CHAPTER 23: PUBLIC EXPERIMENT

23.1 Background of the Public Experiment

Public Experiment was carried out at designated two intersections, namely Gulshan-2 Circle and New Market between Monday 01 and Wednesday 03 March 2010 to monitor whether some traffic management counter measures are effective or not and to investigate whether such improvement measures are applicable into other intersections in near future in DCC and/or DMA.

23.2 Procedures of the Public Experiment

The first procedure of the Public Experiment is the Selection of the Intersections as shown in Figure 23.2-2.

In this Public Experiment, due to very limited budget and time framework, only 18 intersections which latest data are available from the traffic counts under The JICA Study Team in DCC were initially long listed.

However, some very important intersections, such as Gulshan-1 and Gulshan-2 Circles were not covered by the previous but latest traffic counts under The JICA Study Team, therefore, these two are covered by the extra traffic counts under the baseline surveys for the Public Experiment.

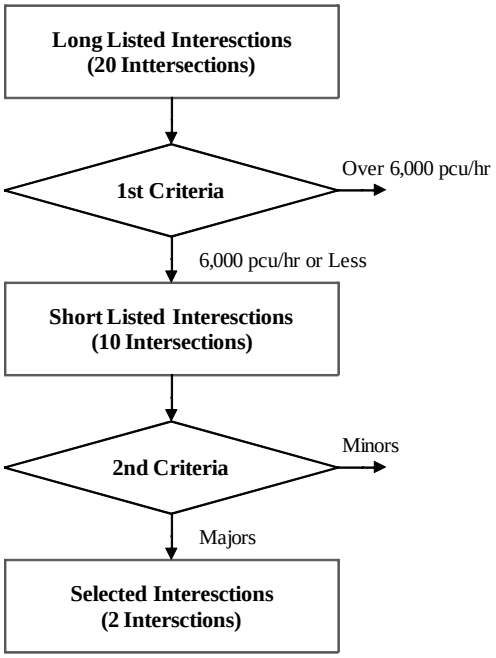


Figure 23.2-1 Selection of Intersections

As a result, total of 20 intersections were long listed and examined with their total traffic volume pass through each intersection during the morning and evening peak hours.

Figure 23.2-2 shows those 20 long listed intersections spread around in DCC, and Table 23.2-1 shows their morning and evening peak hour average traffic volume in passenger car unit (pcu) per hour.

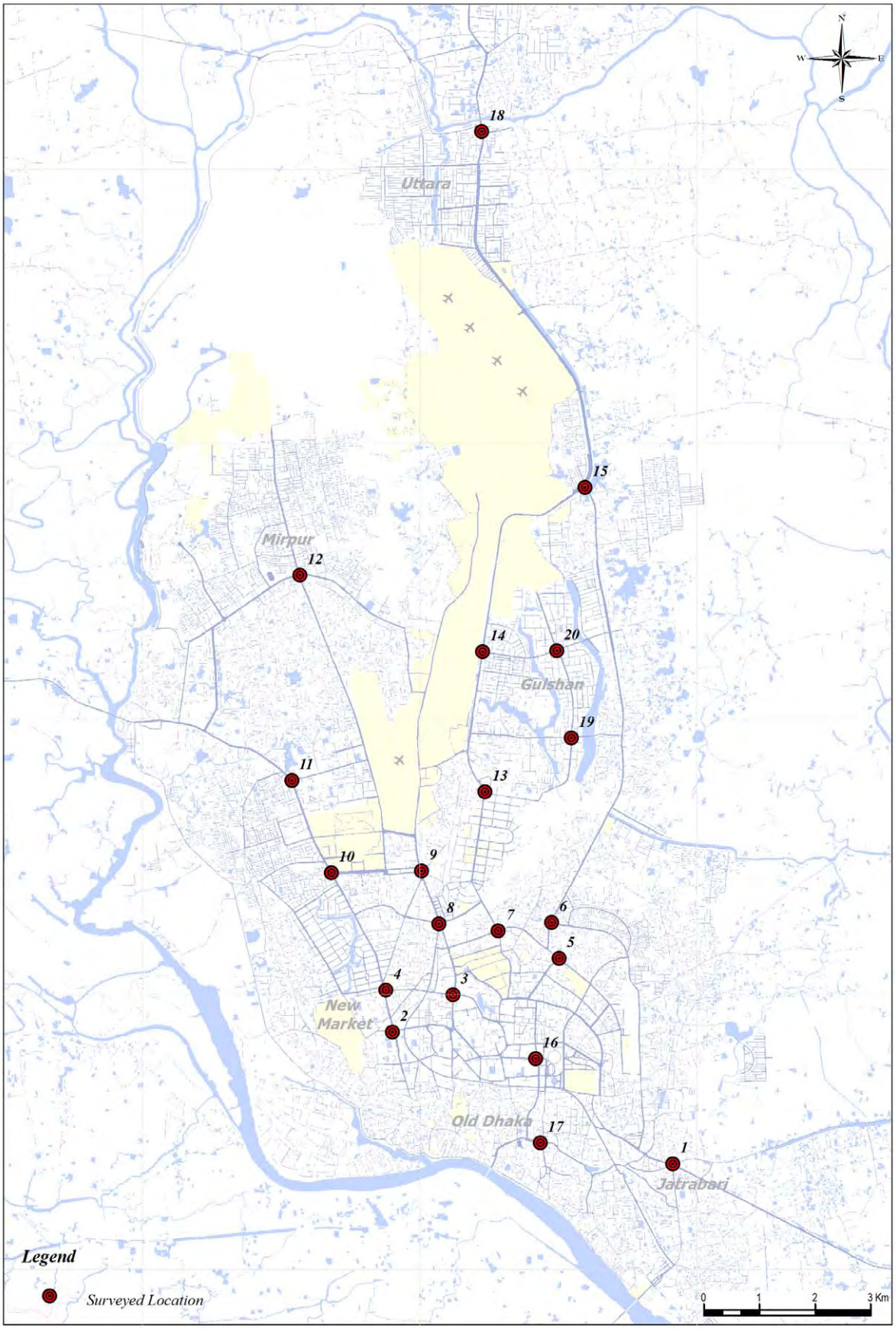


Figure 23.2-2 Long Listed 20 Intersections in DCC

Table 23.2-1 Average Traffic Volume of Long Listed 20 Intersections in DCC

IS No.	Name of Intersection	AM Average Volume (pcu/hr)	PM Average Volume (pcu/hr)	Less than 6,000 pcu/hr
1	Jatrabari	6,748	6,930	
2	New Market	5,231	4,212	√
3	Shahbag	6,849	7,401	
4	Science Lab	7,821	7,911	
5	Malibag	3,829	4,118	√
6	Malibag Rail X	5,370	5,474	√
7	Moghbazar	5,239	5,749	√
8	Sonargaon	10,709	9,891	
9(A)	Farmgate	4,530	3,969	√
9(B)	Farmgate	6,757	6,547	
10	Manik Mia Ave.	8,268	8,709	
11	Shishumela	7,347	6,857	
12	Mirpur-10	4,665	4,740	√
13	Nabisco	5,751	5,504	√
14	Kakoli	6,925	6,880	
15	Kuril Bisho Road	8,992	9,656	
16	GPO	6,826	6,971	
17	English Road	4,108	4,448	√
18	Abdullahpur	5,238	5,697	√
19	Gulshan-1	3,952	4,922	√
20	Gulshan-2	3,647	4,683	√
2	New Market	4,817	6,846	√

Note that traffic flowcharts and matrixes of those 20 intersections are summarized in the attached Technical Notes. In case of further improvement measures considered, refer those charts and matrixes for detailed study and/or analysis, such as calculation of saturated degrees of each intersection or volume capacity ratio (VCR) of approach and departure legs.

According to these data, 11 intersections handled less than 6,000 pcu per hour, however one of which is a part of much larger intersection, therefore 10 of those intersections handled less than 6,000 pcu per hour, and remaining 10 handled more than that.

To avoid too much side effects and/or severe negative impacts, such less traffic intersections are intentionally selected as short listed intersections, however, actual introduction of further improvement measures, such discarded intersection should be reinvestigated near future with much detailed survey and analysis.

Within the short listed 10 intersections, one major intersection from lower middle income area, and another major one from upper middle income area were again purposely selected. Those intersections are New Market and Gulshan-2 as Public Experiment locations.

23.3 General Conditions of the Selected Intersections

New Market Intersection

New Market intersection is located southwest side of DCC, and there are two slip ways constructed during the last decade at northwest and southeast corners. In addition, one long divider was installed along northern approach to divide left turn traffic from north to east.

