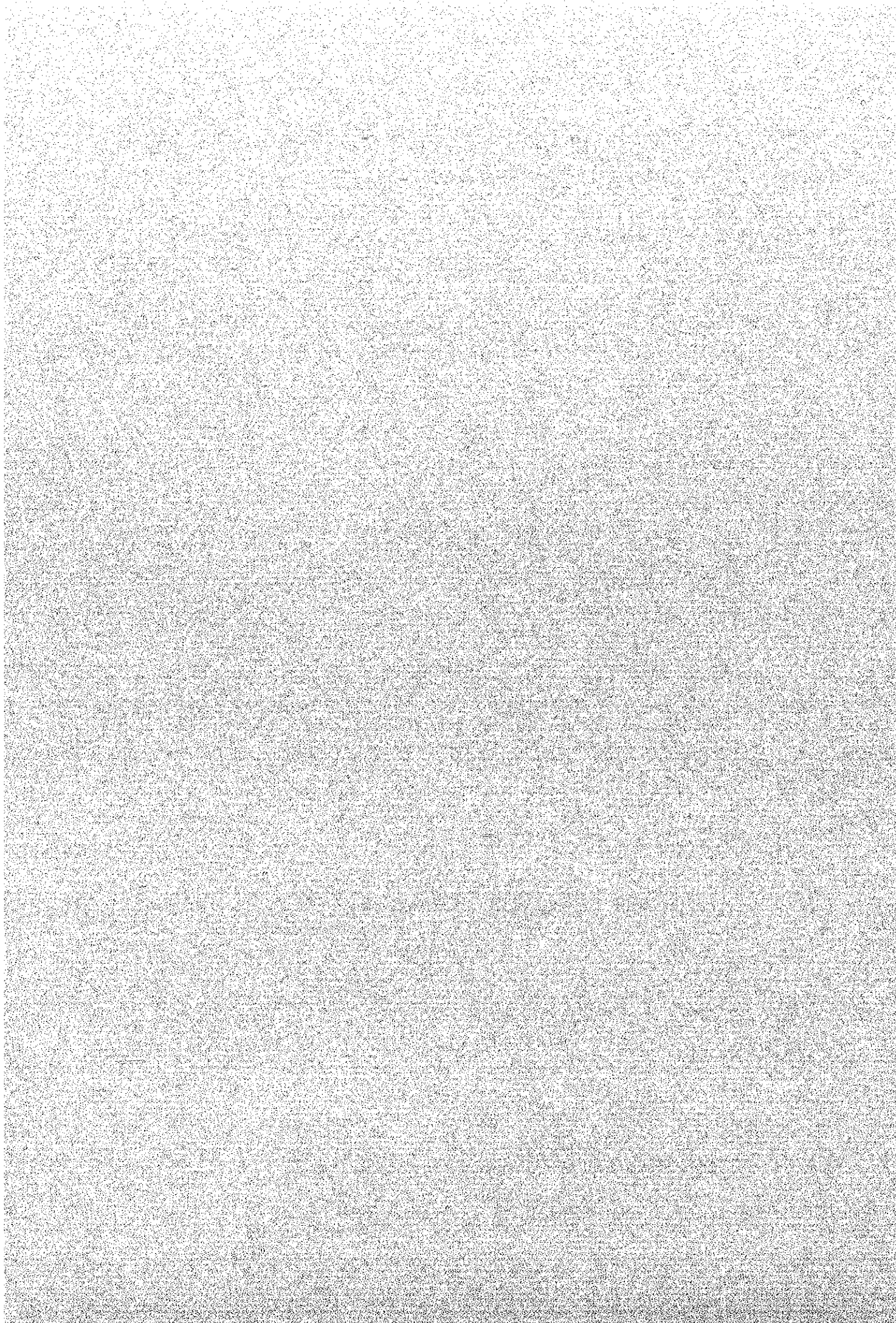


## **CHAPTER 4**

# **CURRENT ROAD TRANSPORT PROFILE**



## CHAPTER 4 CURRENT ROAD TRANSPORT PROFILE

### 4.1 Characteristics of Current Road Transportation

#### 4.1.1 Registered Vehicles

Number of registered motorized vehicles in Bangladesh was about 462 thousand in 1995. The growth rate during 1990 - 95 was 6.8% per annum, while that of microbus was the highest as 51.3% per annum during the same period. In this connection, that of car and jeep, truck and motorcycle was 4.0%, 4.2% and 5.6% per annum, respectively. The level of ownership for total motorized vehicles in 1995 was 3.9 vehicles per 1,000 persons.

Fig. 4.1.1 and Table 4.1.1 show the trend of motorized vehicle composition by type. In 1995, the share of motorcycle was the highest with 39.4%, followed by 25.1% for car and jeep, 14.7% for auto-rickshaw, 9.9% for truck and 8.3% for bus/minibus/microbus in descending order.

Table 4.1.1 Registered Motorized Vehicles in Bangladesh

	1989	1990	1991	1992	1993	1994	1995	Annual Growth Rate 90-95 (%)
Car/Jeep	90,150	95,293	99,135	100,821	103,854	108,605	116,216	4.0
Taxi	2,500	2,650	2,671	2,690	2,780	2,787	2,804	1.1
Bus/Minibus	24,600	25,655	26,449	26,946	27,469	28,463	29,484	2.8
Microbus	400	1,095	2,371	3,498	4,866	7,138	8,672	51.3
Truck	35,200	37,312	38,448	39,307	40,373	42,337	45,805	4.2
Trailer	2,000	2,200	2,304	2,325	2,350	2,354	2,370	1.5
Motorcycle	125,000	138,750	150,171	158,588	165,360	173,167	182,035	5.6
Auto-rickshaw	30,200	32,616	36,796	40,114	43,863	53,851	68,039	15.8
Tractor/Others	5,525	6,077	6,211	6,290	6,335	6,856	6,969	2.8
Total	315,575	341,648	364,556	380,579	397,250	425,558	462,394	6.2

Source : 1996 Statistical Yearbook of Bangladesh

In Bangladesh, rickshaws as non-motorized vehicles exceeds the motorized vehicles in number of registration. The number of registered rickshaws in the whole country was approximately 473 thousand in 1995 as shown in Table 4.1.2. The growth rate during 1990 - 1995 was 6.2% per annum, and this was almost same that of motorized vehicles. Then, number of registered rickshaws in Khulna Former District including Khulna, Bagerhat and Satkhira zilas was about 27 thousand. The number of rickshaws per 1,000 persons in 1995 was 3.9 for the whole country and 4.6 for Khulna Former District, indicating that Khulna has more rickshaws per person than that of the whole country.

Table 4.1.2 Number of Registered Rickshaws

		1990	1991	1992	1993	1994	1995	Annual Growth Rate 90-95 (%)
Bangladesh	Urban	265,093	276,163	296,595	322,210	350,037	380,267	7.5
	Rural	84,478	86,024	87,598	89,201	90,786	92,399	1.8
	Total	349,571	362,187	384,193	411,411	440,823	472,666	6.2
Khulna Former District	Urban	14,601	15,874	32,812	18,107	19,671	21,370	7.9
	Rural	4,869	4,958	5,049	5,141	5,234	5,327	1.8
	Total	19,470	20,832	37,861	23,248	24,905	26,697	6.5

Source : 1996 Statistical Yearbook of Bangladesh

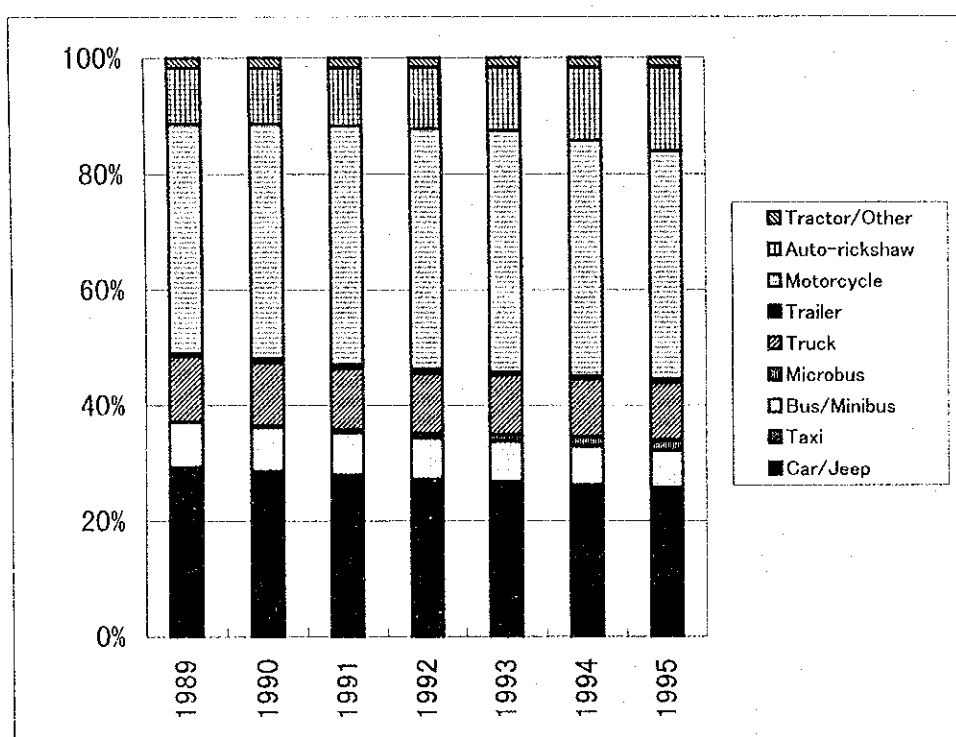


Fig. 4.1.1 Trend of Motorized Vehicle Composition by Type

Source : 1996 Statistical Yearbook of Bangladesh

#### 4.1.2 Road Classification

##### (1) Administrative Area and Classification

Areas under the jurisdiction of Roads and Highways Department (RHD), Ministry of Communications is divided into 7-Zones and 16-Circles in the present. Fig. 4.1.2 shows location of Zones and Circles.

