 by mode of transport crossing Jamuna River: this work accompanies the forecast of the level of each mode in 1982/83 as well as the estimate of transport cost, transport charge, transport time, extent of service, habits and preference of the users, etc. Therefore, judgement has been made in this study based on the interregional movement by item and by mode of transport from the data in 1968/69 and 1972/73 available and the information of the Bangladesh Transport Survey for 1977/78. The modal split will be subject to the presence and absence of the bridge construction. However, the modal allocation has been made to the movement without the bridge.

(b) Good Movement by Goods Items

1) Raw Jute and Jute Products

The mode of transport for the movement of raw jute and jute products which can be classified into primary (movement from farming areas to jute factories or pressing centers) and secondary (movement of the ports for export) is variable with the location of route they are transported. This tendency appears

overwhelmingly remarkable in water transport, i.e. country boat for the primary movement and IWT for the secondary. Table 5-1-3-2 shows the share of the raw jute movement by mode of transport to be used for this study.

The movement of jute products from Dacca to Khulna would be all by inland water with a total tonnage of 200,000 tons.

2) Foodgrains

The probable movement of foodgrains crossing Jamuna River would amount to 92,000 tons from Patuakhali and Barisal to Chittagong, all by IWT.

3) Cement

In the absence of cement projects in Bogra District the movement of cement crossing Jamuna River would be from Chittagong to North Bengal, all by railway.

In the presence of cement projects in Bogra District the movement from Bogra to Dacca and Mymensingh would cross Jamuna River mostly by railway. However, there would be some movement by truck for shorter distance haul.

4) Coal

The movement of coal crossing Jamuna River would

be from India to Chittagong and Dacca by railway and from Khulna to Dacca by IWT.

5) Petroleum

The movement of petroleum crossing Jamuna River would be all by IWT.

6) Iron and Steel

The movement of iron and steel crossing Jamuna River would be all by railway.

7) Fertilizer

The movement of fertilizer crossing Jamuna River would be from Sylhet and Chittagong by railway and from Dacca and Comilla by IWT and railway.

8) Salt

The movement of salt crossing Jamuna River would be from Chittagong to North Bengal by railway, from Comilla to North Bengal by country boat or railway and from Barisal to Dacca by country boat.

9) Sugar

The movement of sugar crossing Jamuna River would be from North Bengal to Dacca and from Kushtia to Comilla. Although the present movement of sugar is by railway and IWT, the movement by truck would increase.



10) Hard Rock

The movement of hardrock crossing Jamuna River would be from Rangpur and Dinajpur to Dacca and Mymensingh almost solely by railway.

Table 5-1-3-2 Movement Share of Raw Jute by Mode of Transport

Origin	Destination	Rate of Allocation by Mode (%)				Type of movement
		Movement in ( ) in 1,000 tons				
		Rail	Road	IWT	Country Boat	
Rajshahi/ Pabna	Chittagong	50 (10)	0	50 (10)	0	Secondary
	Dacca	0	50 (22)	0	50 (23)	Primary
Rangpur/Bogra Dinajpur	Chittagong	100 (40)	0	0	0	Secondary
	Dacca	30 (37)	30 (37)	0	40 (50)	Primary
Comilla	Khulna	0	0	100 (50)	0	Secondary
Dacca	Khulna	0	0	100 (280)	0	Secondary
Mymensingh	Khulna	20 (8)	0	80 (32)	0	Secondary
Patuakhali/ Barisal	Chittagong	0	0	0	100 (5)	Primary
	Comilla	0	0	0	100 (5)	Primary
Faridpur	Comilla	0	0	0	100 (50)	Primary
	Dacca	0	0	0	100 (50)	Primary

Table 5-1-3-3 Movement Share of Cement by Mode of Transport  
-- In the absence of Cement Project --

Origin	Destination	Rate of Allocation by Mode (%)		
		Movement in ( ) in 1,000 tons		
		Rail	Road	IWT
Chittagong	Bogra	100 (16)	0	0
	Rangpur/ Dinajpur	100 (33)	0	0
Khulna	Dacca	0	0	100 (68)

Table 5-1-3-4 Movement Share of Cement by Mode of Transport  
-- in the presence of Cement Project --

Origin	Destination	Rate of Allocation by Mode (%)		
		Movement in ( ) in 1,000 tons		
		Rail	Road	IWT
Bogra	Dacca	70 (163)	30 (70)	0
	Mymensingh	100 (20)	0	0
Khulna	Dacca	0	0	100 (66)

Table 5-1-3-5 Estimated Movement of Coal by Mode of Transport in 1982/83

(Unit: 1,000 tons)

<u>Origin</u>	<u>Destination</u>	<u>T W T</u>
India	Dacca	133
	Chittagong	45
Khulna	Dacca	178

Table 5-1-3-6 Estimated Movement of Petroleum by Mode of Transport in 1982/83

(Unit: 1,000 tons)

<u>Origin</u>	<u>Destination</u>	<u>Rail</u>
Khulna	Dacca	172
Chittagong	Patuakhali/Barisal	43

Table 5-1-3-7 Estimated Movement of Iron & Steel by Mode of Transport in 1982/83

(Unit: 1,000 tons)

<u>Origin</u>	<u>Destination</u>	<u>Rail</u>
Chittagong	Rajshahi/Pabna	7
	Bogra/Rangpur/ Dinajpur	18

Table 5-1-3-8 Movement Share of Fertilizer by Mode of Transport

Origin	Destination	Rate of Allocation by Mode (%)			
		Movement in ( ) in 1,000 tons			
		Rail	IWT	Road	Country Boat
Chittagong	Bogra/Rangpur/ Dinajpur	100(92)	0	0	0
Comilla	Patuakhali/Barisal/ Faridpur	0	80(46)	0	20(12)
	Kushtia/Jessore	0	80(31)	0	20(8)
	Rajshahi/Pabna	10(7)	80(56)	0	10(7)
	Bogra/Rangpur/ Dinajpur	90(92)	10(10)	0	0
Sylhet	Rajshahi/Pabna/ Bogra/Rangpur/ Dinajpur	100(67)	0	0	0
Dacca	Patuakhali/Barisal/ Faridpur	0	80(46)	0	20(11)
	Kushtia/Jessore	20(7)	50(19)	0	30(11)
	Rajshahi/Pabna	40(11)	40(11)	0	20(6)
	Bogra/Rangpur/ Dinajpur	100(39)	0	0	0

Table 5-1-3-9 Movement Share of Salt by Mode of Transport

Origin	Destination	Rate of Allocation by Mode (%)			
		Movement in ( ) in 1,000 tons			
		Rail	IWT	Road	Country Boat
Barisal	Dacca	0	50(2)	0	50(1)
Chittagong	Rajshahi/Pabna/ Bogra/Rangpur	100(70)	0	0	0
	Barisal/Faridpur/ Jessore/Kushtia	0	50(50)	0	50(50)
Comilla	Pabna/Rajshahi	0	20(5)	0	80(20)
	Bogra/Rangpur/ Dinajpur	30(7)	20(5)	0	50(12)
	Faridpur/Jessore/ Kushtia	0	0	0	100(32)

Table 5-1-3-10 Movement Share of Sugar by Mode of Transport

<u>Origin</u>	<u>Destination</u>	<u>Rate of Allocation by Mode (%)</u>		
		<u>Movement in ( ) in 1,000 tons</u>		
		<u>Rail</u>	<u>Road</u>	<u>IWP</u>
Kushtia	Comilla	50(2)	0	50(2)
Rajshahi	Dacca	60(3)	40(2)	0
	Mymensingh	0	100(2)	0
	Comilla	80(3)	20(1)	0
Bogra	Dacca	60(5)	40(3)	0
	Mymensingh	100(5)	0	0
Rangpur	Dacca	100(9)	0	0
	Mymensingh	100(4)	0	0
Dinajpur	Sylhet	100(6)	0	0
	Dacca	100(15)	0	0
	Mymensingh	100(10)	0	0

Table 5-1-3-11 Estimated Movement of Hard Rock by Mode of Transport in 1982/83

(Unit: 1,000 tons)

<u>Origin</u>	<u>Destination</u>	<u>Rail</u>
Rangpur/Dinajpur	Dacca	100
	Mymensingh	20

(3) Traffic in 1982/83 by Bridge Site

The origin-destination of goods movement in 1982/83 has been estimated as in 5-1-3 (1) under the assumption that there would be no bridge construction over Jamuna River. The estimated traffic can be considered to be the minimum as it contains the movement of only 11 main goods and does not include generated traffic from the bridge construction.

The estimated traffic is to be allocated by bridge site, taking into account the future change of the transportation network.

(a) Bahadrabad Bridge Site

1. Influence by bridge construction

\* Railway (goods) -- The distances from Rangpur and Dinajpur to each district in the east are reduced, but the actual route lengths between others will be same as those without the bridge.

\* Highway -- A considerable route length reduction from Mymensingh and Tangail to the west of Jamuna River is expected to produce a great benefit. However, for the trips other than the above zone-pairs the route lengths via Aricha Ferry are shorter by approximately 250 km.

