12. FORMULATION OF THE URBAN TRANSPORT MASTER PLAN

12.1 Development of the RSTP Urban Transportation Master Plan

(1) Methodology

The development of the RSTP Urban Transportation Master Plan adopted the following methodology (see Figure 12.1):

(i) Elaborate the master plan network through a screen line analysis by comparing the network capacity and future demand.

(ii) Identify necessary projects to meet future demand at the same time avoiding excessive capacity.

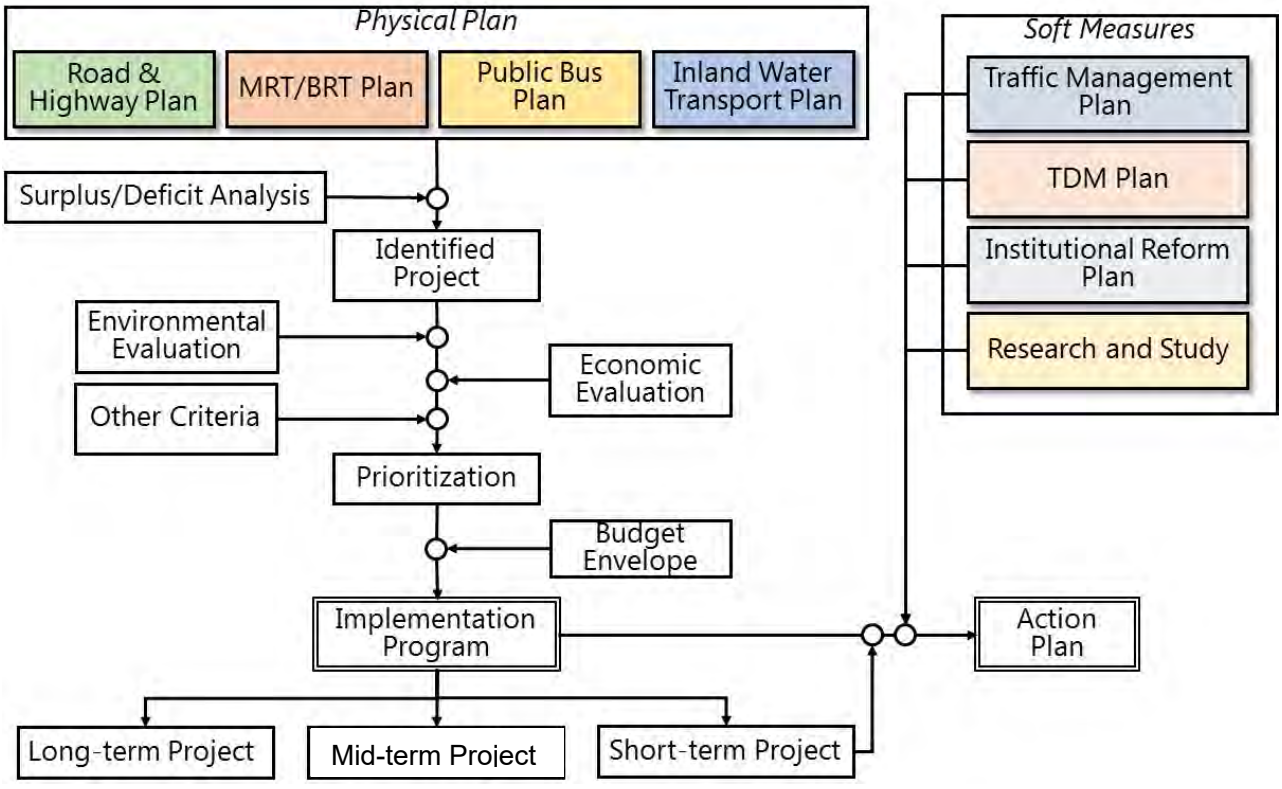
(iii) Conducts economic evaluation of each project to give priority on projects with higher economic return.

(iv) Conduct preliminary environmental assessment of every project and consider countermeasures against environmental problems, if any.

