

## APPENDIX 5: PUBLIC TRANSPORT SYSTEM

### 5.1 Current Level of Public Transport Service Provision

#### 5.1.1 Buses

##### (1) Characteristics of Omni Buses

Most omni buses are considered to be ten meters or more in length.



Figure 5.1-1 Typical Omni Bus Plying the Road within Dhaka City

##### (2) Characteristics of Mini Buses

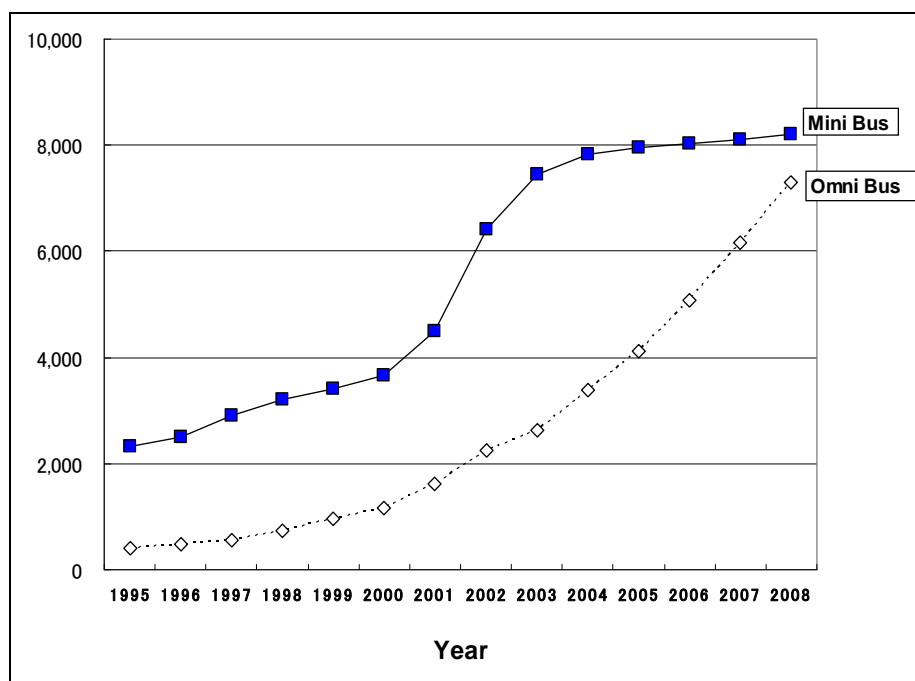
Most mini buses are around eight meters in length with locally manufactured bodies on Isuzu, Hino and Tata chassis and engines.



Figure 5.1-2 Mini Bus in city of Dhaka

## (3) Number of registered omni-bus and mini-bus vehicles

The following figure and table show the recent trend of number of registered omni and mini buses. The number of omni buses has increased significantly between 2000 and 2003. The number of registered mini buses is showing stable increasing trend.



**Figure 5.1-3 Recent Trend of Number of Registered Buses**

Source: BRTA, 2009

**Table 5.1-1 Recent Trend of Numbers of Registered Buses**

vehicle class	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Large bus	414	487	545	729	953	1,155	1,608	2,240	2,614	3,393	4,121	5,070	6,152	7,296
Minibus	2,333	2,500	2,897	3,197	3,412	3,654	4,485	6,409	7,460	7,828	7,946	8,021	8,098	8,205
total	2,747	2,987	3,442	3,926	4,365	4,809	6,093	8,649	10,074	11,221	12,067	13,091	14,250	15,501

## (4) Characteristics of Micro Buses

Micro buses are often called as 'human haulers'. Human haulers are converted pickup trucks with two benches have 9 to 15 seats installed in parallel. Most of them have diesel engines, while some are petro-fueled and small numbers are converted to CNG.



Figure 5.1-4 Maxi



Figure 5.1-5 Auto Tempo



Figure 5.1-6 Laguna

## (5) Bus travel speed estimate

## a) Target Bus Routes

Travel speed measuring survey at morning/evening peak hour and daytime off peak hour was conducted. The target 20 bus routes are summarized in the following Table 5.1-2 and Figure 5.1-7.

Table 5.1-2 Bus Routes for the Survey

No.	Origin and Destination of the Bus Routes	Distance[km]
1	Azimpur-Uttara	20.6
2	Gulistan-Abdullahpur	21.0
3	Gulistan-Mirpur-12	14.0
4	Jatrabari-Mirpur-12	17.0
5	Motijheel-Mohammadpur	10.1
6	Motijheel-Gabtohi	13.0
7	Motijheel-Mirpur-14	20.2
8	Saidabad-Abdullahpur	21.0

No.	Origin and Destination of the Bus Routes	Distance[km]
9	Saidabad-Gabtohi	13.9
10	Sadarghat-Abdullahpur	22.5
11	Fulbaria-Mirpur (Zoo)	15.0
12	Postogola-Mirpur (Duaripara)	21.3
13	Motijheel-Balurghat	15.0
14	Mohammadpur-Khilgaon	15.5
15	Mohammadpur-Dhupkhola	20.6
16	Azimpur-Kuril	20.6
17	Azimpur-Abdullahpur	20.6
18	Kamalapur-Zoo	15.0
19	Dhanmondi (Rassel Square)-Banani	13.0
20	Gabtohi-Khilgaon	21.2



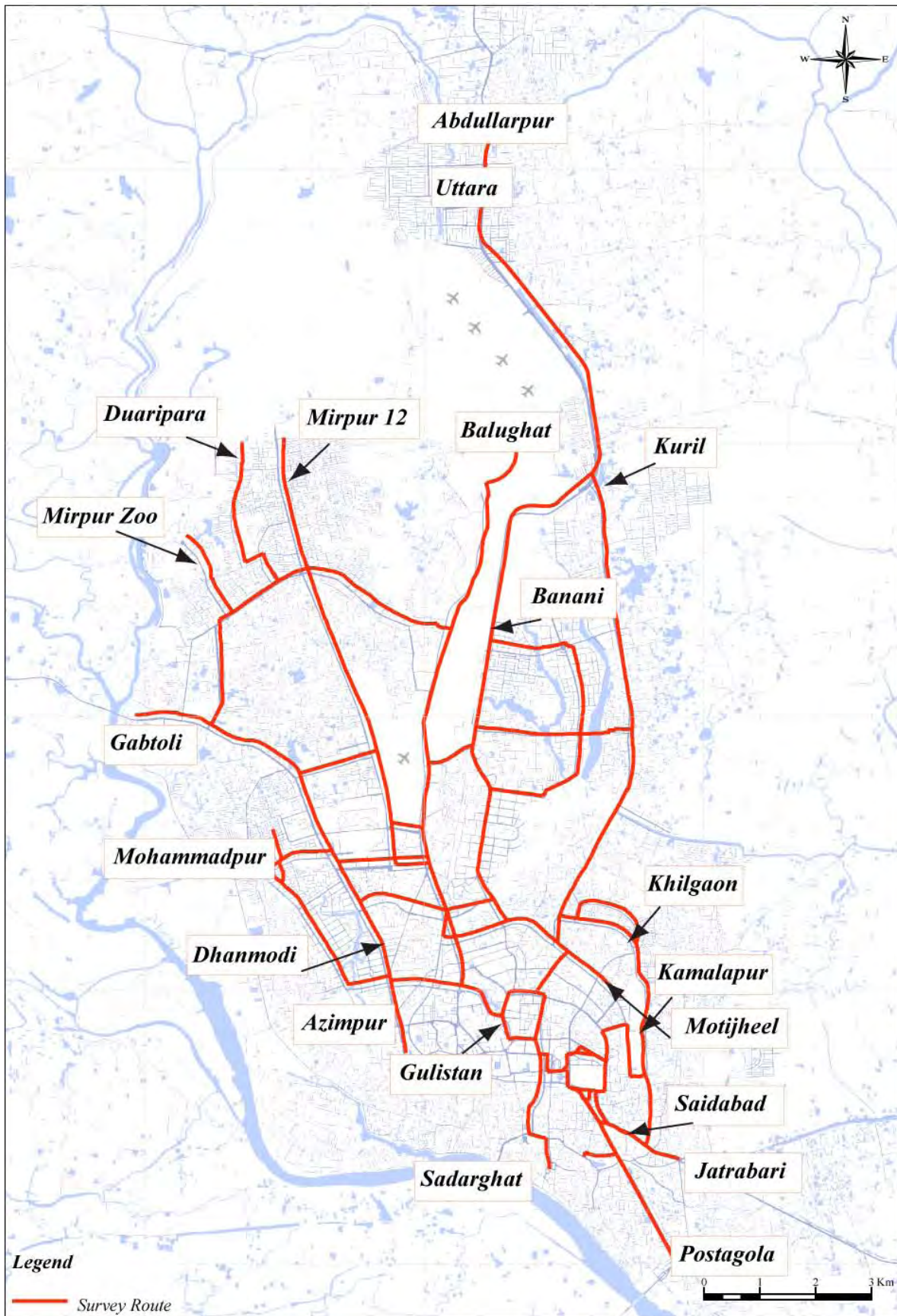


Figure 5.1-7 Bus Routes for which Survey has been Carried out.

## b) Summary of the results

The measured cruising speed is shown in the following Table and Figure. Average speed of the bus was approximately 17.7 km/hr in case of afternoon off-peak time, while 14.4 km/hr in morning/evening peak time. The speed level of the bus plying in Dhaka city is very low.

**Table 5.1-3 Average Cruising Speed of the Buses**

No.	Origin and Destination of the Routes	Average Cruising Speed:[Km/hr] (excluding stopping time)		
		Morning Peak	Evening Peak	Afternoon Off-Peak
1	Azimpur → Uttara	26.3	16.1	19.0
	Azimpur ← Uttara	14.5	18.8	19.6
2	Gulistan → Abdullahpur	23.5	N/A	26.7
	Gulistan ← Abdullahpur	19.4	N/A	24.5
3	Gulistan → Mirpur-12	19.8	12.9	14.9
	Gulistan ← Mirpur-12	15.3	12.3	13.9
4	Jatrabari → Mirpur-12	N/A	12.6	16.0
	Jatrabari ← Mirpur-12	N/A	13.5	16.0
5	Motijheel → Mohammadpur	9.4	N/A	13.2
	Motijheel ← Mohammadpur	10.5	N/A	15.3
6	Motijheel → Gabtali	13.3	14.2	14.7
	Motijheel ← Gabtali	12.1	14.5	13.0
7	Motijheel → Mirpur-14	18.0	14.2	15.9
	Motijheel ← Mirpur-14	15.2	15.3	17.7
8	Saidabad → Abdullahpur	26.6	17.2	22.2
	Saidabad ← Abdullahpur	21.6	19.6	27.4
9	Saidabad → Gabtali	17.6	11.6	18.0
	Saidabad ← Gabtali	16.8	14.0	20.0
10	Sadarghat → Abdullahpur	17.4	12.9	11.9
	Sadarghat ← Abdullahpur	14.1	12.8	10.7
11	Fulbaria → Mirpur (Zoo)	19.9	N/A	18.0
	Fulbaria ← Mirpur (Zoo)	18.0	N/A	18.0
12	Postogola → Mirpur (Duaripara)	16.8	15.3	13.0
	Postogola ← Mirpur (Duaripara)	11.7	14.8	N/A
13	Motijheel → Balurghat	19.2	N/A	N/A
	Motijheel ← Balurghat	12.7	N/A	N/A
14	Mohammadpur → Khilgaon	12.9	14.4	14.8
	Mohammadpur ← Khilgaon	13.2	13.4	11.6

No.	Origin and Destination of the Routes	Average Cruising Speed:[Km/hr] (excluding stopping time)		
		Morning Peak	Evening Peak	Afternoon Off-Peak
15	Mohammadpur → Dhupkhola	13.5	N/A	N/A
	Mohammadpur ← Dhupkhola	10.8	N/A	N/A
16	Azimpur → Kuril	18.8	17.7	20.8
	Azimpur ← Kuril	17.5	11.5	20.4
17	Azimpur → Abdullahpur	13.1	14.5	14.1
	Azimpur ← Abdullahpur	11.8	15.2	12.6
18	Kamalapur → Zoo	N/A	12.7	N/A
	Kamalapur ← Zoo	N/A	15.2	N/A
19	Dhanmondi (Rassel Square) → Banani	7.8	9.8	N/A
	Dhanmondi (Rassel Square) ← Banani	9.2	N/A	8.0
20	Gabtaali → Khilgaon	20.4	14.9	29.5
	Gabtaali ← Khilgaon	21.9	18.4	27.7

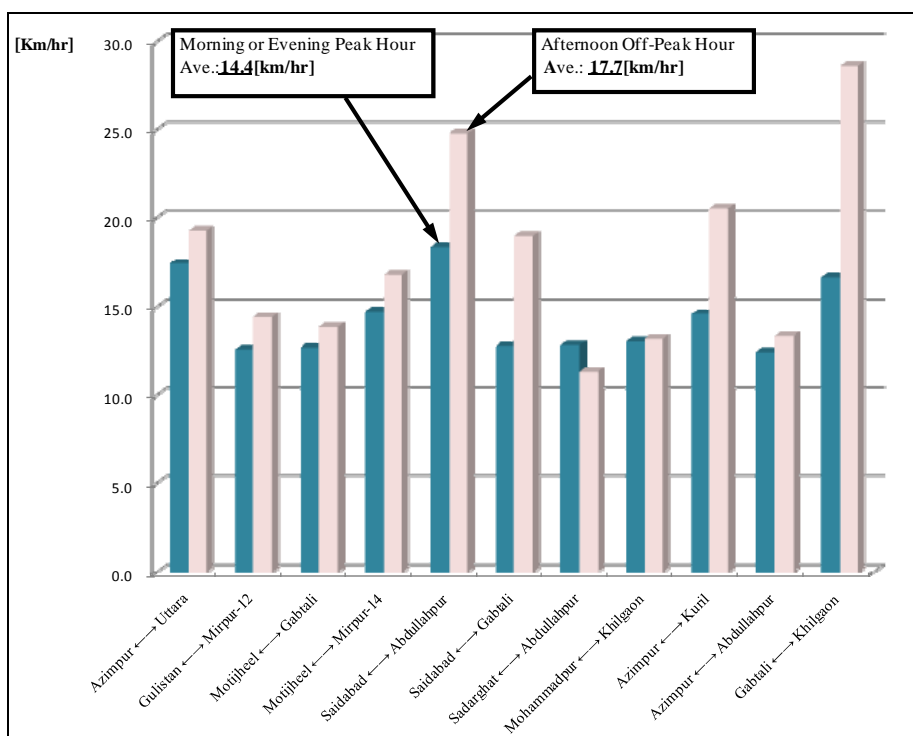


Figure 5.1-8 Average cruising speed of the buses

### 5.1.2 Auto-Rickshaw

#### (1) Characteristics of Auto-Rickshaw

Auto-rickshaw is a three wheeler vehicle also known as ‘baby taxi’ or ‘CNG’. This is a taxi-type service offering motorized door to door public transport. Auto-rickshaws are widely used transport means throughout the Dhaka urban area, particularly for people traveling further distances than normally covered by rickshaws and would prefer convenient door to door service at a lower cost than regular taxis.

Auto-rickshaw is a kind of public transport mean. However, no permission of the fixed service routes is necessary. Only registration is needed.



Figure 5.1-9 Auto rickshaw in City of Dhaka

#### (2) Number of Registered Auto-Rickshaw Vehicles

Prior to December 2001, about 30,000 auto-rickshaws were operated in and around city of Dhaka.

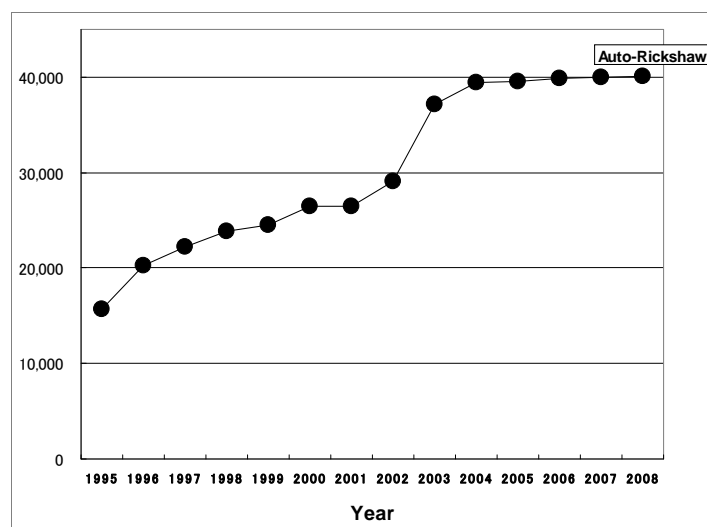


Figure 5.1-10 Number of Registered Auto-Rickshaw Vehicles



**Table 5.1-4 Number of Registered Auto-Rickshaw Vehicles**

vehicle class	1,995	1,996	1,997	1,998	1,999	2,000	2,001	2,002	2,003	2,004	2,005	2,006	2,007	2,008
Auto-Rickshaw	15,660	20,275	22,177	23,866	24,548	26,429	26,504	29,120	37,116	39,460	39,599	39,829	39,950	40,105

Source: BRTA, 2009

### 5.1.3 Taxi

#### (1) Characteristics of Taxi

In Dhaka, three different colored vehicles i.e., yellow, blue and black are plying. The taxi service in Dhaka city has been provided since 1998. As of 2004, there were approximately 60 taxi companies operating taxis in Dhaka city. However, the taxi companies do not operate taxi cabs directly. Rather, they rent the taxi cabs to individual taxi drivers, who actually operate a taxi vehicle and pay rental and fuel fees.