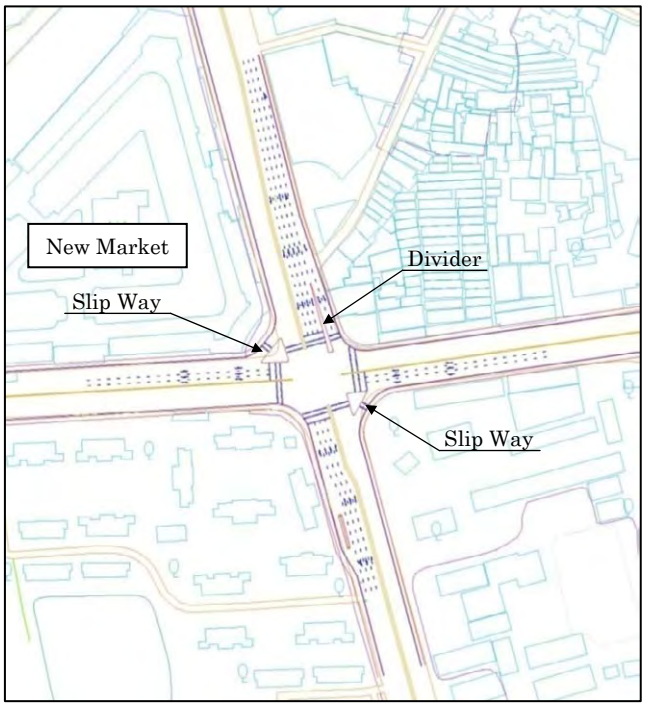


Figure 23.3-1 Layout of New Market Intersection

About land use around intersection, a large scale public market is located on northwestern side and complex of small vendors are located northeastern side. Government staff quarters are located southwestern side, and institutional facilities are located southeastern side as shown in Figure 23.3-1.

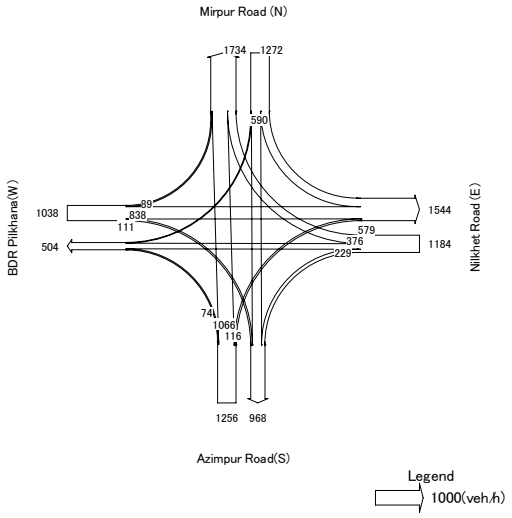
Traffic along North-South axis is dominant with route buses and private cars; on the other hand, traffic along West-East axis is dominant with rickshaws. Average vehicle traffic pass through this intersection was around 4,800 pcu per hour in the morning peak hours and around 6,850 pcu per hour in the evening peak hours. Average pedestrian volume crossing this intersection was around 3,300 persons per hour in the morning peak hours and 6,700 persons per hour in the evening peak hours.

As shown in the Figure 23.3-2, there are relatively large vehicle movements connecting between north and east sides during morning hours. On the other hand, there is massive movements by mainly rickshaws are observe between west side and east side.

And slightly large volume of pedestrian crossing at north and east sides are observed during morning hours, on the other hand, during evening hours, north side movement become about double meanwhile west side movement become much bigger to reach almost 2,450 persons per hour.

Signal cycle of this intersection is around 190 seconds in the morning as well as evening.

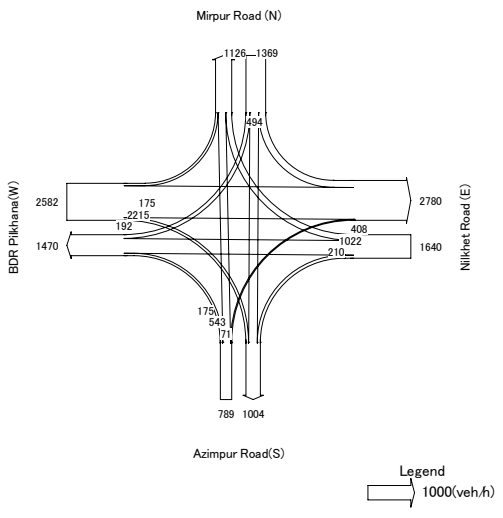
Vehicle Movements at New Market Intersection for AM Average



Out Going

In Coming	N	E	S	W	Total	Percent
N		590	628	54	1,272	26.8%
E	579		229	376	1,184	24.9%
S	1,066	116		74	1,256	26.4%
W	89	838	111		1,038	21.8%
Total	1,734	1,544	968	504	4,748	100.0%
Percent	36.5%	32.5%	20.4%	10.6%	100.0%	

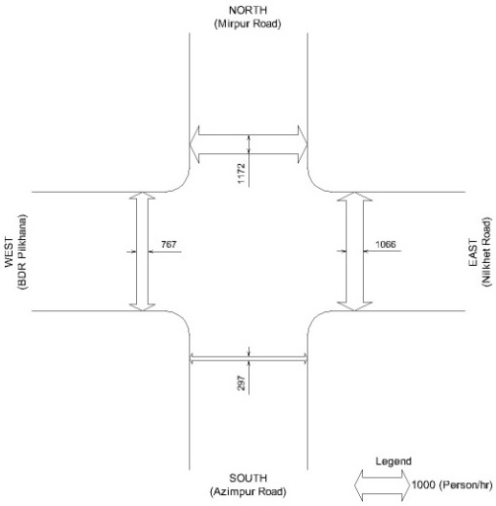
Vehicle Movements at New Market Intersection for PM Average



Out Going

In Coming	N	E	S	W	Total	Percent
N		494	602	273	1,369	21.5%
E	408		210	1,022	1,640	25.7%
S	543	71		175	789	12.4%
W	175	2,215	192		2,582	40.5%
Total	1,126	2,780	1,004	1,470	6,381	100.0%
Percent	17.6%	43.6%	15.8%	23.0%	100.0%	

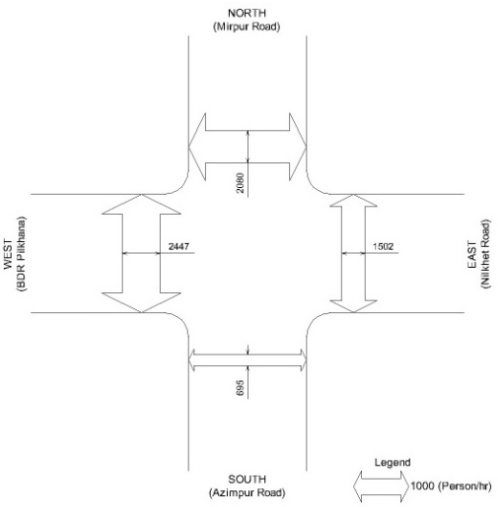
Pedestrian Crossing at New Market Intersection for AM Average



Out Going

In Coming	NW	NE	SE	SW	Total	Percent
NW		835	-	182	1,016	30.8%
NE	337		563	-	900	27.3%
SE	-	503		140	642	19.5%
SW	585	-	157		742	22.5%
Total	923	1,337	720	321	3,301	100.0%
Percent	27.9%	40.5%	21.8%	9.7%	100.0%	

Pedestrian Crossing at New Market Intersection for PM Average



Out Going

In Coming	NW	NE	SE	SW	Total	Percent
NW		741	-	930	1,671	24.9%
NE	1,339		843	-	2,182	32.5%
SE	-	659		214	873	13.0%
SW	1,517	-	481		1,998	29.7%
Total	2,856	1,401	1,325	1,144	6,725	100.0%
Percent	42.5%	20.8%	19.7%	17.0%	100.0%	

Figure 23.3-2 Vehicle & Pedestrian Movements at New Market Intersection before PE

Gulshan-2 Circle Intersection

Gulshan-2 Circle intersection is located at northern side of mid-east block (Gulshan Island) in DCC, and it was initially a well designed roundabout and converted as conventional intersection during last decade. Therefore this particular intersection has circle shaped left over at all four corners and they are utilized as left turn slip way as well as parking spaces for the nearby buildings and/or shops inside circle.