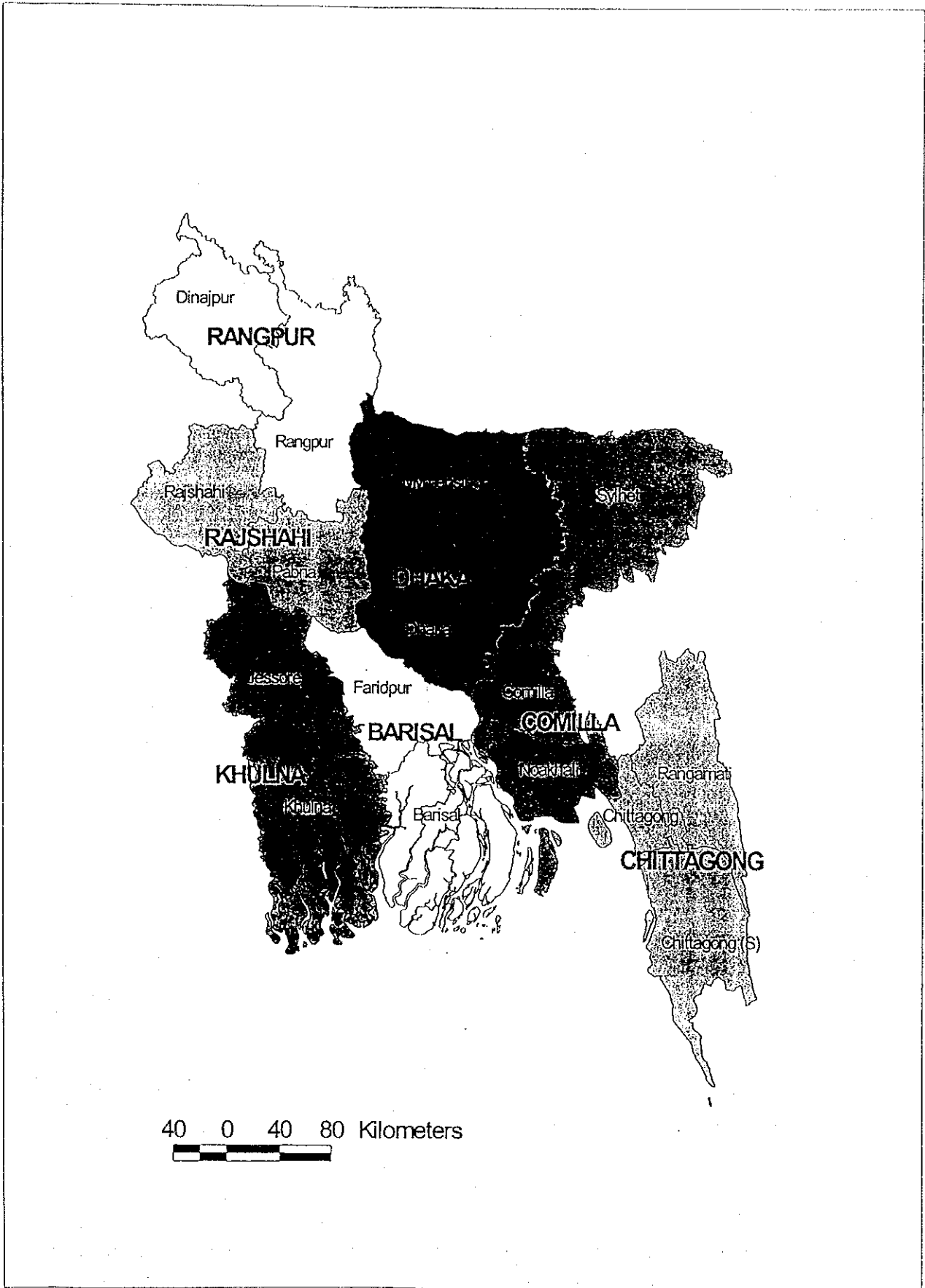


Fig. 4.1.2 Location of RHD Zones and Circles

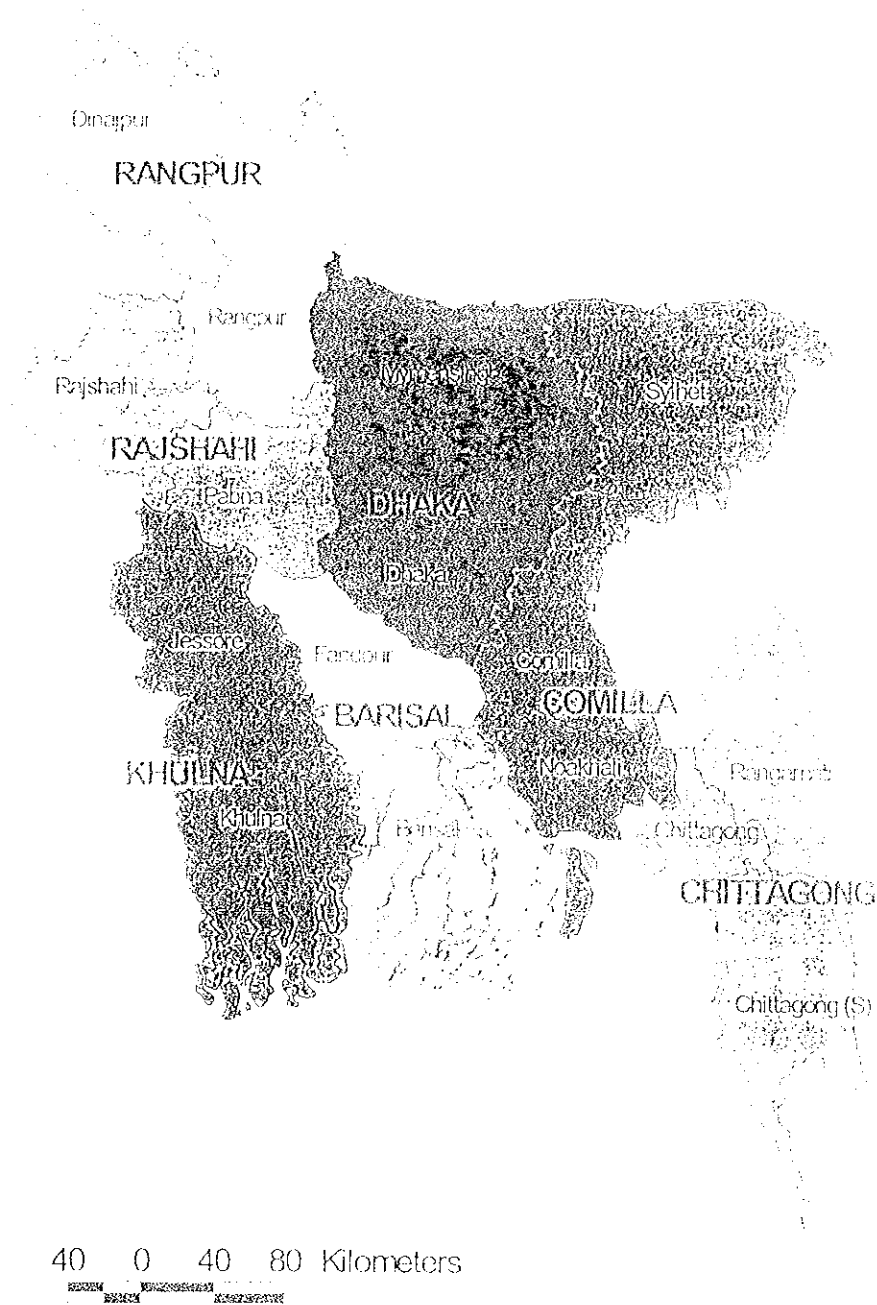


Fig. 4.1.2 Location of RHD Zones and Circles

Roads under the jurisdiction of RHD are administratively classified as National Highway, Regional Highway and Feeder Road-A as shown in Table 4.1.3, and roads other than these three roads are under the jurisdiction of Local Government Engineering Department, Ministry of Local Government.

Table 4.1.3 Administrative Classification of Roads under the RHD

Classification	Contents
National Highway	Major Inte-rurban and Connect Ports, Boundary
Regional Highway	Local Inte-rurban and Connect National Highway
Feeder Road-A	Connect Thana

### (2) Roads in the Study Area

Total length of roads under the RHD is 20,285 km. National Highway accounts for 14% or 2,862 km, Regional Highway for 8% or 1,565 km and Feeder Road-A for 78% or 15,860 km in Bangladesh. Roads in Khulna Circle accounts for 5% or 1,002 km, consisting of National Highway of 67 km (2%), Regional Highway of 125 km (8%) and Feeder Road-A of 810 km (4%). Khulna Circle has low percentage of roads, especially of National Highway.

Table B-4.1.1 in Appendix B shows the length of RHD Roads by Circle in 1996/97. Road length by classification and Circle in 1996/97 are presented in Table 4.1.4.

Table 4.1.4 Length of RHD Roads by Circle in 1996/97

Circle	National Highway	Regional Highway	Feeder Road-A	Total Length
	(%)	(%)	(%)	(%)
Dhaka	314 (23)	66 (5)	626+356* (72) =982	1,362 (100)
Khulna	67 (7)	125 (12)	498+312* (81) =810	1,002 (100)
Jessore	267 (20)	228 (17)	656+179* (63) =835	1,330 (100)
Total in Bangladesh	2,862 (14)	1,565 (8)	10,508+5,352* (78) =15,860	20,285 (100)

### (3) Road Classification by Paved Width

Table 4.1.5 shows roads by paved width and Former District as of June 1992. Roads wider than 6.71 m which are assumed to be 2 lanes or more account for 12% or 905.39 km

in length, while roads less than 3.66 m wide which are one lane and deemed difficult to pass each other account for 57% or 4,699 km in length.

Roads in Khulna Former District comprise 53 km (13%) in length of 6.71 m wide or more and 301 km (78%) in length of 3.66 m wide or less, and it means three fourth of roads are one lane.

Table 4.1.5 Road Length by Former District and Paved Width as of June 1992

Name of Former District	Total (km)	Over 6.71 meter (%)	6.71 meter (%)	5.49 meter (%)	3.96 to 5.18 meter (%)	3.66 meter (%)	Below 3.66 meter (%)
Dhaka	698.80	38.17 (5)	233.74 (33)	103.84 (15)	11.00 (2)	290.74 (42)	21.31 (3)
Khulna	386.03	40.07 (10)	12.57 (3)	31.76 (8)	1.00 (0)	231.85 (60)	68.78 (18)
Jessore	513.13	4.00 (1)	60.51 (12)	100.91 (20)	21.07 (4)	88.84 (17)	237.80 (46)
Kushtia	310.76	- (-)	11.90 (4)	39.87 (13)	43.52 (14)	158.91 (51)	56.56 (18)
Total	8,115.51	124.98 (2)	780.41 (10)	2,254.03 (28)	257.24 (3)	3,291.53 (40)	1,407.32 (17)

#### (4) Road Length by Type of Pavement

Table 4.1.6 shows road length by type of pavement and Former District as of June 1992. Paved roads account for 55% or 8,116 km in length, while gravel road/earth road occupy 29% or 4,214 km in length. Percentage of unpaved roads are still high.

Roads in Khulna Former District comprise 386 km (59%) of paved roads and 84.5 km (13%) in of unpaved roads. More than 87% of roads are assumed to be paved or surface treated.

Table 4.1.6 Road Length by Former District and Type of Pavement as of June 1992

Name of Former District	Total Length (km)	Paved road (%)	HBB or partly paved road (%)	Gravel road (%)	Earthen road (%)
Dhaka	1,213.91	698.80 (58)	209.49 (17)	2.50 (0)	303.12 (25)
Khulna	659.16	386.03 (59)	188.61 (28)	31.00 (5)	53.52 (8)
Jessore	588.39	513.18 (87)	41.39 (7)	- (-)	33.87 (6)
Kushtia	440.37	310.76 (71)	50.09 (11)	1.61 (0)	77.91 (18)
Total in Bangladesh	14,668.38	8,115.51 (55)	2,338.83 (16)	137.57 (1)	4,013.80 +62.67 =4,76.47 (28)



### (5) Pavement Condition

Table 4.1.7 shows road length by pavement condition and Zone in 1996/97. Roads with good or fair condition account for 76% or 7,494 km in length, of which breakdown are 1,828 km (80%) of National Highway, 1,020 km (77%) of Regional Highway and 4,636 km (76%) of Feeder Road-A.

Roads in Khulna Zone comprise 1,132 km (82%) in good or fair condition. It demonstrates that good road maintenance has been done.

Table 4.1.7 Road Length by Zone and Pavement Condition in 1996/97

Zone Road Type	Total Length(km)	Good (%)	Fair (%)	Poor (%)	Bad (%)
<b>Dhaka</b>					
National	465	84 (18)	168 (36)	194 (41)	18 (3)
Regional	217	58 (26)	137 (62)	22 (10)	0 (0)
Feeder-A	1,126	246 (21)	417 (37)	387 (34)	75 (6)
<b>Total</b>	<b>1,810</b>	<b>389 (21)</b>	<b>723 (39)</b>	<b>604 (33)</b>	<b>93 (5)</b>
<b>Khulna</b>					
National	338	183 (54)	122 (36)	32 (9)	1 (0)
Regional	342	164 (47)	69 (20)	89 (26)	20 (5)
Feeder-A	680	333 (49)	260 (38)	86 (12)	0 (0)
<b>Total</b>	<b>1,361</b>	<b>680 (49)</b>	<b>452 (33)</b>	<b>207 (15)</b>	<b>21 (1)</b>
<b>Sub-total N</b>	<b>2,294</b>	<b>1,081 (47)</b>	<b>747 (33)</b>	<b>420 (18)</b>	<b>43 (2)</b>
<b>Sub-total R</b>	<b>1,325</b>	<b>534 (40)</b>	<b>486 (37)</b>	<b>280 (21)</b>	<b>20 (2)</b>
<b>Sub-total F</b>	<b>6,104</b>	<b>1,844 (30)</b>	<b>2,792 (46)</b>	<b>1,353 (22)</b>	<b>113 (2)</b>
<b>Grand Total in Bangladesh</b>	<b>9,733</b>	<b>3,459 (35)</b>	<b>4,035 (41)</b>	<b>2,060 (21)</b>	<b>177 (1)</b>

Note: Report is based on roads for which RCS has successfully completed, totaling 12,524 km out of the currently listed length of 15,437 km.

### 4.1.3 Modal Share in Transport Sector

Road transport plays important roles in transport sector in Bangladesh as progress has been made on road improvement through several Five-Year plans. Fig. 4.1.3 shows trends of modal share of transport sector in Bangladesh. Road transport has high growth of both passenger and freight movement share in 1980s, while rail transport has decreased share in both passenger and freight during the same period.

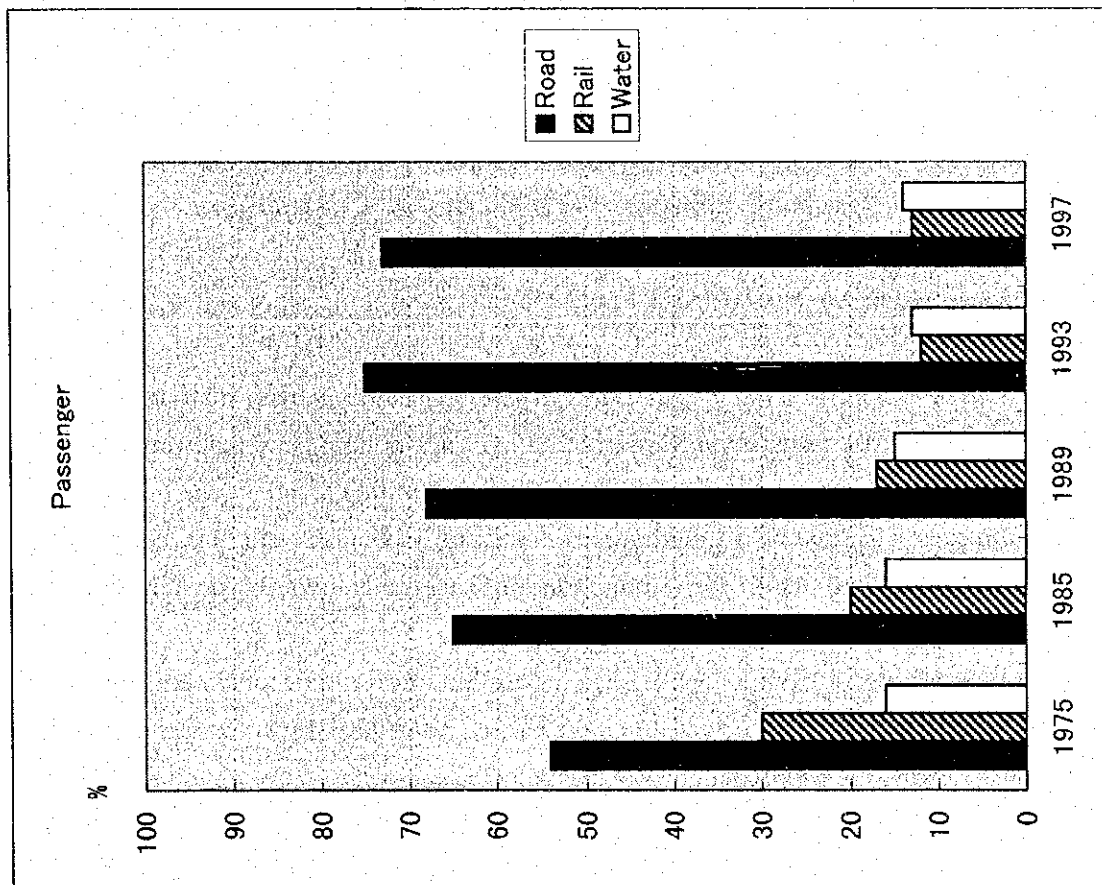
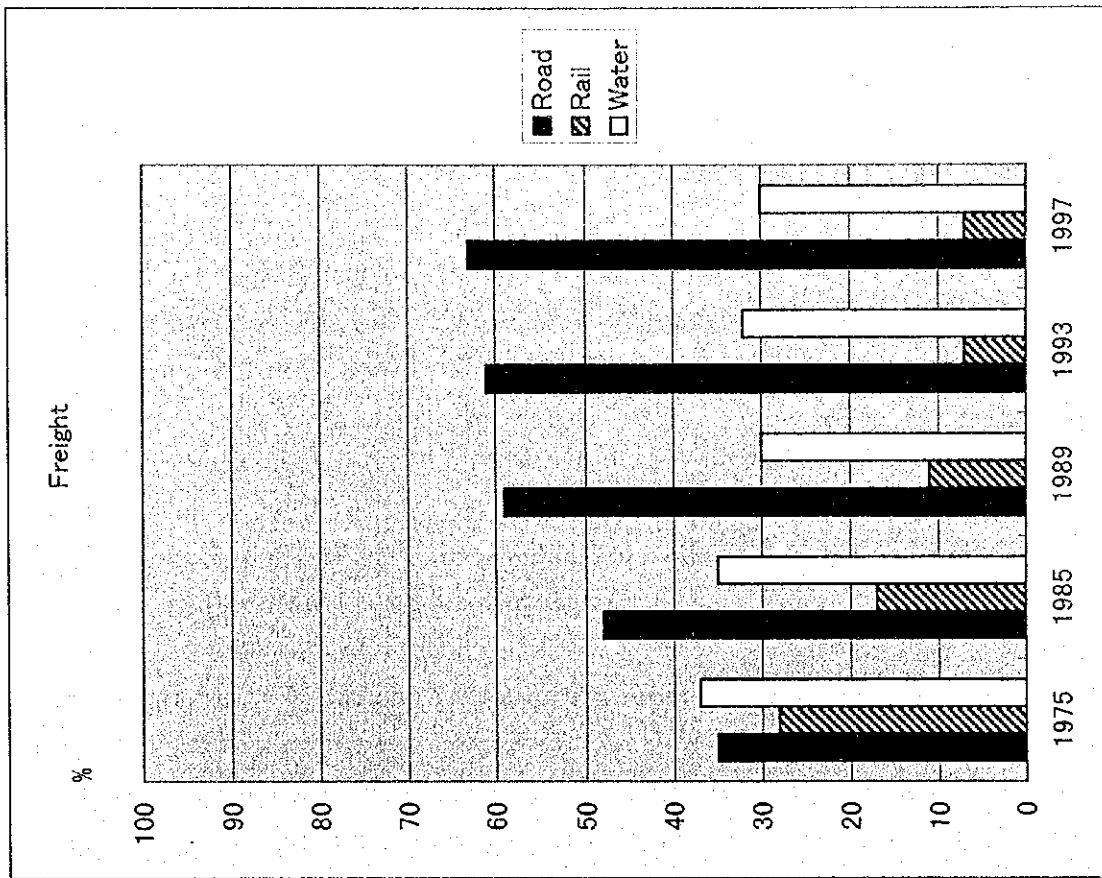


Fig. 4.1.3 Modal Share of Transport Sector in Bangladesh: 1974/75 - 1996/97

## 4.2 Road Network and Inventory

### 4.2.1 Road Network in the Study Area

National Highway No. 7 (NH-7) forms the north-south backbone of road network in the Study area as shown in Fig. 4.2.1, which connects Mongla Port to the north-west region through Khulna and Jessore. Table 4.2.1 summarizes road inventory of NH-7 and other road links.