As of 2004, for 24 hour operation, the drivers paid BDT 950 for air-conditioned, BDT 650 for non-air-conditioned taxi.



Figure 5.1-11 Yellow Taxi Cab



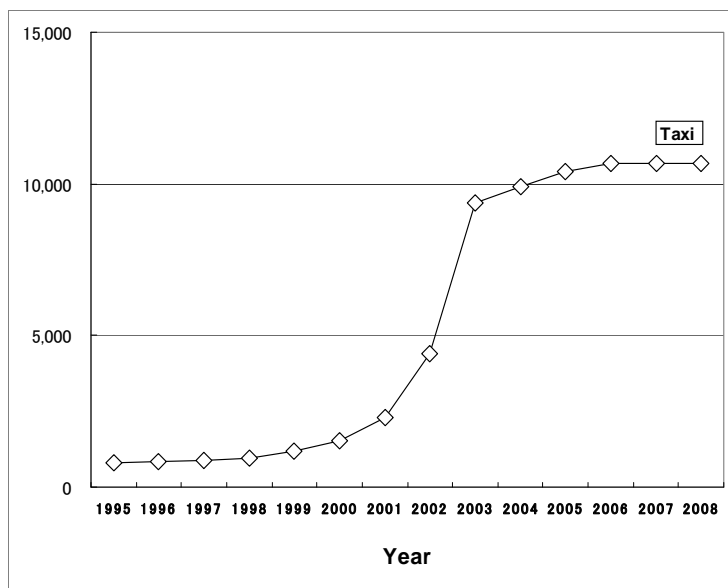
Figure 5.1-12 Blue Taxi Cab



Figure 5.1-13 Black Taxi Cab

#### (2) Number of registered Taxi vehicles

The number of registered taxi vehicles is relatively small. As of the end of 2008, number of registered taxi cab is approximately 10,000.



**Figure 5.1-14 Number of Registered Taxi Vehicles**

Source: BRTA, 2009

**Table 5.1-5 Number of Registered Taxi vehicles**

vehicle class	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
taxi	812	847	861	963	1,178	1,526	2,288	4,389	9,369	9,892	10,406	10,672	10,672	10,672

Source: BRTA, 2009

### 5.1.4 Rickshaw

#### (1) Characteristics of Rickshaw

As a mode of transportation, rickshaws are used for short journeys from home to bus stop or nearby market.



**Figure 5.1-15 Cycle-Rickshaws in Dhaka**

## (2) Number of Registered Rickshaw vehicles

DCC is in charge of supervision of registration of rickshaws. According to DCC statistics, current number of registered rickshaws is around 100,000. However, it is said that additional 400,000 rickshaws are actually operating without licenses, although no specific official statistics could be seen.

## (3) Characteristics of Rickshaw Owners

Through this study, Rickshaw owners were surveyed through interview. The number of interviewees is around 90. The owners' offices are located in the following 10 areas.

**Table 5.1-6 Sampling area of Rickshaw owner interview**

	Name of Areas
1	Demra, Saidabad, Jatrabari
2	Nayabazar, Babubazar, Sadarghat
3	Lalbag, Hazaribag, Islampur
4	Bashabo, Sabujbag, Khilgaon, Motijheel
5	New Market, Dhanmondi
6	Mohammadpur, Adabar, Shyamoli
7	Shewrapara, Taltola, Kazipara, Kafrul, Mirpur
8	Pallabi
9	Mohakhali, Gulshan, Banani
10	Uttara

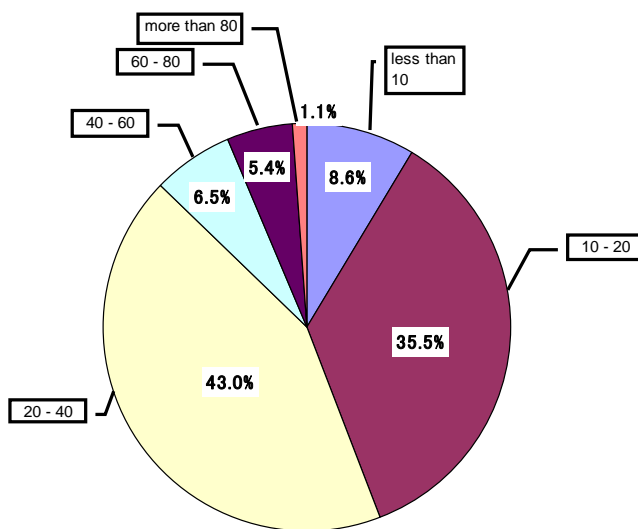
Questionnaire items are the number of Rickshaw owned by owners, rental rate on the daily basis and business duration. Survey results are shown below.

a) Number of Rickshaw Vehicles owned

43% of owners have 20 to 40 Rickshaw vehicles.

**Table 5.1-7 Number of Rickshaws**

	Number	%
Less than 10	8	8.6
10-20	33	35.5
20-40	40	43.0
40-60	6	6.5
60-80	5	5.4
More than 80	1	1.1
TOTAL	93	100.0



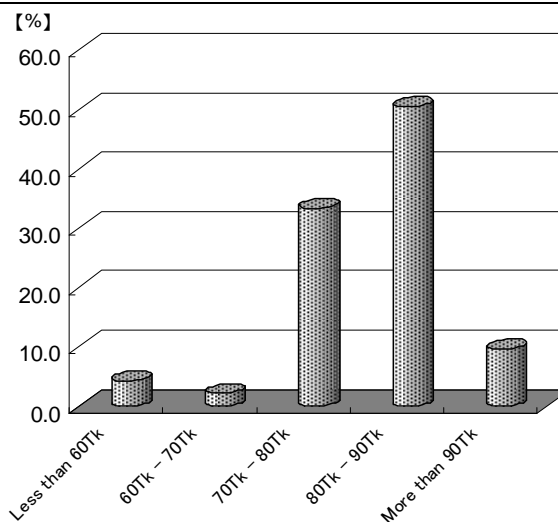
**Figure 5.1-16 Number of Rickshaws**

b) Rickshaw Vehicle Lease Rate

Rental rate imposing on rickshaw pullers is about BDT 80 to 90 per day.

**Table 5.1-8 Rickshaw Rent Rate**

	Number	%
Less than 60Tk	4	4.3
60Tk - 70Tk	2	2.2
70Tk - 80Tk	31	33.3
80Tk - 90Tk	47	50.5
More than 90Tk	9	9.7
TOTAL	93	100.0



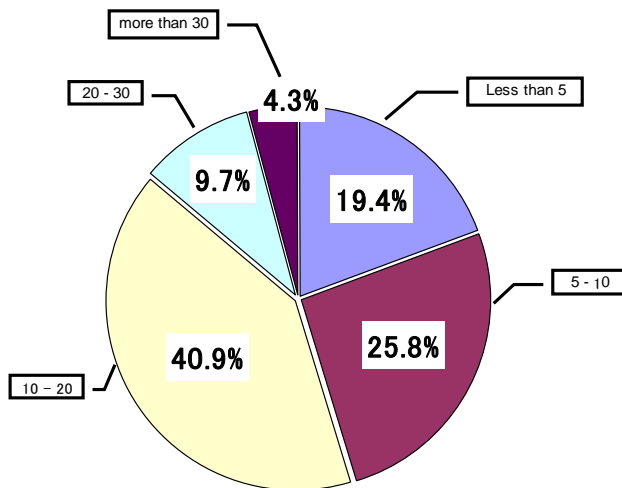
**Figure 5.1-17 Rickshaw Rent Rate**

c) Rickshaw Business Duration

Rickshaw business has been conducted for a long period. More than half of all the owners have been engaged in the rickshaw business for more than 10 years.

**Table 5.1-9 Business Duration**

	Number	%
Less than 5year	18	19.4
5 - 10years	24	25.8
10 - 20years	38	40.9
20 - 30years	9	9.7
More than 30years	4	4.3
TOTAL	93	100.0



**Figure 5.1-18 Business Duration**

(4) Characteristics of Rickshaw Pullers

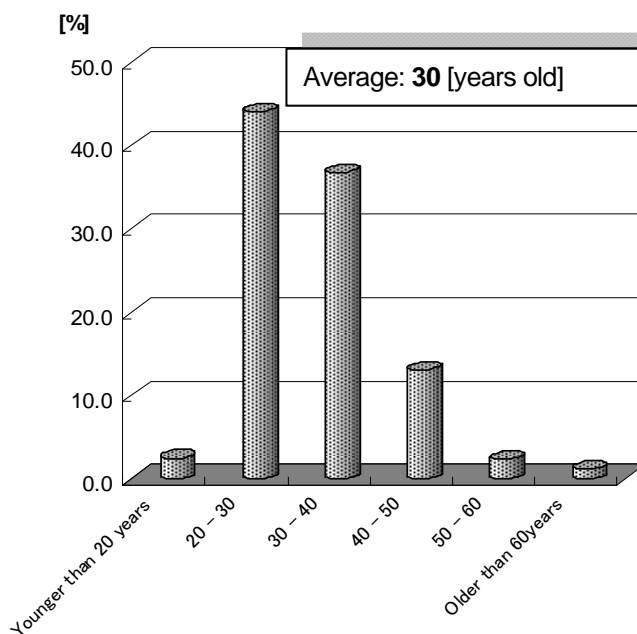
Interview survey with rickshaw pullers was also conducted. The number of interviewees is around 520. Questionnaire items are rickshaw pullers’ age, daily income, number of passengers transported, rental rate and monthly profit. The survey results are shown below.

a) Age of the Rickshaw pullers

Rickshaw pullers are young male as a whole. The majority is 20 to 30 years old. The average age is about 30.

**Table 5.1-10 Age of Rickshaw Pullers**

	Number	%
Younger than 20 years	13	2.5
20 - 30	229	44.1
30 - 40	191	36.8
40 - 50	68	13.1
50 - 60	12	2.3
Older than 60years	6	1.2
TOTAL	519	100.0



**Figure 5.1-19 Age of Rickshaw Pullers**

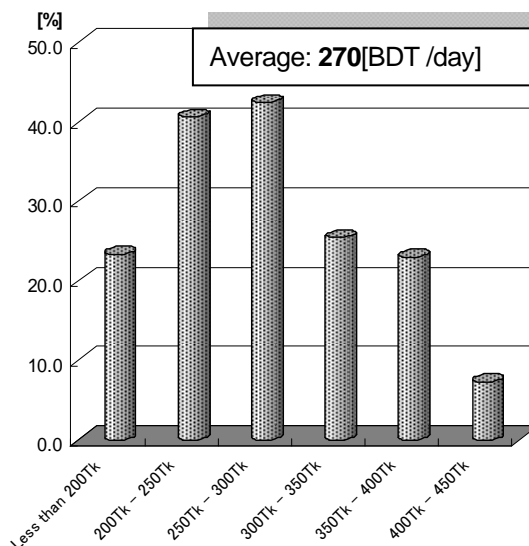


b) Daily income

The average daily income is BDT 270. If subtract BDT 80 from BDT 270 as a rental rate, then net daily income is about BDT 190.

**Table 5.1-11 Daily Income**

	Number	%
Less than 200Tk	77	23.3
200Tk - 250Tk	134	40.6
250Tk - 300Tk	140	42.4
300Tk - 350Tk	84	25.5
350Tk - 400Tk	76	23.0
400Tk - 450Tk	24	7.3
450Tk - 500Tk	5	1.5
More than 500Tk	1	0.3
TOTAL	330	100



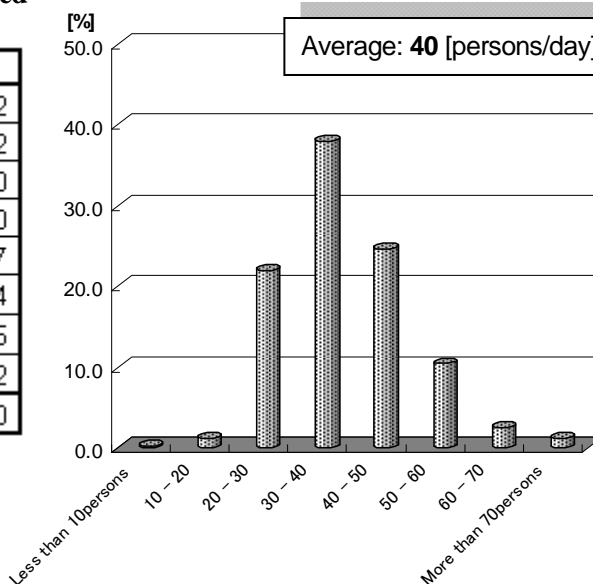
**Figure 5.1-20 Daily Income**

c) Number of daily passengers transported

The majority of the Rickshaw pullers are transporting 30 to 40 passengers per day.

**Table 5.1-12 Daily Passengers Transported**

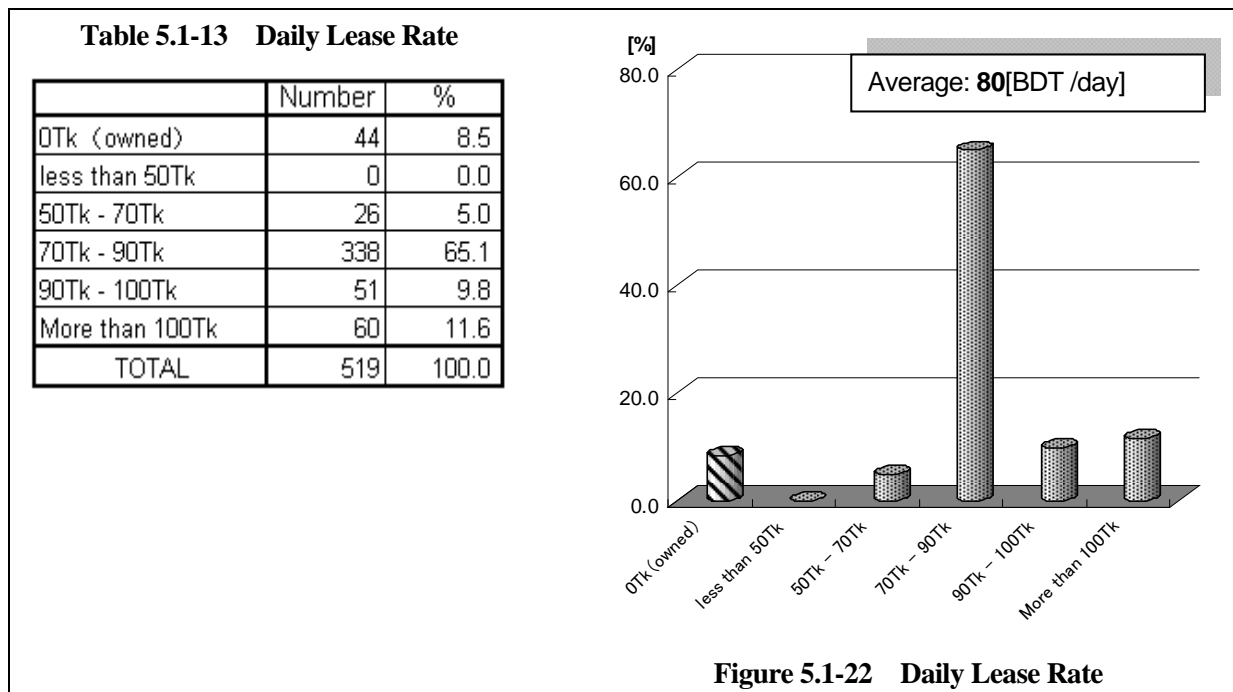
	Number	%
Less than 10persons	1	0.2
10 - 20	6	1.2
20 - 30	114	22.0
30 - 40	197	38.0
40 - 50	128	24.7
50 - 60	54	10.4
60 - 70	13	2.5
More than 70persons	6	1.2
TOTAL	519	100.0