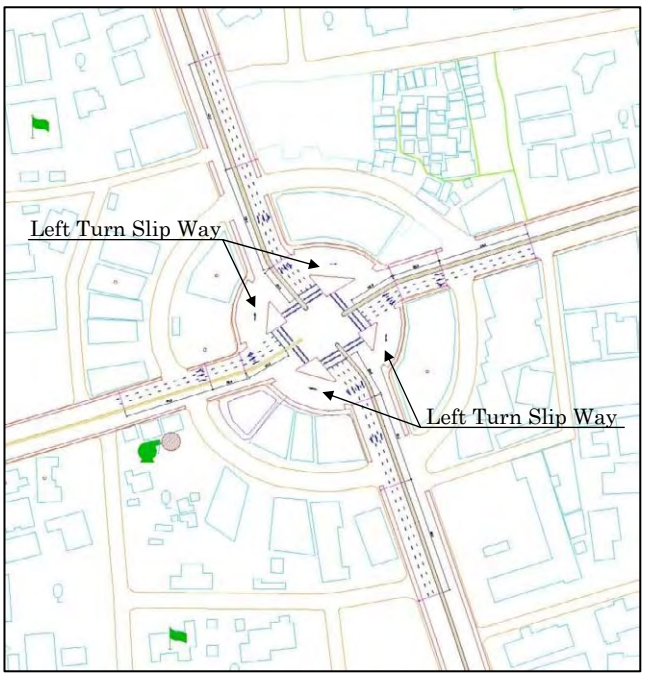


Figure 23.3-3 Gulshan-2 Circle Intersection

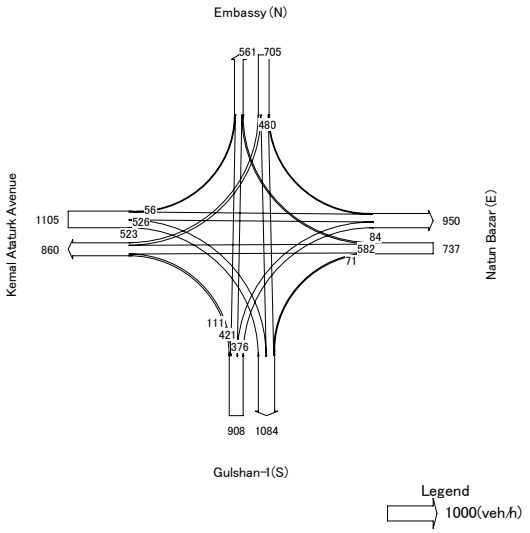
About land use around the intersection is mainly commercial as well as institutional and residential facilities for diplomatic missions and upper-middle to high income classes as shown in Figure 23.3-3.

Traffic passing through this intersection is mainly passenger cars and mini van as well as route buses and mini buses. Rickshaws and Auto Rickshaws are relatively less. Average vehicle traffic volume passing through this intersection was around 3,500 pcu per hour in the morning peak hours and around 4,500 pcu per hour in the evening peak hours. Average pedestrian volume crossing this intersection was around 2,900 persons per hour in the morning peak hours and 3,300 persons per hour in the evening peak hours.

As shown in Figure 23.3-4, relatively large number of vehicle movements between west and south side is observed, however major movements at this intersection are those of connecting between north and south as well as west and east sides during morning and evening.

Pedestrian crossing at this intersection is not so high. Signal cycle of this intersection is around 285 seconds in the morning as well as evening.

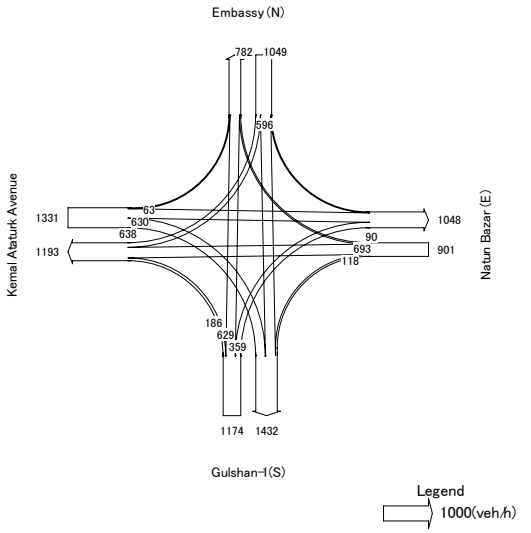
Vehicle Movement at Gulshan-2 Intersection for AM Average



Out Going

In Coming	N	E	S	W	Total	Percent
N		48	490	167	705	20.4%
E	84		71	582	737	21.3%
S	421	376		111	908	26.3%
W	56	526	523		1,105	32.0%
Total	561	950	1,084	860	3,454	100.0%
Percent	16.2%	27.5%	31.4%	24.9%	100.0%	

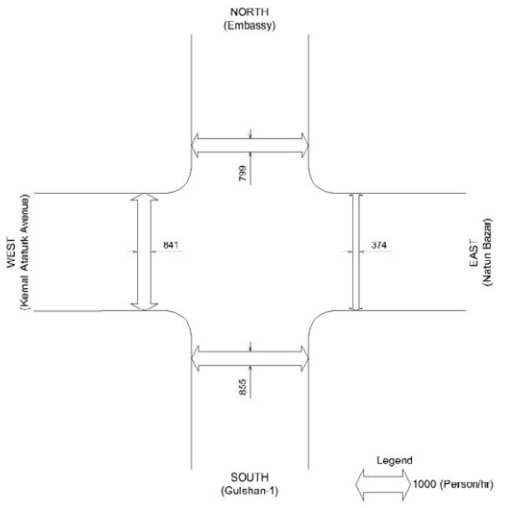
Vehicle Movement at Gulshan-2 Intersection for PM Average



Out Going

In Coming	N	E	S	W	Total	Percent
N		59	676	314	1,049	23.6%
E	90		118	693	901	20.2%
S	629	359		186	1,174	26.4%
W	63	630	638		1,331	29.9%
Total	782	1,048	1,432	1,193	4,455	100.0%
Percent	17.5%	23.5%	32.1%	26.8%	100.0%	

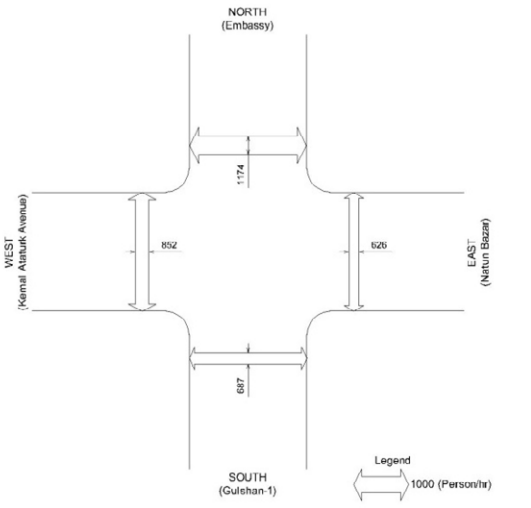
Pedestrian Crossing at Gulshan-2 Intersection for AM Average



Out Going

In Coming	NW	NE	SE	SW	Total	Percent
NW		398	-	470	868	30.2%
NE	401		210	-	610	21.3%
SE	-	164		212	377	13.1%
SW	371	-	643		1,014	35.3%
Total	771	562	853	682	2,868	100.0%
Percent	26.9%	19.6%	29.7%	23.8%	100.0%	

Pedestrian Crossing at Gulshan-2 Intersection for PM Average



Out Going

In Coming	NW	NE	SE	SW	Total	Percent
NW		874	-	353	1,227	36.7%
NE	300		395	-	695	20.8%
SE	-	231		440	672	20.1%
SW	499	-	247		746	22.3%
Total	799	1,105	642	794	3,340	100.0%
Percent	23.9%	33.1%	19.2%	23.8%	100.0%	

Figure 23.3-4 Vehicle & Pedestrian Movements at Gulshan-2 Circle Intersection

23.4 Observed Issues of the Selected Intersections

New Market Intersection

In this intersection following issues are observed during the baseline survey;

Vehicles;

- ✓ Drivers tend to ignore lanes which are not clearly marked especially when they make their turns, such as making right or U turn from mid or left lanes, or make left turn from mid or right lanes
- ✓ Drivers tend to enter relatively narrow slip ways for north approach to east exit from any lanes on the north approach
- ✓ Rickshaws tend to ignore traffic flow direction, especially on the north approach during the morning
- ✓ Buses tend to allow their passengers to get off from or get on to their buses whenever and wherever buses slow down or stop even buses are in the second or third lanes from the left

Pedestrians;

- ✓ Pedestrians tend to ignore traffic signals and less preference for use of pedestrian bridge when they need to cross the streets and/or intersection
- ✓ Pedestrians tend to walk carriageways since sidewalks are narrow and blocked by illegal parking vehicles, especially during the evening
- ✓ Pedestrians tend to jump on to or off from public busses whenever and wherever buses slow down or stop even buses are in the second or third lanes from the left

Figure 23.4-1 Samples of Observed Issues at New Market Intersection

Gulshan-2 Circle Intersection

In this intersection following issues are observed during the baseline survey;

Vehicles;

- ✓ Drivers tend to ignore lanes which are not clearly marked especially when they make their

turns, such as making right or U turn from mid or left lanes

- ✓ Buses tend to block east and west exits when they need to allow their passengers to get on especially during the morning on west exit and during the evening on east exit