2. Change of mode allocation

Rajshahi Division -- The Divisions of Dacca and Chittagong

Railway will still be predominant for the

movement to and from Chittagong as before the bridge construction. The movement of 100,000 tons from Comilla, 90% of which is to be fertilizer from Ashganj, will be allocated to IWT and country boat at a ratio of 2/3 and 1/3 respectively without bridge construction. However, not much shift from inland water to railway will be expected as a result of bridge construction as the inland water transport (IWT) from Ashganj is in a good condition.

The movement to and from Sylhet which is mostly by railway will not be changed by bridge construction.

The movement of Dacca-Bogra, -Dinajpur and -Rangpur is supposed to amount to 300,000 tons. Without bridge construction 70,000 tons (mostly of jute and fertilizer) will be carried by IWT, while with bridge construction most of the movement will be by overland transport.

The movement of Dacca-Pabna and -Rajshahi will not be changed by bridge construction: no shift from IWT to railway will be expected. The route length by the movement of Mymensingh-Bogra, -Rangpur and -Dinajpur by highway will be reduced considerably, nearing to that by railway. Without bridge construction all the movement will be by railway, but with bridge construction a considerable amount will be allocated to highway.

Khulna Division -- The Divisions of Dacca and Chittagong

Inland water transport will be absolutely predominant with or without bridge construction. The allocation of mode of transport can not be supposed to change greatly.

3. O-D movement by mode of transport

The origin-destination movement is to be considered as same with that in Gavargaon bridge site.

(b) Gavargaon Bridge Site

1. Influence by bridge construction

\* Railway (goods): The route lengths will be reduced with the Gavargaon bridge construction except the zone-pairs of Dinajpur and Rangpur - Divisions of Dacca and Chittagong with some increase of length.

\* Highway: A considerable route length reduction from Districts of Mymensingh and Tangail to the west of Jamuna River is expected to produce a benefit. However, the distances between zone-pairs of Dacca District-Bogra, -Rangpur and -Dinajpur will have a length increase. For the other trips the route lengths via Aricha Ferry are shorter.

2. Change of mode allocation

The influence to both railway and highway by bridge construction at this site will not be much



different from that at Bahadurabad bridge site. A shift from IWT to railway and highway will be expected for the movements of fertilizer from Comilla to Pabna and Rajshahi, and jute and sugar from Bogra, Rangpur and Dinajpur to Comilla. The ratio of allocation between railway and highway will not change greatly, railway still remaining predominant. On the other hand, a great shift from railway to highway will be made for the movement of Mymenshingh-Bogra, -Rangpur and -Dinajpur.

### 3. O-D movement by mode of transport

The O-D allocation ratios by mode of transport for the zone-pairs which are supposed to be influenced by the presence and absence of the bridge are shown in percentage in Table 5-1-3-12 and the resulting allocated movements are tabulated in Table 5-1-3-13.

Table 5-1-3-12 Rate of Modal Allocation by Bridge Site  
-- Bahadurabad or Gavargaon --

Origin	District Destination	Rate of Allocation (%)				Goods Movement
		Without bridge	With bridge at Bahadurabad or Gavargaon			
Comilla	Pabna /Rajshahi	Rail	10	Rail	30	Fertilizer
		IWT	80	IWT	60	
		Country boat	10	Country boat	10	
Comilla	Bogra/ Dinajpur/ Rangpur	Rail	90	Rail	100	Fertilizer
		IWT	10	IWT	0	
Bogra/ Rangpur/ Dinajpur	Dacca	Rail	30	Rail	40	Raw jute (primary)
		Road	30	Road	40	
		Country boat	40	Country boat	20	
Bogra/ Rangpur/ Dinajpur	Mymensingh	Rail	100	Rail	50	Others
		Road	0	Road	50	

Table 5-1-3-13 Allocated Movement Crossing Jamuna River by Mode in 1982/83  
-- Bahadurabad or Gavargaon --

(Unit: 1,000 tons)

Origin	Division Destination	Rail	Road	IWT	Country boat	Total
Rajshahi	Chittagong	53	1	10	0	64
Chittagong	Rajshahi	370	0	48	39	457
Rajshahi	Dacca	194	83	13	63	353
Dacca	Rajshahi	123	0	8	3	134
Sub-Total		740	84	79	105	1,008
Khulna	Chittagong	2	0	94	60	156
Chittagong	Khulna	0	0	220	102	322
Khulna	Dacca	125	0	295	51	471
Dacca	Khulna	176	0	420	18	614
Total		1,043	84	1,108	336	2,571
India	Dacca	71		107		178
(Calcutta)	Chittagong					

(c) Sirajganj Bridge Site

1. Influence by bridge construction

\* Railway (goods): The distance from Bogra, Rangpur, and Dinajpur to the east of Jamuna River will increase, among which the distances to and from Mymensingh will be increased by 200-300 km. The distance to and from Dacca increases by 60 km, and that to and from Chittagong will increase by approximately 100 km.

On the other hand the route length between Khulna Division and Dacca District will be reduced by over 200 km, and become shorter than that by IWT route. A great shift from IWT to railway will be made for this movement. The route length between Khulna Division and Chittagong Division will be shortened by more than 100 km.

\* Highway: A considerable route length reduction from Mymensingh and Tangail to the west of Jamuna River will result, while the distance from Dacca and Chittagong to the west of Jamuna River will not be shortened. On the other hand the route lengths to and from Rajshahi and Pabna will be increased by approximately 100 km.

2. Change of mode allocation

\* Rajshahi Division - Divisions of Dacca and Chittagong

As in the case of Bahadurabad and Cavargaon bridge sites not much change of mode allocation will be made after bridge construction.

From the movement between Comilla and the north-west of Jamuna River by railway no effect will be expected as by highway. However, the movement between Comilla and the southwest will have a considerable benefit, since the haul distance by railway will be shorter than that by IWT.

The movement of Dacca-Bogra, -Rangpur and -Dinajpur may not be influenced in mode allocation, while the route distances from Dacca to Rajshahi and Pabna by railway will be much shorter than those by IWT. However, the route length by highway will increase and a great shift to railway from highway will be anticipated: approximately 50,000 tons of raw jute will be diverted to railway transport.

For the movement between Nymensingh and the three northern districts of Jamuna River the route length by railway will be increased by 280 km, while that by highway reduced by 200 km: a great shift to highway from railway will be anticipated.

\* Khulna Division - Divisions of Dacca and Chittagong

Since the route length by IWT between Chittagong

Division and Khulna Division is considered shorter than those by railway and highway, it can not be expected that the mode allocation will be changed greatly by bridge construction. On the other hand a great shift from IWT to railway will be made, although the route length by highway will not be reduced. The ratio of the movement by mode of transport in 1968/69 was 5 for IWT to 4 for railway. Similarly, the rate of the movement by railway between Dacca and Kushtia, Jessore and Faridpur will be greater.

3. O-D movement by mode of transport

The O-D allocation ratios by mode of transport for the zone-pairs which are supposed to be influenced by the present and absence of the bridge are shown in percentage in Table 5-1-3-14 and the resulting allocated movement are tabulated in Table 5-1-3-15.

Table 5-1-3-14 Rate of Modal Allocation by Bridge Site -- Sirajganj --

Origin	District Destination	Rate of Allocation (%)				Goods movement
		Without bridge		With bridge		
Comilla	Pabna/ Rajshahi	Rail	10	Rail	50	Fertilizer
		IWT	80	IWT	40	
		Country boat	10	Country boat	10	
Dacca	Pabna/ Rajshahi	Rail	40	Rail	60	Fertilizer
		IWT	40	IWT	30	
		Country boat	20	Country boat	10	
Pabna/ Rajshahi	Dacca	Rail	0	Rail	10	Raw jute (Primary) Sugar
		IWT	50	IWT	30	
		Country boat	50	Country boat	30	
				Road	30	
Bogra/ Rangpur/ Dinaipur	Nymensingh	Rail	100	Rail	20	All items
				Road	80	
Dacca	Faridpur	Rail	0	Rail	20	Fertilizer
		IWT	80	IWT	60	
		Country boat	20	Country boat	20	
Dacca	Jessore/ Kushtia	Rail	20	Rail	50	Fertilizer
		IWT	50	IWT	20	
		Country boat	30	Country boat	30	
Khulna Dacca	Dacca Khulna	IWT	100	Rail	30	Cement, oil, fertilizer, raw jute (secondary), Jute products, etc.
				IWT	70	

Table 5-1-3-15 Allocated Movement Crossing Jamuna River by Mode in 1982/83 -- Sirajganj --

(Unit: 1,000 tons)

Origin	Division Destination	Rail	Road	IWT	Country boat	Total
Chittagong	Rajshahi	366	0	52	39	457
Rajshahi	Dacca	209	97	0	47	353
Dacca	Rajshahi	117	0	11	6	134
Sub-Total		745	98	73	92	1,008
Khulna	Chittagong	2	0	94	60	156
Chittagong	Khulna	0	0	220	102	322
Khulna	Dacca	0	0	420	51	471
Dacca	Khulna	15	0	577	22	614
Total		762	98	1,384	327	2,571
India (Calcutta)	Dacca Chittagong	0		178		178

(d) Nagarbari Bridge Site

1. Influence by bridge construction

\* Railway (goods): Compared with Sirajganj bridge site almost all route lengths in zone-pairs are shorter by 7-30 km. The shorter distance between Khulna and Dacca is to be noticed. The lengthening of routes by railway and the shortening of routes by highway through Nagarbari bridge site is smaller than in the case of Sirajganj bridge site.