NH-7 has two major roads crossing in Khulna and Jessore to form a regional arterial road network. The east-westward arterial roads are not yet developed due to many river crossings and flooding areas. Only Jessore-Khulna section has an alternative route to NH-7, and other links has no passable alternatives for motorized 4-wheel vehicles in the Study area.

Khulna Former District is severed by the Atai/Rupsa river into two, the western part of 3,522,000 population and the eastern of 1,757,000.

There are two ferry services under the RHD, namely Rupsa Ferry and Jail-Khana Ferry. However, only Rupsa Ferry connects the western part of Khulna Former District to the eastern because Rupsa Ferry is located on National Highway No. 7. Present traffic at Rupsa Ferry consists of approximately 50,000 passengers and 900 motorized vehicles per day.

Passengers and non-motorized vehicle users are mostly Khulna or Rupsa inhabitants.

Motorized vehicular traffic of Khulna origin/destination comprises Khulna - Mongla (National Highway No.7), Khulna-Mollahat/Gopalganj (Regional Highway No.780) and Khulna-Bagerhat/Priopur corridors, while that beyond Khulna consists of Khulna-Jessore (National Highway No.7) and Khulna-Dumuria/Satkhira (Regional Highway No.760) corridor.

Road network in Khulna city is also scarce in terms of space and density of road. Fig. 4.2.2 presents existing road network in Khulna city and its surroundings, which forms two north-south arterial roads with a few east-westward roads and forms radar type network because urbanized area grows in limited suitable land in between rivers and flooding areas. Present development takes place along radial arterial roads towards east and west directions.

Khulna Development Authority (KDA) is formulating the master plan to sustain future development as well as to solve present urban problems, especially traffic congestion at Rupsa ferry and downtown Khulna.

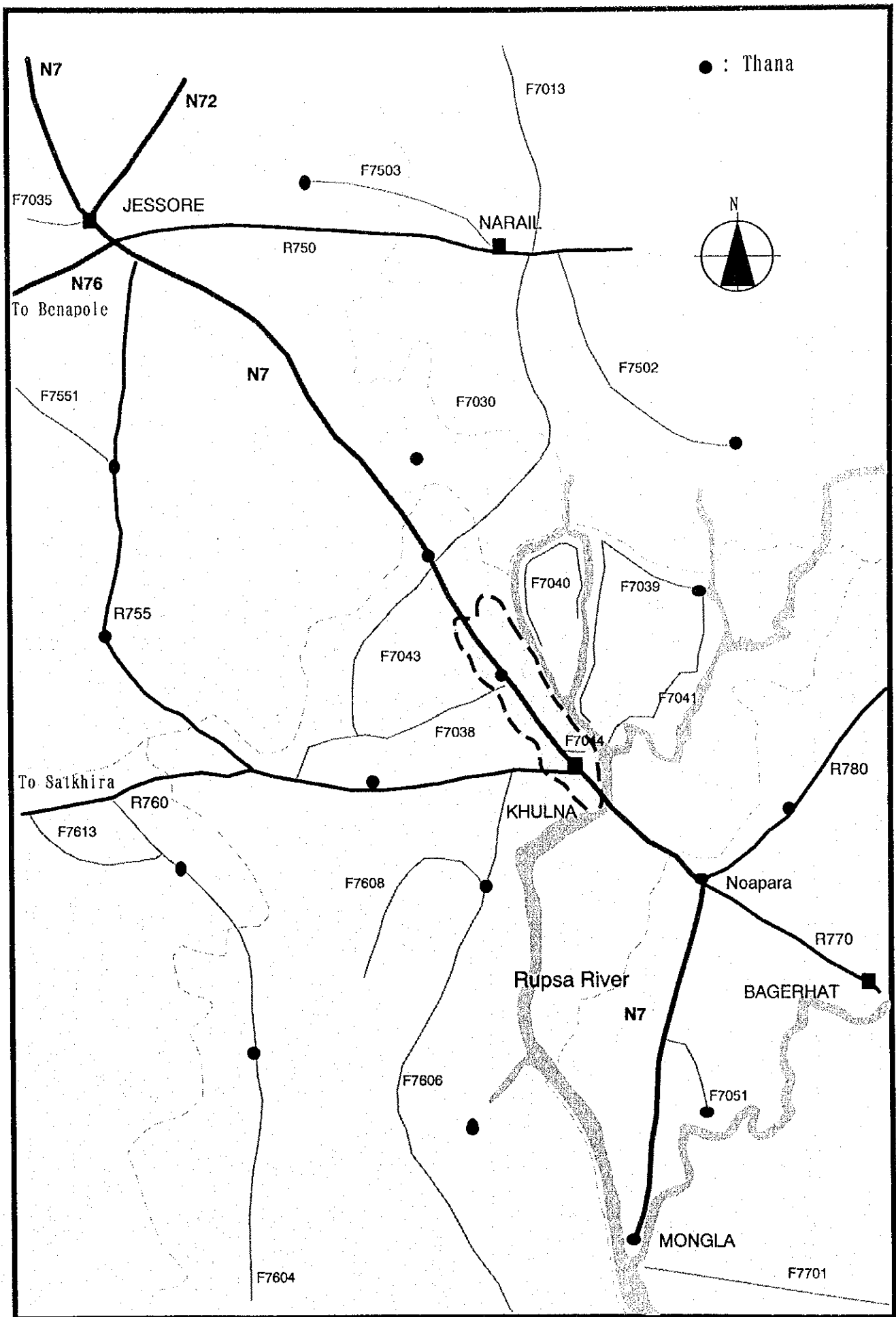


Fig. 4.2.1 Road Network in Khulna and its Surroundings

Table 4.2.1 Road Inventory in the Study Area

Road#	Link#	From	To	Chaimage (km)	Length (km)	Paved Width (m)	Surface Type	Condition Rating	Roughness (IRI)
National Highway									
N7	354	Jessore	Jessore	87.1	149.6	62.5	BS	Fair	3.0
	355	Khulna	Khulna	149.6	159.4	9.8	BS	Poor	4.9
	356	Noapara	Noapara	159.4	185.7	26.3	BS	Fair	5.7
	357	Mongla	Mongla	0.0	43.1	5.4	BS	Fair	3.7
N72	57	Jessore	Magura	0.0	39.2	7.7	BS	Fair	4.7
N76	61	Jessore	Benapole	0.0	32.4	4.8	BS	Fair	4.7
Regional Highway									
R750	234	Jessore	Narail	0.0	38.4	3.2	BS	Poor	8.4
R755	235	Jessore	Chuknagar	0.0	59.0	6.7	BS	Good	NA
R760	236	Khulna	Satkhira	0.0	19.6	5.5	BS	Poor	6.2
R770	237	Noapara	Bagerhat	0.0	44.1	24.5	BS	Good	6.2
	238	Bagerhat	Pirojpur	19.6	34.2	3.6	BS	Poor	7.5
R780	248	Noapara	Mollarhat	0.0	18.0	3.9	BS/HB	Good	4.2
Feeder Road-A									
F7013	7013	Magura	Narail	0.0	25.3	4.7	BS/ER	Good	4.4
F7030	7030	Fultala	Narail	0.0	4.0	NA	-	-	5.6
F7035	7035	Jessore	Airport Road	0.0	38.0	3.3	OT/BS	Good	6.3
F7038	7038	Daulapur	Shahpur	0.0	16.0	3.3	-	-	NA
F7039	7039	Sanerbaza	Terakhada	0.0	28.7	3.6	BS/ER	Good	7.4
F7040	7040	Nagarhati	Kamargati	0.0	20.0	NA	-	-	6.7
F7041	7041	Khulna	Terakhada	0.0	0.8	12.2	BS	Fair	NA
F7043	9707	Fultala	Shahpur	0.0	7.8	3.6	BS	Fair	7.2
F7044	7044	Greater Khulna Road	Rampal	0.0	24.0	3.4	BS	Poor	5.1
F7051	765	Baghamouza	Kalia	0.0	18.9	3.6	BS	Poor	5.4
F7502	766	Narail	Bhatiapara	0.0	19.0	3.0	-	-	NA
F7503	767	Narail	Jhikargacha	0.0	33.0	4.3	-	-	6.3
F7551	9701	Manirampur	Koira	0.0	22.0	3.6	BS/HB	Good	7.9
F7604	7604	Betgram	Dacope	0.0	22.3	2.0	BS/HB/ER	Good	NA
F7606	598	Khulna	Nalian	22.0	10.0	3.2	BS/HB/ER	Good	NA
	599	Dacope	Bararia	0.0	3.0	3.0	NA	-	NA
F7608	7608	Batiaghata	Tala	0.0	30.0	NA	-	-	NA
F7613	7613	Patalghata	Morelganj	0.0	30.0	NA	-	-	NA
F7701	9702	Mongla		0.0					

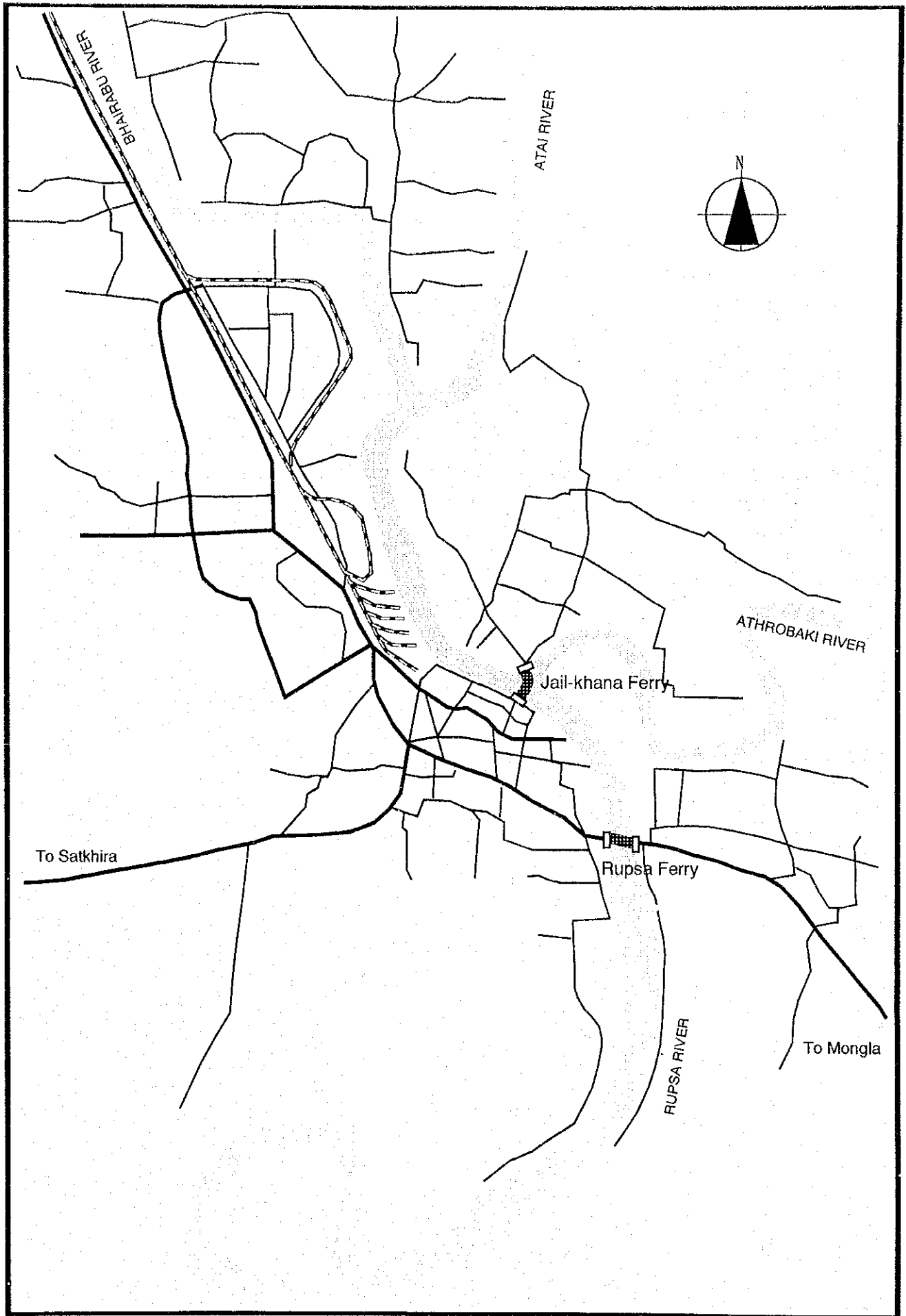


Fig. 4.2.2 Locations of RHD Ferrys in Khulna

#### 4.2.2 Survey on Road Inventory

National Highway No. 7 of Jessore - Khulna - Mongla forms north-southward backbone in the Study area, and several Regional Highways extend towards Bargerhat, Satkhira, Gopalganj and so forth, followed by Feeder Road-A to cover Thanas (small administrative units).