**Figure 5.1-21 Daily Passenger Transported**

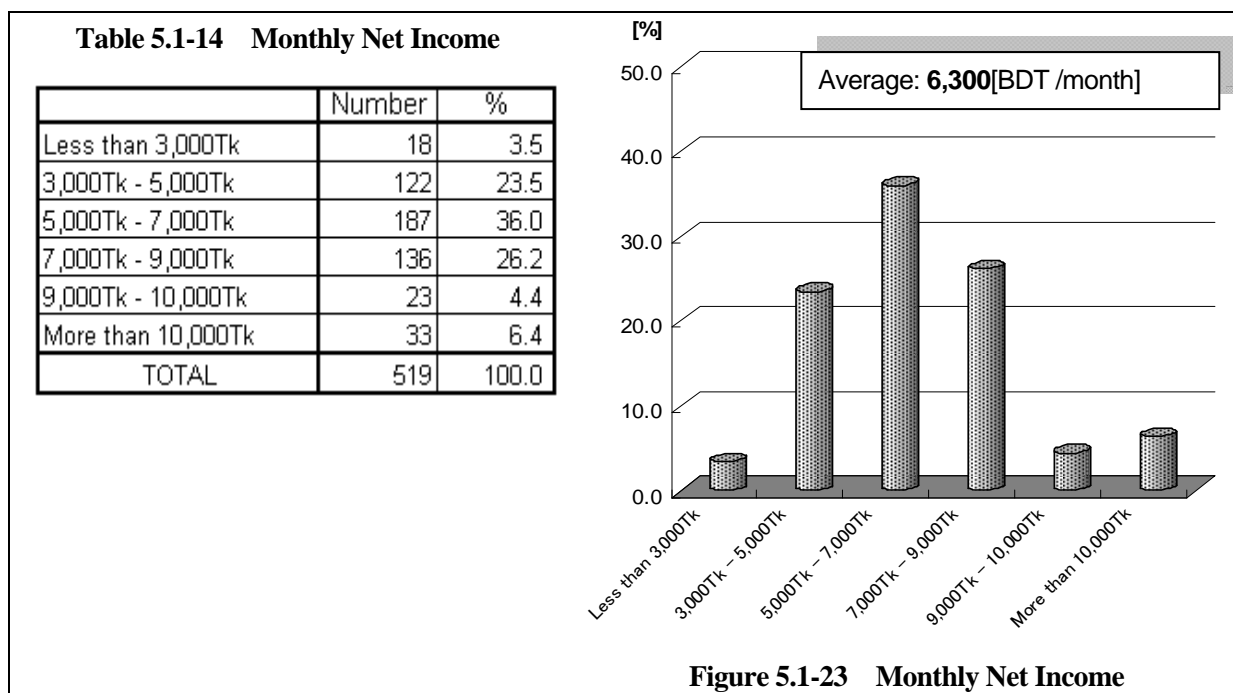
d) Daily lease rate

As previously examined in the section of Rickshaw owner analysis, the average daily lease rate is 80 BDT.



e) Monthly net income

Monthly net income is about 6,300 BDT in average.

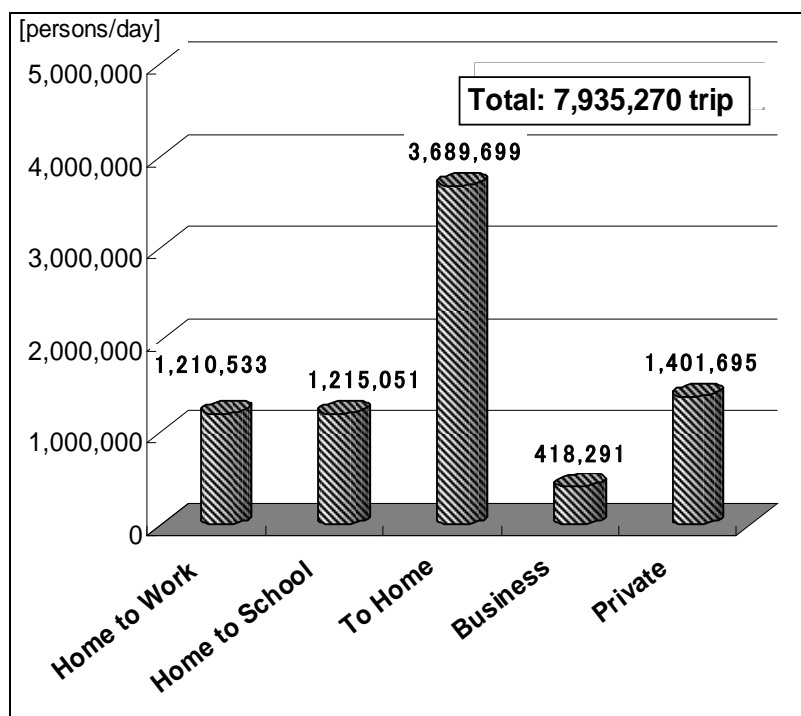


\*Monthly net income = (Daily revenue - Daily lease rate) x 30[days]

## (5) Characteristics of Rickshaw users

## a) Number of users

According to the household survey, the number of daily rickshaw passengers is about 7.9 million. By each trip purpose, 'To Home' is majority as about 3.7 million passengers and 'Private' is the second largest as about 1.4 million. 'Home to work' and 'Home to school' is the third largest as about 1.2 million passengers.



**Figure 5.1-24 Number of Rickshaw Users by Trip Purpose**

Source: Survey results of Household Interview Survey (HIS), JICA Study Team

## b) Rickshaw users survey

Field survey regarding rickshaw users' characteristics was conducted. A total of 500 rickshaw users (about 50 rickshaw users from each DCC zones) interviewed covering different attributes and parameters are as follows:

- i. Respondents attribute (address, gender, age, occupation, and personal income),
- ii. Trip purpose,
- iii. Frequency of usage,
- iv. Origin and destination,
- v. Fare, and
- vi. Travel time between origin and destination.

Field survey results are based on users' attributes.

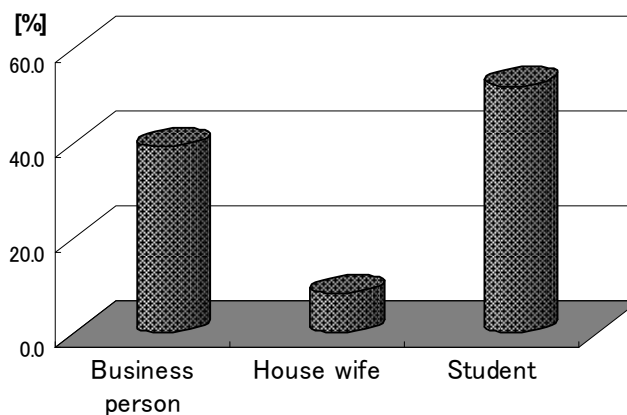
Some attributes of interviewees were identified through the Questionnaire survey as follows:

i. Users' occupation

More than half of all the passengers are students followed by business men.

**Table 5.1-15 Occupation**

	Number	%
Business person	206.0	39.5
House wife	43.0	8.3
Student	272.0	52.2
TOTAL	521.0	100.0



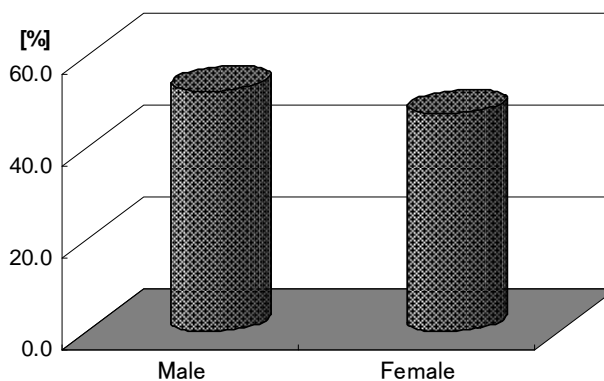
**Figure 5.1-25 Occupation**

ii. Users' gender

Both male and females are using rickshaws approximately at the same proportion.

**Table 5.1-16 Gender**

	Number	%
Male	274	52.6
Female	247	47.4
TOTAL	521	100.0



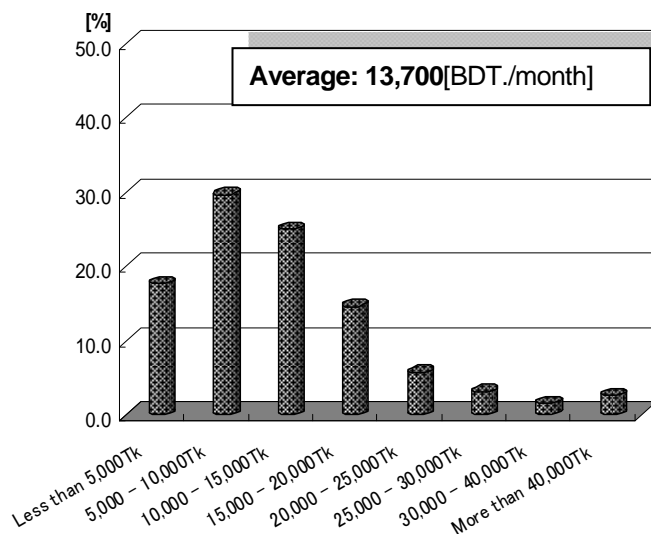
**Figure 5.1-26 Gender**

iii. Users' Monthly Income

User's monthly income is middle income level covering BDT 5,000 to 20,000. The average is about BDT 14,000.

**Table 5.1-17 Monthly Income**

	Number	%
Less than 5,000Tk	34	17.7
5,000 - 10,000Tk	57	29.7
10,000 - 15,000Tk	48	25.0
15,000 - 20,000Tk	28	14.6
20,000 - 25,000Tk	11	5.7
25,000 - 30,000Tk	6	3.1
30,000 - 40,000Tk	3	1.6
More than 40,000Tk	5	2.6
<b>TOTAL</b>	<b>192</b>	<b>100</b>



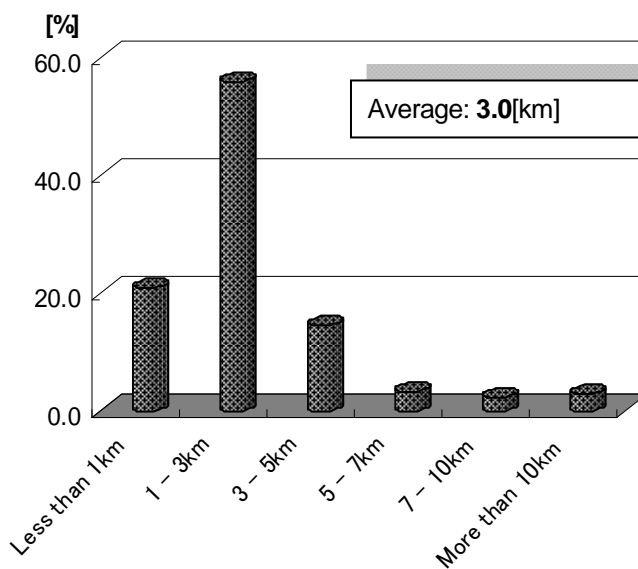
**Figure 5.1-27 Monthly Income**

iv. Travel distance

Travel distance ranges from 1 to 3 km. The average is about 3 km.

**Table 5.1-18 Travel Distance**

	Number	%
Less than 1km	43	20.9
1 - 3km	115	55.8
3 - 5km	30	14.6
5 - 7km	7	3.4
7 - 10km	5	2.4
More than 10km	6	2.9
<b>TOTAL</b>	<b>206</b>	<b>100.0</b>

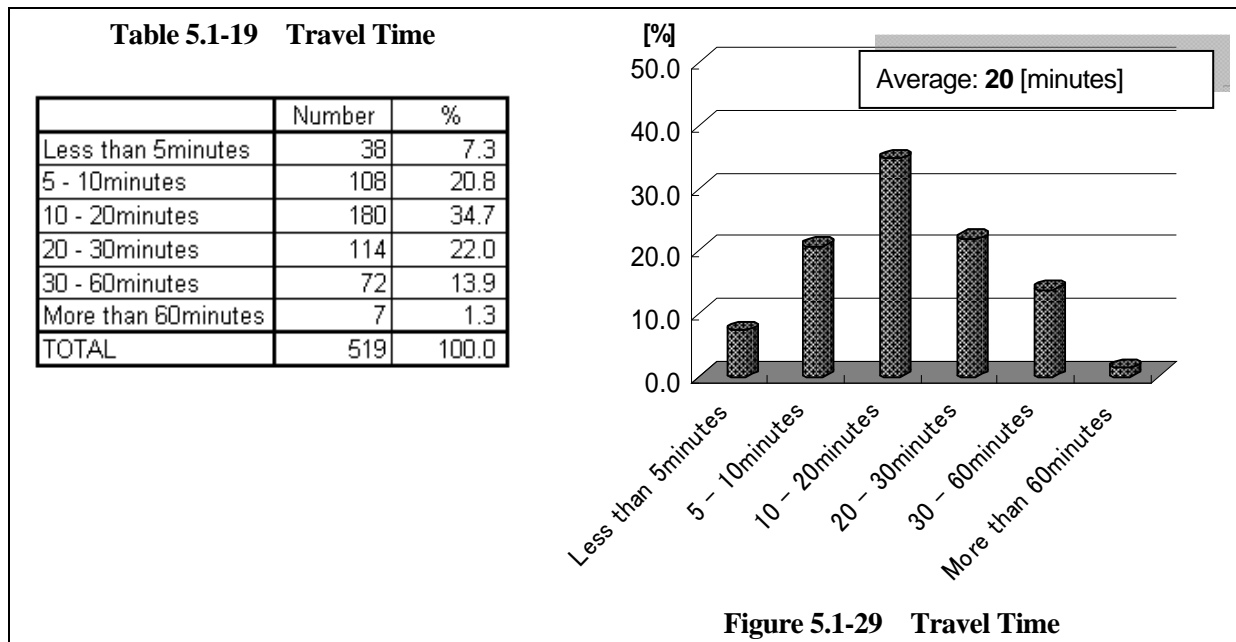


**Figure 5.1-28 Travel Distance**



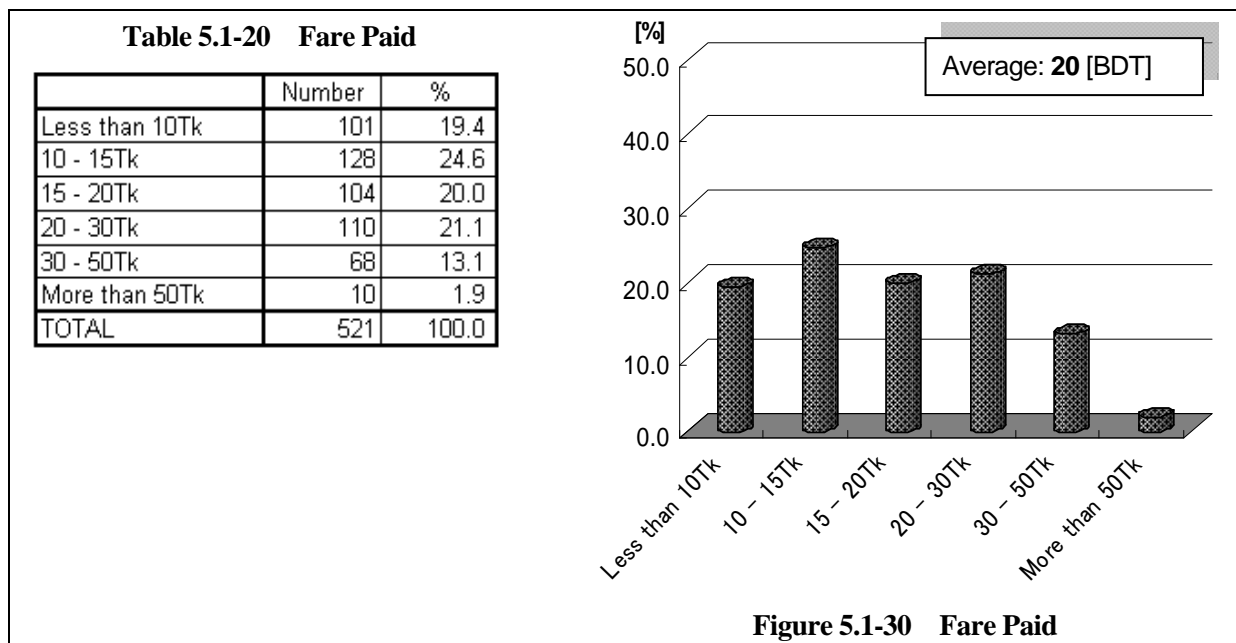
v. Travel Time

The average travel time is 20 minutes.



vi. Fare Paid

The average fare paid is BDT 20 per trip.



## 5.2 Passenger Terminals

Here we discuss current condition of passenger transport terminals including inter-city bus terminals, railway stations and waterway transport stations.

### 5.2.1 Bus Terminals

#### (1) Bus Terminal Users Interview Survey

Passengers at the bus terminals (including stand) were interviewed during the survey. There were five survey sites and the list of the target bus terminals are shown in the following map.