Pedestrians;

- ✓ Pedestrians tend to ignore traffic signals and sometimes prefer to cross diagonally when they need to cross the streets and/or intersection
- ✓ Pedestrians tend to walk carriageways since sidewalks are narrow and blocked by illegal parking vehicles, especially during the evening

Figure 23.4-2 Samples of Observed Issues at Gulshan-1&2 Circle Intersections

23.5 General Findings and Counter Measures Proposed

Followings are general findings on traffic issues classified by 3E aspects (Engineering, Education, and Enforcement) during the baseline surveys;

Engineering

- ✓ Too Much Pedestrian against Narrow Sidewalks
- ✓ Not Properly Set Signal Cycle
- ✓ Not Properly Designed Geometry
- ✓ Not Properly Provided Street Lights (Especially inside Intersection)
- ✓ Not Properly Maintained Markings

Education

- ✓ Ignorance of Traffic Signal by (Especially) Pedestrian
- ✓ Ignorance of Lane Demarcation by Driver (Especially U-Tune & Right Turn)
- ✓ Illegal Parking by Rickshaw & Private Car near Intersection
- ✓ Illegal Boarding & Alighting by Passenger inside Intersection

Enforcement

- ✓ Less Control on Pedestrian

- ✓ Too Long or Frequent Override on Signal System
- ✓ Less Control on Rickshaw & Private Car Parking & Bus Stopping Near or Inside Intersections

Followings are proposed counter measures for the Public Experiment;

Engineering

- ✓ Installation of Traffic Corns along Left Lane as Temporally Sidewalk Space
- ✓ Readjusting Signal Cycle & Green Light Distributions
- ✓ Provision of Lane Markings (Arrows, Dividing, Stopping, Pedestrian Crossing, and Right Turn Guiding Lines)

Education

- ✓ Audio Guidance to All Road Users (Pedestrians, Drivers, Puller, etc.)
- ✓ Installation of Banners, and Distribution of Stickers & Leaflets

Enforcement

- ✓ Additional Control on Pedestrian
- ✓ Minimize Override on Signal System
- ✓ Additional Control on Rickshaw & Private Car Parking & Bus Stopping Near or Inside Intersections

Followings are proposed counter measures for further Technical Cooperation Scheme;

Engineering

- ✓ Widening of Sidewalk Space
- ✓ Introduction of 2-phase Signal Sequence System and/or Activator
- ✓ Provision of Exclusive Right Turn Lane
- ✓ Provision of Extra U-Turn Slit before Intersection
- ✓ Provision of Intersection Lighting System
- ✓ Introduction of One-Way Scheme on Minor Streets

Education

- ✓ Introduction of Traffic Park & Guidance for School Kids
- ✓ Introduction of Good Manner Driver Certificates

Enforcement

- ✓ Installation of Surveillance & Audio Warning System
- ✓ Introduction of Special Motor Cycle Units (Traffic)

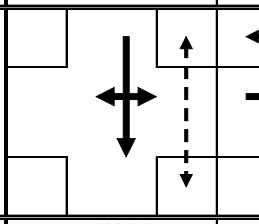
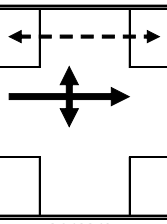
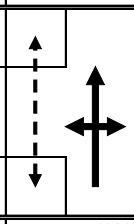
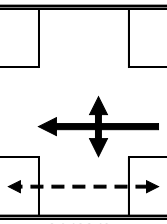
23.6 Computer Simulations based on the Traffic Signal Settings

As mentioned in the previous section, one of the reasons for too long queues and subsequent delay caused by such queues in most of intersections in DCC is evidently due to not properly

set traffic signals; one is too long cycle and the other is counter clock-wise single phase operation applied for such intersections.

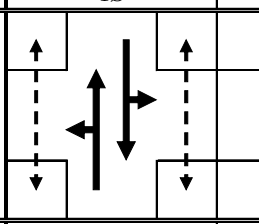
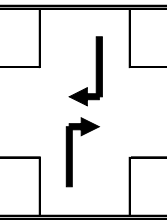
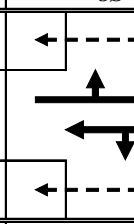
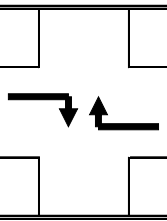
Therefore, the JICA Study Team has carried out series of computer simulations to find out the effects of modification of traffic signal settings, such as change of signal cycle time and signal sequences pattern from single to dual phases. Such measures are summarized in Figure 23.6-1;

Modified Signal Phase Plan-1 (Single)

Phase		1Ø	2Ø	3Ø	4Ø	Total
Schematics						
Signal Cycle Time (sec)	G	45/66/90	39/63/84	45/66/90	39/63/84	168/258/348
	Y	2	2	2	2	8
	R	1	1	1	1	4
	T	48/69/93	42/66/87	48/69/93	42/66/87	180/270/360

NM/G2/G1

Modified Signal Phase Plan-2 (Dual)

Phase		1Ø	2Ø	3Ø	4Ø	Total
Schematics						
Signal Cycle Time (sec)	G	57	27	57	27	168
	Y	2	2	2	2	8
	R	1	1	1	1	4
	T	60	30	60	30	180

Legend Vehicle Pedestrian

NM/G2/G1

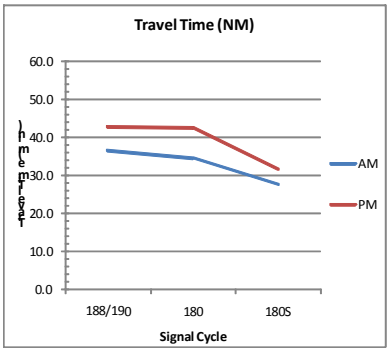
G : Green Y : Yellow R : Red T: Total

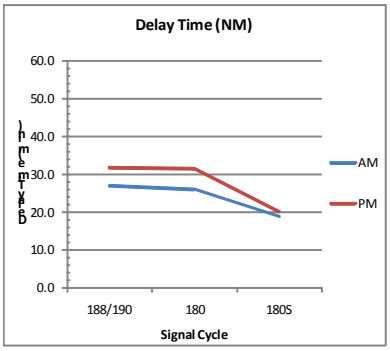
Figure 23.6-1 Proposed Traffic Signal Cycle & Sequence Pattern

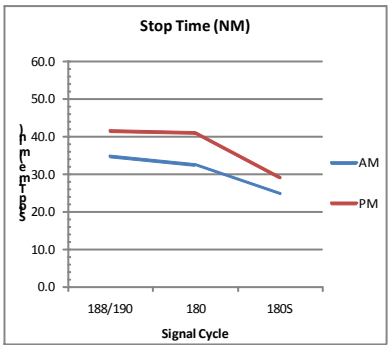
Figure 23.6-2 and Figure 23.6-3 indicates results of those computer simulations for New Market and Gulshan-2 Circle Intersections, respectively.

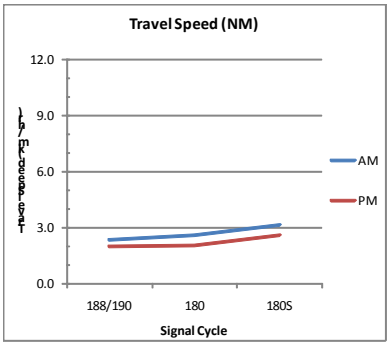
According to these results, minor modification of signal cycle time from current irregular length of 188/190 seconds to rounded length of 180 seconds for New Market or 286/283 to 270 for Gulshan-2 Circle will not provide so much improvement.

However, in case of New Market Intersection, modification of signal phase pattern from counter-clockwise single to both ways dual will provide better results, such as around 25 points reduction of travel time, and over 30 points reductions of delay and stop times. As a result, average travel speed will be improved by over 30 points as a whole although absolute speed is not so high.