National Highways in the Study area generally are in good condition except N7-356 : Khulna - Noapara, having asphaltic pavement width of 7 m or wider. Regional Highways are of 3.6 m to 6.7 m wide, while Feeder Road-A are of less than 4.3 m wide except F7044 in Khulna, and both are in poor condition.

The study team carried out a supplementary road inventory survey in August 1998. Figs. B-4.2.1 and B-4.2.2 in Appendix B show the survey location, and Table 4.2.2 shows road inventory in Khulna and its surroundings.

Table 4.2.2 Road Inventory in Khulna

Location Number	Road #	Road Name	From	To	Median				Carrageway				Width (m)				Surface Type	Drainage	Remark		
					N-E		S-W		N-E		S-W		N-E		S-W					N-E	S-W
					N-E	S-W	N-E	S-W	N-E	S-W	N-E	S-W	N-E	S-W							
1	N7	Jessore-Khula Road	Jessore	Fultala	-	-	-	-	6.9	-	-	-	-	-	-	-	BS	X			
2	N7	Jessore-Khula Road	Fultala	Daulatpur	-	-	-	-	6.9	-	-	-	-	-	-	-	BS	X			
3	N7	Jessore-Khula Road	Fultala	Daulatpur	-	-	-	-	6.4	-	-	-	-	-	-	-	BS	X	Brick Shoulder		
4	N7	Jessore-Khula Road	Fultala	Daulatpur	1.2	7	7	-	7	-	-	-	2.5	2.5	-	-	BS	X			
5	N7	Jessore-Khula Road	Fultala	Daulatpur	-	-	-	-	6.9	-	-	-	2.6	2.6	-	-	BS	X			
6	N7	Jessore-Khula Road	Daulatpur	Khulna	-	-	-	-	8.8	-	-	-	1.15	1.5	-	-	BS	X			
7	N7	Jessore-Khula Road	Khulna City	Khulna	-	-	-	-	8.7	-	-	-	1.6	1.7	-	-	BS	X			
8	N7	Jessore-Khula Road	Khulna City	Khulna City	-	-	-	-	8.7	-	-	-	2.5	5.05	-	-	BS	△			
9	N7	Jessore-Khula Road	Khulna City	Khulna City	1	7.7	7.85	-	7.7	-	-	-	-	2.5	2.5	-	BS	○			
10	N7	Upper Jessore Road	Khulna City	Khulna City	1.1	7.6	7.7	-	7.7	-	-	-	-	3.35	2.4	-	BS	○			
11	N7	Khanjahan Ali Road	Khulna City	Khulna City	-	-	-	-	11.45	-	-	-	-	1.3	-	-	BS	○			
12	N7	Khanjahan Ali Road	Khulna City	Khulna City	0.4	5.85	6.55	0.75	6.55	0.75	0.75	-	-	3.35	1.35	-	BS	○	Brick Shoulder		
13	N7	Khanjahan Ali Road	Khulna City	Khulna City	0.4	6.15	6.3	0.6	6.3	0.6	0.65	-	-	3.8	1.7	-	BS	○	Brick Shoulder		
14	N7	Khulna-Mongla Road	Khulna	Noapara	-	-	-	-	7.3	-	-	-	2.5	2.5	-	-	BS	X			
15	N7	Khulna-Mongla Road	Noapara	Mongla	-	-	-	-	7.3	-	-	-	-	0.75	0.75	-	BS	X			
16	N7	Khulna-Mongla Road	Noapara	Mongla	-	-	-	-	7.5	-	-	-	2.5	2.5	-	-	BS	X			
17	R760	Khulna-Satkhira Road	Khulna City	Khulna City	-	-	-	-	7.95	2.65	1.85	-	-	-	1.6	-	BS	○	Brick Shoulder		
18	R760	Khulna-Satkhira Road	Khulna City	Khulna City	-	-	-	-	7.5	5.65	6.4	-	-	1.85	-	-	BS	○	Under Rehabilitation		
19	R760	Khulna-Satkhira Road	Khulna City	Khulna City	-	-	-	-	8	-	-	-	0.9	1.25	-	-	BS	X			
20	R760	Khulna-Satkhira Road	Khulna	Dumuria	-	-	-	-	6	-	-	-	2.2	2.2	-	-	BS	X			
21	R770	Noapara-Bagerhat Road	Noapara	Bagerhat	-	-	-	-	5.5	-	-	-	2.5	2.5	-	-	BS	X			
22	R780	Noapara-Mollarhat Road	Noapara	Mollarhat	-	-	-	-	3.6	-	-	-	2.4	2.4	-	-	BS	X			
23	F7038	Daulapur-Shahpur Road	Daulatpur	Shahpur	-	-	-	-	3.6	-	-	-	3.2	3.8	-	-	BS	○			
24	F7038	Daulapur-Shahpur Road	Daulatpur	Shahpur	-	-	-	-	3.6	-	-	-	1.5	1.8	-	-	BS	X			
25	F7043	Fultara-Shahpur Road	Fultala	Shahpur	-	-	-	-	5.2	-	-	-	0.7	0.7	-	-	BS	△			
26	F7043	Fultara-Shahpur Road	Fultala	Shahpur	-	-	-	-	3.7	-	-	-	1.5	1.5	-	-	BS	X			
27		KDA Mona Sarak	Khulna City	Khulna City	-	-	-	-	12	-	-	-	2.8	1.65	-	-	BS	X			
28		KDA Mona Sarak	Khulna City	Khulna City	-	-	-	-	6.3	3.1	2.6	-	2.95	4.7	-	-	BS	X			
29		Jalil Sarani	Khulna City	Khulna City	-	-	-	-	6.5	3	3	-	2.5	2.5	-	-	BS	○	Brick Shoulder		
30		Jalil Sarani	Khulna City	Khulna City	-	-	-	-	6.5	-	-	-	2.95	4.7	-	-	BS	○			
31		Mazid Sarani	Khulna City	Khulna City	2.45	6.4	6.4	-	6.4	-	-	-	3.25	4.7	-	-	BS	○			
32		B.I.D.C. Road	Khulna City	Khulna City	-	-	-	-	12	-	-	-	-	3.55	2.7	-	BS	○			
33		B.I.D.C. Road	Khulna City	Khulna City	-	-	-	-	5.8	-	-	-	4.6	2.65	-	-	BS	○			
34		Road No-11	Khulna City	Khulna City	-	-	-	-	6	-	-	-	4	1.8	-	-	BS	○			
35		Old Jessore Road	Khulna City	Khulna City	-	-	-	-	9.1	-	-	-	-	-	2.5	2.2	BS	○			
36		KDA Avenue	Khulna City	Khulna City	2	12.7	12.65	-	12.65	-	-	-	-	1.6	1.6	-	BS	○			
37		KDA Avenue	Khulna City	Khulna City	1.9	11	11	-	11	-	-	-	-	2.5	2.6	-	BS	○			
38		KDA Avenue	Khulna City	Khulna City	1.95	11.25	11.1	-	11.1	-	-	-	-	2.5	1.45	-	BS	○			
39		Upper Jessore Road	Khulna City	Khulna City	0.9	12.75	8.1	-	8.1	-	-	-	-	2.05	4.5	-	BS	○			
40		Lower Khana-Sabur Road	Khulna City	Khulna City	-	11.15	-	-	-	-	-	-	-	1.4	1.65	-	BS	○			
41		Lower Khana-Sabur Road	Khulna City	Khulna City	-	8	-	-	-	-	-	-	1.2	1.4	-	-	BS	○			
42		Hazi Mohsin Road	Khulna City	Khulna City	-	7.7	-	-	7.7	-	-	-	-	1.8	1.95	-	BS	○			



## 4.3 Road Traffic

### 4.3.1 Existing Road Traffic Data

#### (1) Traffic Census by Roads and Highways Department (RHD)

RHD conducted a traffic count survey in 1995 as the nation wide traffic census to reveal traffic situation on all roads under RHD. RHD has been conducting survey every year for updating the data.

There are five corridors that connect Khulna with other district centers in the Study area as follows;

- a) Khulna - Jessore : National Highway No.7  
This connects Khulna and northern area of Khulna division, northwest region of Bangladesh. In Addition, it is the main route for Dhaka and for West Bengal in India.
- b) Khulna – Satkhira : Regional Highway No.760  
This connects Khulna and west area of Khulna division.
- c) Khulna – Mongla Port: National Highway No.7  
This connects Khulna and south area of Bagerhat zila including Mongla Port.
- d) Khulna – Mollahat: Regional Highway No.780  
This connects Khulna and north area of Bagerhat zila/southwest area of Dhaka division. It is second route for Dhaka.
- e) Khulna - Bagerhat  
This connects Khulna and Bagerhat/Barisal Division.

Table 4.3.1 shows traffic volume by type of vehicles on arterial roads of which link No. is shown in Fig. 4.3.1.

Table 4.3.1 The Annual Average Daily Traffic Volume (AADT)-1

Section	Year	Road No.	Link No.	Carts	Rickshaw	Bicycle	Motorcycle	Auto Rickshaw	Car	Utility	Micro Bus	Mini Bus	Large Bus	Small Truck	Medium Truck	Heavy Truck	Motorised Vehicles				Non-motorized Vehicles	Total vehicle
																	1	2	3	4		
1	1995/96	N7		18	2306	1925	523	837	335	49	142	125	753	15	1276	0	2693	1360	4053	3849	7902	
1	1996/97	N7	355	4	3319	2797	998	399	549	480	548	620	1439	297	2067	0	6000	1396	7396	6120	13516	
1	1997/98	N7	355	1	2333	2124	800	462	971	414	776	383	1784	14	2504	0	6846	1292	8138	4458	12596	
2	1995/96	N7		31	1659	1614	524	949	390	1	348	584	467	90	399	0	2279	1473	3752	3304	7056	
2	1996/97	N7	356	11	709	911	404	474	90	128	187	276	542	23	308	0	1554	878	2432	1631	4063	
2	1997/98	N7	356	22	562	706	390	609	212	139	307	580	258	74	431	56	2057	959	3056	1290	4346	
3	1995/96	N7		11	789	788	278	477	147	30	131	470	150	18	160	0	1106	755	1861	1588	3449	
3	1996/97	N7	357	1	909	1026	249	366	74	70	118	217	265	4	252	0	1000	615	1615	1936	3551	
3	1997/98	N7	357	6	527	682	200	452	75	76	115	216	196	4	205	0	827	652	1479	1215	2694	
4	1995/96	R770		0	758	380	162	146	47	46	62	175	208	11	74	0	623	308	931	1138	2069	
4	1996/97	R770	237	1	607	536	233	161	43	71	84	66	473	21	88	1	947	394	1241	1144	2385	
4	1997/98	R770	237	1	229	262	209	156	83	89	128	19	370	8	207	0	904	365	1269	492	1761	
5	1995/96	R780																				
5	1996/97	R780	248	16	2477	2416	411	296	23	23	36	69	167	11	73	0	402	707	1109	4909	6018	
5	1997/98	R780	248	34	1037	971	379	285	74	32	96	99	129	21	174	0	625	664	1289	2042	3331	
6	1995/96	R760		52	3225	2228	737	257	473	43	214	174	144	24	209	0	1281	994	2275	5505	7780	
6	1996/97	R760	236	0	1749	2078	475	78	61	46	168	186	201	1	268	197	1128	553	1681	3827	5506	
6	1997/98	R760	236	2	1987	2273	860	35	73	74	112	320	25	42	597	0	1243	895	2138	4242	6380	
7	1995/96	N76		13	1695	2269	961	96	576	167	255	149	498	103	1189	1	2917	1057	3974	3917	7891	
7	1996/97	N76	61	4	3648	4651	1152	93	604	195	273	35	736	47	1464	1	3355	1245	4500	8303	12903	
7	1997/98	N76	61	17	1347	1354	802	156	633	319	340	130	697	157	847	23	3146	958	4104	2718	6822	
8	1995/96	N7		3	3411	4018	1168	434	463	356	374	124	1000	147	1520	2	3986	1602	5588	7432	13020	
8	1996/97	N7	354	10	4715	5930	1363	710	517	459	385	182	1220	118	1834	4	4719	2063	6782	10055	16937	
8	1997/98	N7	354	271	3567	3427	751	638	402	176	424	26	1066	118	1405	139	3756	1389	5145	7265	12410	
9	1995/96	N72		2	1346	1887	579	392	229	70	207	47	527	100	731	0	1911	971	2882	3235	6117	
9	1996/97	N72	57	945	2798	1570	632	420	260	253	152	219	304	41	856	3	2088	1052	3140	5313	8453	
9	1997/98	N72	57	0	6495	7085	825	576	470	395	385	0	571	251	1005	0	3077	1401	4478	13590	18068	
10	1995/96	R750		1	906	654	257	23	47	55	48	20	225	19	84	0	498	280	778	1561	2339	
10	1996/97																					
10	1997/98	R750	234	3	1555	2133	743	27	146	63	141	27	229	26	94	0	726	770	1496	3631	5187	
11	1995/96	R755		23	2154	1973	680	389	67	48	67	23	214	50	211	0	700	1068	1766	4150	5918	
11	1996/97	R755	235	7	2290	1938	676	485	56	63	96	8	189	16	199	0	632	1161	1793	4235	6028	
11	1997/98	R755	235	11	2770	2662	847	584	172	180	195	7	242	39	447	0	1282	1431	2713	5443	8156	