(v) Make a final prioritization of all physical projects by examining their respective characteristics from different perspectives.

(vi) Classify the projects into three categories, namely short-, medium- and long-term projects, by considering the financial constraints.

(vii) Prepare an action plan for short-term projects together with “soft” measures.



Source: RSTP Study Team

Figure 12.1 Development Procedure for the Master Plan

(2) Output of the Transportation Network Plan

The RSTP urban transportation network plan was developed based on a review and a modification of the STP network plan. The main points of the modification or adoption of the STP network master plan are as follows:

i. Harmonization with future urban structure, land-use plan and development of network plan.

ii. The supply of road space is in accordance with the network development strategy based on road hierarchy and level of demand.

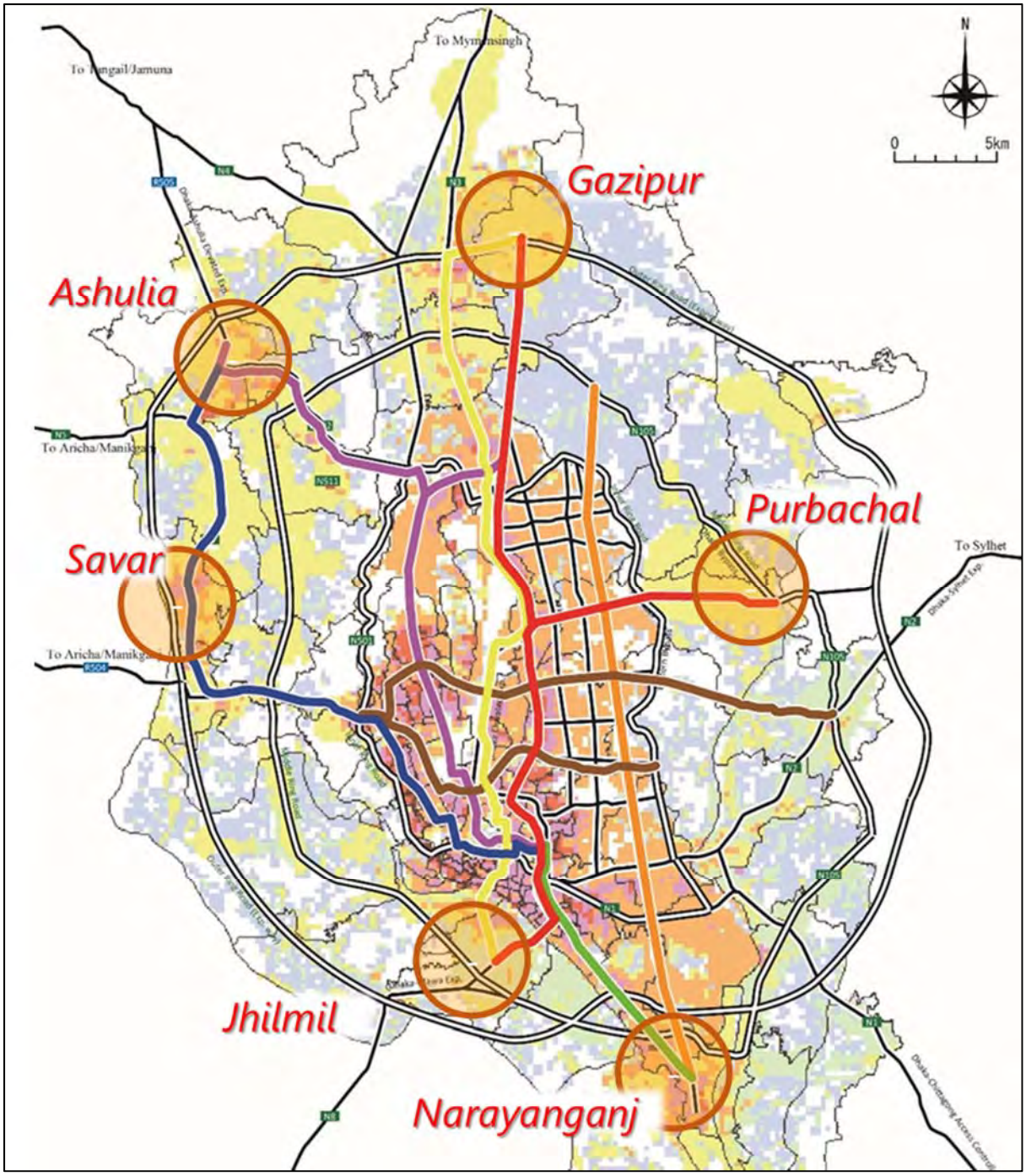
iii. RSTP retains the basic concept of STP.