\* Highway: A slight increase of route lengths will result in the movement between Pabna, Rajshahi and Kushtia and the east of Jamuna River. The effect on highway transportation will be considerably great. However, no effect will be expected for the movement to and from Khulna Division excluding Kushtia District, since the traffic via Coalundo by the Aricha Ferry is more favourable.

The movement between Nymensingh and Rangpur, Dinajpur and Bogra will have a longer route by 200 km, which is equivalent to the route length without bridge construction. Therefore, the effect on highway will be smaller than in the case of Sirajganj bridge site.

2. Change of mode allocation

\* Rajshahi Division --- Divisions of Dacca and Chittagong

The route length by railway of Comilla-Rajshahi

and -Pabna will have a greater decrease than in the case of Sirajganj bridge site.

A greater shift from IWT to railway will be expected. A similar modal share will occur in the movement of Dacca-Rajshahi and -Pabna. On the other hand, the movement of Mymensingh-Bogra, -Rangpur and -Dinajpur will occupy a similar share for highway compared with the other three cases.

\* Khulna Division -- Divisions of Dacca and Chittagong

The railway movement between Dacca and Khulna Divisions will have a larger share from IWT than in the case of Sirajganj.

3. O-D movement by mode of transport

The O-D allocation ratios by mode of transport for the zone-pairs which are supposed to be influenced by the presence and absence of the bridge are shown in percentage in Table 5-1-3-16 and the resulting allocated movements are tabulated in Table 5-1-3-17. Fundamentally this case is similar to that for Sirajganj.



Table 5-1-3-16 Rate of Modal Allocation by Bridge Site -- Nagarbari --

Origin	District Destination	Rate of Allocation (%)		Goods Movement	
		Without bridge	With bridge		
Comilla	Pabna/ Rajshahi	Rail	10	60	Fertilizer
		IWT	80	30	
		Country boat	0	10	
Dacca	Pabna/ Rajshahi	Rail	40	70	Fertilizer
		IWT	40	20	
		Country boat	20	10	
Pabna/ Rajshahi	Dacca	Rail	0	10	Raw jute (primary) Sugar
		IWT	50	25	
		Country boat	50	25	
		Road	0	40	
Bogra/ Rangpur/ Dinajpur	Mymensingh	Rail	100	Rail 40	All items
				Road 60	
Dacca	Faridpur	Rail	0	20	Fertilizer
		IWT	80	60	
		Country boat	20	20	
Dacca	Jessore/ Kushtia	Rail	20	60	Fertilizer
		IWT	50	20	
		Country boat	30	20	
Khulna Dacca	Dacca Khulna	IWT	100	Rail 40	Cement, oil, fertili- zer, raw jute ( secondary), jute products, etc.
				IWT 60	

Table 5-1-3-17 Allocated Movement Crossing Jamuna River by Mode in 1982/83  
-- Nagarbari --

(Unit: 1,000 tons)

Origin	Division Destination	Rail	Road	IWT	Country boat	Total
Chittagong	Rajshahi	377	0	41	39	457
Rajshahi	Dacca	195	83	13	62	353
Dacca	Rajshahi	125	0	6	8	134
Sub-Total		750	84	70	104	1,008
Khulna	Chittagong	2	0	94	60	156
Chittagong	Khulna	0	0	220	102	322
Khulna	Dacca	167	0	253	51	471
Dacca	Khulna	228	0	368	18	614
Total		1,147	84	1,005	335	2,571
India (Calcutta)	Dacca Chittagong	89	0	89		178

#### 5-1-4 Goods Movement after 1982/83

As for the goods traffic after 1982/83 the rate of increase in production by goods has been adopted as the rate of traffic increase. Based on the study results of goods flows in Chapter 3 the rates of increase in production of goods are assumed as in Table 5-1-4-1.

Table 5-1-4-2 shows the goods movement crossing Jamuna River until 1992/93 summarized by mode of overland transport and by bridge site, which is based on the following assumptions:

1. The estimated average rate of increase in the goods crossing Jamuna River would be maintained at a same rate.
2. The estimated movement is limited to the main goods only. Additional movement expected to arise from the development projects of cement manufacturing and coal mining in Bogra District is considered in estimating the cross river traffic.
3. The rate of miscellaneous goods other than main goods to the total goods is estimated to be from 10 to 20% from the actual results in 1968/69 and 1972/73.

The overland goods movement crossing Jamuna River tabulated in the table contains additional movement by 20% of the estimated cross river movement, taking into account the generated traffic by the bridge construction,

The output from the mining development in Bogra District was incorporated in the movement in 1992/93 and thenceforth. The goods traffic in 2003 was linearly extrapolated.

Table 5-1-4-1 Estimated Rate of Increase In Production After 1982/83

Item	Rate of Increase (%)
Raw jute	0
Jute Products	0
Food Grain	3
Cement	6
Coal	5
Petroleum	5
Iron and Steel	5
Fertilizer	7
Salt	3
Sugar	3
Hard rock	7

Table 5-1-4-2 Estimated Goods Movement Crossing Jamuna River by Mode, 1982/83 and 1992/93

(Unit: 1,000 tons/year)

Year Mode	Site Bahadurabad Gabargaon		Sirajganj		Nagarbari	
	1982/83	1992/93	1982/83	1992/93	1982/83	1992/93
Railway	762	1,815(1,189)	1,048 [71]	2,248(1,737)	1,149 [89]	2,393(1,915)
Highway	98	264(176)	84	273(165)	84	295(181)
Inland- water	73 [178]	122	79 [107]	133	70 [89]	114
Country boat	92	153	105	177	[104]	171
Total	1,025 [178]	2,354(1,640)	1,316 [178]	2,831(2,212)	1,405 [178]	2,973(2,381)

- Note: 1) Figure in ( ) shows the goods movement in the absence of coal mining project and cement project in Bogra District.
- 2) Figure in [ ] shows the goods movements with India.
- 3) The mining project in Bogra District is assumed to be in operation in 1990's.
- 4) Goods movement by inland-water between Khulna Division and Dacca and Chittagong Divisions is excluded.

## 5-2 Future Passenger Movement

### 5-2-1 Estimated Present Trips

#### (1) Zoning

For the estimation of the present and future passenger trips, zoning of the country was established and all zones were integrated into four large zones or regions, by taking into account important factors resulting from the regional separations by the four rivers, Jamuna, Ganges, Padma and Meghna, and the present and future transportation networks, etc.

Zoning is tabulated in Table 5-2-1-1 and illustrated in Figure 5-2-1-1.

#### (2) Actual Cross River Passengers

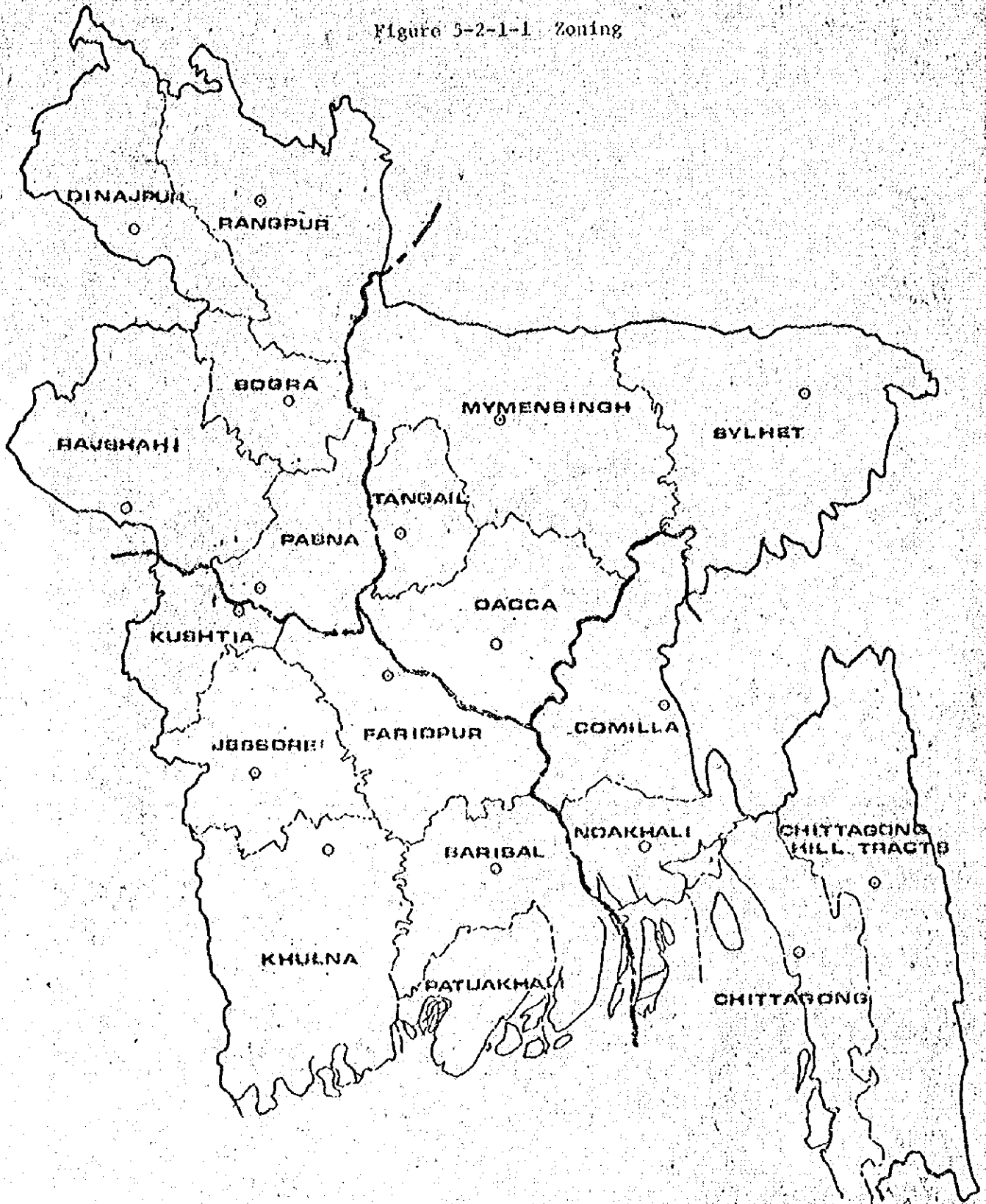
In order to check the adequacy of the use of the gravity model, the data of the origin-destination interview survey conducted by the Jamuna Bridge Survey Team in June 1974 were used. The model results were calibrated and compared with the actual data for their justification. The actual data of passengers who crossed Jamuna River are as follows:

Aricha Ferry(highway ferry):	5,076 persons/2 days
Sirajganj Ferry(railway ferry):	5,505 persons/2 days
Bahadurabad Ferry(railway ferry):	6,769 persons/2 days
<hr/>	
Total :	17,350 persons/2 days

The above number, converted into annual passengers volume, amounts to approximately 3 million. Assuming that the number

of passengers by country boat or non-registered ferry is equivalent to 30% of the above figure, the number of passenger crossing Jamuna River is estimated to be 4 million annually.

Figure 5-2-1-1. Zoning



(3) Passenger Trips on the Modal

The modal results of 19 zones were integrated into the four large zones in matrix as in Table 5-2-1-2.

From the table the possible passenger trips moving between east and west are estimated to be 8,370 thousand as below:

NE ↔ NW :	3,700 thousand trips/year
NE ↔ SW :	2,550
SE ↔ NW :	1,120
SE ↔ SW :	930
<hr/>	
Total :	8,370 thousand trips/year

In order to estimate the number of passenger trips which cross Jamuna River on each route as above, 100%, 100%, 30% and 10% are assumed for the four routes of NE ↔ NW, NE ↔ SW, SE ↔ NW, and SE ↔ SW, respectively.

NE — NW :	100%	3,770 thousand trips/year
NE — SW :	100%	2,550
SE — NW :	30%	280
SE — SW :	10%	110
<hr/>		
Total :		6,710 thousand trips/year

The possible cross river passenger trips on the modal is estimated to be 6,710 thousand, which is 1.6 times the actual volume of cross river passengers, 4,000 thousand as in (2) of this sub-section. The difference of 60% is considered as the portion of the development trips in this study.

Table 5-2-1-1 List of Zones for Traffic Study

Cross Zone	Zone No.	District
Northeast (NE)	1	Sylhet
	2	Dacca
	3	Mymensingh
	4	Tangail
Southeast (SE)	5	Chittagong
	6	Chittagong Hill Tracts
	7	Noakhali
Southwest (SW)	8	Comilla
	9	Khulna
Northwest (NW)	10	Patuakhali
	11	Barisal
	12	Faridpur
	13	Jessore
Northwest (NW)	14	Kushtia
	15	Rajshahi
	16	Pabna
	17	Bogra
	18	Rangpur
	19	Dinajpur

Table 5-2-1-2 Passenger Trips Distribution  
(Origin - Destination), 1974

(Unit: 10,000 trips/year)

	NE	SE	SW	NW	Total
NE	973	950	255	377	3,528
SE		539	93	112	2,233
SW			916	647	2,917
NW				822	2,780
Total					11,458



## 5-2-2 Estimated Future Trips

### (1) Trip Distribution

The total trips of the country in 1993, on the hypothesis that there existed a bridge across Jamuna River, are estimated to be 306 million. With the gravity analysis the estimated total generating trips were distributed to each zone, district, proportionate to the population in each district. Table 5-2-2-1 shows the distributed trips in 1993 by district. Based upon the above findings, the desired trip distribution of passengers among the large zones in 1993 was examined by bridge site on an origin-destination basis. The results were tabulated in Table 5-2-2-2 where the result by districts (Zone) was summed into large regional zones.

### (2) Probable Passenger Movement Across Jamuna River

From the origin-destination table of the passenger trip distribution the probable passenger trips in 1993 crossing Jamuna River were estimated by bridge site. The proposed bridge sites, Bahadurabad and Gabargaon are very close, and the result for Bahadurabad is considered the same as that for Gabargaon as studied in the case of goods movement. Table 5-2-2-3 shows the estimated passenger movements between the east and the west of the country by bridge site and the resulting movement pattern.

### (3) Passenger Movement by Mode of Transport

In order to distribute the estimated passenger trips crossing Jamuna River to the competing transport modes of railway,

highway and inland water, the rate of modal split was determined as in Table 5-2-2-4. The rate of inland water was assumed first and then the rates of the remaining two overland modes were estimated on the basis of the prevailing regional modal split in Japan as follows:

<u>Year</u>	<u>Railway</u>	<u>Highway</u>	<u>Year applied to this study</u>
1963	88.5 %	11.5 %	1974
1973	58.5	41.5	1993

Table 5-2-2-5 and 5-2-2-6 indicate the annual passenger trips and the average daily passenger trips by transport mode, respectively. The trips in 1983 were interpolated. Thus the distributed passenger trips for the modes of railway and highway are assumed to be the passenger traffic crossing the proposed Jamuna bridge.

Table 5-2-2-1 Estimated Trips  
Generating from District, 1993  
(Unit: 10,000 trips/year)

Zone No.	District	No. of Trips
1	Sylhet	1,870
2	Dacca	3,780
3	Mymensingh	3,070
4	Tangail	870
5	Chittagong	1,890
6	Chittagong Hill Tracts	200
7	Noakhali	1,290
8	Comilla	2,250
9	Khulna	1,600
10	Ratnakhali	530
11	Barisal	1,440
12	Faridpur	1,480
13	Jessore	1,580
14	Kushtia	980
15	Rajshahi	2,030
16	Padma	1,230
17	Bogra	960
18	Rangpur	2,360
19	Dinajpur	1,200
	Total	30,600

Table 5-2-2-2 Passenger Trips Distribution  
(Origin - Destination), 1993

Behadurabad, Gabargaon Unit: 10,000 trips/year

	NE	SE	SW	NW	Total
NE	2,355	2,510	878	1,495	9,593
SE		1,182	343	419	5,636
SW			2,250	1,886	7,607
NW				1,991	7,782
Total					30,618

Sirajganj

	NE	SE	SW	NW	Total
NE	2,296	2,438	963	1,596	9,589
SE		1,163	371	494	5,629
SW			2,218	1,841	7,611
NW				1,925	7,781
Total					30,610

Nagarbari

	NE	SE	SW	NW	Total
NE	2,190	2,323	1,260	1,618	9,587
SE		1,149	456	550	5,627
SW			2,088	1,715	7,613
NW				1,950	7,783
Total					30,610

Table 5-2-2-3 Estimated Passenger Movement between East and West by Bridge Location in 1993

Unit: 10,000 trips/year

Movement pattern	Site		Bahadurabad	Sirajganj	Nagarbari
	Year		1993	1993	1993
NE - NW			1,495	1,596	1,618
NE - SW			878	963	1,266
SE - NW			419	494	550
SE - SW			343	371	456
Total			3,135	3,424	3,890

Table 5-2-2-4 Rate of Modal Split for Passenger Movements between East and West, 1974 and 1993

(Unit: %)

Movement pattern	Site	Year		1974				1993			
		Mode	Year	Rail	Road	IWT	Total	Rail	Road	IWT	Total
Northeast ↕ Northwest	Bahadurabad Gabargaon			80	10	10	100	80	10	10	100
	Sirajganj			80	10	10	100	80	10	10	100
	Nagarbari			80	10	10	100	75	10	15	100
Northeast ↕ Southwest	Bahadurabad Gabargaon			71	9	20	100	47	33	20	100
	Sirajganj			71	9	20	100	47	33	20	100
	Nagarbari			71	9	20	100	44	31	25	100
Southeast ↕ Northwest	Bahadurabad Gabargaon			44	6	50	100	29	21	50	100
	Sirajganj			44	6	50	100	29	21	50	100
	Nagarbari			44	6	50	100	29	21	50	100
Southeast ↕ Southwest	Bahadurabad Gabargaon			18	2	80	100	12	8	80	100
	Sirajganj			18	2	80	100	12	8	80	100
	Nagarbari			18	2	80	100	12	8	80	100