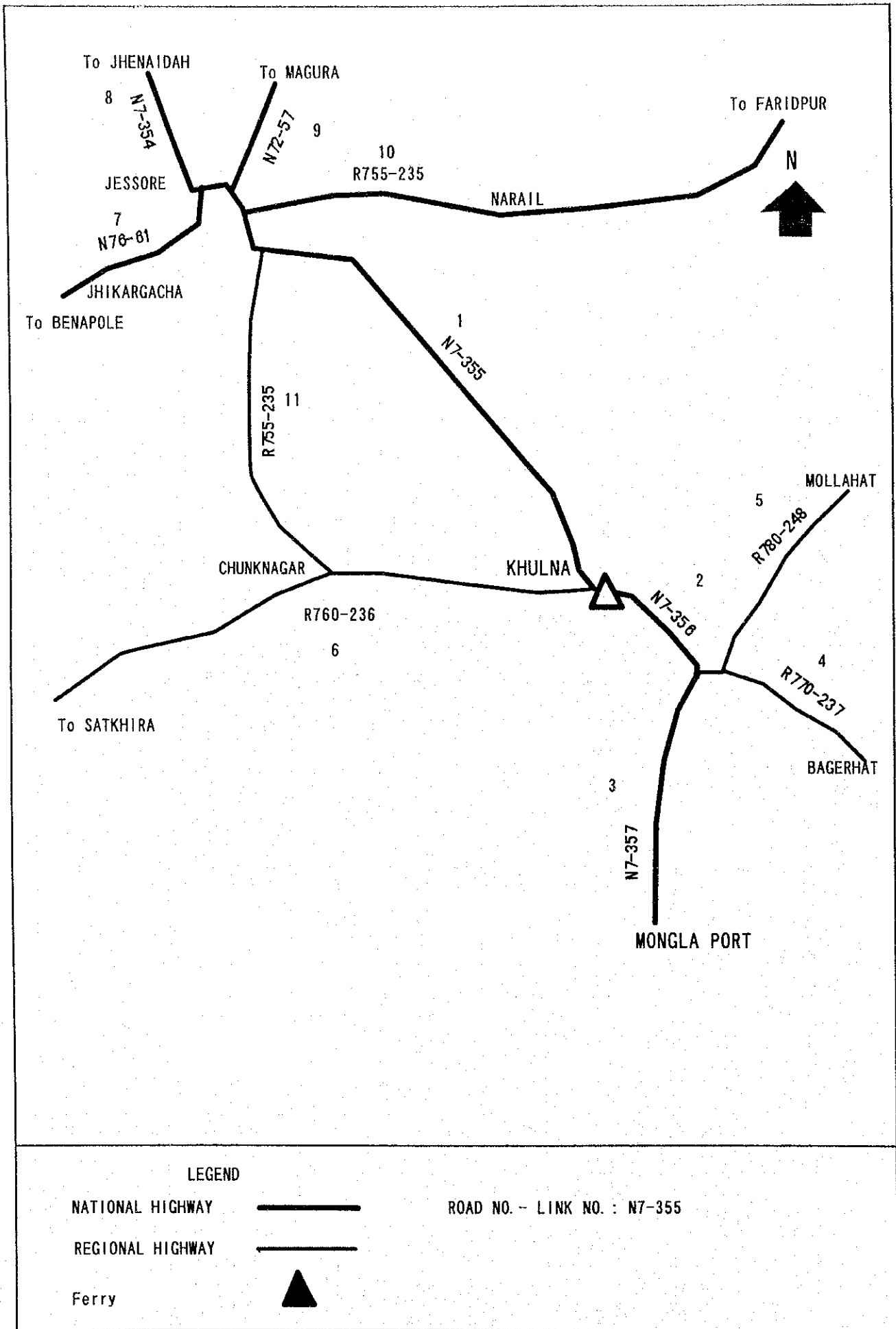


Fig. 4.3.1 The Highway Network and Link Number

Salient features of traffic in the Study area are as follows;

- 1) Motorized Vehicle Traffic (Please refer to Fig. B-4.3.1 in Appendix B)  
Highest motorized vehicles of 8,100 vehicles/day is observed in Khulna–Jessore road in 1997/98. Other roads have traffic volume of more or less 3,500 vehicle/day. Traffic volume on Noapara-Mongla as a part of Khulna–Mongla Road is around 1,500 vehicle/day.
- 2) Non-motorized/Motorized Ratio  
Motorized vehicles in the Study area remain unchanged in general during 1995/96 to 1997/98, while non-motorized vehicles decreased. However, motorized vehicular traffic on Khulna–Jessore road is still increasing even such circumstances.
- 3) Heavy Vehicle Ratio  
High percentage of heavy vehicle ratio of more than 25% is observed in road sections of Khulna–Jessore and Khulna–Satkira.

Main traffic flows related to Khulna through Jessore are assumed as follows:

- i) Northwest area of Bangladesh – N7 – Jessore – Khulna
- ii) Central and West area of Bangladesh – N72 - Jessore – Khulna
- iii) Benapole (at Indian border) – N76 – Jessore - Khulna

Main traffic flows related to Khulna through Rupsa are assumed as follows:

- i) Central and West area of Bangladesh – R780 - Rupsa – Khulna
- ii) Barisal – R770 – Rupsa – Khulna

Khulna-Mongla Road has coarse network and scarce catchment area of traffic generation other than Mongla Port.

## (2) Traffic Survey Data in Khulna Master Plan Study by KDA

Neither traffic count data nor OD table obtained by roadside interview survey of Khulna Master Plan Study is available at present because the study is underway and such data is in process.

Time schedule of Khulna Master Plan Study is as follows;

- i) Interim Report : End of September, 1998
  - ii) Draft Final Report : End of January, 1999
- Final Report : End of May, 1999

### (3) Bus Route

There are 35 registered bus routes in Khulna Circle as shown in Fig. 4.3.2, and Table B-4.3.1. in Appendix B.

Number of bus routes operating in the Study area including Rupsa Ferry are as follows:

a) Khulna - Jessore :	18 Routes
b) Khulna – Satkhira :	4 Routes
c) Rupsa– Mongla :	2 Routes
d) Rupsa– Mollahat:	6 Routes
e) Rupsa – Bagerhat:	5 Routes
f) Rupsa Ferry (Khulna - Rupsa)	7 Routes

It seems to be due to congested Rupsa Ferry that bus routes passing the ferry are significantly small, taking into consideration 13 bus routes plying toward eastern part of the Study area from Rupsa.

### (4) Traffic Regulation

No traffic control and regulation such as legal speed limits, no right-turning, truck lane control, one way traffic control and so forth are strictly enforced on in the Study area.

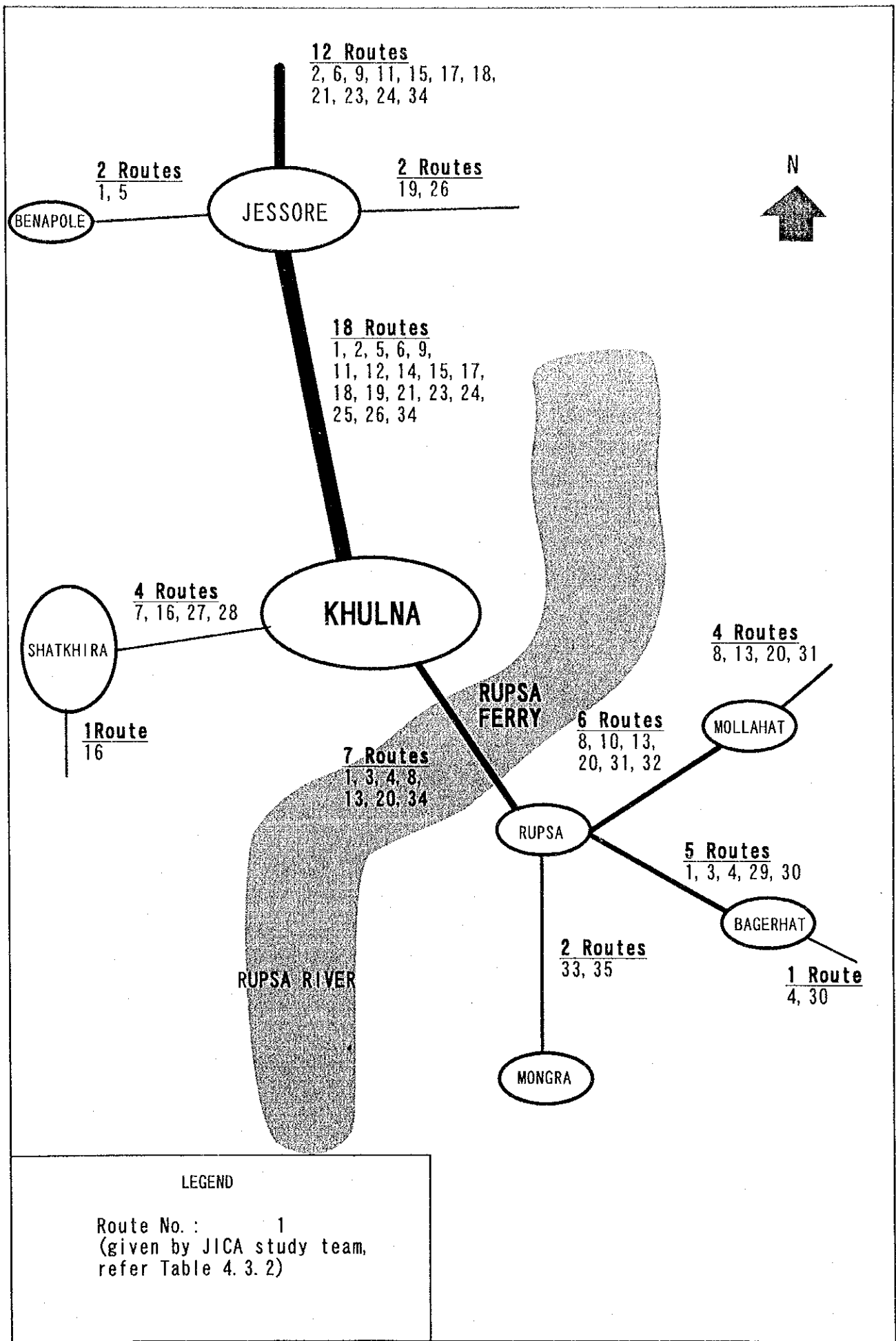


Fig. 4.3.2 Bus Routes in the Study Area

### 4.3.2 Rupsa Ferry

#### (1) Present Situation of Rupsa Ferry

Khulna urban area is severed by the Rupsa river into two, Khulna in the west and Rupsa in the east. Khulna urbanized area is spread widely in the west side of the river, and residential area in Rupsa is scattered along roads and rivers in the east side, especially in the vicinity of Rupsa ghat. Rupsa ferry ghat exists on National Highway No. 7 to form a part of Khulna - Noapara Road, and it is located in the southern part of Khulna crossing the 350 m wide Rupsa river. There are two ferry services under the RHD, namely Rupsa Ferry and Jail-Khana Ferry. Except these two ferry services, many private ferry services are in operation, using small country boats with or without engine to ply the river for passengers and non-motorized vehicles. These private ferry services are estimated at twenty (20) locations, comprising 50 small boats with engine and 300 country boats.

#### (2) Ferry Terminal Facilities and Operation

Two ferry terminal facilities consist of ferries as shown in Table 4.3.2.

Table 4.3.2 Ferry and its Capacity

Name of Ferry Ghat	Road#	Ferry Type	Propulsion	Engine	HP	Capacity HV	Pontoon
Rupsa	N7	UT-I-014/85	Schettle NAV-100/150	Dorman	140KW6LTE	9	PI-027/85
Rupsa	N7	UT-I-015/85	Schettle NAV-100/150	Dorman	140KW	9	PI-048/85
Rupsa	N7	UT01/79	Hydromaster	Ford	120	9	PI-1049/85
Rupsa	N7	UT06/79	HRP-170	DAF	200	9	PI-028/89
Rupsa	N7	UT02/79	HRP-170	DAF	210	9	Bagerhaten
Jail-Khana	F7641	UT-II(imp)-05/88	HRP-170	HRP-110	110	4+2	PI-062/90
Jail-Khana	F7641	UN-017/72	-	-	-	-	-

Two ghats in both sides exist at Rupsa Ferry to operate two ferries simultaneously. However, five (5) ferries are always in operational conditions.

At Jail-Khana Ferry, there are one ghat in both sides and usually one ferry is operated.

These ferry services under the RHD are operating for 24 hours.

### (3) Toll Rates

Toll rates are shown in Table 4.3.3. The toll rates are the same at both Rupsa and Jail-Khana and passengers are free of charge.

Table 4.3.3 Toll Rates as of August 1998

(in Taka)

Type of vehicle/Others	Rupsa	Jail-khana
Truck	88.00	88.00
Truck-lorry	88.00	88.00
Coaster / Minibus	38.00	38.00
Micro-bus / Pick-up	32.00	32.00
Auto-Rickshaw	13.00	13.00
Motor Cycle	3.00	3.00
Bi-cycle	2.00	2.00
Rickshaw / Van	3.00	3.00
Cow / Baffalo	2.00	2.00
Goat / Sheep	0.50	0.50
Push-cart	4.00	4.00

### (4) Traffic

Daily traffic at Rupsa Ferry is tabulated in Table 4.3.4. Annual traffic at Rupsa Ferry and Jail-Khana Ferry for last five year periods are tabulated in Table 4.3.5, and locations are shown in Fig. 4.2.2.

Cursory look about traffic at Rupsa ferry is as follows;

- a) Annual Motorized Traffic : 293,000
  - Trucks : 70,000
  - Buses : 40,000
  - Passenger Cars : 167,000
  - Daily Passengers : 50,000 - 60,000
- b) Motorcycles : 16,000



Table 4.3.4 Daily Traffic at Rupsa Ferry

Items	Nos.
Bus	38
Truck	278
Minibus/ Coaster	226
Pickup	66
Car/Jeep	157
Motor Cycle	55
Auto Rickshaw	33
Rickshaw/Van	110
Bi-Cycle	225
Total	1,188

It can be pointed out that considerable passenger volume occupy the capacity and motorized vehicles may reach to traffic capacity on the assumption that present operating system should be kept. It is sure that such passenger traffic should be taken into account to deliberate scheme of the Bridge.

#### (5) Problems related to Ferry Operation

##### 1) Tidal Fluctuation

Approximately 3 m high tidal fluctuation takes place at Rupsa Ferry. Ferry ghat is always inundated during spring tide, and it makes the traffic congestion worse. Furthermore, slope of approach bridge and its related facilities face physical difficulties to cope with such high fluctuation, especially steep slope on approach bridge. It sometimes causes to let over-loaded trucks or old vintage buses/cars be stuck on the way.

##### 2) Embarking and Disembarking

Mixed traffic of passengers and motorized vehicles share the same access bridge and road. It is due to one access that entrance traffic should wait to embark until exit traffic should disembarks completely. However, it is often observed at peak hours that both directions of traffic conflict on approach road or even on bridge, and neither traffic control nor enforcement is done.

Table 4.3.5 Annual Traffic at Rupsa and Jail-Khana Ferry in the Last 5 Years

year	Vehicles	1993-94	1994-95	1995-96	1996-97	1997-98
RUPSA	Truck	34,500	87,503	63,745	72,160	70,172
	Bus	6,395	122,210	12,700	11,363	19,500
	Mini Bus	5,400	6,613	10,893	15,250	21,350
	Car	25,490	31,211	24,597	28,730	46,332
	Jeep	27,700	22,378	13,291	14,110	20,638
	Pick up	7,850	11,537	13,806	13,315	24,215
	Micro Bus	5,455	38,225	40,672	43,450	61,650
	Auto Rickshaw	2,270	6,722	8,475	8,780	12,896
	Motor bike	-	32,266	13,930	14,300	15,760

year	Vehicles	1993-94	1994-95	1995-96	1996-97	1997-98
JAIL KHANA	Truck	470	635	964	276	-
	Bus	-	37	52	6	48
	Mini Bus	171	116	134	23	1,752
	Car	305	484	744	142	50
	Jeep	432	650	972	151	275
	Pick up	95	364	500	115	712
	Micro Bus	360	435	880	-	592
	Auto Rickshaw	92	495	671	56	585
	Motor bike	925	95	105	179	632

### 3) Approach Road and Terminal Plaza

There is a terminal plaza in the vicinity of ferry terminal. The terminal plaza has two access roads to connect to each ferry ghat respectively. Many shops and street vendors occupy space along access roads and terminal plaza. Moreover, number of rickshaws wait for passengers at terminal plaza.