iv. Coordination of the highway network with public transportation development.

v. Use of existing and future road space for the most efficient modes of transportation, such as MRT and BRT.

vi. Prioritization of the CBD and immediate improvement of the urban environment.

vii. Fully taking account of potential development areas and their need for efficient transportation systems, both public and private.



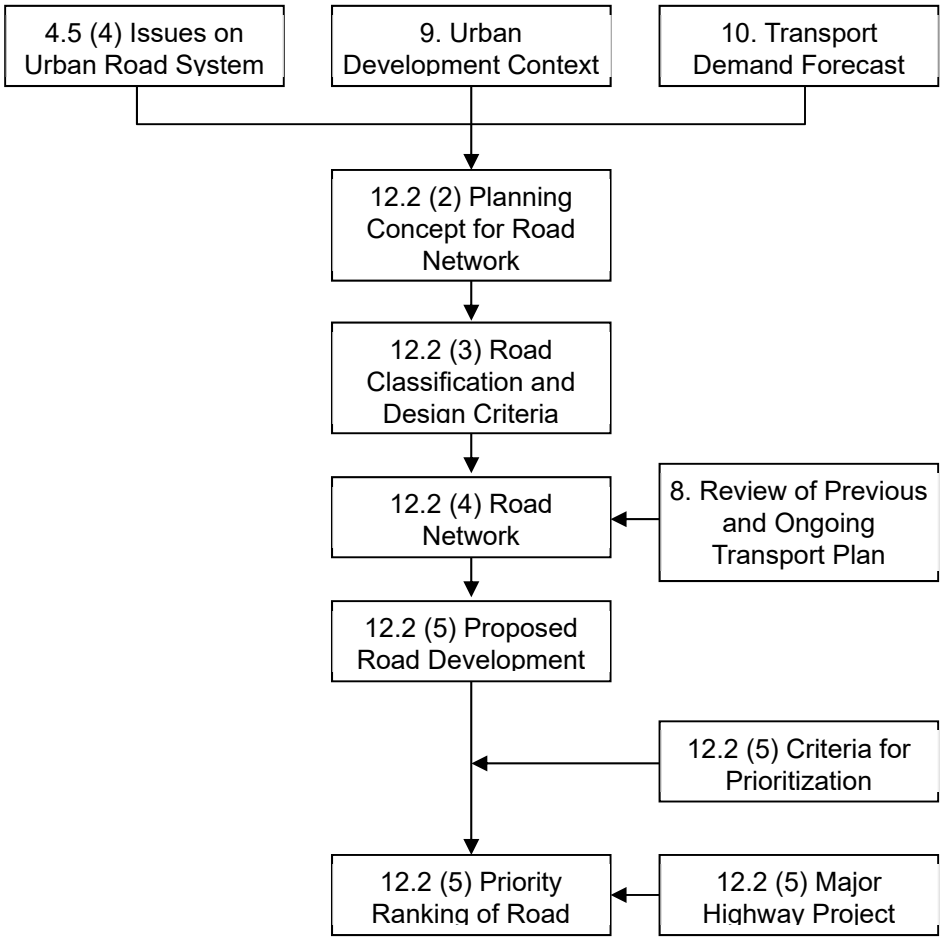
Source: JICA Study Team

Figure 12.2 RSTP, Urban Transport Master Plan

12.2 Road Network Development Plan

(1) Study Procedure

Road network development plan in 2035 was proposed through the study procedure illustrated in Figure 12.3.