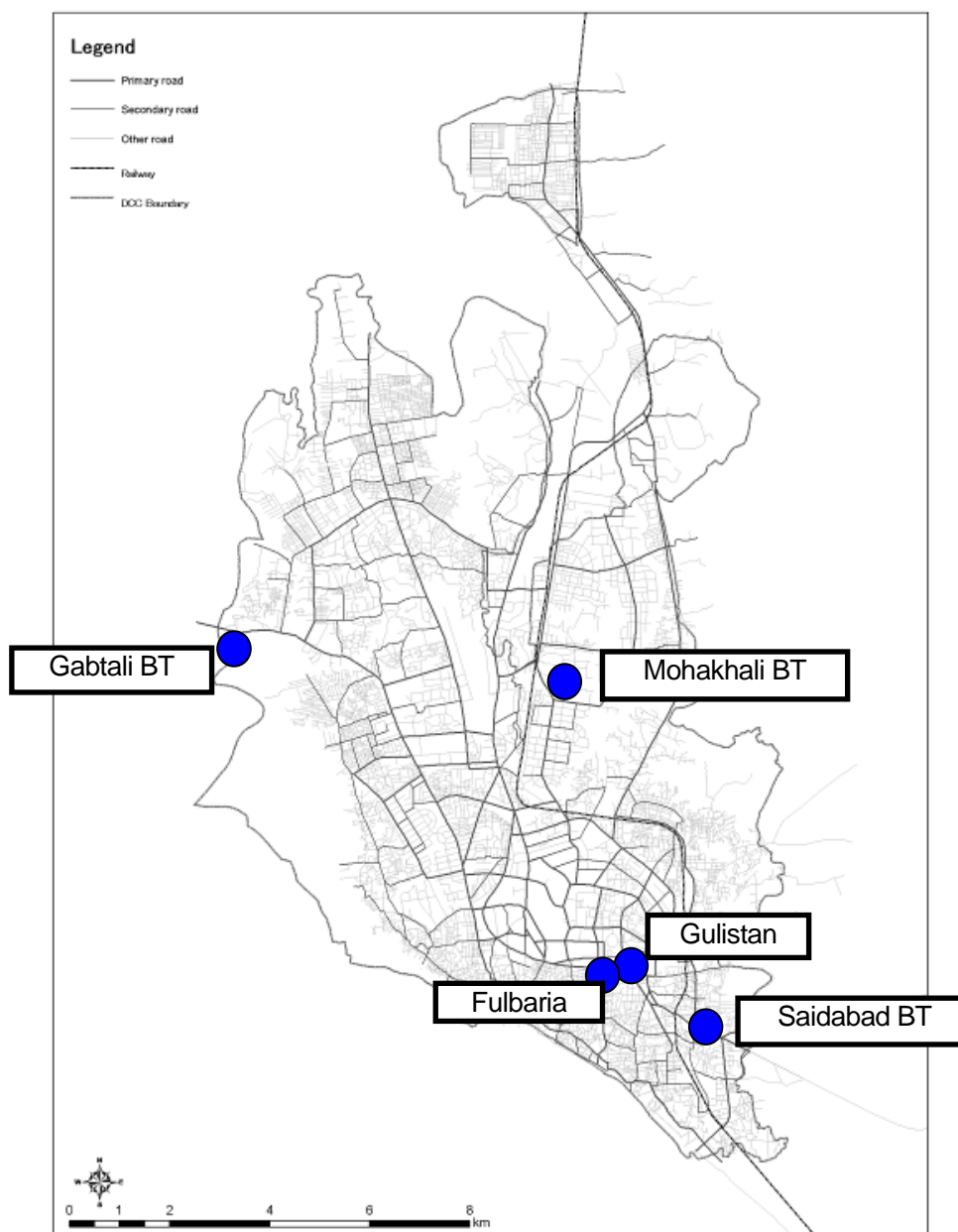


Figure 5.2-1 Location of the Target Bus Terminals

## (2) General Feature of the Target Bus Terminal

The target facilities are serving inter-city bus service provision. Those huge facilities were constructed by DCC.



**Figure 5.2-2 Overview of the Inter City Bus Terminals**

## (3) Questionnaire Items

Questionnaire items of the survey are as follows:

**Table 5.2-1 Questionnaire items for Bus Terminal user survey**

Questionnaire item	Contents
Users' attributes	
Trip purpose	Work/School/Own Business/Social or Recreation /Shopping/Others
Frequency of usage	Every day/Once a week/Once a month/Occasionally
Interviewee's monthly income	Less than BDT 2,000 - More than BDT 25,000
Users' behavior and evaluation	
Access transport mode	Bus/Human hauler/Auto-Rickshaw /Private Car/Taxi/Motor Cycle/Rickshaw /Train /Water Transport/Walk
Egress transport mode	same as above
Waiting time	less than 10minutes – More than 120 minutes
Level of satisfaction for information provision service	satisfied/not satisfied
Evaluation of service quality	good/poor/very poor/extraordinary poor

(4) Users' attributes

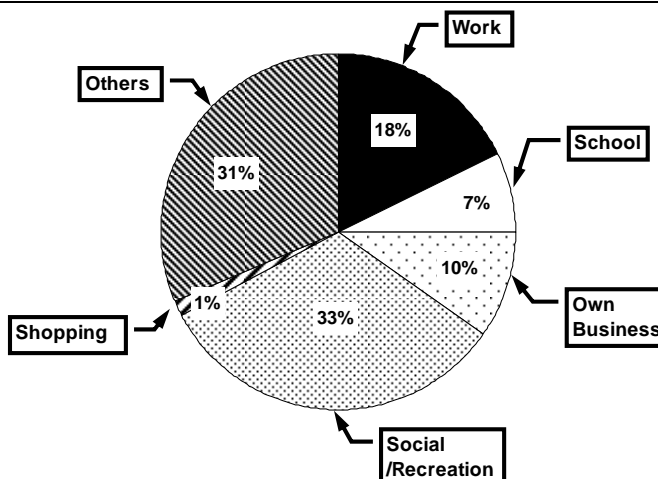
Some attributes of interviewees were identified through the Questionnaire survey as follows:

a) Trip purpose

The majority of trip purposes are 'Social or Recreation'. Such trip purposes are not daily but occasional trips. Daily trip is 'Work', 'School', 'Own businesses and 'Shopping'. The sum of these trip purposes is about 35%.

**Table 5.2-2 Trip Purpose**

	Number	%
Work	169	17.7
School	69	7.2
Own Business	94	9.9
Social/Recreation	308	32.3
Shopping	14	1.5
Others	300	31.4
TOTAL	954	100.0



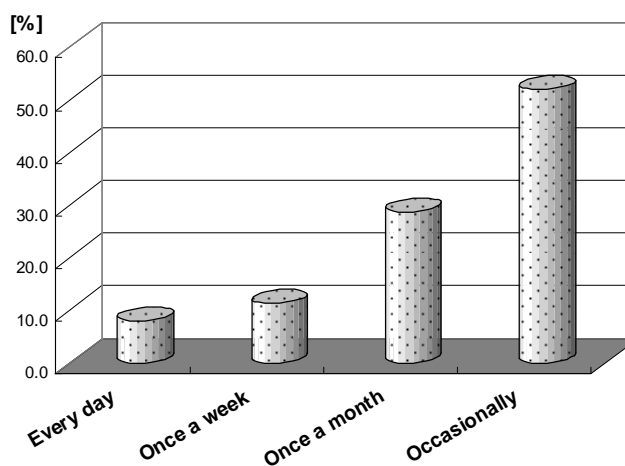
**Figure 5.2-3 Trip Purpose**

b) Frequency of usage

As seen the trip purpose, most of the users are following occasional purpose. Therefore, the majority of the frequency of usage is 'Occasionally'.

**Table 5.2-3 Frequency of Usage**

	Number	%
Every day	75	8.0
Once a week	106	11.3
Once a month	268	28.7
Occasionally	485	51.9
TOTAL	934	100.0



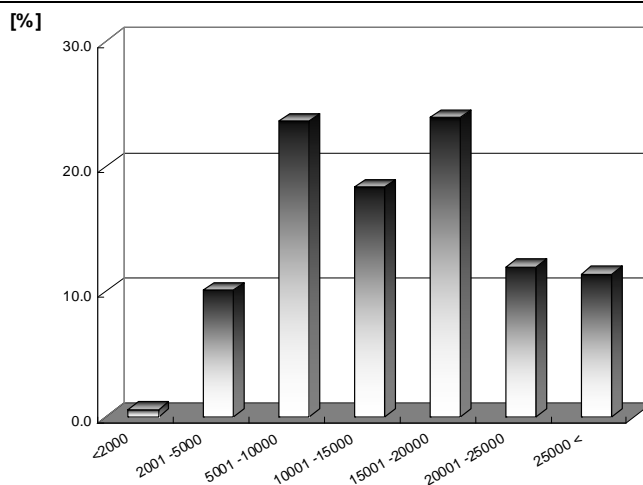
**Figure 5.2-4 Frequency of Usage**

c) User's monthly income

The users are neither lowest income group nor highest income group. The major monthly income ranges from BDT 5,000 to 20,000.

**Table 5.2-4 User's Monthly Income**

	Number	%
<2000	4	0.6
2001-5000	71	10.1
5001-10000	166	23.6
10001-15000	129	18.4
15001-20000	168	23.9
20001-25000	84	12.0
25000<	80	11.4
TOTAL	702	100.0



**Figure 5.2-5 User's Monthly Income**

(5) Users' Transport Behavior and Evaluation for the Bus Terminal Service Provision

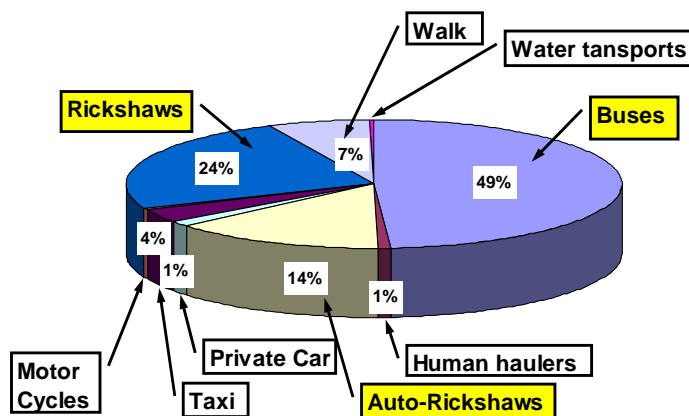
Some attributes of interviewees were identified through the Questionnaire survey as follows:

a) Access/Egress transport mode

Major access transport means are city bus, auto-rickshaw and rickshaws. On the contrary, almost 100% of the egress transport means are city buses.

**Table 5.2-5 Access Transport Mode**

	Number	%
Buses	502	48.8
Human hauler	10	1.0
Auto-Rickshaw	143	13.9
Private Car	12	1.2
Taxi	36	3.5
Motor Cycle	4	0.4
Rickshaw	250	24.3
Walk	68	6.6
Train	0	0.0
Water Transport	3	0.3
TOTAL	1,028	100.0

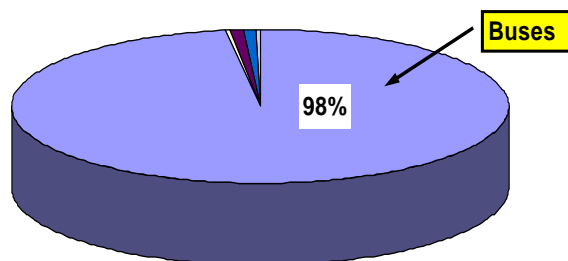


**Figure 5.2-6 Access Transport Mode**



**Table 5.2-6 Egress Transport Mode**

	Number	%
Buses	1,043	97.7
Human hauler	1	0.1
Auto-Rickshaw	4	0.4
Private Car	0	0.0
Taxi	7	0.7
Motor Cycle	0	0.0
Rickshaw	11	1.0
Walk	2	0.2
Train	0	0.0
Water Transport	0	0.0
TOTAL	1,068	100.0



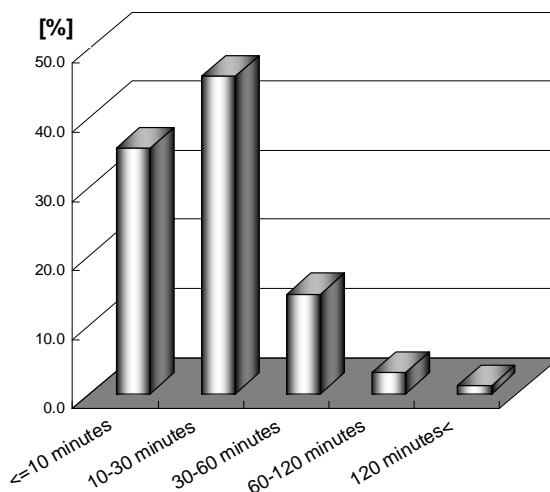
**Figure 5.2-7 Egress Transport Mode**

b) Waiting time

Waiting time to catch a transport ranges from 10 to 30 minutes.

**Table 5.2-7 Waiting Time**

	Number	%
<=10 minutes	342	35.4
10-30 minutes	443	45.9
30-60 minutes	139	14.4
60-120 minutes	30	3.1
120 minutes<	11	1.1
TOTAL	965	100.0



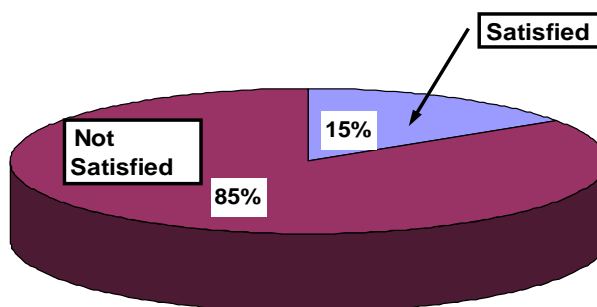
**Figure 5.2-8 Waiting Time**

c) Level of satisfaction for information service provision

Level of users' satisfaction on information provision is very low. About 85% users are not satisfied with the current level of information service provision.

**Table 5.2-8 Level of Satisfaction**

	Number	%
Satisfy	149	15.4
Not Satisfy	816	84.6
TOTAL	965	100.0



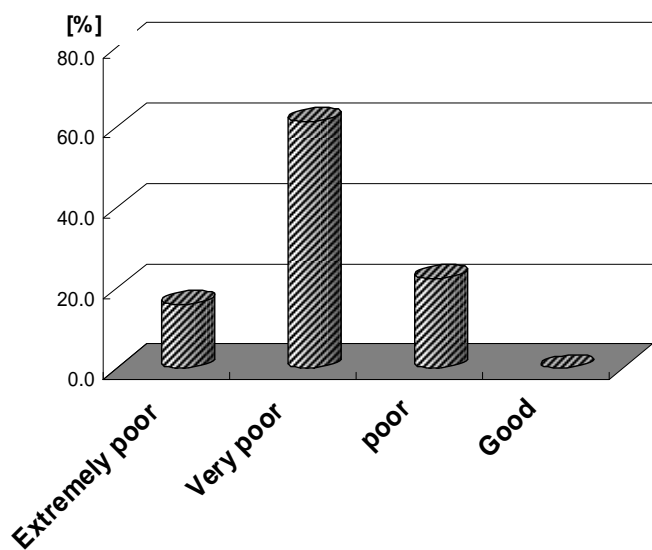
**Figure 5.2-9 Level of Satisfaction**

d) Evaluation of service rank

Overall estimation of bus terminal is very unsatisfactory. Nobody answered 'Good'.