Such mixed traffic situation makes traffic congestion worse during peak hours.

#### 4.3.3 Traffic Survey

As a part of the Study, the following three kinds of traffic surveys were conducted at the beginning of September 1998 in order to grasp travel characteristics of vehicles, vessels and cargo movements in the Study area.

- 1) Roadside Interview Survey
- 2) Traffic Count Survey
- 3) Vessel/Ship Traffic Count Survey

##### (1) Roadside Interview Survey

###### 1) Objectives

The objectives of the survey are to obtain the base year (1998) vehicular travel pattern data on major road crossing the Khulna city corporation boundary, on access roads toward the Rupsa ferry ghat, on some connecting Rupsa ferry ghat and major cities and on a road connecting Benapole and Jessore. The obtained information shall be helpful to identify Origin-Destination patterns in terms of vehicular movements in the Study area and international vehicular movement from/to India.

###### 2) Survey Location

Totalling eight (8), survey sites were designated by the JICA study team and are presented in Fig. 4.3.3.

### 3) Method of survey

#### a) Survey Period

The survey was conducted from 6:00AM to 6:00PM during three (3) days (Monday through Wednesday) .

At each site, a roadside interview survey for 12 hours were conducted together with a traffic count survey.

#### b) Interview

Sampled classified vehicles passing the survey points were leaded to interview point, and a interviewer interview a driver for obtaining the information of the survey items. The survey was carried out by both directions.

#### c) Survey Items

The major survey items consist of as follows:

- origin/destination
- passing time
- trip purpose
- type of vehicles
- number of passengers
- freight type (only for truck)
- load capacity (only for truck)
- load condition of freight carried (only for truck)

#### d) Type of vehicles

The type of vehicles for this survey are classified into the following ten (10) categories:

- Motorcycle
- Auto Rickshaw
- Car
- Pickup Truck
- Micro Bus
- Mini Bus
- Large Bus
- Small Truck
- Medium Truck
- Large Truck

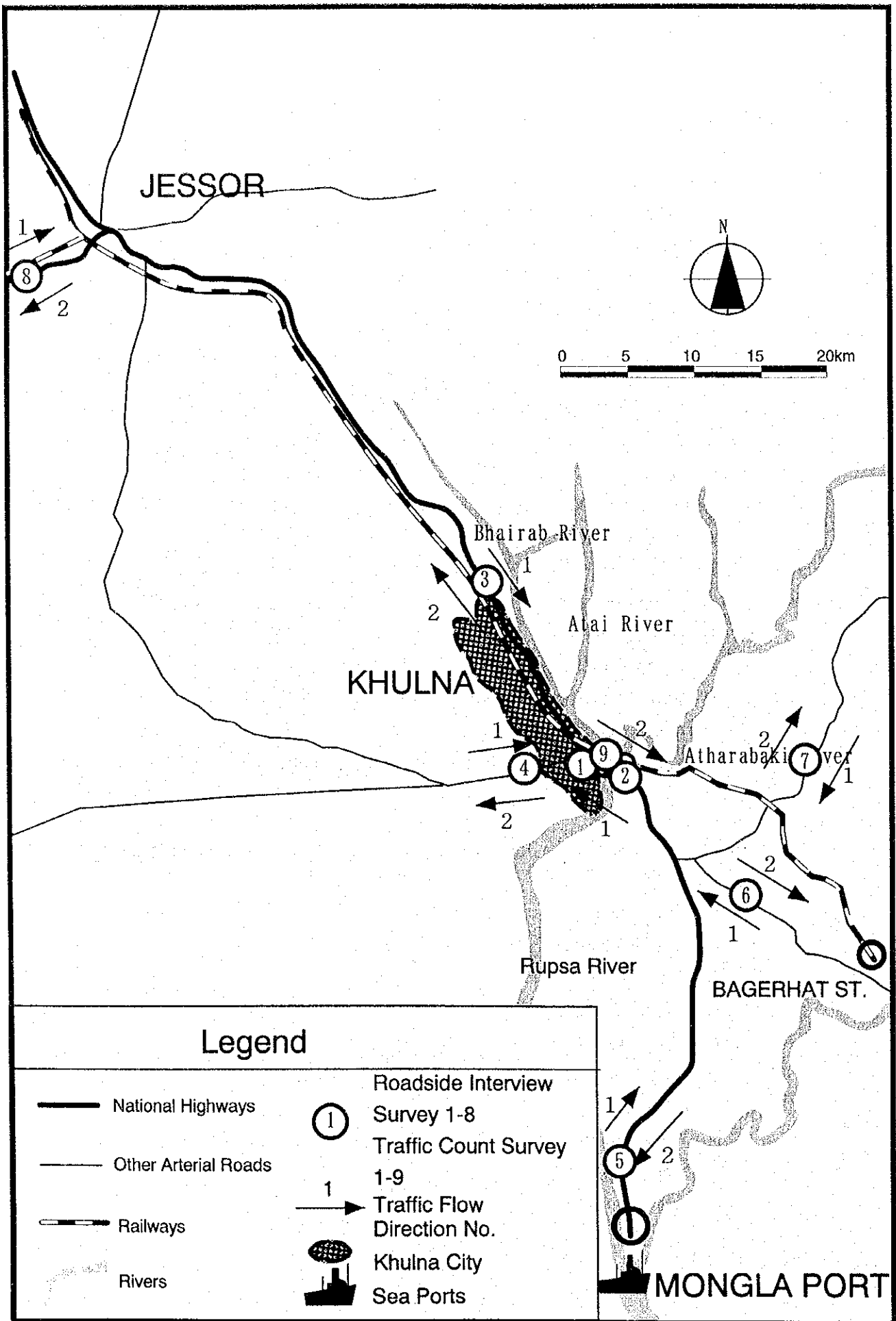


Fig. 4.3.3 Location of Survey Sites for the Roadside Interview TC Survey

## (2) Traffic Count Survey

### 1) Objectives

The objectives of the survey is to obtain the classified vehicle traffic volume on major road crossing the Khulna city corporation boundary, on access roads toward the Rupsa ferry ghat, on some connecting Rupsa ferry ghat and major cites and on a road connecting Bonapole and Jessore and Rupsa Ghat. The obtained traffic count data shall provide necessary information for identifying some of currently observed traffic problems in terms of traffic volume and for expanding the results of roadside interview survey.

### 2) Survey Location

Totalling nine (9), survey sites were designated by the JICA study team and are presented in Fig. 4.3.3.

### 3) Method of survey

#### a) Survey Period

24-hour count survey was conducted from 6:00AM to 6:00AM of the next day.

The survey was performed continuously during one week (Sunday through Saturday).

#### b) Count record

All classified vehicles passing the survey points were counted by vehicle type. 24-hour traffic count survey was recorded during every one hour. The survey was carried out by both directions.

#### c) Type of vehicles

The type of vehicles for this survey are classified into the following twelve (12) categories:

- \* Motorcycle
- \* Auto Rickshaw
- \* Car
- \* Pickup Truck
- \* Micro Bus
- \* Mini Bus
- \* Large Bus
- \* Small Truck
- \* Medium Truck
- \* Large Truck

- \* Rickshaw
- \* Others

### (3) Vessel/Ship Traffic Count Survey

#### 1) Objectives

The objective of the survey is to obtain the vessel/ship traffic volume at bridge crossing points proposed by ADB.

#### 2) Scope of works

Totally four (4) 12-hour survey sites have been designated by the JICA study team and are presented in Fig. 4.3.4.

#### 3) Method of Survey

##### a) Count record

All classified vessels/ships passing the survey points were counted by vehicle type. A 12-hour vessel/ship traffic count survey was recorded at every one hour. This survey was carried out by both directions.

##### b) Survey Period

The survey was conducted from 6:00AM to 6:00PM.

The survey was performed continuously during one week (Monday through Sunday).

##### c) Type of vessels

The type of vessels for this survey are classified into the following seven (7) categories:

- \* Tanker
- \* Passenger Ship
- \* Cargo Vessel (propelled by engine)
- \* Cargo Vessel (propelled by oars or sails )
- \* Barge (Towed)
- \* Fishing boat
- \* Others

#### 4) Daily Regularly Operated Vessel/Ship

Regularly operated vessel/ship routes ships registered in BIWTA are only for passenger in the

Study area, according to BIWTA.

Total 15 routes are in operation, and only one route of Khulna–Dhaka, is operated by BIWTA and remaining the 14 routes are operated by private companies. These passenger ship routes from/to Khulna are shown in Table B-4.3.2 in Appendix B and Fig. 4.3.5 respectively.

No route in Atherobaki river for passenger, two ships on one route in the Atai river ten ships on two routes in the Bhairab river and 34 ships on 12 routes in the Rupsa river are found among them, and most of them are on daytime operation.

#### 4.3.4 Results of Traffic Survey

The survey results except Road Side Interview Survey are summarized here, and the result of Road Side Interview Survey are given in Chapter 8 : Traffic Demand Forecast.

##### (1) Traffic Count Survey

Daily traffic volume at each survey point by each type of vehicles is given in Table B-4.3.3 in Appendix B, and its fluctuation is shown in Appendix B, Figs. B-4.3.2 through B-4.3.10.

##### (2) Vessel/Ship Traffic Count Survey

Daily traffic volume at each survey point by each type of vessels and its fluctuation is shown in Appendix B, Figs. B-4.3.11 through B-4.3.14.

Fig. 4.3.6 shows comparison of averaged daily vessel traffic at each survey point.