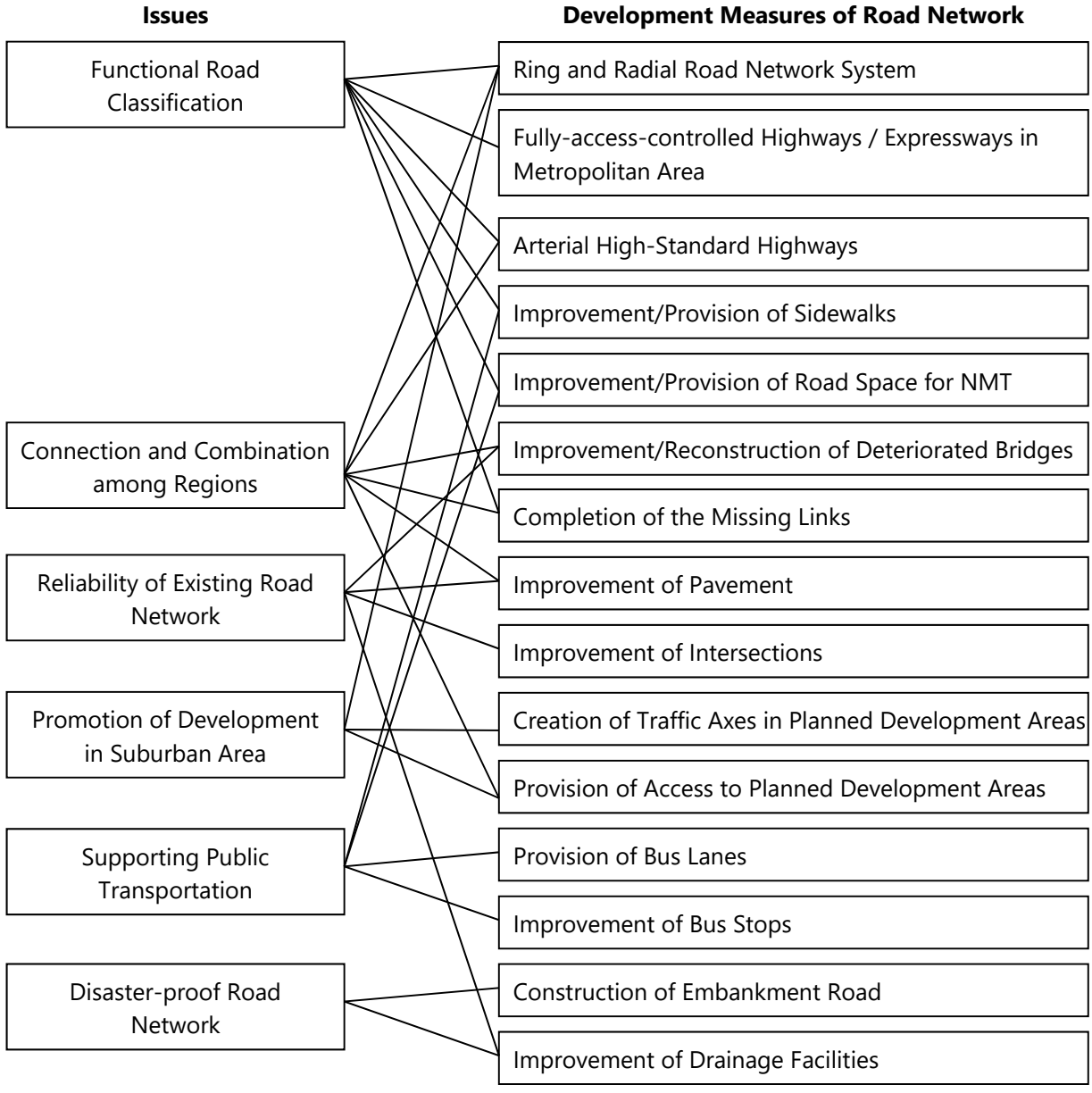
Source: JICA Study Team

Figure 12.3 Study Procedure

(2) Planning Concept for Road Network Development

1) Issues and Development Measures of Road Network

Based on the issues on existing road system (Chapter 4), future land use scenarios (Chapter 10), and future traffic demand forecast (Chapter 10), the development measures of road network are prepared as shown in Figure 12.4.



Source: JICA Study Team

Figure 12.4 Issues and Development Measures of Road Network

2) Concept of "3 Rings and 8 Radials" Network System

To alleviate excess concentration of population and industry in the Dhaka Metropolitan Area, measures of decentralization of city functions must be promoted in order to relieve overcrowding that will eventually improve the quality of life of urban residents and develop businesses in peripheral areas.