**Table 5.2-9 Service Rank**

	Number	%
Extremely poor	150	15.9
Very poor	581	61.6
poor	212	22.5
Good	0	0.0
TOTAL	943	100.0



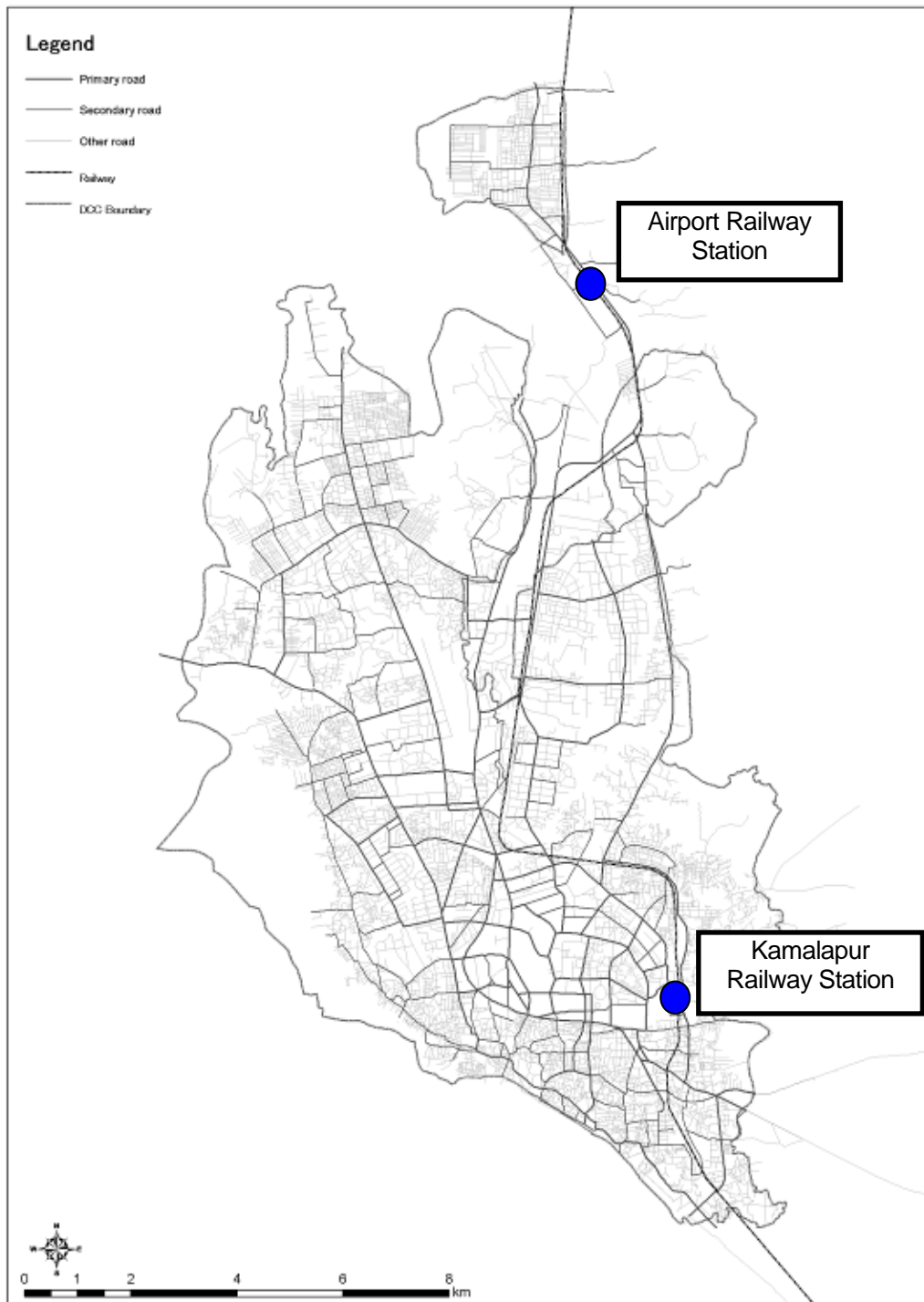
**Figure 5.2-10 Service Rank**

## 5.2.2 Railway Stations

### (1) Characteristics of Railway Station Users

#### a) Survey Targets

Bus terminal passengers were interviewed during survey. The list of the target bus terminals are shown in the following map.



**Figure 5.2-11 Location of the Target Railway Stations**

(2) Questionnaire Items

Questionnaire items of the survey are as follows:

**Table 5.2-10 Questionnaire items for Bus Terminal user survey**

Questionnaire item	Contents
<b>Users' attributes</b>	
Trip purpose	Work/School/Own Business/Social or Recreation /Shopping/Others
Frequency of usage	Every day/Once a week/Once a month/Occasionally
Interviewee's monthly income	Less than BDT 2,000 - More than BDT 25,000
<b>Users' behavior and evaluation</b>	
Access transport mode	Bus/Human hauler/Auto-Rickshaw /Private Car/Taxi/Motor Cycle/Rickshaw /Train /Water Transport/Walk
Egress transport mode	same as above
Waiting time	less than 10minutes – More than 120 minutes
Level of satisfaction for information provision service	satisfied/not satisfied
Evaluation of service quality	good/poor/very poor/extraordinary poor

(3) Users' Attributes

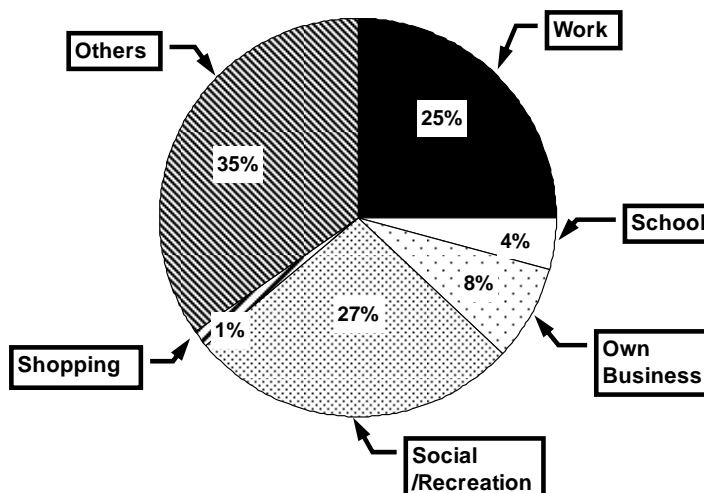
Some attributes of users (interviewees) were identified through the Questionnaire survey as follows:

a) Trip purpose

The Majority is 'Social/Recreational'. This trip purpose is not corresponding to daily trip.

**Table 5.2-11 Trip Purpose**

	Number	%
Work	134	24.9
School	23	4.3
Own Business	42	7.8
Social/Recreation	145	27.0
Shopping	7	1.3
Others	187	34.8
TOTAL	538	100.0



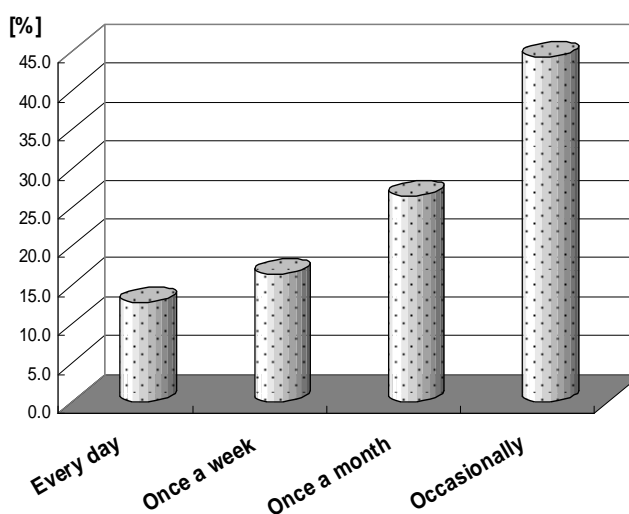
**Figure 5.2-12 Trip Purpose**

b) Frequency of Usage

The majority of the users travel occasionally.

**Table 5.2-12 Frequency of Usage**

	Number	%
Every day	69	12.8
Once a week	89	16.5
Once a month	143	26.4
Occasionally	240	44.4
TOTAL	541	100.0



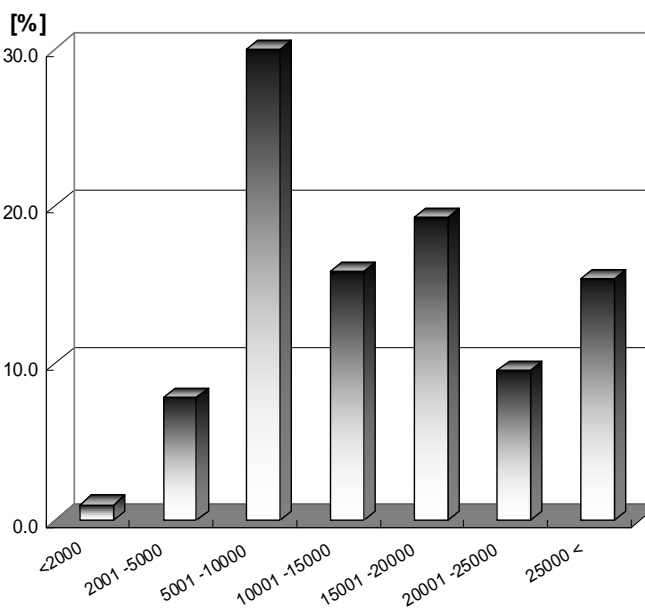
**Figure 5.2-13 Frequency of Usage**

c) User's Monthly Income

The majority (65%) of the users' monthly income range from BDT 5,000 to 20,000.

**Table 5.2-13 User's Monthly Income**

	Number	%
<2000	4	1.0
2001-5000	32	7.8
5001-10000	127	31.1
10001-15000	65	15.9
15001-20000	79	19.3
20001-25000	39	9.5
25000<	63	15.4
TOTAL	409	100.0



**Figure 5.2-14 User's Monthly Income**

(4) Users' Transport Behavior and Evaluation for the Bus Terminal Service Provision

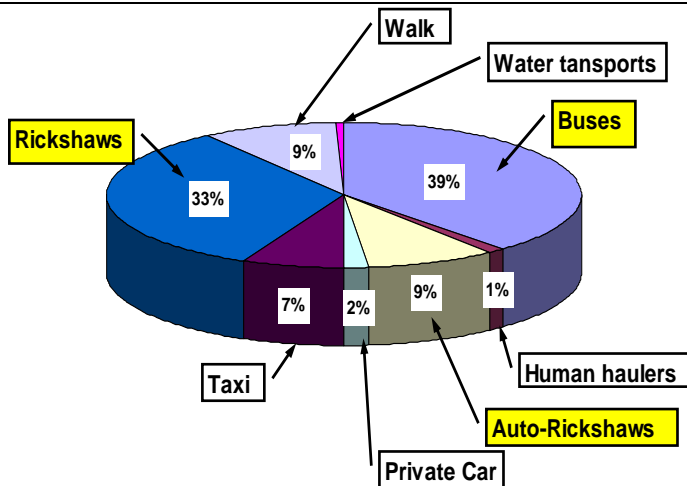
Some attributes of interviewees were identified through the Questionnaire survey as follows:

a) Access/Egress Transport Mode

The major access and egress transport means are city buses, auto-rickshaws and rickshaws.

**Table 5.2-14 Access Transport Mode**

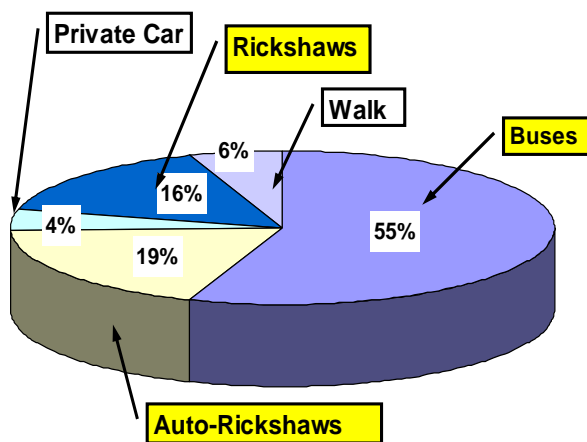
	Number	%
Buses	167	38.2
Human hauler	5	1.1
Auto-Rickshaw	39	8.9
Private Car	7	1.6
Taxi	31	7.1
Motor Cycle	0	0.0
Rickshaw	146	33.4
Walk	40	9.2
Train	0	0.0
Water Transport	2	0.5
TOTAL	437	100.0



**Figure 5.2-15 Access Transport Mode**

**Table 5.2-15 Egress Transport Mode**

	Number	%
Buses	50	55.6
Human hauler	0	0.0
Auto-Rickshaw	17	18.9
Private Car	4	4.4
Taxi	0	0.0
Motor Cycle	0	0.0
Rickshaw	14	15.6
Walk	5	5.6
Train	0	0.0
Water Transport	0	0.0
TOTAL	90	100.0



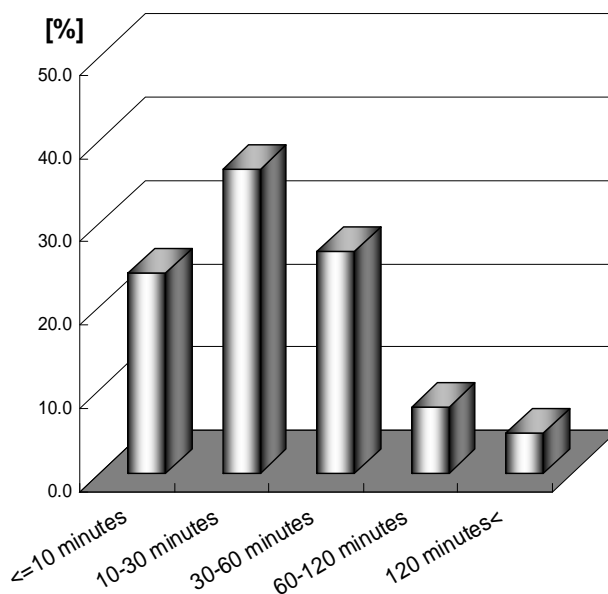
**Figure 5.2-16 Egress Transport Mode**

b) Waiting time

The waiting time for majority of the passengers ranges from 10 to 30 minutes.

**Table 5.2-16 Waiting Time**

	Number	%
<=10 minutes	130	24.0
10-30 minutes	198	36.6
30-60 minutes	144	26.6
60-120 minutes	43	7.9
120 minutes<	26	4.8
TOTAL	541	100.0



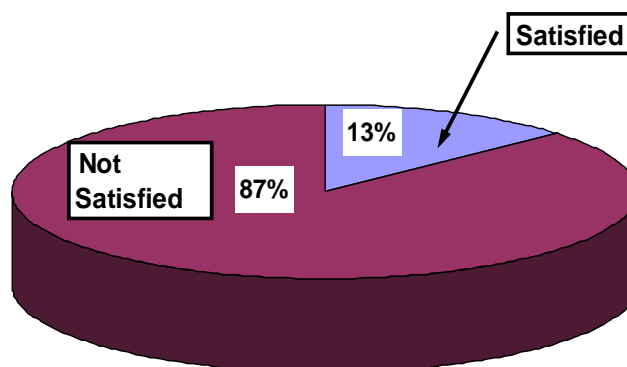
**Figure 5.2-17 Waiting Time**

c) Level of satisfaction for information service provision

Level of users' satisfaction is very low. About 87% users are not satisfied with the present condition of the service provision at the railway stations.

**Table 5.2-17 Level of Satisfaction**

	Number	%
Satisfy	72	13.3
Not Satisfy	469	86.7
TOTAL	541	100.0



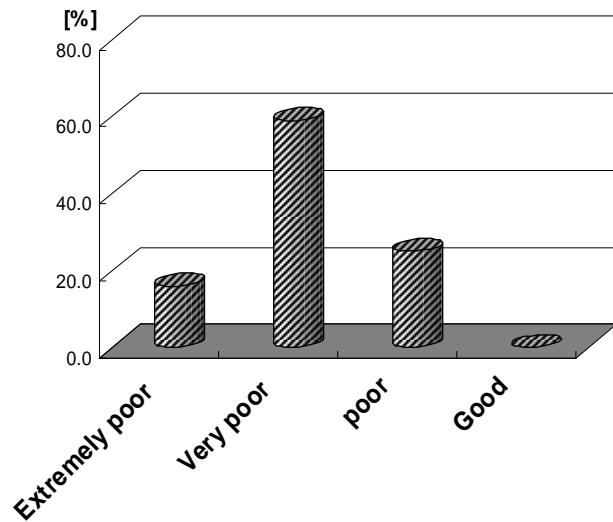
**Figure 5.2-18 Level of Satisfaction**

d) Evaluation of service rank

Overall evaluation shows very low level. Most of the users complained about ‘poor’ railway station services.

**Table 5.2-18 Service Rank**

	Number	%
Extremely poor	84	15.9
Very poor	311	59.0
poor	132	25.0
Good	0	0.0
TOTAL	527	100.0



**Figure 5.2-19 Service Rank**



### 5.2.3 Inland Waterway Stations

(1) Survey targets

Bus terminal passengers were surveyed through interview. The Sadarghat Launch station is shown in the following map.



Figure 5.2-20 Location of target inland waterway station

## (2) General Feature of the Target Inland Waterway Stations

Cargo river transport is the major water transport mode being in operation. Passenger transport service is provided for passengers crossing the river and cruising in long distance to outside Dhaka.