Table 5-2-2-5 Estimated Passenger Trips Crossing Jamuna River by Mode of Transport, 1983 and 1993  
(Unit: 10,000 persons/year)

Movement pattern	Site	Year							
		1983		1993					
	Mode	Rail	Road	IWT	Total	Rail	Road	IWT	Total
Northeast ↑	Behadurabad Gabargaon	774.5	96.8	96.8	968.1	1,196.0	149.5	149.5	1,495.0
	Sirajganj	822.5	102.8	102.8	1,028.1	1,276.8	159.6	159.6	1,596.0
Northwest	Nagarbari	792.9	103.9	142.2	1,039.0	1,213.5	161.8	242.7	1,618.0
Northeast ↑↓	Behadurabad Gabargaon	291.2	149.3	110.1	550.6	412.7	289.7	175.6	878.0
	Sirajganj	322.8	164.3	121.8	608.9	452.6	317.8	192.6	963.0
Southwest	Nagarbari	411.8	204.7	191.6	808.1	557.0	392.5	316.5	1,266.0
Southeast ↑↓	Behadurabad Gabargaon	84.7	45.4	130.0	260.1	121.5	88.0	209.5	419.0
	Sirajganj	100.8	53.6	154.4	308.8	143.3	103.7	247.0	494.0
Northwest	Nagarbari	113.1	59.8	172.9	345.8	159.5	115.5	275.0	550.0
Southeast ↑↓	Behadurabad Gabargaon	28.6	14.0	170.4	213.0	41.2	27.4	274.4	343.0
	Sirajganj	31.0	15.2	184.8	231.0	44.5	29.7	296.8	371.0
Southwest	Nagarbari	38.3	18.7	228.0	285.0	54.7	36.5	364.8	456.0
Total	Behadurabad Gabargaon	1,179.0	305.5	507.3	1,991.8	1,771.4	554.6	809.0	3,135.0
	Sirajganj	1,277.1	335.9	563.8	2,176.8	1,917.2	610.6	896.0	3,424.0
	Nagarbari	1,356.1	387.1	734.7	2,477.9	1,984.7	706.3	1,199.0	3,890.0

Table 5-2-2-6. Average Daily Passenger Trips Crossing Jamuna River by Mode of Transport, 1983 and 1993

(Unit: persons/day)

Movement pattern	Site.	Year		1983		1993		Total	IWI	Total
		Mode	Rail	Road	IMT	Rail	Road			
Northeast ↓ Northwest	Behadurabad Gobargaon		21,219	2,652	2,652	32,767	4,096	4,096	4,096	40,959
	Sirajganj		22,534	2,817	2,817	34,981	4,373	4,373	4,373	43,727
Northeast ↑ Southwest	Nagarbari		21,724	2,847	3,896	33,247	4,433	6,649	6,649	44,329
	Behadurabad Gobargaon		7,976	4,091	3,017	11,307	7,937	4,811	4,811	24,055
Southwest	Sirajganj		8,843	4,501	3,336	12,400	8,707	5,277	5,277	26,384
	Nagarbari		11,283	5,607	5,249	15,260	10,753	8,671	8,671	34,684
Southeast ↓ Northwest	Behadurabad Gobargaon		2,320	1,243	3,563	3,329	2,411	5,740	5,740	11,480
	Sirajganj		2,761	1,468	4,229	3,926	2,841	6,767	6,767	13,534
Southeast ↑ Southwest	Nagarbari		3,098	1,639	4,737	4,370	3,164	7,534	7,534	15,068
	Behadurabad Gobargaon		784	383	4,669	1,129	751	7,518	7,518	9,398
Total	Sirajganj		850	416	5,063	1,219	814	8,132	8,132	10,165
	Nagarbari		1,051	511	6,246	1,499	1,000	9,995	9,995	12,494
Total	Behadurabad Gobargaon		32,299	8,369	13,901	48,532	15,195	22,165	22,165	85,892
	Sirajganj		34,988	9,202	15,445	52,526	16,735	24,549	24,549	93,810
Total	Nagarbari		37,156	10,604	20,128	54,376	19,350	32,849	32,849	106,575

### 5-3 Estimate of Modal Capacity

#### 5-3-1 Required Modal Capacity

The estimated traffic by modes of overland transport crossing Jamuna River has been converted into respective modal capacity on the following assumptions:

##### (1) Goods

###### 1. Railway

- one freight wagon carries 20.0 tons,
- one freight train consists of 60 wagons,
- actual rate of loading is 95 percent, and
- annual working periods is 365 days.

###### 2. Highway

- one truck carries 5 tons,
- actual rate of loading is 80 percent,
- annual working period is 365 days, and
- 1 truck = 3 passenger car equivalent (P.C.E.)

##### (2) Passengers

###### 1. Railway

- one coach carries 70 passengers,
- one train consists of 20 coaches, and
- annual working period is 365 days.

###### 2. Highway

- one bus carries 40 passengers,
- one passenger car carries 3.5 persons,
- annual working period is 365 days, and
- 1 bus = 5 passenger car equivalent (P.C.E.)

In this study passenger cars include all passenger carriers except buses. The allotment of passenger rides to bus and passenger car was examined with the survey results of the years 1973 and 1974 (each survey period was two days).

	<u>Rate of allotment</u>	
	<u>Bus</u>	<u>Passenger Car</u>
1973	70%	30%
1974	76	24

For the near future the above rate was applied. However, for the projections for the distant future a rate of allotment to bus and passenger car was assumed to be 50 and 50 percent respectively with full consideration of the increase of vehicular demand affected by the construction of the proposed Jamuna bridge.

The numbers of converted carriers by mode of transport as specified above are tabulated in Table 5-3-1-1 and 5-3-1-2, for railway and highway respectively, each of which indicates the required annual and average daily traffic crossing Jamuna River by bridge site. Similarly, the traffic in the presence of coal mining project and cement project in Bogra District are tabulated in Table 5-3-1-3 and 5-3-1-4 for railway and highway respectively.



Table 5-3-1-1 Estimated Number of Railway Trains Crossing Jamuna River - In the absence of coal mining project and cement project in Bogra District -

Site/ Type	Year Trains	1982/83		1992/93		2002/03	
		Annual (100)	Average daily	Annual (100)	Average daily	Annual (100)	Average daily
Bahadurabad, Gabargaon							
Passenger		95	26	146	40	197	54
Freight		8	2	15	4	20	5
<b>Total</b>		<b>103</b>	<b>28</b>	<b>161</b>	<b>44</b>	<b>217</b>	<b>59</b>
Sirajganj							
Passenger		95	26	146	40	190	52
Freight		15	4	22	6	29	8
<b>Total</b>		<b>110</b>	<b>30</b>	<b>168</b>	<b>46</b>	<b>219</b>	<b>60</b>
Nagarbari							
Passenger		102	28	153	42	219	60
Freight		15	4	22	6	29	8
<b>Total</b>		<b>117</b>	<b>32</b>	<b>175</b>	<b>48</b>	<b>248</b>	<b>68</b>

Table 5-3-1-2 Estimated Number of Vehicles Crossing Jamuna River  
 - in the absence of coal mining project and cement  
 project in Bogra District -

Site/ Type	Year Vehicles	1982/83		1992/93		2002/03	
		Annual (100)	Average daily	Annual (100)	Average daily	Annual (100)	Average daily
<b>Bahadurabad, Gabargaon</b>							
Passenger Car		4,365	1,196	7,928	2,172	10,928	2,994
Bus		387	106	694	190	944	258
Truck		248	68	445	122	796	218
<b>Total (P.C.E.)</b>		<b>5,000 (7,044)</b>	<b>1,370 (1,930)</b>	<b>9,067 (12,733)</b>	<b>2,484 (3,488)</b>	<b>12,665 (18,036)</b>	<b>3,470 (4,938)</b>
<b>Sijaiganj</b>							
Passenger Car		4,796	1,314	8,731	2,392	11,931	3,268
Bus		416	114	767	210	1,017	278
Truck		212	58	416	114	818	224
<b>Total (P.C.E.)</b>		<b>5,424 (7,512)</b>	<b>1,486 (2,058)</b>	<b>9,914 (13,814)</b>	<b>2,716 (3,784)</b>	<b>13,766 (19,470)</b>	<b>3,770 (5,330)</b>
<b>Nagarbari</b>							
Passenger Car		5,533	1,516	10,089	2,764	13,589	3,724
Bus		489	134	883	242	1,163	318
Truck		212	58	453	124	978	268
<b>Total (P.C.E.)</b>		<b>6,234 (8,614)</b>	<b>1,708 (2,360)</b>	<b>11,425 (15,863)</b>	<b>3,130 (4,346)</b>	<b>15,730 (22,338)</b>	<b>4,310 (6,118)</b>

Note: Figure in ( ) indicates passenger car equivalent (P.C.E.)

1 bus = 5 P.C.E. and 1 truck = 3 P.C.E.