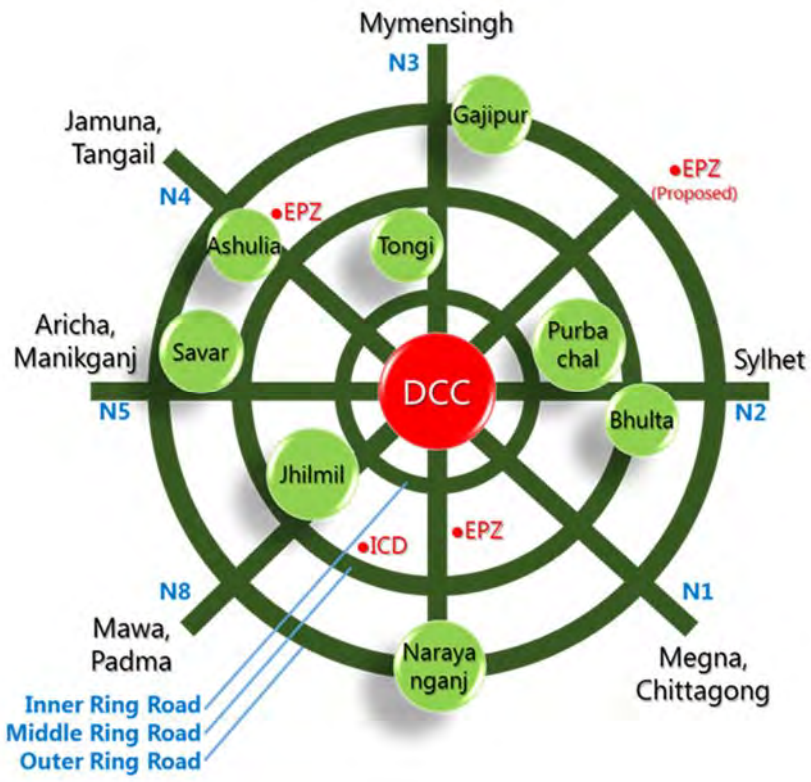
These measures will contribute in the reduction of commuting time and will alleviate traffic congestion while at the same time creating a balanced urban environment. A key measure is the development of ring and radial road network.

Ring and Radial road network provides the following two functions:

i. Reduce through traffic and disperse incoming and outgoing traffic

ii. Support the development of an optimal urban environment by creating independent urban spheres through the connection of core centers.

Figure 12.5 illustrates the concept of "3 Rings and 8 Radials" road network in RAJUK area. Satellite regional centers and specialized centers are connected by "Rings and Radials" Network System.