Figure 5.2-21 A Cargo vessel



Figure 5.2-22 Major Passenger Boats

## (3) Questionnaire Items

Questionnaire items of the survey are as follows:

Table 5.2-19 Questionnaire items for bus terminal user questionnaire survey

Questionnaire item	Contents
Users' attributes	
Trip purpose	Work/School/Own Business/Social or Recreation /Shopping/Others
Frequency of usage	Every day/Once a week/Once a month/Occasionally
Interviewee's monthly income	Less than BDT. 2,000 - More than BDT. 25,000
Users' behavior and evaluation	
Access transport mode	Bus/Human hauler/Auto-Rickshaw /Private Car/Taxi/Motor Cycle/Rickshaw /Train /Water Transport/Walk
Egress transport mode	same as above
Waiting time	less than 10minutes – More than 120 minutes
Level of satisfaction for information provision service	satisfied/not satisfied
Evaluation of service quality	good/poor/very poor/extraordinary poor

(4) Users' Attributes

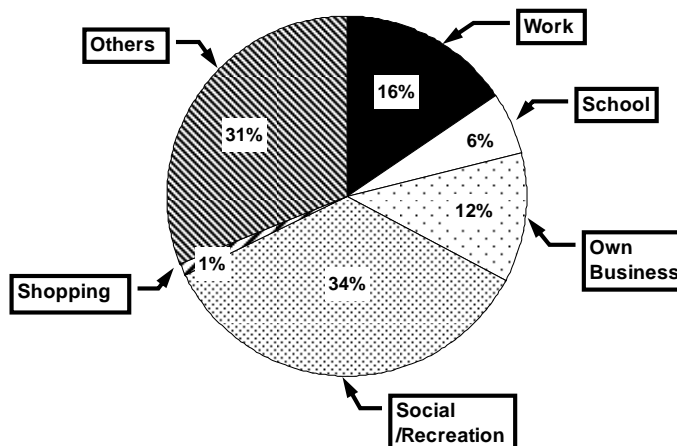
Some attributes of interviewees were identified through the Questionnaire survey as follows:

a) Trip Purpose

Same as the other transport modes as previously discussed, the major purpose is 'Social/Recreation'.

**Table 5.2-20 Trip Purpose**

	Number	%
Work	31	15.6
School	11	5.5
Own Business	23	11.6
Social/Recreation	70	35.2
Shopping	2	1.0
Others	62	31.2
TOTAL	199	100.0



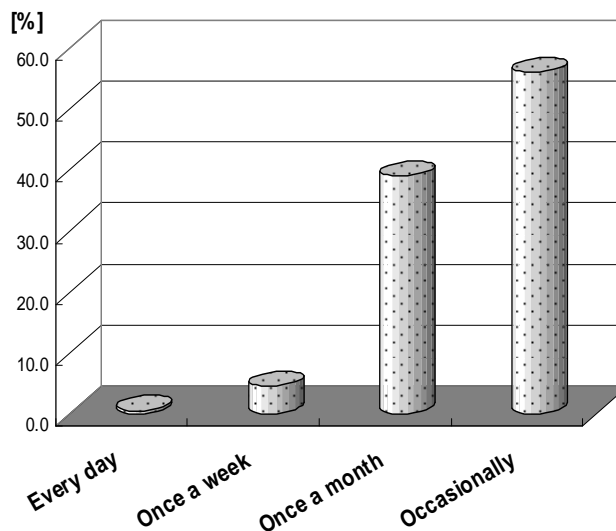
**Figure 5.2-23 Trip Purpose**

b) Frequency of Usage

The majority of the user travel 'Occasionally'.

**Table 5.2-21 Frequency of Usage**

	Number	%
Every day	1	0.5
Once a week	9	4.5
Once a month	78	39.0
Occasionally	112	56.0
TOTAL	200	100.0



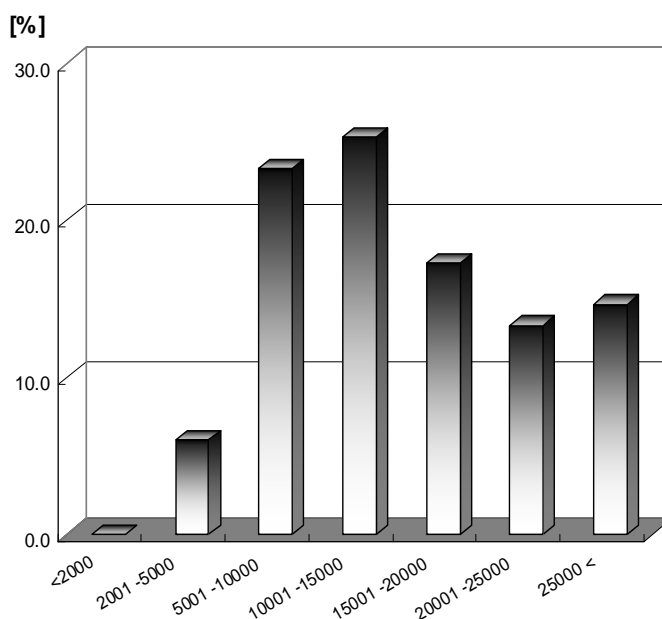
**Figure 5.2-24 Frequency of Usage**

c) User's Monthly Income

Average monthly income of the users ranges from BDT 5,000 to 15,000.

**Table 5.2-22 User's Monthly Income**

	Number	%
<2000	0	0.0
2001-5000	9	6.0
5001-10000	35	23.3
10001-15000	38	25.3
15001-20000	26	17.3
20001-25000	20	13.3
25000<	22	14.7
TOTAL	150	100.0



**Figure 5.2-25 User's Monthly Income**

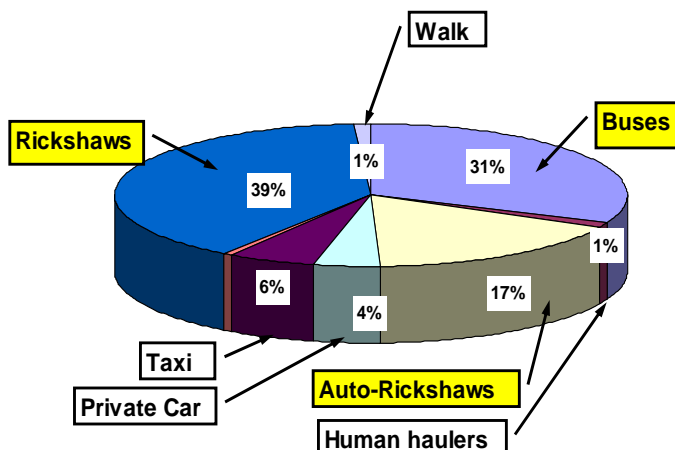
(5) Users' transport behavior and evaluation for the terminal service provision

a) Access/Egress Transport Mode

City buses, auto-rickshaws and rickshaws are the main access/egress transport moods. To the contrary, almost all egress transport means are city buses.

**Table 5.2-23 Access Transport Mode**

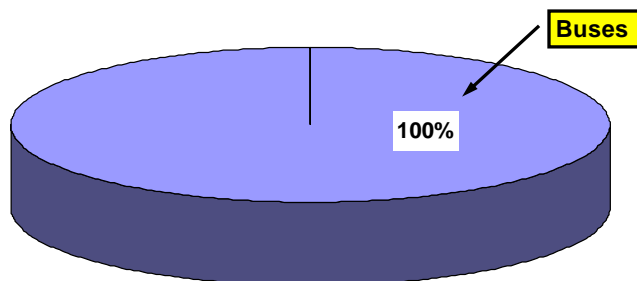
	Number	%
Buses	61	31.4
Human hauler	2	1.0
Auto-Rickshaw	33	17.0
Private Car	8	4.1
Taxi	11	5.7
Motor Cycle	1	0.5
Rickshaw	76	39.2
Walk	2	1.0
Train	0	0.0
Water Transport	0	0.0
TOTAL	194	100.0



**Figure 5.2-26 Access Transport Mode**

**Table 5.2-24 Egress Transport Mode**

	Number	%
Buses	23	100.0
Human hauler	0	0.0
Auto-Rickshaw	0	0.0
Private Car	0	0.0
Taxi	0	0.0
Motor Cycle	0	0.0
Rickshaw	0	0.0
Walk	0	0.0
Train	0	0.0
Water Transport	0	0.0
TOTAL	23	100.0



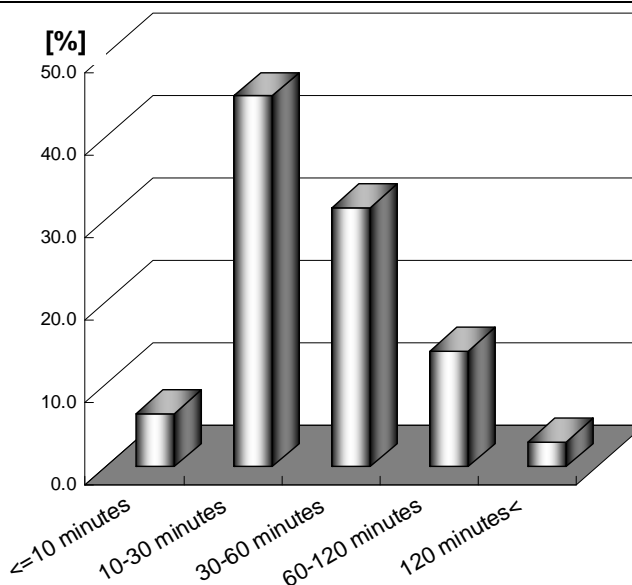
**Figure 5.2-27 Egress Transport Mode**

b) Waiting Time

The majority of the users' have to wait for 10 to 60 minutes to catch the transport.

**Table 5.2-25 Waiting Time**

	Number	%
<=10 minutes	13	6.5
10-30 minutes	90	45.0
30-60 minutes	63	31.5
60-120 minutes	28	14.0
120 minutes<	6	3.0
TOTAL	200	100.0



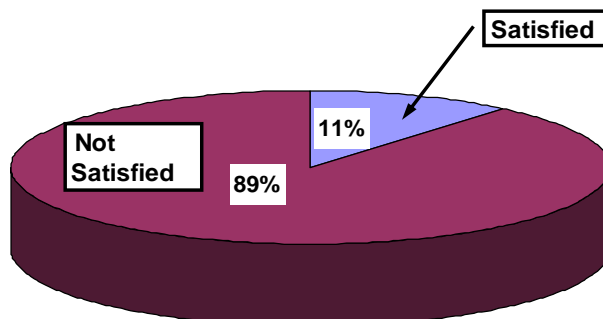
**Figure 5.2-28 Waiting Time**

c) Level of Satisfaction for Information Service Provision

Level of satisfaction is quite low. About 90% passengers are not satisfied with the present information provision service system at the water transport terminals.

**Table 5.2-26 Level of Satisfaction**

	Number	%
Satisfy	22	11.0
Not Satisfy	178	89.0
TOTAL	200	100.0



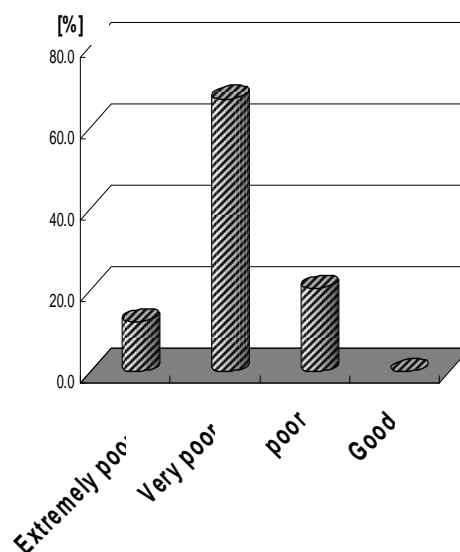
**Figure 5.2-29 Level of Satisfaction**

d) Evaluation of Service Rank

Service evaluation level is very low. About 90% of the passengers ranked the service status either 'Poor' or 'Very poor'.

**Table 5.2-27 Service Rank**

	Number	%
Extremely poor	24	12.3
Very poor	131	67.2
poor	40	20.5
Good	0	0.0
TOTAL	195	100.0



**Figure 5.2-30 Service Rank**

### 5.3 Traffic Movement Study on Rickshaw

#### 5.3.1 Objective of the Study

The objective of the study is to find the travel pattern characteristics of rickshaw within the Dhaka City. Travel pattern characteristics encompass the travel speed, travel time, trips, trip length etc. In this study, it has been selected ten (10) locations from the ten zones, where the zones defined by the DCC (Here the zones are simply the administrative units i.e. to ease the DCC administrative work and to provide service to the city dwellers effectively. In order to that the total DCC area was divided in smaller units is called zone). The underlying objective to choose the survey location in this way is to get an overall scenario regarding the travel pattern characteristics of rickshaw movement within the DCC territory.

#### 5.3.2 Outline of the Survey

##### (1) Survey Period

Rickshaw traffic movement GPS survey was carried out for 10 days (1 day per 1 location) within the period from 12 July 2009 to 4 August 2009.

The period of survey was around 7:00 a.m to around 9:00 p.m (Bangladesh Local Time).

Time of Survey: 12 July 2009 to 4 August 2009

Period of Survey: 7:00 a.m to 9:00 p.m

##### (2) Survey Location

Rickshaw Traffic movement GPS survey locations are shown in Table 5.3-1. Here in the table it has been mentioned local area name where the rickshaw owner (Garage) location is placed. Also it has been assigned a location ID (example R1, where 'R' stands for Rickshaw and then one integer number in chronological order) in order to visualize in the map, illustrated in the following figure.

**Table 5.3-1 Rickshaw GPS Survey Location**

Location ID	Rickshaw Owner Location	Survey Date
R1	Gopibag	12July 2009
R2	Basabo/Madertek	14July 2009
R3	Hazaribag	16July 2009
R4	Mohammadpur	20July 2009
R5	Jatrabari	22July 2009
R6	Manik Nagar	25July 2009
R7	Azimpur (Section)	27July 2009
R8	Kallayanpur	30July 2009
R9	Badda	02Aug 2009
R10	Uttara	04Aug 2009

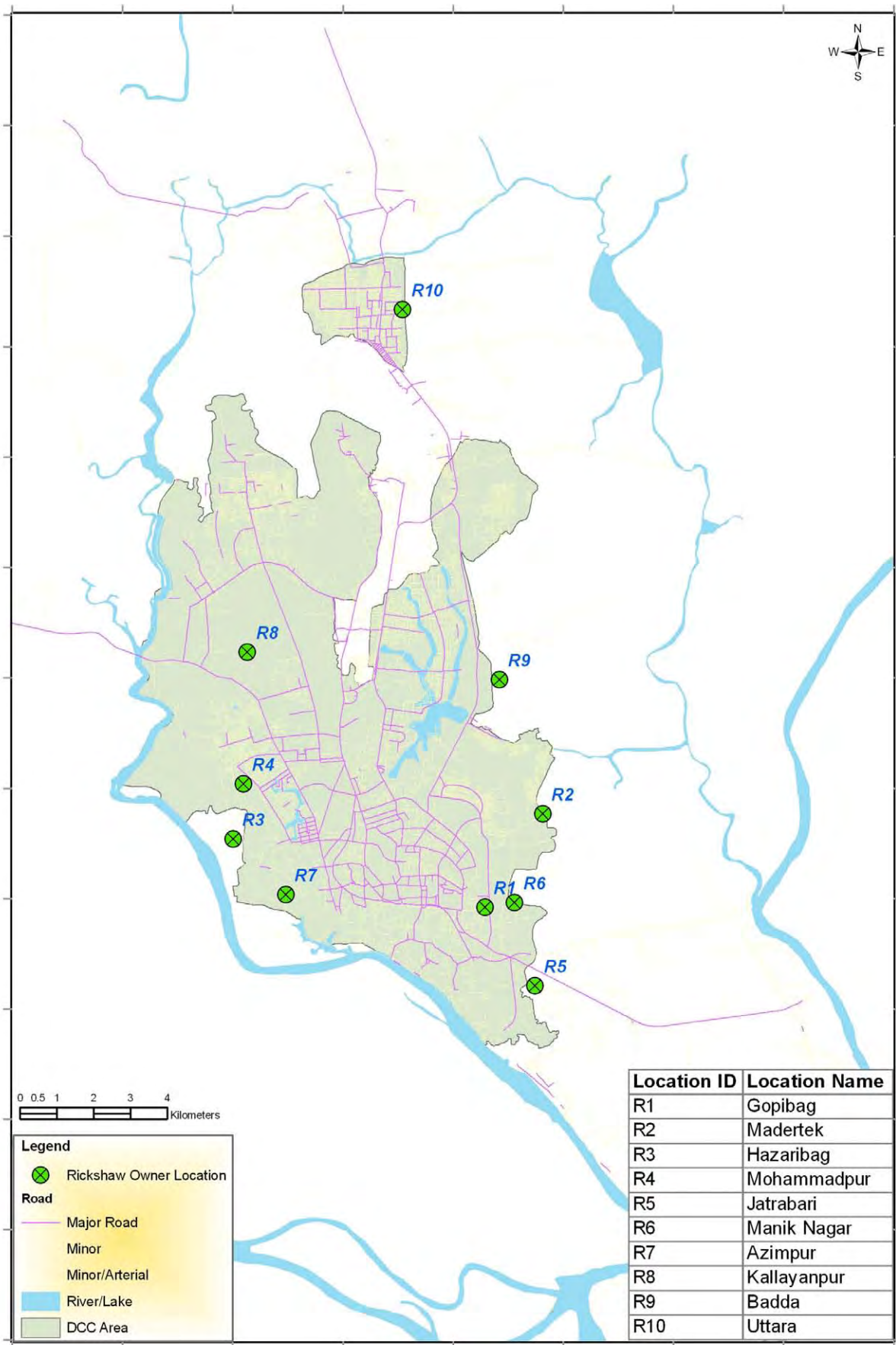


Figure 5.3-1 Location of Rickshaw Traffic Movement GPS Survey



## (3) Sample Size

In each location, ten (10) samples were selected i.e. total 100 (10x10) survey sample's (Rickshaws) GPS survey were carried out. But, sometimes unfortunately after downloading the data from GPS device to computer, it was found data errors due to mechanical failure of the GPS device or operational failure of the survey person. So the numbers of effective survey samples were shown in the Table 5.3-2 below.