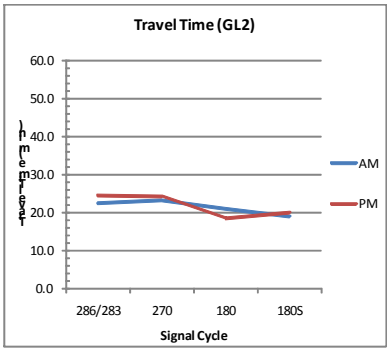


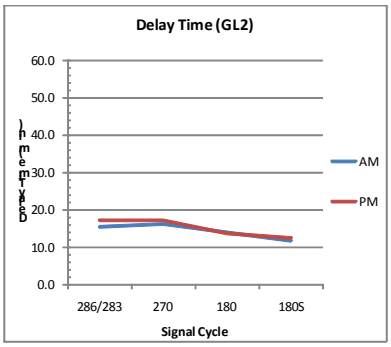


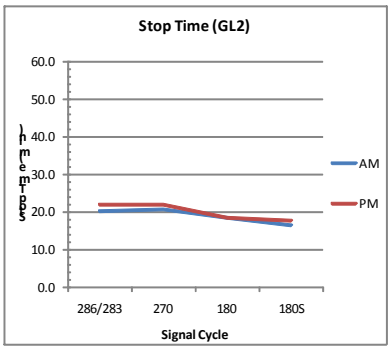
	Travel Time (min)		Delay Time (min)		Stop Time (min)		Travel Speed (km/hr)	
AM-188	36.5	*1.00*	27.2	*1.00*	34.8	*1.00*	2.4	*1.00*
AM-180	34.4	*0.94*	26.1	*0.96*	32.6	*0.94*	2.6	*1.11*
AM-180S	27.6	*0.75*	18.8	*0.69*	24.9	*0.71*	3.2	*1.34*
PM-190	42.9	*1.17*	31.8	*1.17*	41.6	*1.20*	2.0	*0.86*
PM-180	42.5	*1.16*	31.4	*1.16*	41.1	*1.18*	2.0	*0.87*
PM-180S	31.4	*0.86*	20	*0.74*	28.9	*0.83*	2.6	*1.11*

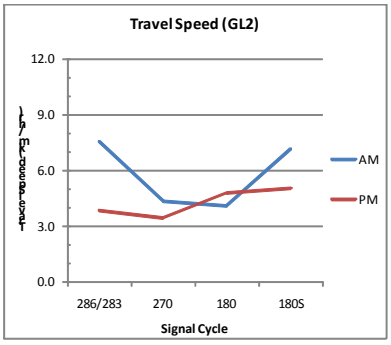
Left; Simulator Outputs, Right; Indexes

Figure 23.6-2 Results of Computer Simulations at New Market Intersection









	Travel Time (min)		Delay Time (min)		Stop Time (min)		Travel Speed (km/hr)	
AM-286	22.5	*1.00*	15.5	*1.00*	20.2	*1.00*	7.6	*1.00*
AM-270	23.2	*1.04*	16.4	*1.06*	20.9	*1.04*	4.4	*0.58*
AM-180	20.9	*0.93*	14.0	*0.90*	18.6	*0.92*	4.1	*0.54*
AM-180S	19.0	*0.85*	11.8	*0.76*	16.6	*0.83*	7.1	*0.95*
PM-283	24.5	*1.09*	17.3	*1.11*	22.1	*1.09*	3.8	*0.51*
PM-270	24.4	*1.09*	17.2	*1.11*	22.0	*1.09*	3.5	*0.46*
PM-180	18.5	*0.83*	13.7	*0.88*	18.5	*0.92*	4.8	*0.63*
PM-180S	20.0	*0.89*	12.6	*0.81*	17.7	*0.88*	5.1	*0.67*

Left; Simulator Outputs, Right; Indexes

Figure 23.6-3 Results of Computer Simulations at Gulshan-2 Circle Intersection

In case of Gulshan-2 Circle Intersection, with change of signal cycle time from 270 seconds or over to 180 seconds will improve some extents of those performance indicators between 7 and 10 points during the morning peak hours, and 16 and 24 points during the evening peak hours.

On the other hand, modification of signal phase pattern from counter-clockwise single to both ways dual will not provide so much improvements on first 3 indicators, namely travel, delay and stop times somehow, however, travel speed will be improved by 75 points in case of morning and 6 points in case of evening, if compared with that of counter-clockwise single pattern and signal cycle of 180 seconds.

23.7 Implementations & Results of Public Experiment

Before Public Experiment

Based on the site observations and computer simulations, following items are authorized to be implemented as Public Experiment in the Traffic Management Committee represented by DMC, DCC, and BRTA/C which chaired by DTCB in late January 2010;

- ✓ Installation of Lane Markings, Traffic Sign
- ✓ Installation of Traffic Corns along Left Lane as Temporally Sidewalk Space
- ✓ Readjusting Signal Cycle & Green Light Distributions

During Public Experiment

Public Experiment was carried out between Monday 01 and Wednesday 03 March 2010 after some night works and preceding traffic campaign from Monday 22 to Sunday 28 February 2010, following results are achieved, however, due to breakdown of control boards of traffic signals, readjustment of signal cycle and green light distribution was not done as proposed;

- ✓ Lane demarcation was clarified and traffic became smooth
- ✓ By securing sidewalk space, pedestrian can cross road safely

Recommendations

Following recommendations are advised from the results of the Public Experiment;

- ✓ Lane markings and traffic signs should be installed in major intersections in DCC, especially within the influence area of each intersection
- ✓ Enough sidewalk spaces at intersections in consideration of peak hour pedestrian volume are necessary
- ✓ Repair and regular maintenance of control boards of traffic signal are highly recommended

Comparisons

Observed seen before and during the Public Experiment are shown in Figure 23.7-1.

Before During

Figure 23.7-1 Before and During the Public Experiments

Other details of the baseline surveys (before PE) and the monitoring surveys (during PE), such as traffic counts, queue length and signal cycle surveys as well as travel speed surveys are summarized in the attached Technical Notes.

Note that, most of schools were closed during the baseline surveys in early January, and New Market was closed on the day of the monitoring survey on Tuesday 02 March 2010, therefore, direct comparisons between former data and later data may not reflect effect of the Public Experiment properly.

23.8 Traffic Campaign for the Public Experiment and Traffic Safety Awareness

Traffic Campaign was implemented in accordance with the Public Experiment implementation.

Objective

The objectives of the Campaign were;

- ✓ To inform the Public Experiment to the citizens
- ✓ To enhance traffic safety awareness and traffic manner in Dhaka
- ✓ To promote The Study Team and JICA presence among the citizens to enhance effective and efficient project implementation through local people's understanding and support.

Implementation Organizations

As it shown Figure 23.8-1, The Campaign and the Public Experiment related activities and the preparation were done in corporation with DTCB, TMC and The JICA Study Team.

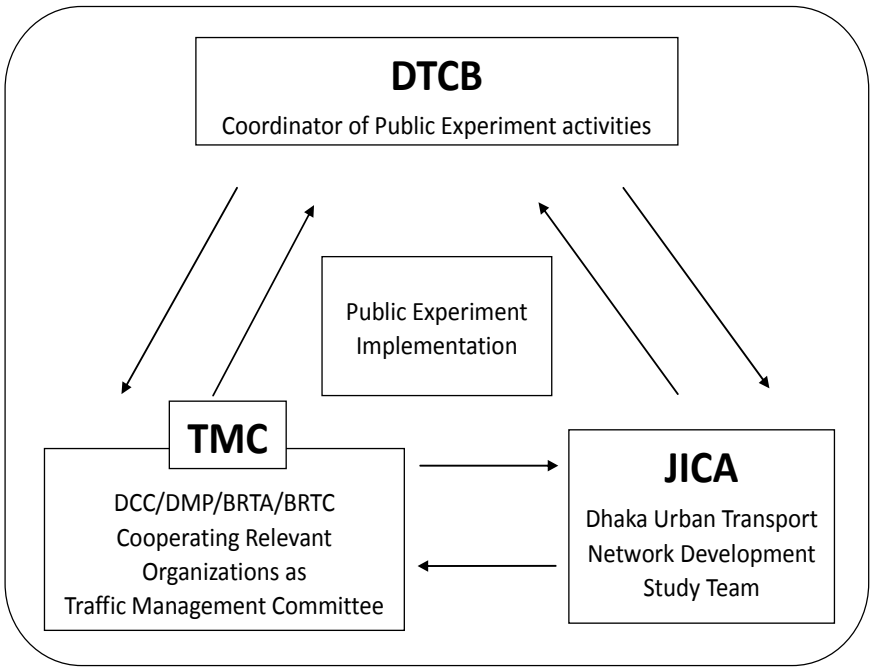


Figure 23.8-1 The Traffic Campaign and Public Experiment Implementation Relevant Organizations

Detail of the Campaign Implementation

The details of the Campaign implementation are shown below.

Duration: From 22 February to 3 March 2010

Target Area: Gulshan 2 and New Market Intersections

Means: Radio Spot

Newspaper

Poster for bus

Flyer for Road Users

Speaker to inform the Campaign and for the traffic Control and Guidance for road users.

Installation of Banners for showing direction of each road lane, information of the Public Experiment, and Traffic Awareness Slogan at the targeted intersections.

Activity

Traffic Control and Guidance, and distribution of flyer by volunteer at the targeted intersections (Gulshan 2 and New Market Intersection).

Opening ceremony of the Public Experiment in Gulshan 2 intersection by inviting Press.