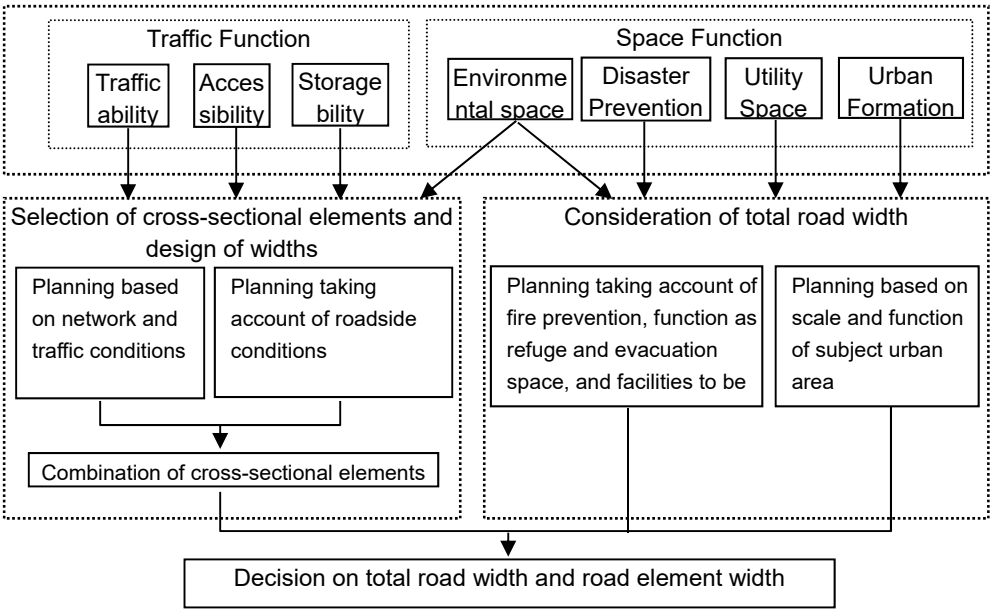


Source: JICA Study Team

Figure 12.5 3 Rings and 8 Radials Road Network System in RAJUK Area

(3) Road Classification and Design Criteria

Due consideration to road function is essential in cross-section planning because urban roads facilitate traffic and provide space for varied purpose. Especially, the space function of medians, shoulders, sidewalks, and service roadways was taken into account in harmony with the relevant urban land uses.



Source: JICA Study Team

Figure 12.6 Concept of Cross-section Planning based on Road functions

Functional road classification is important to formulate an efficient and effective road network which is therefore proposed by taking into consideration below mentioned road design manuals and guidelines. Following the road classification, the Study Team proposes the road design policies for road structures and traffic management measures and their typical cross section as mention in Table 12.1, Figure 12.7 and Figure 12.8, respectively.

a) Road design manual, Road and Highway Department, Ministry of Communication, Bangladesh

b) Road design manual, Ministry of Local Government, Bangladesh

c) Road design manual, RAJUK, Ministry of Housing and Public Works

d) A Policy on Geometric Design of Highway and Streets, the American Association of State Highway and Transport Officials (AASHTO), Washington DC.

e) Highway Capacity Manual, Fourth Edition, Transport Research Board, National Research Council (NRC), Washington DC.

f) Guide for Design of Pavement Structure, AASHTO

g) Road Structure Guidelines, Japan Association of Road

Table 12.1 Road Function of Future Road Network by Road Classifications

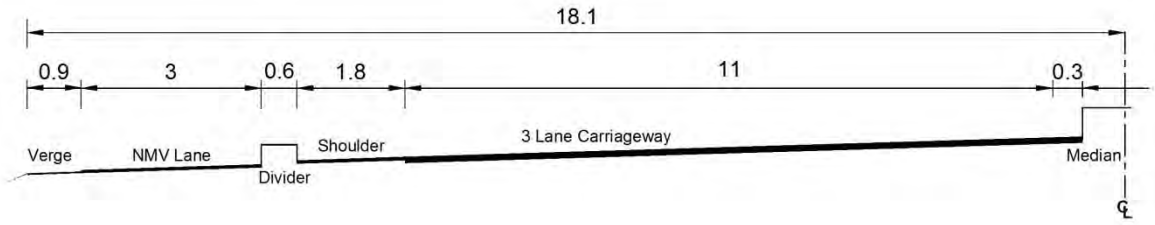
Item	Road Classification			
	Expressway	**Primary Road**	**Secondary Road**	**Collector Road**
Access Control	Full-access controlled	Limited-access controlled	Non-access controlled	Non-access controlled
Structure	Embankment/ Viaduct	At-grade (Flyover)	At-grade	At-grade
Design Speed (km/h)	100, 80, 60	80, 60	50, 40	40, 30
Number of Lanes	4-8	4-8	2-4	2-4
Pedestrian Facility	N/A	Dual Sidewalk	Dual Sidewalk	If required
Bus Lanes	N/A	Possible	Possible	N/A
Rickshaw	Prohibited	Prohibited	Possible	Possible