**Table 5.3-2 Sample size of Rickshaw Traffic Movement GPS survey**

Location ID	Rickshaw Owner Location	No. of Samples Surveyed	No. of Effective Sample	Effective Sample Rate (%)
R1	Gopibag	10	8	80%
R2	Basabo/Madertek	10	8	80%
R3	Hazaribag	10	8	80%
R4	Mohammadpur	10	7	70%
R5	Jatrabari	10	9	90%
R6	Manik Nagar	10	10	100%
R7	Azimpur (Section)	10	10	100%
R8	Kallayanpur	10	10	100%
R9	Badda	10	9	90%
R10	Uttara	10	9	90%
<i>Total</i>		<i>100</i>	<i>88</i>	<i>88%</i>

**5.3.3 Procedure of the Survey**

## (1) Equipment used for the Survey

In this study the following equipment was used

- Product Name : Wireless GPS Logger  
 Trade Name : Holux  
 Model No. : M-241  
 Powered by : One AA Battery (12 Hours)  
 Memory size : Record up to 130, 000 position including latitude, longitude, time and altitude  
 Dual Interface : Bluetooth or GPS-mouse by USB cable  
 Logging mode : By distance or time, unit by kilometer or mile and 3 languages (English, Traditional Chinese, and Simplified Chinese) support.

**Figure 5.3-2 Wireless GPS Logger**

## (2) Survey Procedure

## a) Set up Equipment

There are six (6) operational modes in this GPS device:

- i. Track Log Mode
- ii. Time Mode
- iii. Show Position Mode
- iv. Show Speed and Altitude Mode
- v. Measure Distance Mode
- vi. Setting Mode

First, GPS device has been set-up by the user before going for survey in the field to log the data.

In the device enter the Setting Mode, and then follow the steps in Box 1.3-1

**Box 1.3-1 Steps to Set the GPS Device**

>>Distance By menu > select “Point” – signifies that measure distance is by point.

>>Km/mile Menu > select “km” – signifies that the units of measure distance and show speed in km.

>>Log Record menu > select “Full Stop” – signifies that recording the log data in full memory and then stop recording.

>> Log by Time menu > select number of sec “30”. – signifies that recording log data by time and in every 30 sec it will record one waypoint.

>> Log by Distance menu > skip this option – since log by time is selected.

>> Language menu > select Language “English”

>> Auto Log Menu > select “Yes” – signifies that after switch on the device it will search for connecting satellite signals and automatically start the log record.

In the Time Mode option, go to select the Time Zone Adjustment. This is UTC<sup>1</sup> time receiving from GPS, which can't be adjusted but time zone selecting is allowed. Selected Time zone adjustment is +7, to meet the Bangladesh local time (during the period of survey, it was DST<sup>2</sup>).

## b) Distribution of Equipment

The GPS survey supervisor visits the rickshaw owner location (Garage) previous day of the day when he intends to carry out the survey, in order to make them (rickshaw owner and pullers) understand the purpose and procedure of the survey, because sometimes they misunderstood and not want to cooperate to carry out the survey. So that was the challenge of the supervisor to

<sup>1</sup> UTC means Greenwich Mean Time (Coordinated Universal Time)

<sup>2</sup> DST means Daylight Savings Time (during DST Bangladesh Local Time is UTC+7)

persuade them to cooperate and carry the GPS device with them (rickshaw pullers) when driving the rickshaw for survey.

On the next day, very early morning the supervisor goes to the rickshaw owner place and distributes the GPS device among the ten pre-selected rickshaw pullers and switch on the device to make the device ready for data logging. Here the supervisor took one cautionary measure, i.e. he has to wrap up the device with thin polythene to make the GPS device water tight, because, during the survey period it was rainy season in Bangladesh.

c) Collection of Equipment

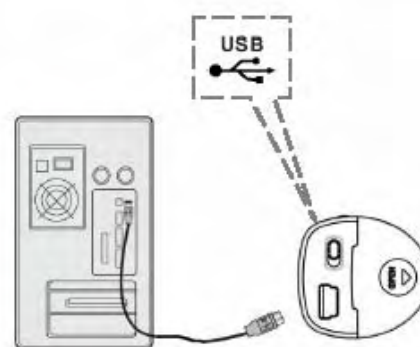
At the evening of the day of survey, the supervisor goes to the rickshaw owner place to collect the GPS device from the rickshaw puller. Sometimes he had stay for more than one hour because the rickshaw pullers return to the owner place at different time.

d) Download of Collected Data

In order to download data, two steps are followed,

*Step-1: Connecting device to PC*

M-241 supports two kinds of connection to PC, through USB cable or Bluetooth. In this survey, USB connection is used. GPS device connection to PC through USB cable is shown as follows.



**Figure 5.3-3 Device Connection to PC through USB Cable**

*Step-2: Download the data*

In this study HoluxUtility.exe application software is used to download the log data to PC after connecting the device to the PC and easily export the log data.

“Holux Logger Utility” allows the user to adjust Track Log Setting and Track Log Format Conversion and Track Log Photo Link. Utility main screen includes four sub pages:

Page 1: Device Setting

Page 2: Track Log Setting

Page 3: Track Log Format

Page 4: Track Log Photo


In this study no track log photo has been taken, so this page has been skipped. The Page setting has illustrated below Box 1.3-2 with chronological action steps next.

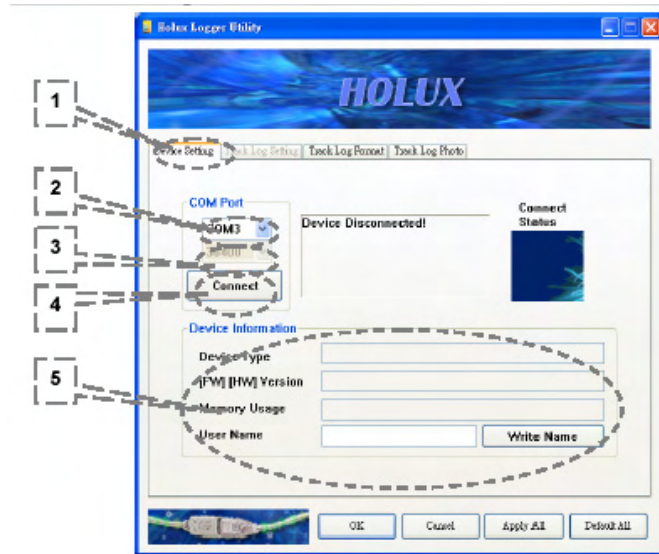
e) Changes of Battery

M-241 wireless GPS logger is powered by one AA alkaline battery and the battery changes after every one day (avg. 12 hours) GPS survey.

**Box 1.3-2 Holux Logger Utility Setups**

**Page1: Device Setting**

1. Page: Device setting page.
2. COM Port: Select COM Port.
3. Baud rate: Select Baud rate. (Default: 38400)
4. Connect: Connect the Holux Logger Utility to device.
5. Device Information: If the device connected to Holux Logger Utility, the **device information** will show a descriptive message and the **Connect button will change to Disconnect**. The device LCD will show an “” icon.



**Page 2: Track Log Setting**

1. Page: Track Log Setting Page.
2. Record Style: Select Record Style- **Full and stop**
3. Log Argument: Select Log Argument- **30 sec**
4. Upload: Go to upload Track Log Data from Device to PC- **Click on it**
5. Clear: Clear All Data of Device- **after down loading the clear the device by clicking on it**
6. Apply All: Set “Track Log Setting” and save these settings in device – **click on it**
7. Default All: Update all setting to default. (If the user wants to save “Track Log Setting” in the device, please click the “Apply All” button)



**Box 1.3-3 Holux Logger Utility Setup**

On click “**Upload**” button (step-4) in page-2 Track Log setting the following popup menu will appear



1. Directory: Select the directory for saving.
2. Directory: If the user has Image files for Track Log Data, please go to select the image directory after the “Combine JPG file” item has been selected.
3. Write Total Track Log: If the “Write Total Track Log” is selected, Utility will save total log data to another file (\*.trl) and “\*.kml” file.
4. OK: Upload log data to “\*.trl” files on the selected directory. If the user executes step 2, it will combine the image files and log data to a “\*.kml ” files else it will create “\*.kml” files without image combined.
5. Cancel: Do nothing, and exit.

**Page 3: Track Log Format**

1. Page: Track Log Format Page.
2. Directory: Select the track log source file (\*.trl) that you are uploading.
3. Time Zone (UTC+-): Select the time zone as device time zone (UTC).
4. Output Format: Select the output file format that you want to convert.



5. Convert: Convert the source file (\*.trl) to the selected file format.
6. Apply All: Set “Track Log Setting” and save these settings in the device.
7. Default All: Update all settings to default. (click “Apply All” button to save “Track Log Setting”)



### 5.3.4 Analysis of Survey Result

#### (1) Analytical Items

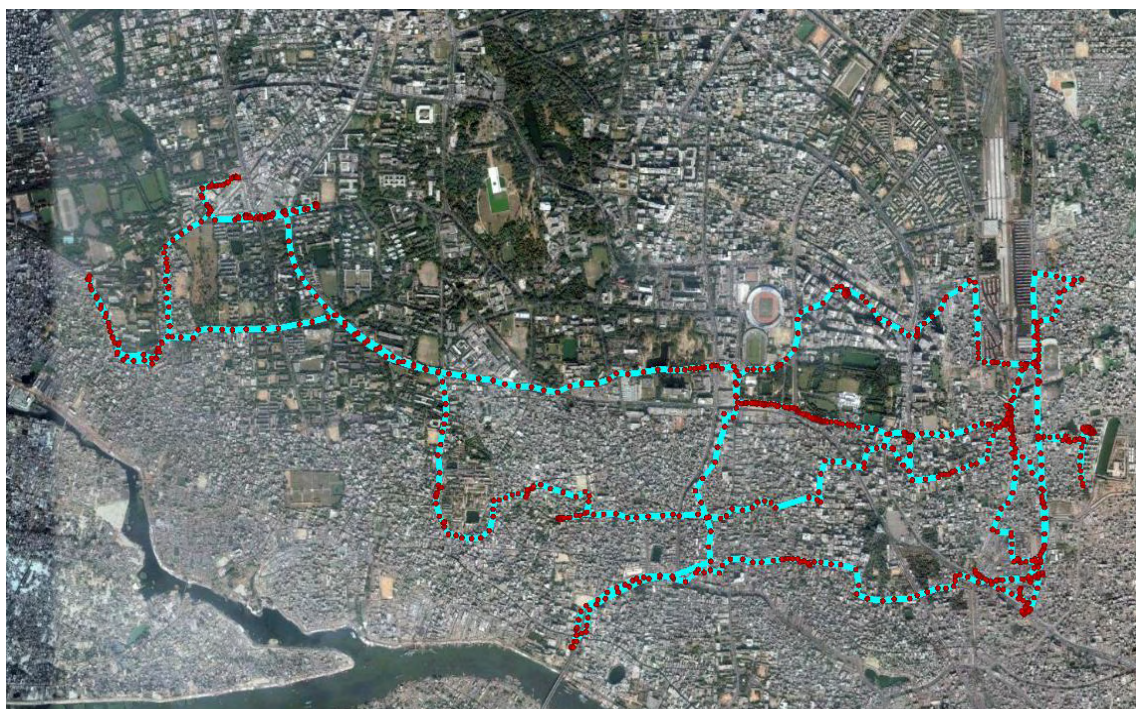
The analytical items are initially as follows;

- ✓ Working time and running distance
- ✓ Area of Rickshaw Movement
- ✓ Working time and running distance
- ✓ Number of Trips and Trip Length
- ✓ Number of Trips and Travel Time
- ✓ Number of Trips and Travel Speed

#### (2) General Trip Analysis

##### a) Trace Map

After downloading the rickshaw movement GPS survey track log data as “\*.kml” file format, it can be visualize in the Google Earth map. Here in Figure 5.3-4 visualizing one day one sample data in the trace map, illustrating the path/route followed the rickshaw movements with passenger. On the map the red points are the waypoints and blue lines are path/route traveled in one day by one rickshaw. Within the route where the points are densely placed, it reveals that either the rickshaw was waiting for the passenger hiring or be the traffic congestion at that time on that particular route, particular place.



**Figure 5.3-4** An example of waypoints and route of Rickshaw movement on Google Earth

b) Area of Rickshaw Movement

Here the “area” means the extended domain figured out through observation the movement of the rickshaw associated with the survey location.

The location of rickshaw movement GPS survey was shown in the map and from each location ten samples (rickshaws) were chosen. These ten rickshaws movement extent in respect of area was shown in the map.

The following map demarcating by ring represents each respective movement extent. Actually all the ten rickshaws’ movement at one location tends to concentrate within that area encompasses by the ring.

It is obvious that the shape of the ring is not identical. The area of movement of location R1, R2, R5, R6 projected towards western side as because these locations are placed in the south-eastern fringe of Dhaka city area, which triggers the tendency of movement of the city dwellers towards western or central core area of city. The opposite criteria are attributable for the locations of R3 and R7, which are placed at the south-western fringe of Dhaka city. The tendency of the dwellers in these areas is to travel/move towards the north and north-east direction the core area of city.

Regarding the location of R4, R8 and R9, the shape of the ring of movement areas are projecting towards the north-south direction, particularly for the location area of R4 (Dhanmondi / Mohammadpur / Rayer Bazar), R8 (Shaymoli / Agargaon) and R9 (Basabo/Madertek / Khilgaon) the movement pattern is in the north-south direction as the city dwellers develop their residential growth pattern in that direction. So the shape describes the inherent tendency of the dwellers of these domains is to move towards the North-South direction.

Finally, the movement area of location R10 (Uttara) is nearly concentrated in the northern fringe end of DCC, as because in the south of Uttara the most important and busiest airport road, which is rickshaw free and far east & west side still not fully developed as residential area. As a result the dwellers movements are concentrating immediately around the Dhaka-Mymensing Road. For short distance travel, people of this area use the rickshaw.

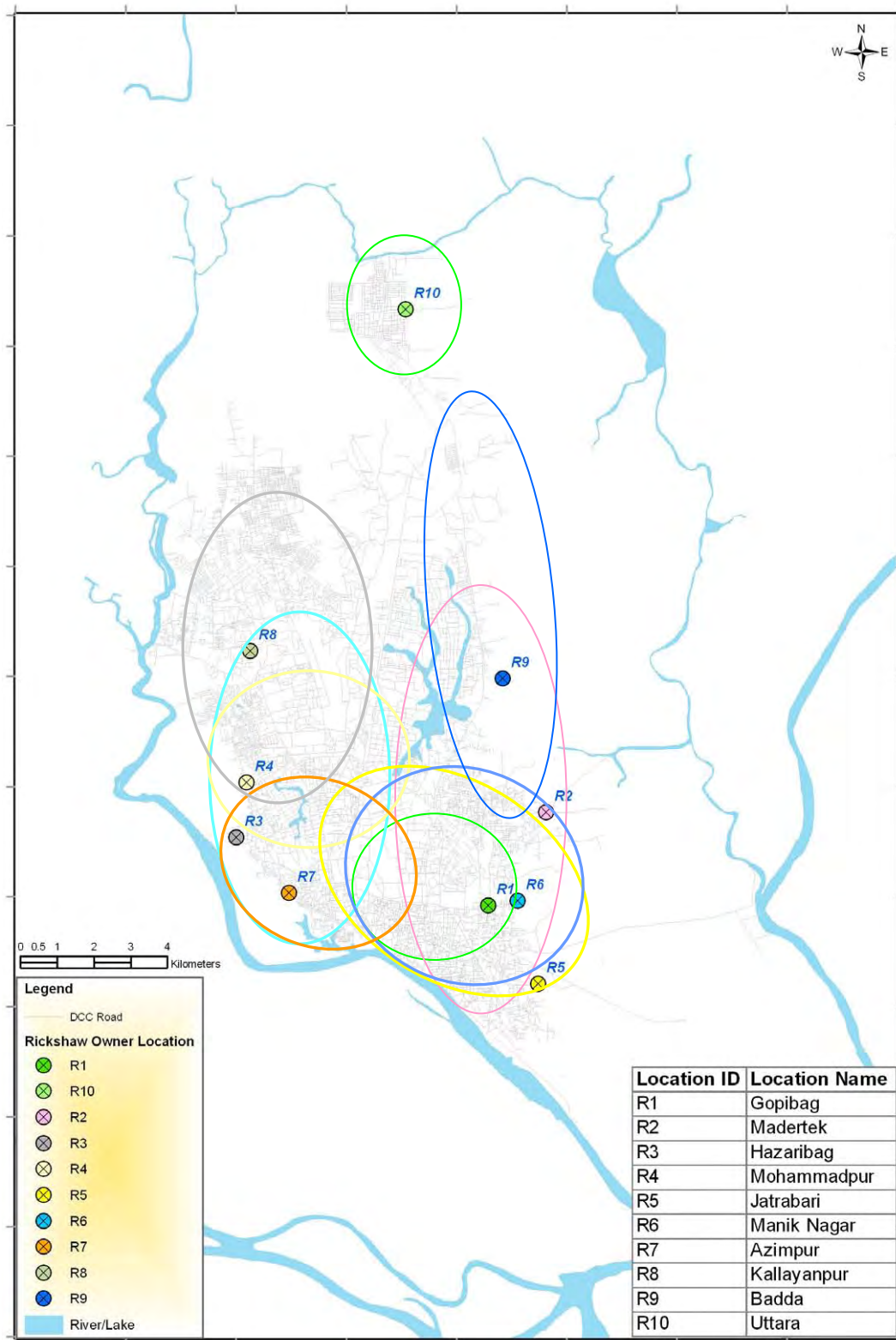


Figure 5.3-5 Area of Rickshaw Movement



## c) Working time and running distance

In the following Table 5.3-3 the working time (hr/sample) and running distance (km/sample) are given. Here in the table the value worked out for working time and running distance only from the effective sample. Definition of working and running distance are given below:

**Working time = Finishing time – starting time**

Here, Finishing time = the time when the rickshaw puller stopped his work/movement (normally in the evening/early night).