The Result

At the beginning of the campaign activity at the targeted intersection, the road user didn't understand the meaning of the traffic manners and traffic guidance, so that it was sometime had argue between the volunteer and the road users or totally ignored the Traffic Guidance. However, as the campaign activity were known among the people through the Media Advertisement and intensive volunteers' effort at the site, Road users gradually started to follow the Traffic Guidance, then some of road users started to follow the traffic rule and manner by themselves. However, lack or breakdown of basic traffic infrastructure such as signal, pedestrian road, and other traffic equipment prevent road user from adequate traffic function use and safety. Therefore, traffic infrastructure improvement is also required together with traffic education.

Recommendation

Continuous Traffic Safety Awareness Activities by using Media and On-site Activities in corporation with Traffic Awareness Relevant Organization.

- ✓ Set up Traffic Safety Awareness Volunteer Group for Sustainable Traffic Guidance Activity to Support Traffic Police. Such as the Boy and Girl Scout.
- ✓ Verbal Traffic Awareness Activity such as Audio Guidance on site, TV/Radio Spot, and Set up Traffic Safety class is necessary especially for illiterate road users.
- ✓ Traffic Safety and Manner Education should be conducted for children at school.

CHAPTER 24: CONCLUSIONS AND RECOMMENDATION

24.1 Conclusions

24.1.1 Optimal Urban Transport Network Plan

The evaluation of the various alternative transport scenarios was done in terms of amount of potential users for MRT and impact on alleviation of road traffic congestion. Indices adopted in the evaluation are a) number of potential users, b) average degree of congestion, c) Total vehicle kilometer, and d) total time consuming.

As the results, it is concluded that in the year 2025, 'Do Minimum Scenario' can be the most optimal plan from the view point of the amount of expected demand, impact of alleviation of road traffic congestion and financial capability of the Bangladesh Government.

24.1.2 Public Transport Development Plan

(1) Public Transport Development Policies

Based on the public transport planning concept, the following four (4) key policies for public transport development policies are recommended as follows;

a) Introduction of mass transit system based on hierarchy of public transport system

Presently, the public transport systems in Dhaka are operating only road-based low capacity transit system. Therefore, it is necessary to introduce the Mass Rapid Transit (MRT) and Bus Rapid Transit (BRT) Systems to meet future transport demand.

b) Building integrated public transport system

Developing an intermodal public transport system consisting of MRT that is proposed to introduce to Dhaka and bus and para-transit systems requires the efficient integration and interconnection of the different public transport elements.

c) Public transport for low income group

According to the passenger preference, low income group people are used mainly for public bus. This is due that transport cost of public bus is comparatively cheaper than the other modes. It is necessary to improve conventional bus transport services in order to cope with the needs for the poor people.

d) Public transport system for promotion of urban development

In the context of Dhaka, the JICA Study Team proposes to develop the mass rapid transit railway (MRT) system in order to solve traffic congestion in the Central Business District

(CBD), to promote new urban development to accommodate increasing population and to promote appropriate urban development.

(2) Mass Transit System Plan

The MTS network plan is recommended in order to accommodate future population increase. In the year 2050, it may be necessary to construct MTS network as shown in Table 24.1-1 and Figure 24.1-1.

Table 24.1-1 Summary of MRT System Plan

	Section	Starting Point	Via	Terminating Point	System proposed by STP	Length (km)	Remarks
Line 1	Purbachar-Saidabad Line	Purbachar	DTI Road	Saidbad	BRT	23	
Line 2	Gastali - Saidabad Line	Gastali	New Market	Saidabad	BRT	14	
Line 3	UTTRA-Old Dhaka Line	UTTRA	Airport Road	Old Dhaka	BRT	26	
Line 4	UTTRA - Saidabad Line	UTTRA	Tajgaon	Saidabad	MRT	22	
Line 5	Circular Line	Badda	Mirpur	Badda	MRT	22	
Line 6	Pallabi -Saidabad Line	UTTRA Pahes 3	National Assembly	Saidabad	MRT	22	
Line 7	Purbachar-Savar Line	Purbachar	Zia Colony	Savar	-	22	Future line
Line 8	East Fringe Line	Tongi	Satarkul	Narayanganj	-	22	Future line

Source JICA Study Team

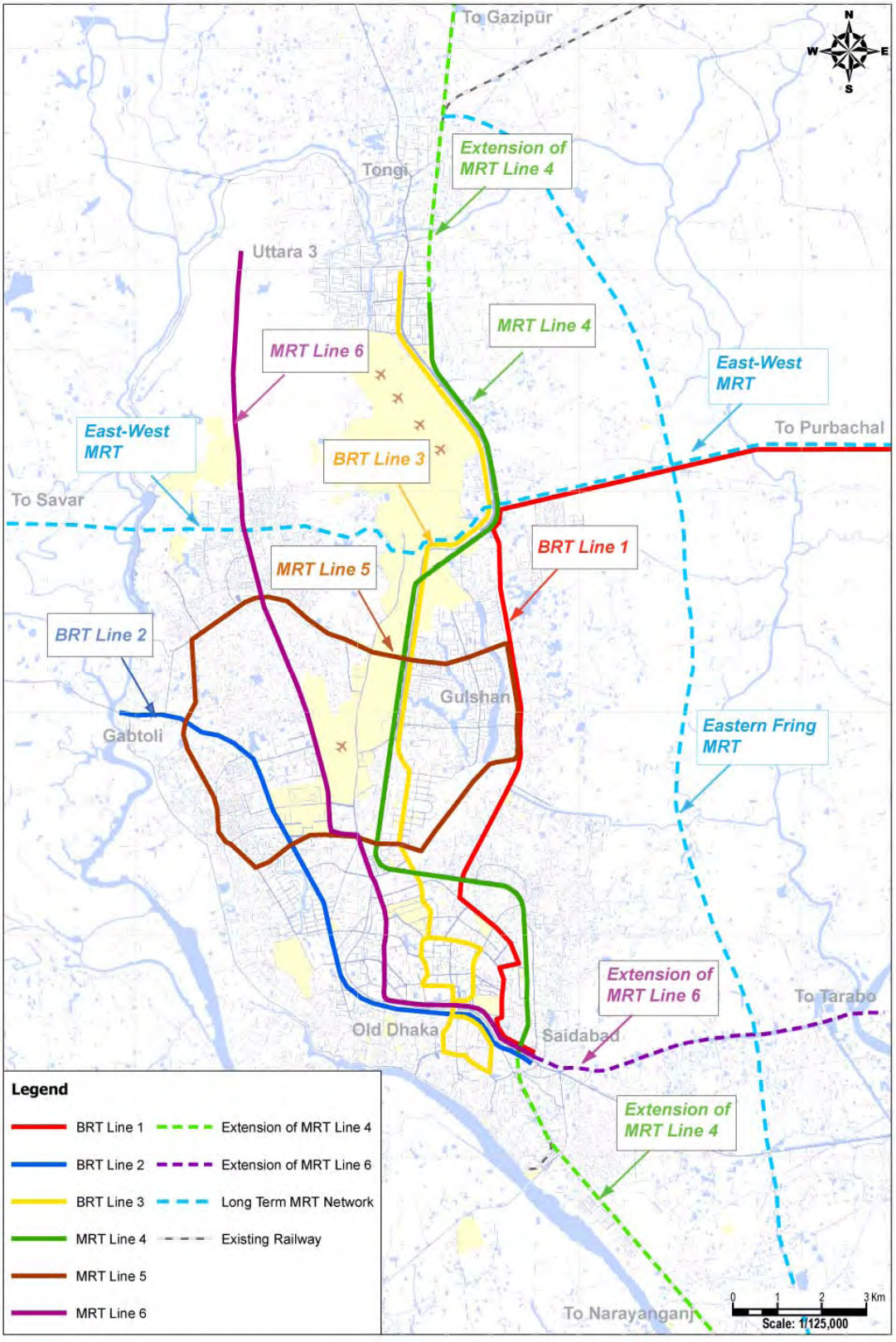


Figure 24.1-1 Mass Rapid Transit Plan

24.1.3 Road Network Plan

The principals of the road network development plan for DCC and DMA are;

a) To improve based on hierarchical and functional road network.
b) To improve the primary road network to link between CBD of Dhaka and urban cores, satellite communities and division centers.
c) To improve the missing link within the urbanized area in order to prepare efficient road network.
d) To develop the grid type road network for newly development areas taking into consideration the geographic feature of the East Fringe Area,
e) To construct the Urban Expressway to make backbone road network in the center of Dhaka.
f) To improve Inner Ring Road to serve traffic from Dhaka to regional centers in RAJUK area but also in Bangladesh.

While the principals of the road network development for RAJUK area are as follows;

a) To develop the road network taking into consideration hierarchy and road functions,
b) To development as concept of ring and radial road network,

The recommended road network development plan in DCC and DMA is shown in Figure 24.1-2.