Source: JICA Study Team

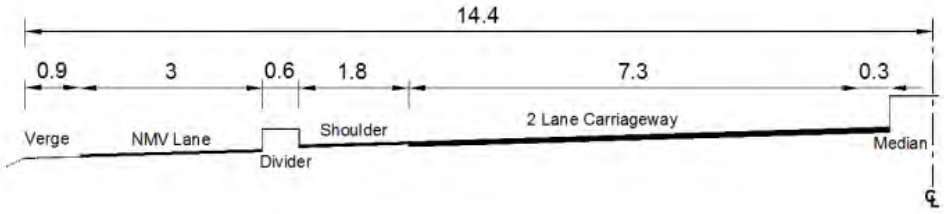
The choice of cross-section is crucial in obtaining a cost-effective solution in meeting traffic demands. Most of the roads in Bangladesh are built on embankments and every extra meter of crest width will add considerably to the cost. Therefore, the width of the carriageway and shoulder should be the minimum, just necessary to carry the traffic volume efficiently and safely.

Figure 13.7 and Figure 13.8 illustrate the typical cross sections mainly quoted from “Geometric Design Standards for Roads and Railways Division, RHD 2000”. In the feasibility study or designing phase of each project, it is required to carefully consider each component of the cross section such as carriageway and shoulder width, the necessity of NMV lanes and sidewalks, and bus bays/ stopping places by taking the circumstances of the project area into account. One of the particular characteristics of Bangladesh roads is the large number of NMVs and pedestrians. Failure to provide proper NMV lanes will significantly reduce the traffic capacity of the road, particularly on heavily-trafficked sections. In most situations, pedestrians can share the paved shoulder, however, on sections where there are huge number of pedestrians, shoulders must have enough width and smooth surface or it is necessary to provide a separate footway.

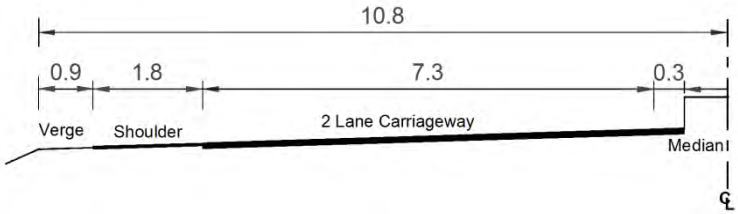
・ Type 1: Dual 3 lane with NMV lanes [Primary Road]



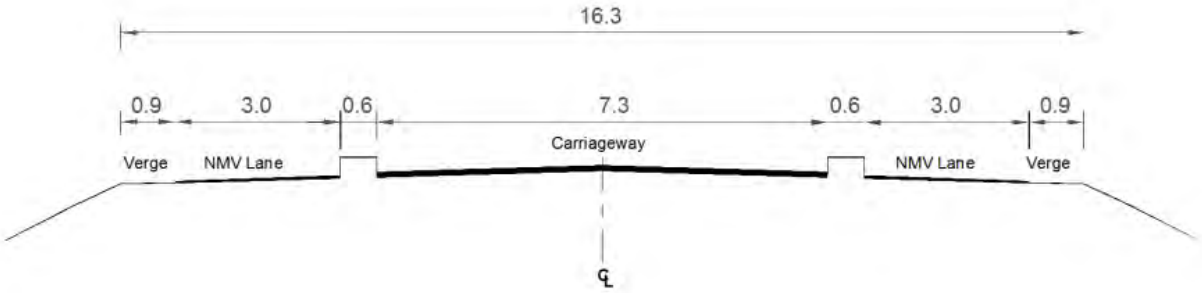
・ Type 2a: Dual 2 lane with NMV lanes [Primary/Secondary Road]