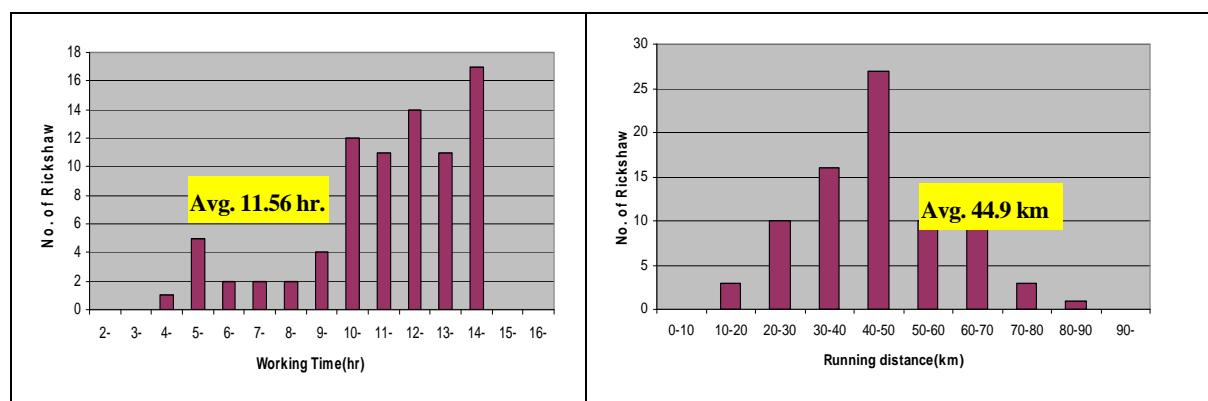
Starting time = the time when the rickshaw puller started his work (normally in the very morning)

**Running distance = the distanced traversed by the rickshaw puller from start to finish.**

**Table 5.3-3 Rickshaw traffic movement GPS survey working time and running distance**

Location ID	Rickshaw Owner Location	Rickshaw	
		Working Time (hr/sample)	Running Distance (km/sample)
R1	Gopibag	10.90	36.6
R2	Basabo/Madertek	10.40	42.9
R3	Hazaribag	11.16	50.9
R4	Mohammadpur	12.09	47.1
R5	Jatrabari	11.51	46.0
R6	Manik Nagar	9.57	41.4
R7	Azimpur (Section)	13.07	50.7
R8	Kallayanpur	13.48	45.6
R9	Badda	13.51	59.3
R10	Uttara	9.86	31.5
	<i>Average</i>	<i>11.56</i>	<i>44.9</i>

Frequency of working time and running distance of rickshaw traffic movement is shown in the Figure 5.3-6. The average working time of rickshaw is 11.56 hours per sample per day and the average running distance is 44.9 km per sample per day. From the statistics of the GPS survey data, it has been found that about 70% rickshaw pullers' average working time is more than ten (10) hours per day and 33% rickshaw pullers' running working distance is within the range of average running distance.



**Figure 5.3-6 Working time and running distance**

### (3) Detailed Trip Analysis

In this study, each track log data of (\*.kml) rickshaw traffic movement GPS survey has been look into vigorously in Google Earth. From careful observation of log data and recognizing the travel pattern, it has been identified the trip and its start/end point. Once identifying the trip, trip time and distance has been calculated easily. Here the analyzer, should have enough discretionary power to identify the trip (with passenger), waiting time, running time (without passenger), return back to owner location and he also should have to be familiar with the location (like whether the location is residential, commercial, office area, school/college or market place, bus-stoppages, railway station etc.), then it is easy to identify the trip, waiting and running condition to see the waypoints and route/path on Google Earth.

The distance is calculated in excel spreadsheet from the latitude/longitude of waypoints following the spherical law of cosine formula:

$$D = \text{Acos}(\sin(\text{lat1}) * \sin(\text{lat2}) + \cos(\text{lat1}) * \cos(\text{lat2}) * \cos(\text{lon2} - \text{lon1})) * R$$

Where, D = Distance in Kilometer

$\text{Acos}(\text{lat1})$  = Arc cosine of Latitude of point-1

$\sin(\text{lat2})$  = Sine of Latitude of point-2

$\cos(\text{lat1})$  = cosine of Latitude of point-1

$\cos(\text{lat2})$  = cosine of latitude of point-2

$\cos(\text{lon2} - \text{lon1})$  = cosine of difference of longitude of point-1 and point-2

R = earth's radius (mean radius = 6,371 km)

(All the values of latitude and longitude used in this formula is in radians)



Figure 5.3-7 An example of Trip identification on Google Earth

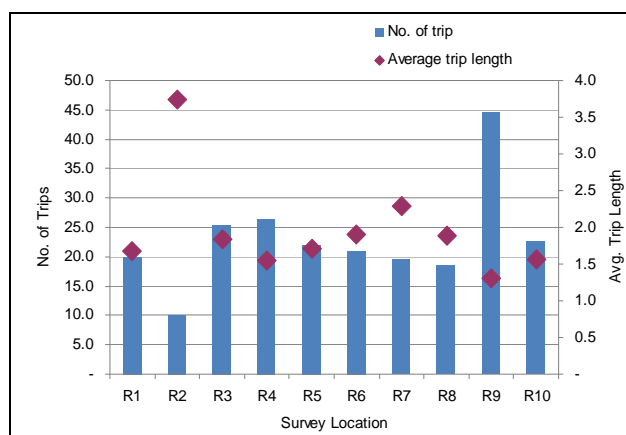
(4) Number of Trips and Trip Length

Numbers of trips (avg. per location per sample per day) and trip length (km/trips) in each survey location are shown in the Table 5.3-4.

Table 5.3-4 Number of Trips and Trip Length

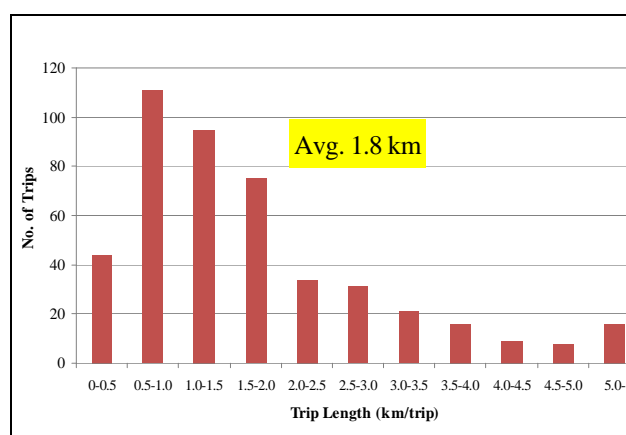
Location ID	Rickshaw owner Location Name	Avg. No. of Trips with passenger (trips/sample-day)	Avg. Trip Length (km/trips)
R1	Gopibag	20.0	1.7
R2	Basabo/Madertek	10.0	3.7
R3	Hazaribag	25.5	1.8
R4	Mohammadpur	26.5	1.5
R5	Jatrabari	22.0	1.7
R6	Manik Nagar	21.0	1.9
R7	Azimpur (Section)	19.5	2.3
R8	Kallayanpur	18.5	1.9
R9	Badda	44.5	1.3
R10	Uttara	22.5	1.6
	<i>Average</i>	<i>23.0</i>	<i>1.8</i>

Average number of trips and average trip length is shown in the Figure 5.3-8 against the survey location, where the graph illustrates that in location R2 the no. of avg. trips are lowest (10 trips) but the avg. trip length is maximum (3.7 km/trip) and in location R9 the avg. no. of trips are maximum (44.5) but the avg. trip length is lowest (1.3 km/trip).



**Figure 5.3-8** Avg. no. of trips and trip length per location

The frequency of trip length is shown in the Figure 5.3-9. From figure it has been observed that avg. trip length is 1.8 km/trip and 65% trips lay within the trip length 1.5 km and maximum number (23%) trips is less or equal to the length of 1.0 km/trip. From which it can be concluded that for short trips particularly people use rickshaws.



**Figure 5.3-9** Trip length

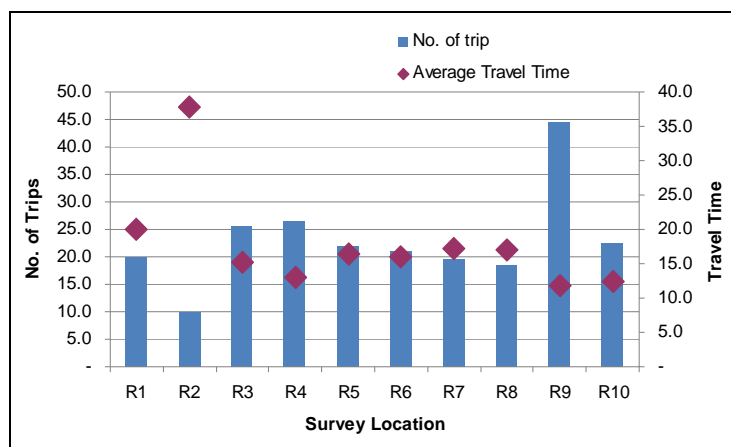
(5) Number of Trips and Travel Time

Travel time (in min) per trips is shown in the Table 5.3-5, where the average travel time is 15.6 minutes. Relation among Travel time against trips in each location area is shown in Figure 5.3-10.

**Table 5.3-5** No. of Trips and Travel Time

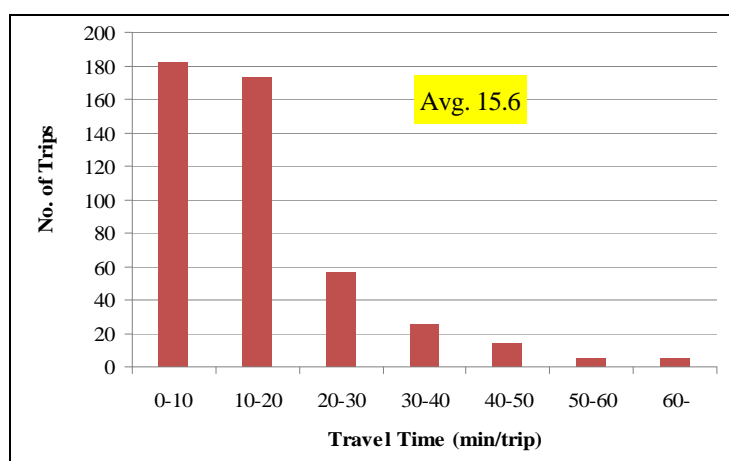
Location ID	Area Name	No. of Trips (trips/sample)	Travel Time (min/trips)
R1	Gopibag	20.0	19.9
R2	Basabo/Madertek	10.0	37.8
R3	Hazaribag	25.5	15.1
R4	Mohammadpur	26.5	12.9
R5	Jatrabari	22.0	16.4
R6	Manik Nagar	21.0	16.0
R7	Azimpur (Section)	19.5	17.1
R8	Kallayanpur	18.5	17.1
R9	Badda	44.5	11.9
R10	Uttara	22.5	12.4
	<b>Average</b>	<b>23.0</b>	<b>15.6</b>

Avg. no. of trips per sample per location and avg. travel time (in min) per trips per location is shown in the Figure 5.3-10. Since in the location R2 the avg. length is more, so it takes more time to complete trip and the vice-versa for the location R9. This travel time is the summation of mainly travel time, congestion time and capability of the rickshaw puller how he drives.



**Figure 5.3-10 No. of Trips and Travel Time versus Survey location**

The frequency of travel time per trips per day is shown in Figure 5.3-11. From chart it has been observed that 31% trips travel time lies within 10 minutes and 29% trips travel time lies within 10 to 20 minutes. So their avg. travel time is in between them i.e. 15.6 minutes.



**Figure 5.3-11 Travel Time**

(6) Number of Trips and Travel Velocity

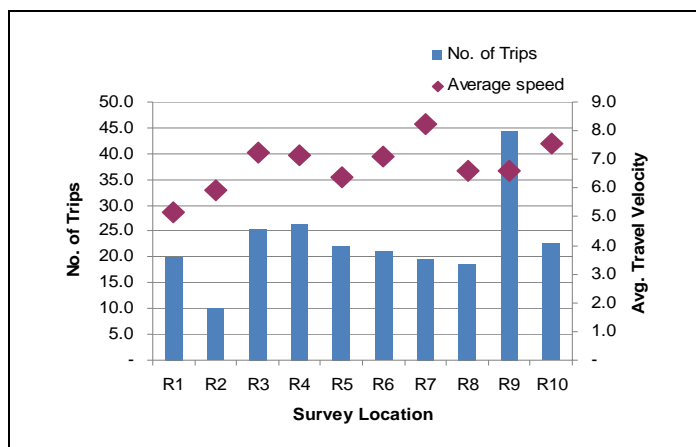
Number of average trips and travel velocity in each survey location are shown in the Table 5.3-6. The relation between average trip length and travel velocity are shown in and Figure 5.3-12 in Figure 5.3-13 respectively.

**Table 5.3-6 No. of Trips and Travel Velocity**

Location ID	Rickshaw Owner Location Name	Avg. No. of Trips with passenger (trips/sample)	Travel Velocity (km/hr/trip)
R1	Gopibag	20.0	5.2
R2	Basabo/Madertek	10.0	5.9
R3	Hazaribag	25.5	7.2
R4	Mohammadpur	26.5	7.2
R5	Jatrabari	22.0	6.4
R6	Manik Nagar	21.0	7.1
R7	Azimpur (Section)	19.5	8.2
R8	Kallayanpur	18.5	6.6

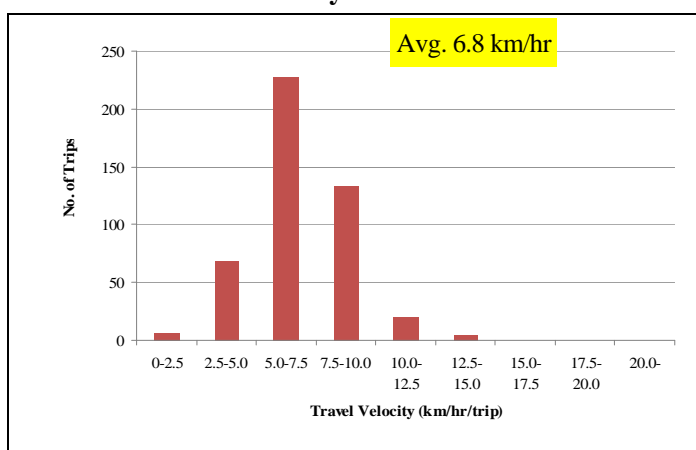
Location ID	Rickshaw Owner Location Name	Avg. No. of Trips with passenger (trips/sample)	Travel Velocity (km/hr/trip)
R9	Badda	44.5	6.6
R10	Uttara	22.5	7.6
	<i>Average</i>	23.0	6.8

Travel speed worked out from the distance travel per unit time; here the travel time per trip is the main contributor to the travel velocity. Because travel time varied from one location to another location due to many reasons like traffic congestion scenario, road condition, traffic mixed pattern etc.



**Figure 5.3-12 No. of Trip and Travel Velocity Versus Survey Location**

The frequency of travel velocity is shown in the Figure 5.3-13. From the chart it has been observed that maximum no. of trips (38%) travel velocity lies within the range of 5 to 7.5 km/hr as well as average travel velocity lies within that range.



**Figure 5.3-13 Travel Velocity**