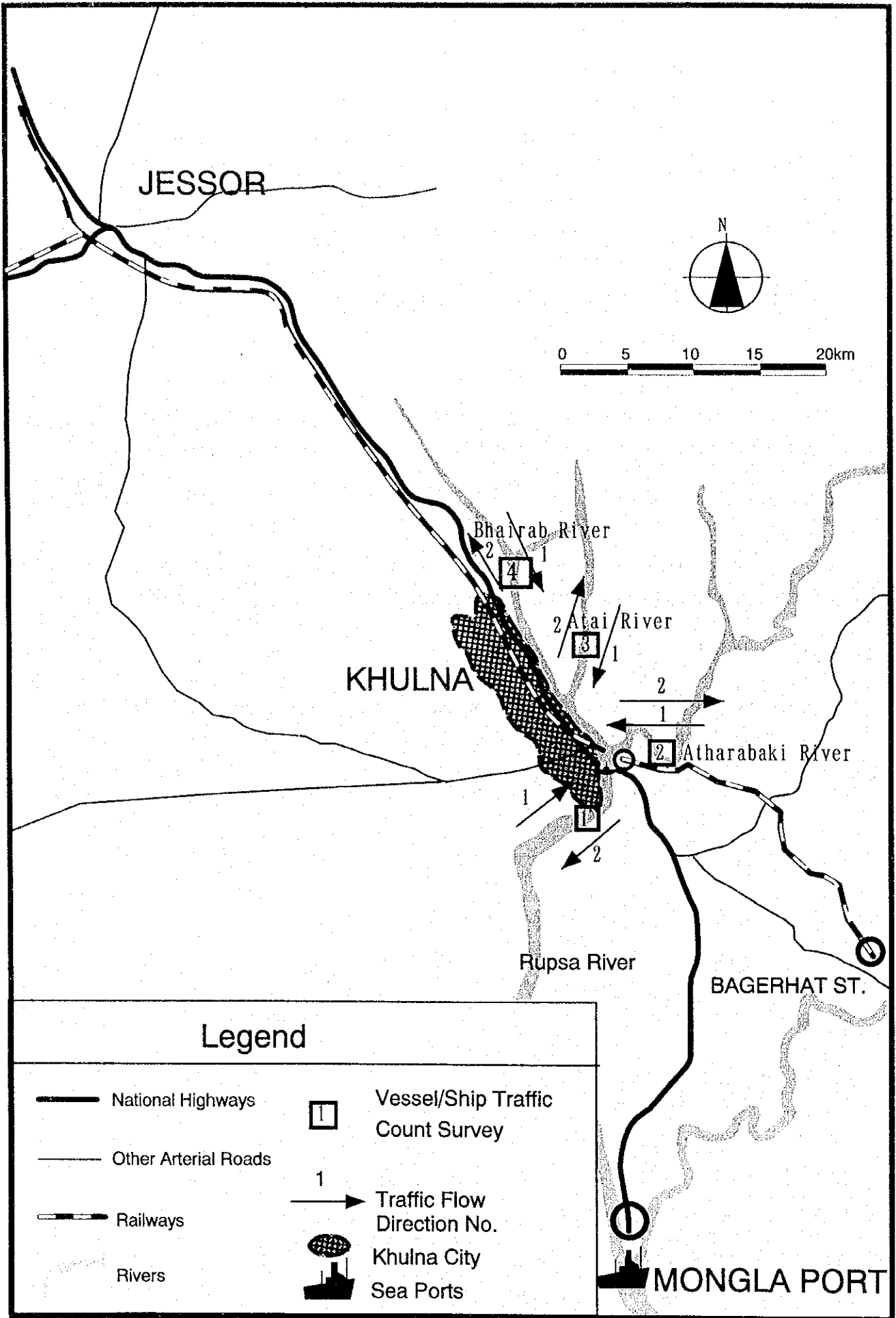


Fig. 4.3.4 Location of Survey Sites for the Vessel/Ship TC Survey

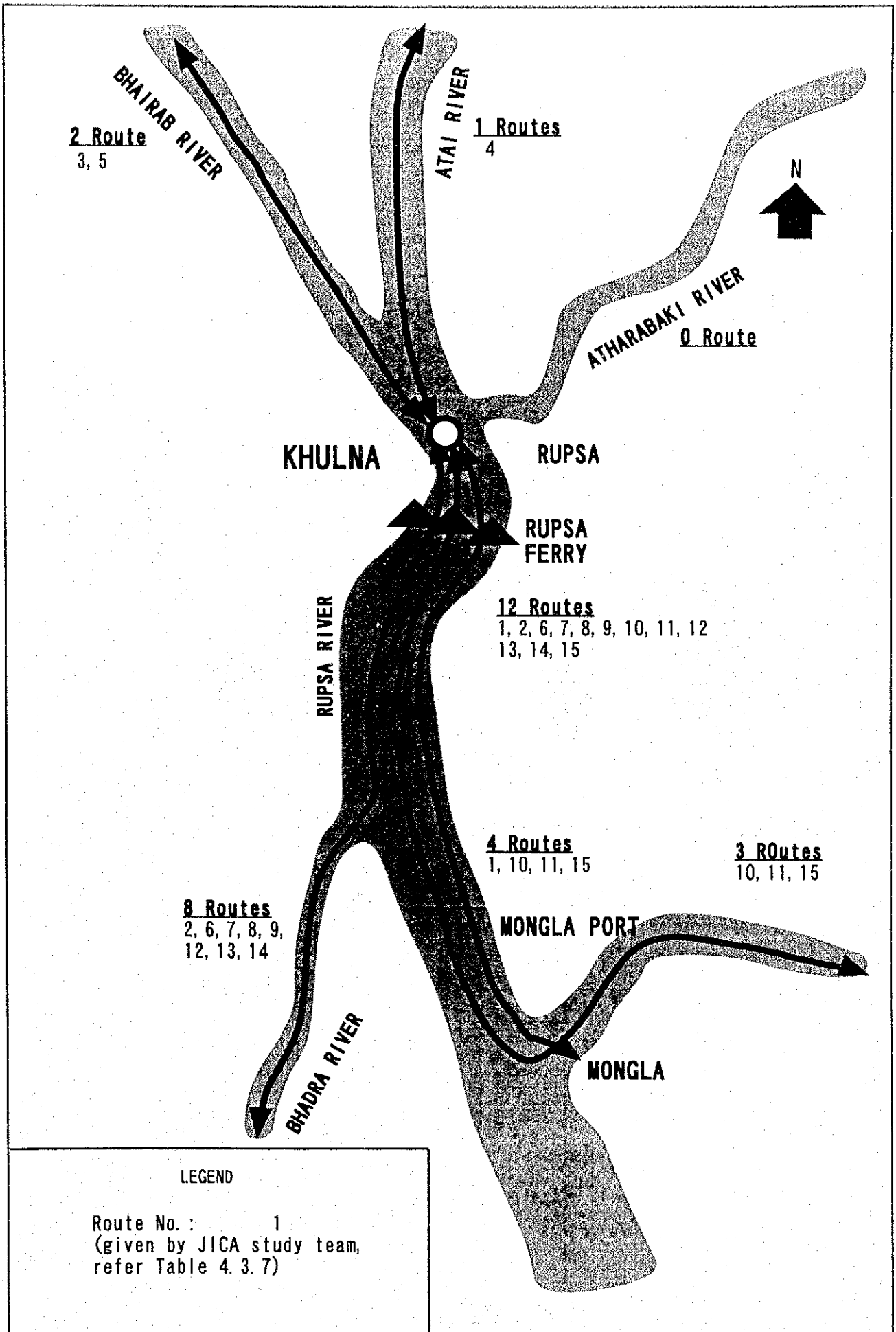


Fig. 4.3.5 Passenger Ship Route

Daily Vessel Traffic at each Survey Points (Average during Sep. 1 - Sep. 7, 1997)

Location	Fishing	Cargo Engine	Cargo Oar	Passenger Ship	Tanker	Barge	Others	Total
1 Rupsa	124	107	30	22	2	8	3	296
2 Atherobaki	95	3	143	0	0	0	84	325
3 Atai	880	5	40	1	0	0	4	930
4 Bhairab	25	85	18	9	0	3	17	158

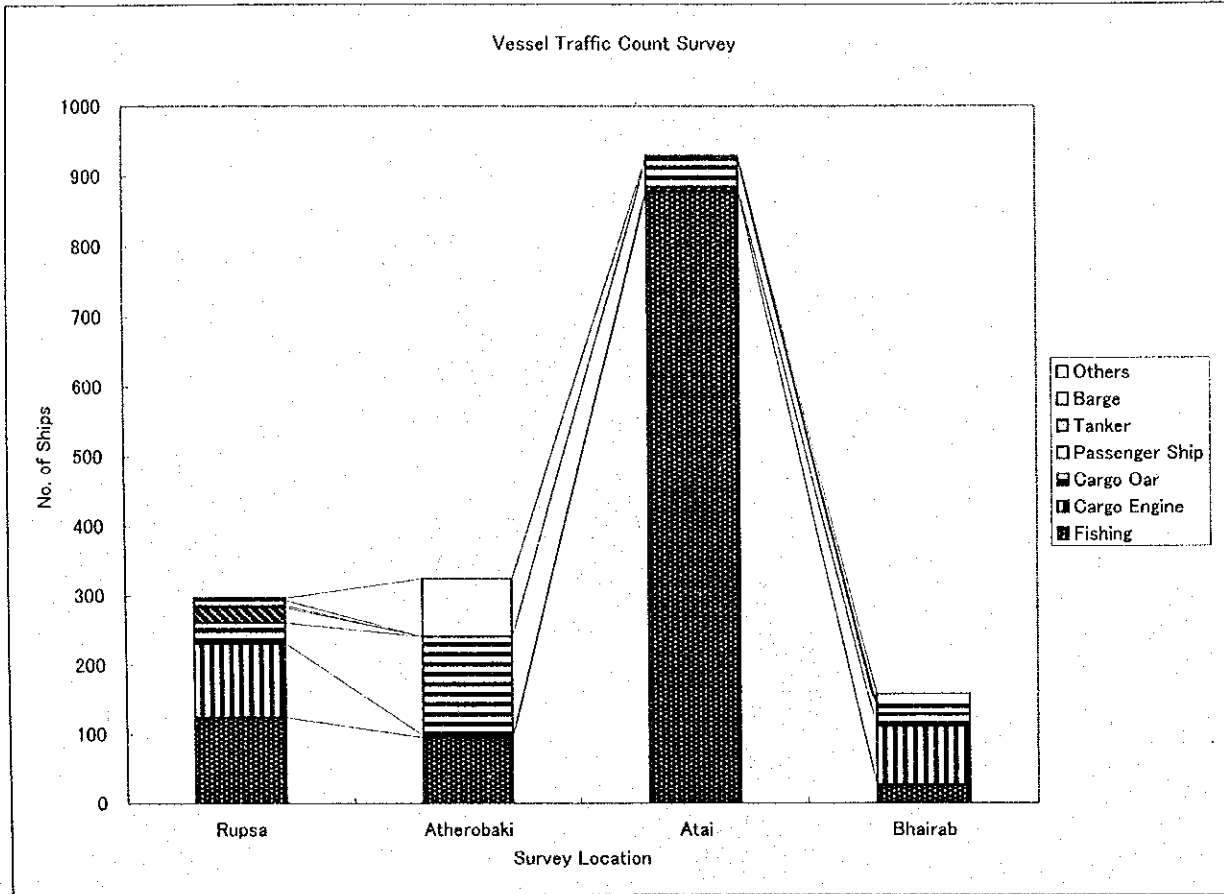


Fig. 4.3.6 Daily Vessel Traffic at Each Survey Points (Average during Sep. 1 - Sep. 7, 1997)

#### 4.3.5 Analysis on Traffic Count Survey

##### (1) Traffic Volume and Composition

No significant discrepancy is found in motorized vehicular traffic between traffic count data obtained from RHD and traffic survey conducted by the study team as shown in Fig. 4.3.7

Highest motorized traffic is observed in Khulna - Jessore section. Motorized traffic in this section has salient features such as high bus/truck percentage of 42% and 4.7 times as high as that of Khulna - Mongla road. Motorized traffic on other radial arterial roads remain low at the level of 1,000 - 3,000 veh./day. Traffic volume and composition of traffic by vehicle type is shown in Fig. 4.3.8.

High non-motorized vehicles are also observed at every survey points, especially in the vicinity of Khulna city.

##### (2) Traffic Movement at Rupsa Ferry

Traffic movement at Rupsa Ferry is studied in implication with traffic count surveys of No. 1 and No. 2 at both sides of the ferry. Fig. 4.3.9 shows difference of traffic movement in terms of volume and type of vehicle. Following features are found;

- 1) Very high non-motorized traffic exist at Khulna terminal, while high volume of buses are found at Rupsa terminal. Trip length of users may explain this change of modes, namely short trips are dominant in Khulna side and medium and long trips prevail in Rupsa side.
- 2) High portion of buses at Rupsa terminal decline to cross the Rupsa river or may be controlled because of congestion and wait passengers in Rupsa side.
- 3) Passenger cars, motorcycles and trucks are observed quantitatively the same at three survey points, and they are of through traffic.
- 4) Remarkable peak traffic in morning and evening are observed as shown in Fig. 4.3.10. It reveals commuters are to be main traffic.

Location			Motorized Vehicles						Non-Motorized Vehicles	Total
			M/Cycle	AutoRick	P/cars	Buses	Trucks	Sub-Total		
Khulna - Jessore	RHD	N7-355	830	462	1,385	2,943	2,518	8,138	4,458	12,596
	JICA	No. 3	485	1,805	616	949	1,179	5,034	3,345	8,380
Khulna - Noapara	RHD	N7-356	390	609	351	1,145	561	3,056	1,290	4,346
	JICA	No. 2	373	928	285	861	444	2,892	2,213	5,105
Noapara - Mongla	RHD	N7-357	200	452	151	467	209	1,479	1,215	2,694
	JICA	No. 5	123	29	170	443	295	1,061	409	1,470
Noapara - Bagerha	RHD	R770-237	209	156	172	517	215	1,269	492	1,761
	JICA	No. 6	143	217	140	435	236	1,172	379	1,551
Noapara - Mollahat	RHD	R780-248	379	285	106	324	195	1,289	2,042	3,331
	JICA	No. 7	235	222	87	207	179	930	776	1,706
Khulna - Satkhira	RHD	R760-236	860	35	147	457	639	2,138	4,242	6,380
	JICA	No. 4	735	471	340	574	446	2,567	6,603	9,170