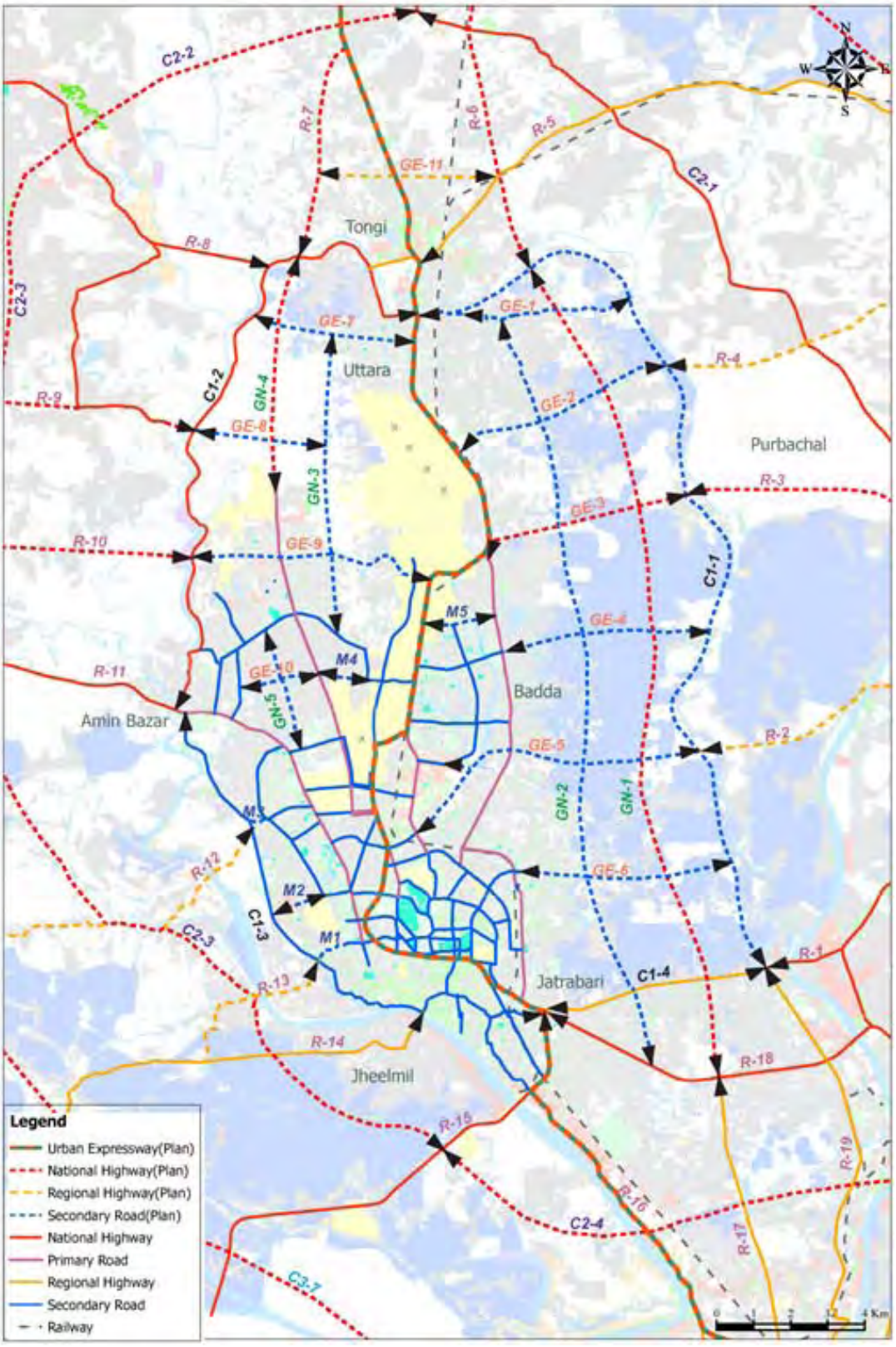


Figure 24.1-2 Recommended Road Network in DCC/DMA

24.1.4 Traffic Management Plan

The existing traffic congestion is largely caused by inadequate road usage due to a lack of traffic management. An appropriate systematic traffic management system is essential for safety and smooth traffic flows on roads, making a maximum usage of road facilities to enlarge the current road capacities.

- To achieve smooth traffic flow
- To reduce traffic accidents, and
- To create pedestrian –friendly facilities

To achieve the above-mentioned objectives, the traffic management plan composed of the following measures is recommended;

Table 24.1-2 Traffic Management Measures by Phase

Countermeasures	Short-Term	Medium-Term
● Improvement of bottleneck intersections	✓	
● Improvement of parking system	✓	✓
● Improvement of traffic safety facilities	✓	
● Improvement of traffic signal control	✓	✓
● Introduction of ITS system		✓
● Traffic safety education	✓	
● Institutional coordination	✓	

It is concluded that the intersection improvement and traffic safety awareness made in the public experiment are very effective to achieve smooth vehicle and pedestrian traffic flow. It is therefore recommended that continuous intersection improvement to the other intersections and traffic safety awareness should be made periodically.

24.1.5 Mass Rapid Transit System Line No. 6 Development

According to the STP proposal, the Line 6 connects between Pallabi in the north of the City and Saidabad in the south with the total length of 16 km. Taking into account future urbanization of Dhaka city, DHUTS is recommended its extension from Pallabi to Uttara-3 area, where RAJUK has undertaken large housing developments. Total length of proposed Line 6 is 22 km from Uttara-3 to Saidabad including 6 km of extension. Thus the Line 6 has two terminals and 16 intermediate stations.

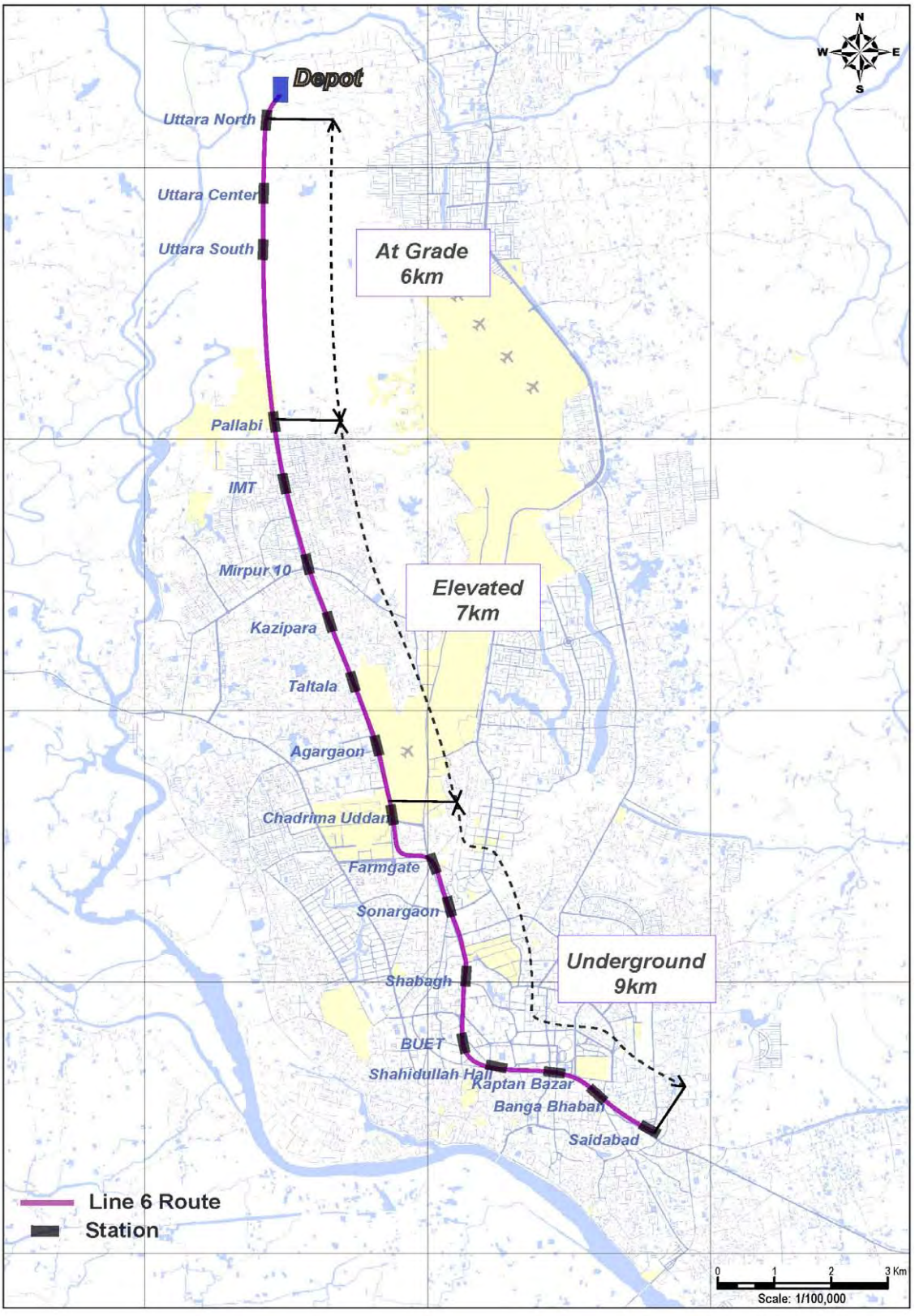
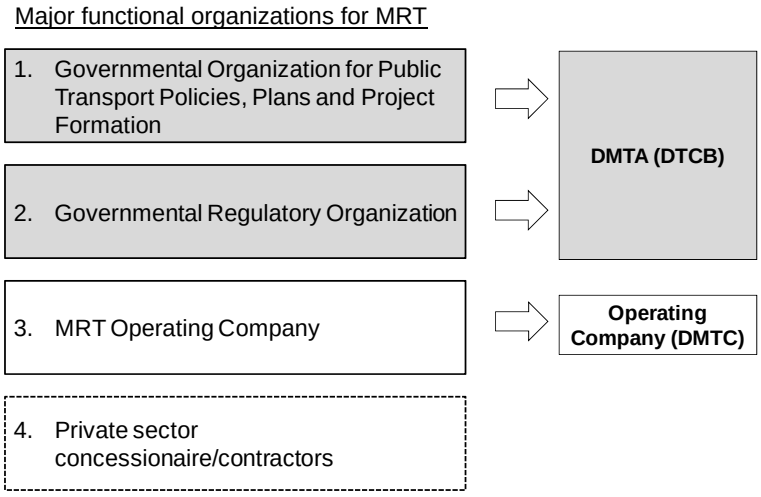