Table 3-3-1-3 Estimated Number of Railway Trains Crossing Jamuna River  
 -- In the presence of coal mining project and cement project  
 in Bogra District --

Site Type	Year Trains	1982/83		1992/93		2002/03	
		Annual (100)	Average daily	Annual (100)	Average daily	Annual (100)	Average daily
<b>Bahadurabad, Gobargaon</b>							
Passenger		95	26	146	40	197	54
Freight		8	2	22	6	30	8
<b>Total</b>		<b>103</b>	<b>28</b>	<b>168</b>	<b>46</b>	<b>227</b>	<b>62</b>
<b>Sirajganj</b>							
Passenger		95	26	146	40	190	52
Freight		15	4	22	6	38	10
<b>Total</b>		<b>110</b>	<b>30</b>	<b>168</b>	<b>46</b>	<b>228</b>	<b>62</b>
<b>Nagarbari</b>							
Passenger		102	28	153	42	219	60
Freight		15	4	22	6	38	10
<b>Total</b>		<b>117</b>	<b>32</b>	<b>175</b>	<b>48</b>	<b>257</b>	<b>70</b>

Table 5-3-1-4 Estimated Number of Vehicles Crossing Jamuna River  
 -- In the presence of coal mining project and cement project  
 in Bogra District --

Site Type	Year Vehicles	1982/83		1992/93		2002/03	
		Annual (100)	Average daily	Annual (100)	Average daily	Annual (100)	Average daily
Bahadurabad, Gabargaon							
Passenger		4,365	1,196	7,928	2,172	10,928	2,994
Bus		387	106	694	190	944	258
Truck		248	68	665	182	1,190	326
<b>Total (P.C.E.)</b>		<b>5,000 (7,044)</b>	<b>1,370 (1,930)</b>	<b>9,287 (13,193)</b>	<b>2,544 (3,608)</b>	<b>13,062 (19,218)</b>	<b>3,578 (5,262)</b>
Sirajganj							
Passenger		4,796	1,314	8,731	2,392	11,931	3,268
Bus		416	114	767	210	1,017	278
Truck		212	58	687	188	1,343	368
<b>Total (P.C.E.)</b>		<b>5,424 (7,512)</b>	<b>1,486 (2,058)</b>	<b>10,185 (14,627)</b>	<b>2,790 (4,006)</b>	<b>14,291 (21,045)</b>	<b>3,914 (5,762)</b>
Nabarbari							
Passenger		5,533	1,516	10,089	2,764	13,589	3,724
Bus		489	134	883	242	1,163	310
Truck		212	58	792	202	1,621	464
<b>Total (P.C.E.)</b>		<b>6,234 (8,614)</b>	<b>1,708 (2,360)</b>	<b>11,764 (16,880)</b>	<b>3,208 (4,580)</b>	<b>16,373 (24,267)</b>	<b>4,486 (6,646)</b>

Note: Figure in ( ) indicates passenger car equivalent (P.C.E.)

1 bus = 5 P.C.E., and 1 truck = 3 P.C.E.

#### 5-4 Possible Traffic Capacity of Jamuna Bridge

In the course of the Jamuna bridge survey work it has been decided that the proposed Jamuna bridge with a sectional composition of a 2-lane highway and a signal gage rail track would meet the increasing transportation demand for the distant future. In order to check the possible traffic capacity of the bridge, a study was made by changing the combination of the forecasted traffic by rail and road. By far the most important is the problem whether the single gage track is sufficient for the future transportation need, with the relationship of the daily frequency of trains to the station intervals.

Thus several trials were made and the final method and assumption are as follows:

The total amount of goods to cross the Jamuna bridge is set at 10,000,000 tons annually, which is much greater than the movement roughly estimated for the year 2003. That amount is allocated to the two overland transports; 4,800,000 tons for highway and 5,200,000 tons for rail. The highway section of the bridge, having a two-lane width, can handle 140,000,000 passengers per year other than the goods movement of 4,800,000 tons. Since the goods movement of 5,200,000 tons per year can be carried by 13 freight trains per day, the number of the remaining available trains can be allotted to the rail passenger movement, varying with station intervals. Table 5-4-1-1 shows the relationship between the frequency of rail trains and the

station intervals with the allowable traffic volume.

With shorter station intervals the single gage track would meet the traffic demand for the distant future.

Table 5-4-1-1 Possible Traffic Capacity of Jamuna Bridge

Total No. of trains operated daily	RAILWAY						HIGHWAY			Total No. of passengers carried annually (1,000 persons)	Total amount of goods carried annually (1,000 tons)
	Station intervals (km)	No. of passenger trains operated daily	No. of passengers carried annually (1,000 persons)	No. of freight trains operated daily	Annual amount of goods carried (1,000 tons)	No. of passengers carried annually (1,000 persons)	Annual amount of goods carried (1,000 tons)				
40		27	13,800	13	5,200	14,000	4,800	27,800	10,000		
45	12	32	16,350	13	5,200	14,000	4,800	30,350	10,000		
50	10	37	18,910	13	5,200	14,000	4,800	32,910	10,000		
55	9	42	21,460	13	5,200	14,000	4,800	35,460	10,000		
60	8	47	24,020	13	5,200	14,000	4,800	38,020	10,000		
65	7.5	52	26,590	13	5,200	14,000	4,800	40,590	10,000		
70	6.5	57	29,130	13	5,200	14,000	4,800	43,130	10,000		
75	6	62	31,680	13	5,200	14,000	4,800	46,680	10,000		
80	5.5	67	34,240	13	5,200	14,000	4,800	48,240	10,000		

## CHAPTER 6 ROUGH ESTIMATES OF DIRECT BENEFITS

The direct benefits for the various candidate bridge sites are calculated by accounting for the saving in travel time and in travel distance of passengers and the saving in transportation distance of goods.

### 6-1 Saving in travel time

The passenger volume varies according to the site of the bridge. Also, the amount of travel time saved through the construction of the bridge also varies. The direct benefits for the various bridge sites through the saving in travel time are computed as follows:

Table 6-1-1 Saving in Travel Time for Year 1993

<u>Bridge site</u>	<u>Passenger Volume</u> (1,000 pass/year)	<u>Saving in pass-km</u> (1,000 pass-km/year)	<u>Saving in pass-hour</u> (1,000 pass-hour/year)
1. Bahadrabad	14,550 (31,350)	867,660	28,920
2. Sirajganj	34,240 (34,240)	1,793,910	59,800
3. Nagarubari	25,410 (38,900)	2,056,850	68,560

From the point of passenger volume, the volume of passengers using the Sirajganj bridge site will exceed that using the Nagarubari bridge site, and the value in passenger service is highly recognized. However, in terms of saving in travel time, the annual saving of the Nagarubari bridge site exceeds that of the Sirajganj bridge site by 15% and is the greatest of all candidate-sites.



In the above table, the passengers volumes in ( ) denote the total cross river volume of the Jamuna River at the candidates bridge sites. The percentage of passengers using the bridges at the various sites are respectively 46%, 100% and 65%. In this respect, it can be concluded that the Sirajganj bridge site also ranks high in terms of percentage of bridge usage.

#### 6-2 Saving in vehicle travel distance

The saving in travel distance of passengers is converted into the saving in travel distance of vehicles. In the calculation, the share of passengers by vehicles in the total cross-river passengers volume is estimated at 24% for the Bahadrabad site, 24% for Sirajganj site and 26% for the Nagarubari site. At this percentage, the saving in passenger travel distance is as follows.

1. Bahadrabad	208,240 thousand pass-km/year
2. Sirajganj	430,530 thousand pass-km/year
3. Nagarubari	534,780 thousand pass-km/year

The above saving in passenger travel distance is converted into vehicle travel distance by assuming a 50% - 50% share between passenger cars and buses and assuming that the average passengers per vehicle are 3.5 persons for a passenger car and 40 persons for a bus. The results are as follows.

Table 6-2-1 Saving in vehicle travel distance, 1993

	<u>Bridge site</u>	<u>Passenger car</u>	<u>Bus</u>	<u>Total</u>
1.	Bahadrabad	29,750	2,600	32,350
2.	Sirajganj	61,500	5,380	66,880
3.	Nagarubari	76,400	6,680	83,080

(Unit: thousand vehicle-km/year)

### 6-3 Saving in goods transportation distance

The saving in goods transportation distance for the year 1982/83 is estimated as follows:

Table 6-3-1. Saving in Goods Transportation Distance (1982/83)  
in thousand ton-km

	<u>Bridge site</u>	<u>By Railway</u>	<u>By Road</u>	<u>Total</u>
1.	Bahadrabad	4,632	-27,736	-23,104
2.	Sirajganj	182,241	-10,500	171,741
3.	Nagarubari	150,549	-2,352	148,197

### 6-4 Calculation of Value of Direct Benefits

#### 6-4-1 Assumptions of calculation

In the calculation of the value of direct benefits the following assumptions were made.