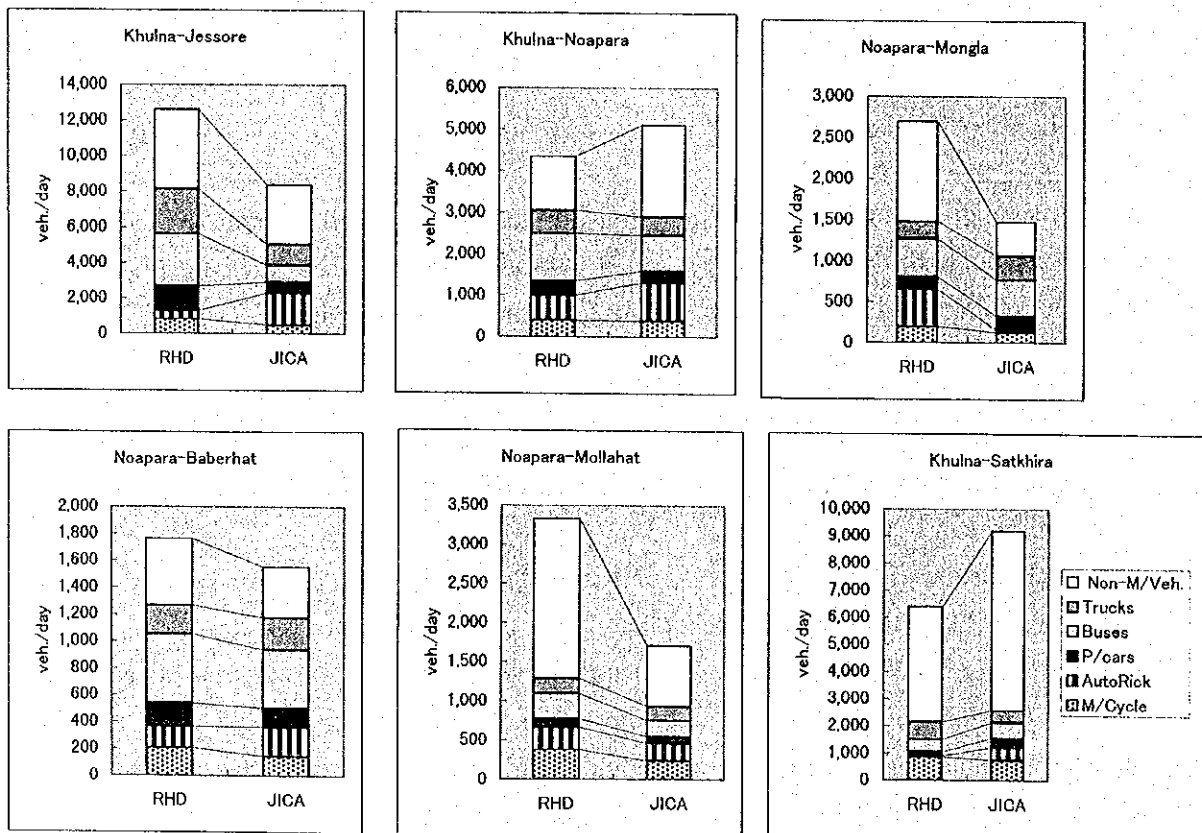


Fig. 4.3.7 Comparison of traffic Volume between RHD and JICA Surveys

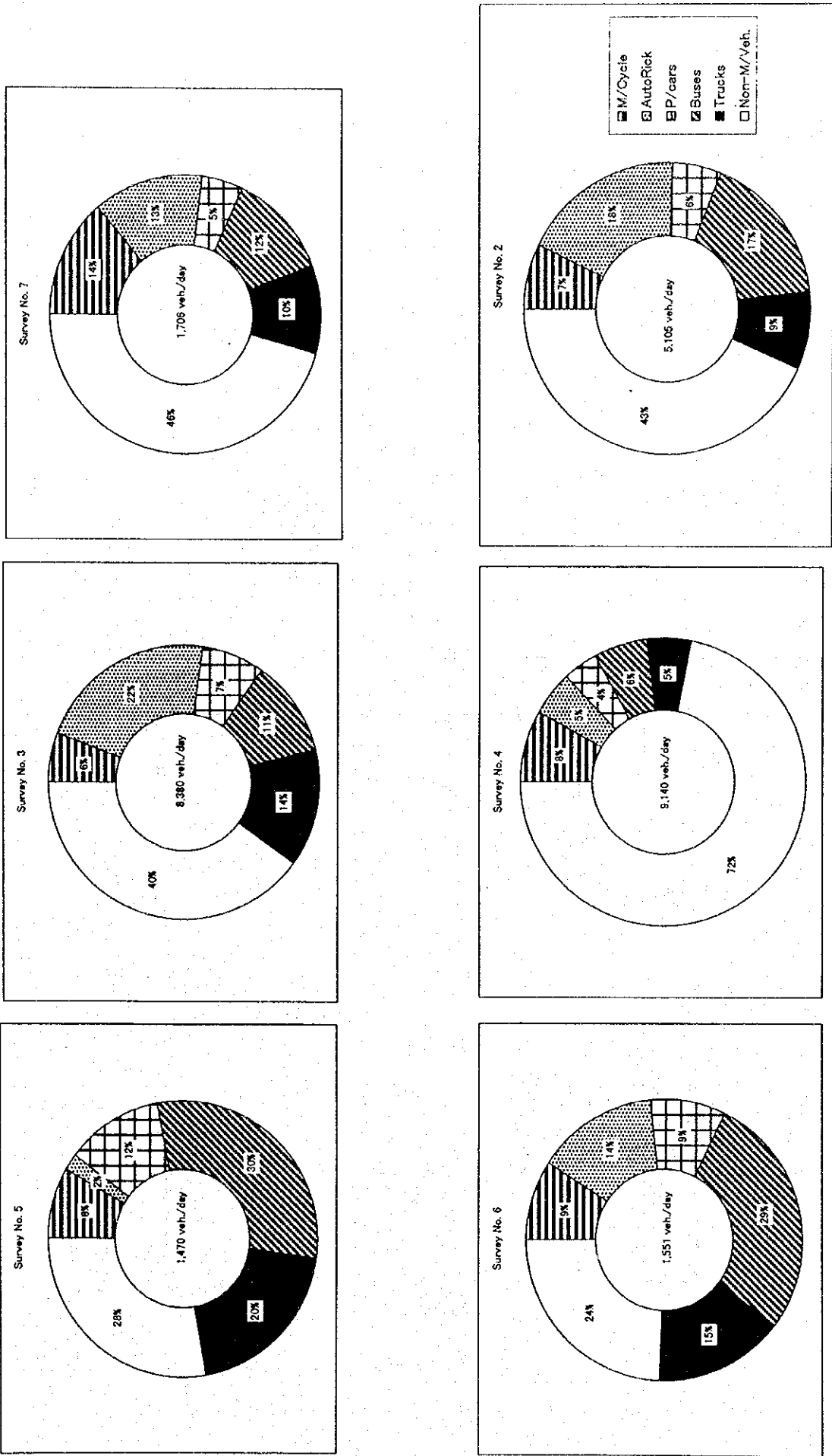
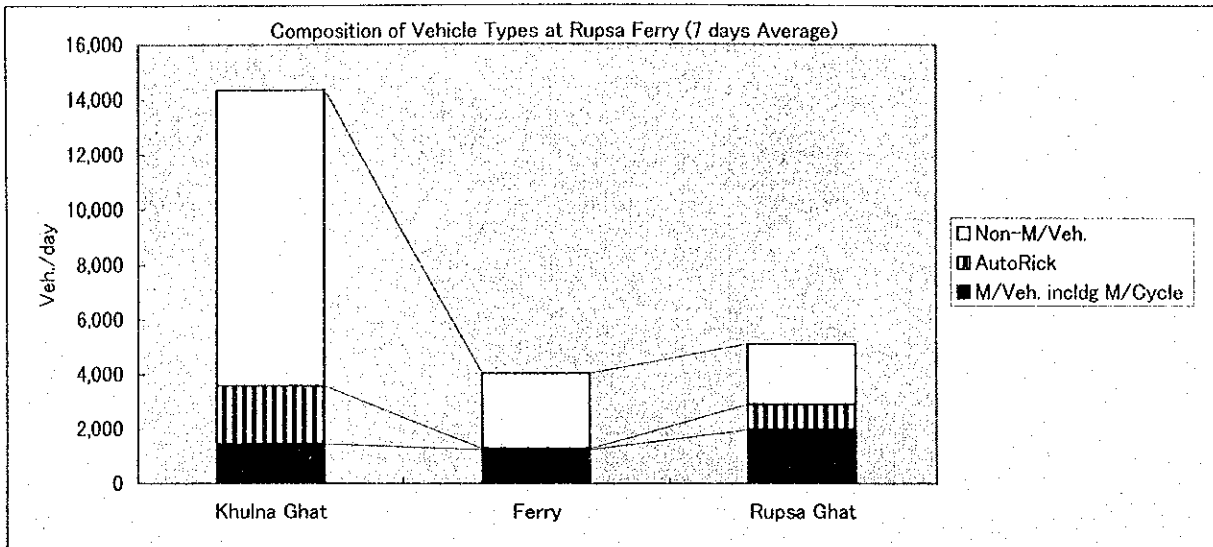


Fig. 4.3.8 Composition of Traffic by Each Type of Vehicles (7 Days Average)

Veh./day

No.	Location	Motorized Vehicles		Non-Motorized Vehicles	Total
		Motorized incldg M/Cycle	AutoRick		
No. 1	Khulna Ghat	1,453	2,120	10,772	14,344
No. 9	Ferry	1,245	29	2,760	4,034
No. 2	Rupsa Ghat	1,964	928	2,213	5,105



Location	M/Cycle	AutoRick	P/cars	Buses	Trucks	Total
No.1 Khulna Ghat	541	2120	344	200	368	3,572
No.9 Ferry	406	29	247	198	393	1,274
No.2 Rupsa Ghat	373	928	285	861	444	2,892

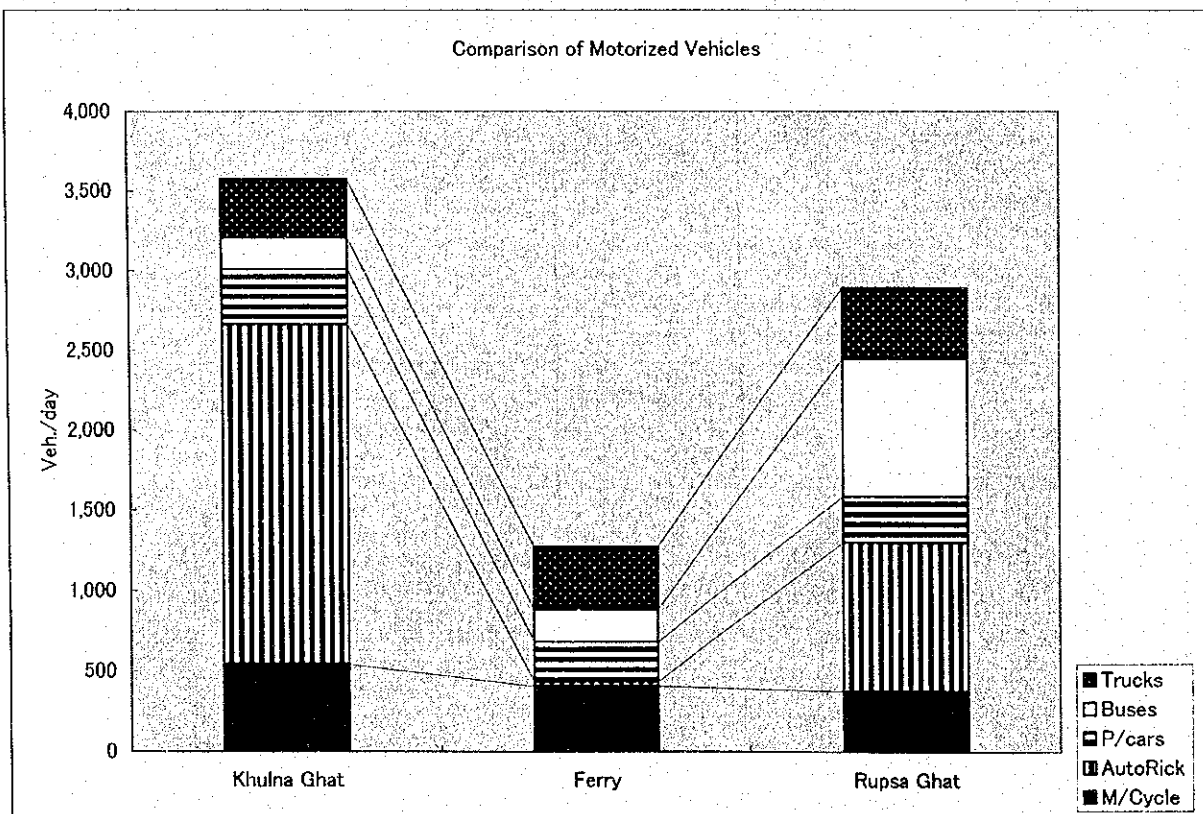
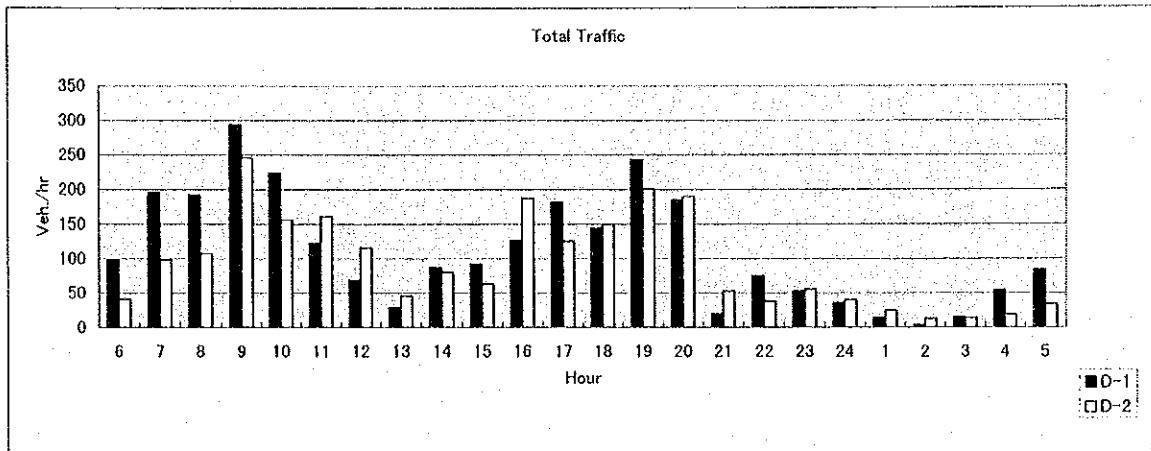
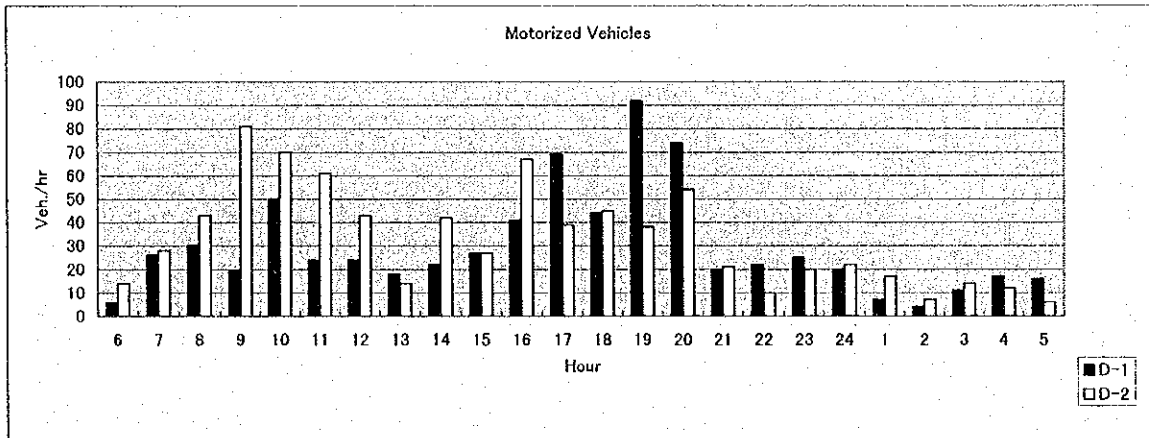


Fig. 4.3.9 Salient Features of Traffic Movement at Rupsa Ferry

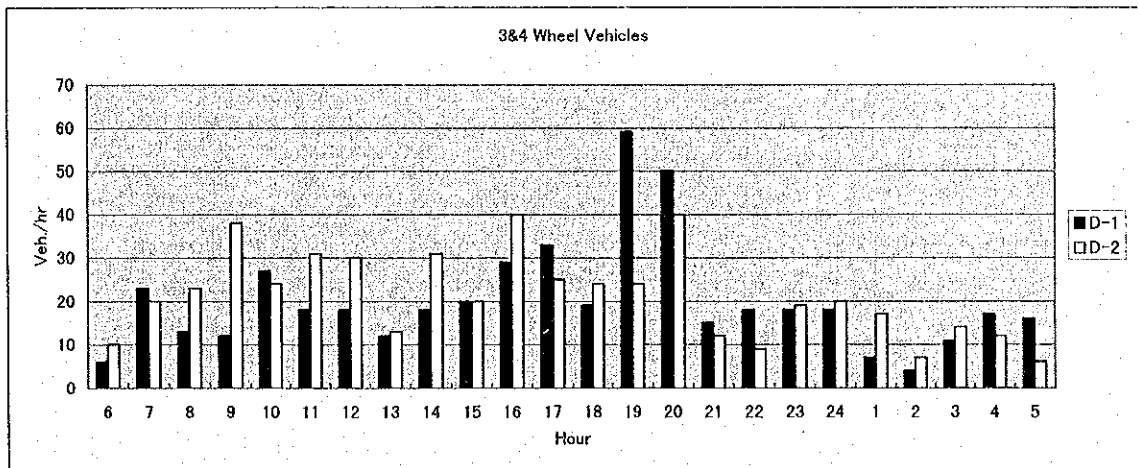
Hour		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5
Total Traffic	D-1	98	195	192	294	224	122	68	28	87	92	127	101	144	243	185	20	75	53	36	14	4	15	54	84
Total Traffic	D-2	41	98	107	246	156	161	116	46	80	63	187	125	150	201	190	53	38	55	40	25	13	14	19	34



Hour		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5
Motorized Vehicles	D-1	6	26	30	19	50	24	24	18	22	27	41	69	44	92	74	20	22	25	20	7	4	11	17	16
Motorized Vehicles	D-2	14	28	43	81	70	61	43	14	42	27	67	39	45	38	54	21	10	20	22	17	7	14	12	6



Hour		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5
3&4 Wheel Vehicles	D-1	6	23	13	12	27	18	18	12	18	20	29	33	19	59	50	15	18	18	18	7	4	11	17	16
3&4 Wheel Vehicles	D-2	10	20	23	38	24	31	30	13	31	20	40	25	24	24	40	12	9	19	20	17	7	14	12	6



Legend:  
 D-1 : to Khuina  
 D-2 : from Khuina

Fig. 4.3.10 Fluctuation of Hourly Traffic Volume at Rupsa Ferry on September 7, 1998