Figure 24.1-3 MRT Line 6 Route and Structure (Base Case)

24.1.6 Institutional Development

DMTA is scheduled to establish by restructuring of DTCB, and an MRT operating company, DMTC should be newly established. DMTA should assume the functions that DTCB was mandated to fulfill, including the formulation of policies and plans and the coordination among the related organizations. Also, DMTA is expected to determine public transport related projects like MRT and BRT, and regulate public transport operating organizations. DMTA itself may implement part of the MRT project, e.g. only infrastructure part, in accordance with the appropriate financial sharing between DMTA and DMTC. DTMC is an independent organization in charge of MRT project implementation and operation.



Source: JICA Study Team

Figure 24.1-4 Basic Role Demarcation between DMTA and DMTC

24.1.7 Implementation Program

The total planning period is 16 years from 2010 to 2025, which is divided into the following three (3) phases:

a) Short Term Period: 2010 - 2015
b) Medium Term Period: 2016 – 2020
c) Long Term Period: 2021 - 2025

Based on the proposed implementation schedule, the required investment costs are estimated, as shown in Table 24.1-3. According to this table, the following findings can be made;

a) The total investment costs are required for US$ 4.8 billion by 2025. Among those costs, US$ 1.6 billion is required for the project implementation in the short term, US$ 1.5 billion is required in the medium term, and US$ 1.7 billion is the long term.

b) Against the required costs, local fund may be available for US$ 1.7 million by 2025. The remaining balance of about US$ 3.1 billion shall be procured form private sector and/or foreign assistance.

c) It is assumed that the development of infrastructure in MRT system and BRT system are financed by foreign funding agencies. In addition, major arterial roads proposed by DHUTS, such as the east fringe road, middle ring road and outer ring road, are also expected to be financed by foreign funding agencies.

Table 24.1-3 Investment Requirements and Available Funds

Item		Total	Short Term (2010-2015)	Medium Term (2016-2020)	Long Term (2021-205)
Required Cost					
1	Public Transport Development	2,482.0	980.0	760.7	741.3
2	Roads and Highways	1,596.0	417.1	475.5	703.4
3	Traffic Management	732.1	161.4	275.7	295.0
4	Environmenatal & Management	32.0	12.0	10.0	10.0
5	Institutional Improvement	15.0	9.0	6.0	-
Total		4,857.1	1,579.5	1,527.9	1,749.7
Avaiable Fund					
1	Available Local Fund	0.0	0.0	0.0	0.0
2	Private Participation	1,193.0	388.0	375.3	429.8
3	Foreign Assistance	3,664.1	1,191.5	1,152.6	1,320.0
Total		4,857.1	1,579.5	1,527.9	1,749.7

24.1.8 Recommendation of the High Priority Projects

Among the candidate projects, the following projects are selected as the high priority projects.

1. Public Transport Projects
   - MRT Line 6 Project
   - BRT Line 3 Project
2. Road Projects
   - Eastern fringe road project
   - Southern section of middle ring road
   - Flyover projects
3. Traffic Management
   - Comprehensive traffic management project
4. Organizational development for DMTA and DMTC

24.2 Recommendation

(1) Investment Allocation Plan

At present, the financial status of the Bangladesh Government is very tight and there are many problems and issues to be resolve in order to secure the necessary funds. The following improvement measures are recommended by the Study Team:

a) To collect additional taxes such as road taxes entering CBD which aim at solving traffic congestion at CBD
b) To use the semi- Government fund such as RAJUK development funds
c) To use private funds from third sector or introduce PPP scheme

(2) Follow-Up on DHUTS Study

1) Feasibility Study on MRT Line 6 Project

The DHUTS Study recommended that the most urgent project among the high priority projects is the MRT Line 6 Project. This project is construction project of Mass Rapid Transit Railway System (MRT) line 6 where starts from North of Dhaka to Saidabad. Total length of 22 km. This construction project will be catalyst to improve not only solving road congestion but also enhancement of travel behavior of Dhaka People.

2) Comprehensive Traffic Management Improvement Project

The DHUTS Study also recommended this traffic management improvement project based on the lessons of the public experiences. This project aims at a) achieving smooth traffic flow, b) ensuring traffic safety for pedestrians. This project includes a) intersection improvement, b) u-turning point improvement, c) traffic signal improvement, d) road marking and signs and e) improvement of coordination between traffic related agencies.

3) Eastern Fringe Road Project with Urban Development Projects

The DHUTS Study also recommended construction of the Eastern Fringe Road with Urban Development in the Eastern Fringe Area. The project aims at a) promotion of urban development along the eastern fringe area of Dhaka, b) providing bypass of Airport Road, and DIT road, and c) providing accessibilities to people of eastern fringe area. This project is to construct the eastern fringe road in the eastern fringe area of Dhaka from Tongi to Narayangaji. Total length is about 23.1 km.

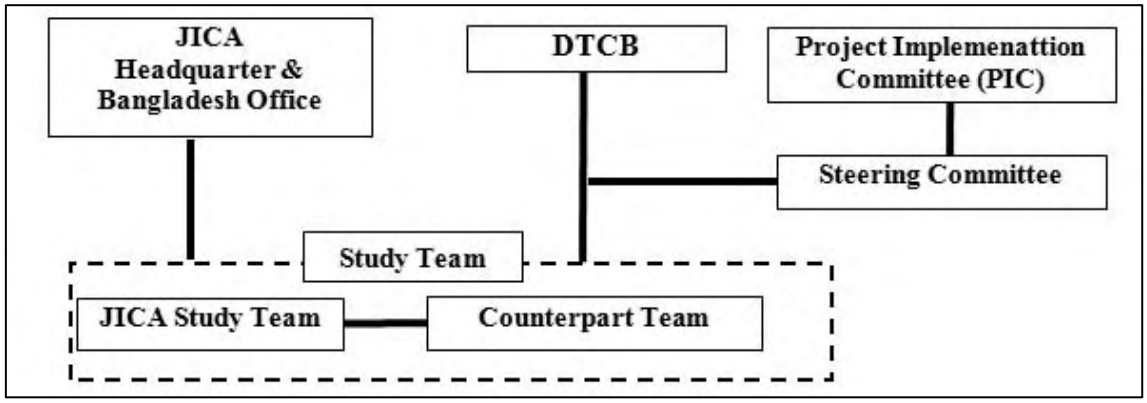
4) Mogh Bazar Flyover Project

The DHUTS Study recommended to construct the flyover of Mogh Bazar which is the most congested intersection in Dhaka. This project aims at a) providing smooth traffic at bottleneck intersections, and b) providing higher level of services for road traffic.

5) Institutional and Organizational Development Project

This project aims at establishment of appropriate organizational structure for implementation and operation of the proposed MRT system. This project includes formulation of organization structure, role of each organization, number of staff, etc.

ATTACHMENT: STUDY EXECUTION AND ORGANIZATION



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