- (1) Number of year of vehicle depreciation: 15 years
- (2) Annual running mileage of vehicle: 70% of that recorded in Japan
- (3) Operating cost of vehicles: 200% of the cost of fuel (gasoline)
- (4) Cost of vehicles: passenger car: 60,000 TK  
truck & bus: 80,000 TK
- (5) Cost of gasoline: 15 TK/imp.gallon
- (6) Gasoline mileage: 7km/litre
- (7) Running mileage of vehicle in Japan: passenger car: 38.1 km/day  
truck: 123.2 km/day  
bus: 119.0 km/day
- (8) Value of time saved:  $1,000 \text{ TK} \times 1/20 \text{ day} \times 1/8 \text{ hours} \times 1/10 = 0.625 \text{ TK/hour}$   
(10% of average time value)
- (9) Operating cost per kilometer
  - (i) Depreciation: passenger car:  $60,000 \times 1/15 \times 1/365 \times 1/(38.1 \times 0.7) = 0.41 \text{ TK/km}$   
truck:  $80,000 \times 1/15 \times 1/365 \times 1/(123.2 \times 0.7) = 0.17 \text{ TK/km}$   
Bus:  $80,000 \times 1/15 \times 1/365 \times 1/(119.0 \times 0.7) = 0.175 \text{ TK/km}$

(ii) Direct operating expenses (all vehicles) :  $15 \times 1/4.546 \times 1/7$   
 = 0.47 TK/km

(iii) Total operating cost: passenger car: 0.88 TK/km/vehicle  
 truck: 0.64 TK/km/vehicle  
 bus: 0.645 TK/km/vehicle

6-4-2 Total value of direct benefits

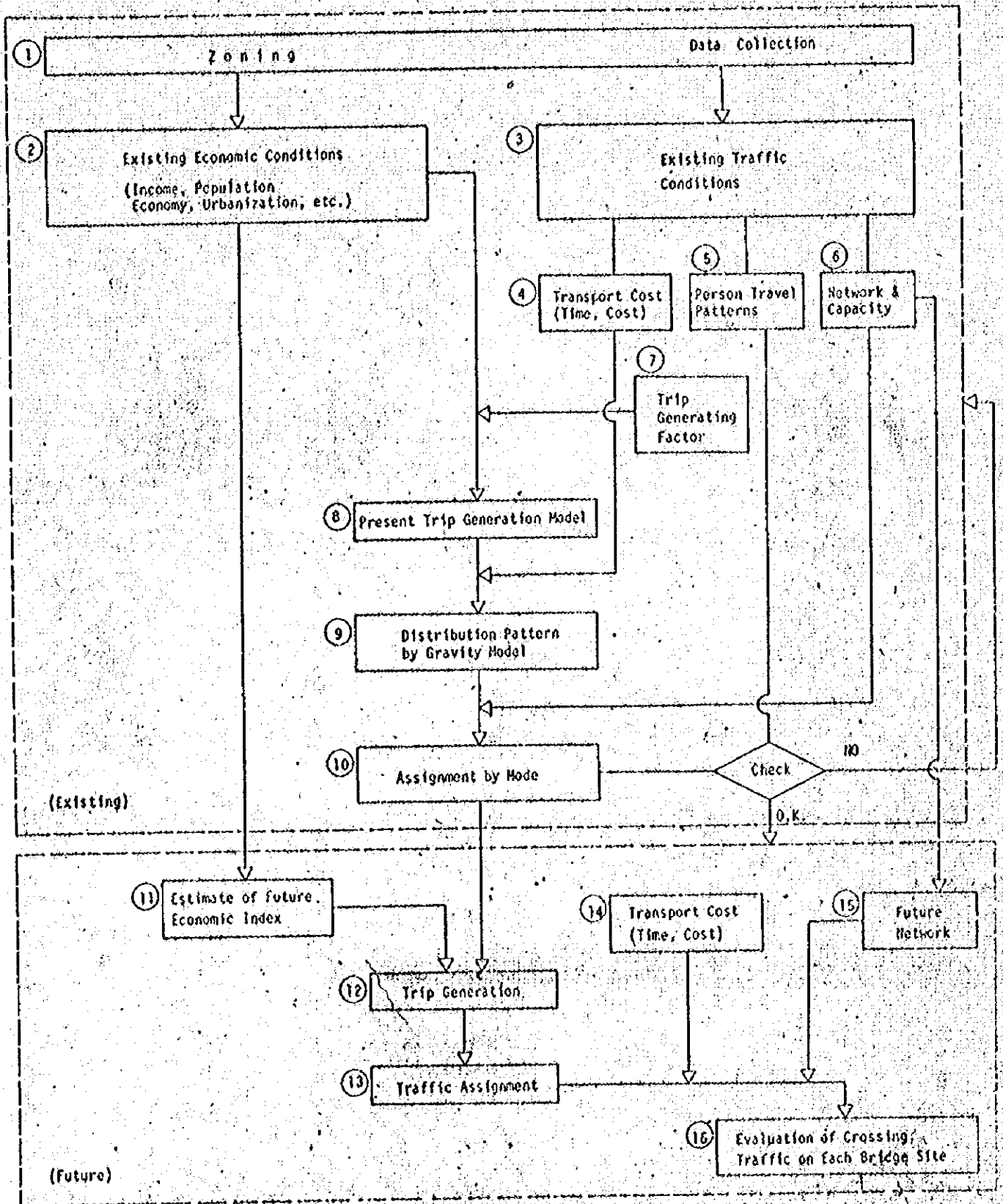
Total value of direct benefits for the various bridge sites  
 are thus calculated as follows:

Table 6-4-1 Total value of direct benefits, 1993

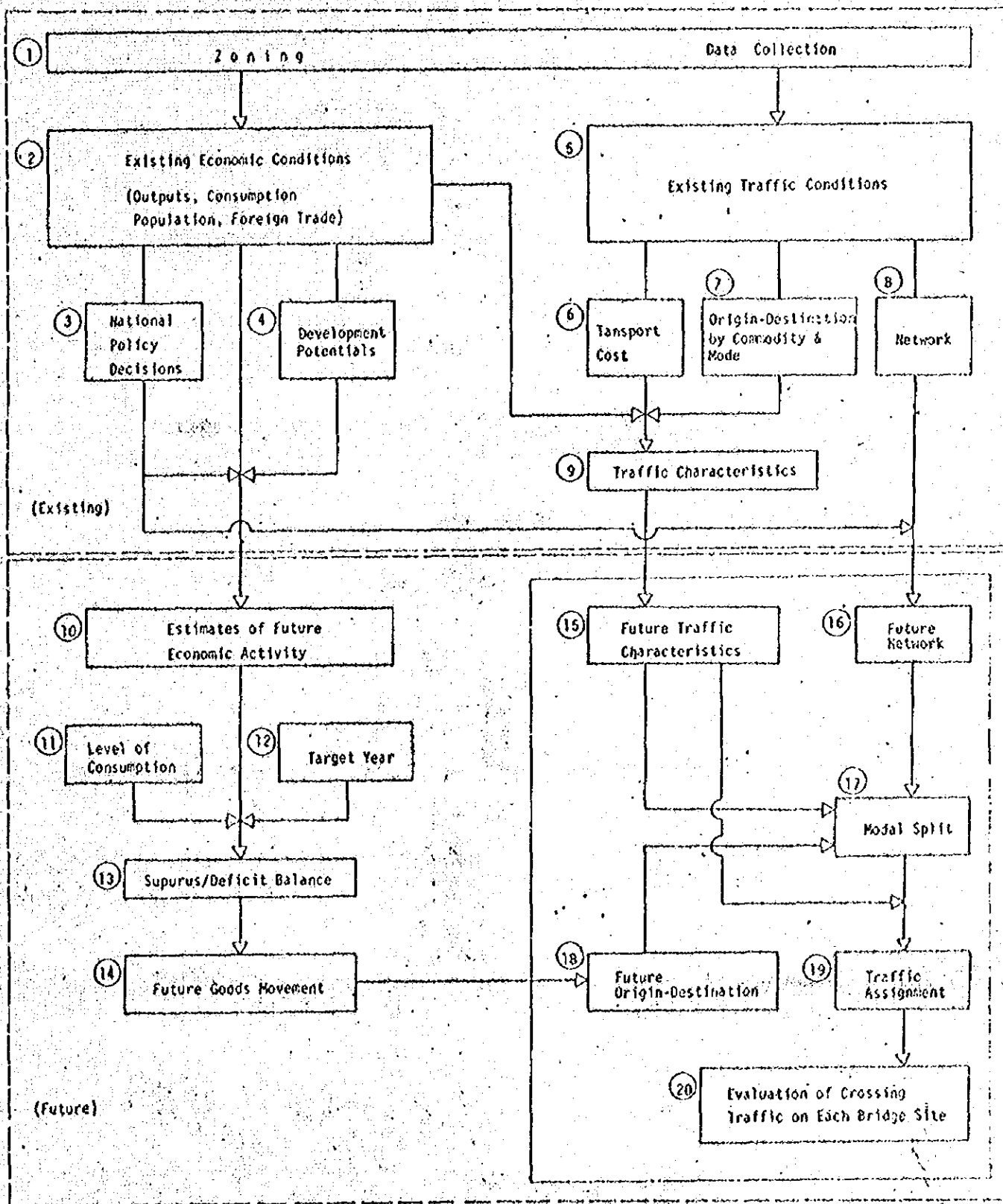
Bridge site	Saving in passenger travel time	Saving in passenger travel distance	Saving in goods transport distance	Total
1. Bahadrad	180.7	278.6	---	459.3
2. Sirajganj	373.8	575.9	0.2	949.9
3. Nagarubari	428.5	715.4	0.2	1,144.1

(unit: 100 thousand taka)

APPENDIX 1  
 FORECASTING PROCESS FOR PASSENGERS ACROSS THE JAMUNA



APPENDIX 2.  
FORECASTING PROCESS FOR GOODS ACROSS THE JAMUNA







JAMAICA RIVER FERRY TRANSPORT SURVEY  
Vehicle Interview

Sheet No. \_\_\_\_\_

Recorded by \_\_\_\_\_ from \_\_\_\_\_ to \_\_\_\_\_  
Time Departure \_\_\_\_\_, Arrival \_\_\_\_\_ Date: June \_\_\_\_\_ 1974

Veh Type	Capacity	Load		Commodity		Secondary	Prop	Origin Place Tham or P. S.	Destination place	Comments e.g. tons, route
		Goods	Pass	Secondary	Primary					
1		0 1/2	1 1+				1 1/2			
2		0 1/2	1 1+				1 1/2			
3		0 1/2	1 1+				1 1/2			
4		0 1/2	1 1+				1 1/2			
5		0 1/2	1 1+				1 1/2			
6		0 1/2	1 1+				1 1/2			
7		0 1/2	1 1+				1 1/2			
8		0 1/2	1 1+				1 1/2			
9		0 1/2	1 1+				1 1/2			



JAMUNA BRIDGE SURVEY OFFICE  
UNDER OVERSEAS TECHNICAL COOPERATION AGENCY, JAPAN  
HOUSE NO. 703, ROAD NO. 19  
DHANMONDI RESIDENTIAL AREA  
DACCA, BANGLADESH  
(NEW MARKET P.O. BOX NO. 5020)  
PHONE: 317056 & 317060

Ref. No. T.E.S.T.-XXV/ /74

Date June 22, 1974

Dear Sir,

Subj: Jamuna Bridge Survey Questionnaire.

We are pleased to introduce ourselves as an organisation that is conducting feasibility survey work of the proposed bridge to be constructed over the river, Jamuna. Moreover, this is for your information that the First Phase of the survey work has been completed and at the present moment the Japanese experts are busy with the compilation of the Interim Report to be submitted to the Bangladesh Government.

The Economic Survey Team headed by Mr. Toshima is now in Bangladesh to collect information as per Questionnaire attached which is self explanatory.

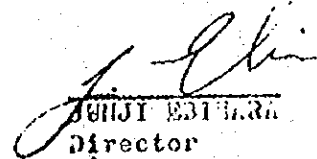
We would appreciate if you could kindly send us the Questionnaire duly filled within a week.

We take this opportunity of expressing our gratitude for your co-operation.

Thanking you.

Yours faithfully,

Enclo: Questionnaire.

  
J. Chinn  
Director

c.c. File.

"Your co-operation of the survey will help to build your nation"

**CONFIDENTIAL**

1/2/74

SURVEY OF SHIPMENT OF GOODS IN BANGLADESH, 1974  
 Government of Bangladesh and Jamuna Bridge Survey  
 Office in Bangladesh  
 \*\*\*\*\*

1.1 Name of the establishment : \_\_\_\_\_

1.2 Name of owner/occupier of the factory : \_\_\_\_\_

1.3 Location address : \_\_\_\_\_

1.4 Type of enterprise : please tick mark  applicable one :

- (a) Proprietorship.
- (b) Partnership.
- (c) Private Ltd. Company.
- (d) Public Ltd. Company (Stock Co.)
- (e) Corporation.
- (f) Others (specify).

1.5 Please state the following :

A. When the factory started production for the first time ?

Year : \_\_\_\_\_ Month : \_\_\_\_\_

B. Category in manufacturing (in details) :

C. Main input (raw materials or processed goods) :

D. Main output (products or finished goods) :

1.5 How many persons of different categories were employed in the factory as per pay roll of June 1969 & 1974 ?

- (a) Production and mainforce workers:.....
- (b) Managerial, technical & professional:.....
- (c) Clerical: .....
- (d) Others: .....
- (e) Total: .....

	1969	1974
(a)		
(b)		
(c)		
(d)		
(e)		

If you can't remember the break-up of 1969 please answer the total employed only.

2.1 Please state goods in-and out-flow during July 1973 to June 1974 and also during July 1969 to June 1970 ?

- A. Amount of goods shipped (Taka):.....
- B. Weight of goods shipped in Mds:.....
- C. Amount of goods received (Taka):.....
- D. Weight of goods received in Mds:.....

1969/70	1973/74

2.2 Please state the quantity of raw materials or products by the transport facilities you use in 1973/74 :

- A. How much raw material did you bring to your factory by Rail ?
- B. How much raw material did you bring to your factory by Truck ?
- C. How much raw material did you bring to your factory by Motor Launches, Steamers and other mechanically propelled vessels ?
- D. How much raw material did you bring to your factory by country boat (naukha) ?
- E. How much raw material did you bring to your factory by other means ?
- F. How much of your manufactured products were shipped outside your factory by Rail ?
- G. How much of your manufactured products were shipped outside your factory by Truck ?
- H. How much of your manufactured products were shipped by Motor Launches, Steamers and other mechanically propelled vessels ?
- I. How much of your products were shipped by country boat (naukha) ?
- J. How much of your products were shipped by other means ?

Quantity (Mds)	Value (1000 Taka)

2.3 A. How many hours a month did your factory work in May 1974 ?

\_\_\_\_\_ hours.

B. Also in May 1970 ?

\_\_\_\_\_ hours.

2.4 Please state the quantity and value of different items of raw materials purchased from outside the town/'bandar' where your factory is located during July 1973 to June 1974 ?

	Name of raw material	Don't fill-up	Unit of measurement of quantity	Don't fill-up	Quantity	Value (Taka)
1						
2						
3						
4						
5						

2.5 Please state what quantity of raw material did you bring for your factory during July 1973 to June 1974 (except the town/'bandar'/village where your factory is located) :-

Name of place from where raw materials were received.	Unit of measurement of quantity	Quantity	Distance from your factory in miles	Main transport means	Average days required	Average freight charges
1. Dacca & Tejgaon						
2. Narayanganj						
3. Chittagong						
4. Khulna						
5.						
6.						
7.						
8.						
9.						

\* Please write the name from where raw materials were received in sub-divisionary.

2.6 Please state the quantity and value of manufactured goods (products) of your factory shipped outside the town/'bandar' where your factory is located during July 1973 to June 1974 ?

	Name of products	Don't fill-up	Unit of measurement of quantity	Don't fill-up	Quantity	Value (Taka)
1						
2						
3						
4						
5						

2.7 Please state what quantity of products did you ship from your factory during July 1973 to June 1974 (except the town/'bandar'/village where your factory is located) :-

Name of place from where products were sent	Unit of measurement of quantity	Quantity	Distance from your factory in miles	Main transport means	Average days required	Average freight charges
1. Dacca & Tejgaon						
2. Narayanganj						
3. Chittagong						
4. Khulna						
5.						
6.						
7.						
8.						
9.						

\* Please write the name from where raw materials were received in sub-divisionary.

2.8 Please state the historical trend of your factory (or establishment)

Year	Capital	Employees	Received goods		Shipped goods	
			Quantity ( )	Value (1000 Tk.)	Quantity ( )	Value (1000 Tk.)
68						
69						
70						
71						
72						
73						

\* Please specify the unit of measurement of quantity in the parenthesis

2.9 Please mark a circle in the applicable boxes concerning the selection of the transport facilities.

Reason for selection	Trucking	Railway	Mechanised vessels	Country boats	Others
	A	B	C	D	E
(1) Low rate of freight					
(2) Speedy (or faster)					
(3) Security (damage; loss theft, etc.)					
(4) Steady (sureness of arrival time)					
(5) For connection (Client)					
(6) Easy access to trans-shipment point					
(7) Good service					
(8) Other means not available					
(9) Tradition					
(10) Others					

2.10 Please answer the following questions :

A. Do your raw materials come from the other side of the river Jamuna ? ( Yes, No )

B. Are your products shipped across the river Jamuna from your factory ? ( Yes, No.)

If your answer 'Yes' at least one of them, please proceed to the next questions.

C. How many days were you required to cross the Jamuna ?  
( Approximately \_\_\_\_\_ days )

D. How much was it the charge for crossing the Jamuna ?  
( \_\_\_\_\_ Taka/Rds.)

2.11 Please state in details the influence to your factory (or establishment) if the proposed Jamuna Bridge should be constructed in a convenient distance from your place, such as saving of cost and time (or days), shorter distance, enlargement of the commuting distance of your employees possibility or probability of enlargement of your establishment, etc.

Reason for selection	Trucking	Railway	Mechanised vessels	Country boats	Others
	A	B	C	D	E
(1) Low rate of freight					
(2) Speedy (or faster)					
(3) Security (damage, loss, theft, etc.)					
(4) Steady (sureness of arrival time)					
(5) For connection (Client)					
(6) Easy access to trans-shipment point					
(7) Good service					
(8) Other means not available					
(9) Tradition					
(10) Others					

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