・ Type 2: Dual 2 lane carriageway [Secondary Road]



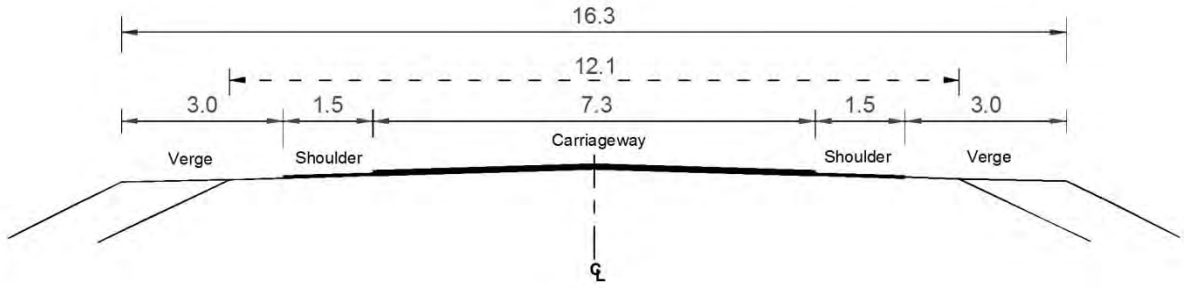
・ Type 3a: 7.3m carriageway with NMV lanes [Secondary Road]



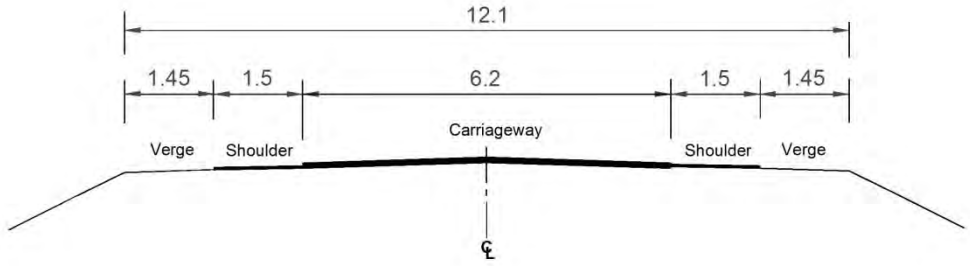
Note: NMV lanes can be replaced with service lanes
Source: Geometric Design Standards for Roads and Highway Department, RHD, 2000

Figure 12.7 Typical Cross Section (1)

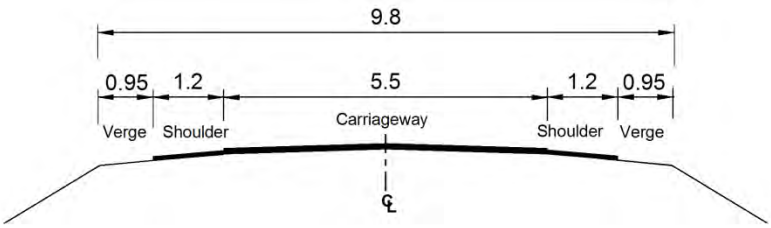
・ Type 3: 7.3m carriageway [Secondary Road]



・ Type 4: 6.2m carriageway with 1.5m shoulders [Secondary/Collector Road]



・ Type 5: 5.5m carriageway [Collector Road]



Note: NMV lanes can be replaced with service lanes

Note: verges can be omitted or replaced with sidewalks in urban area

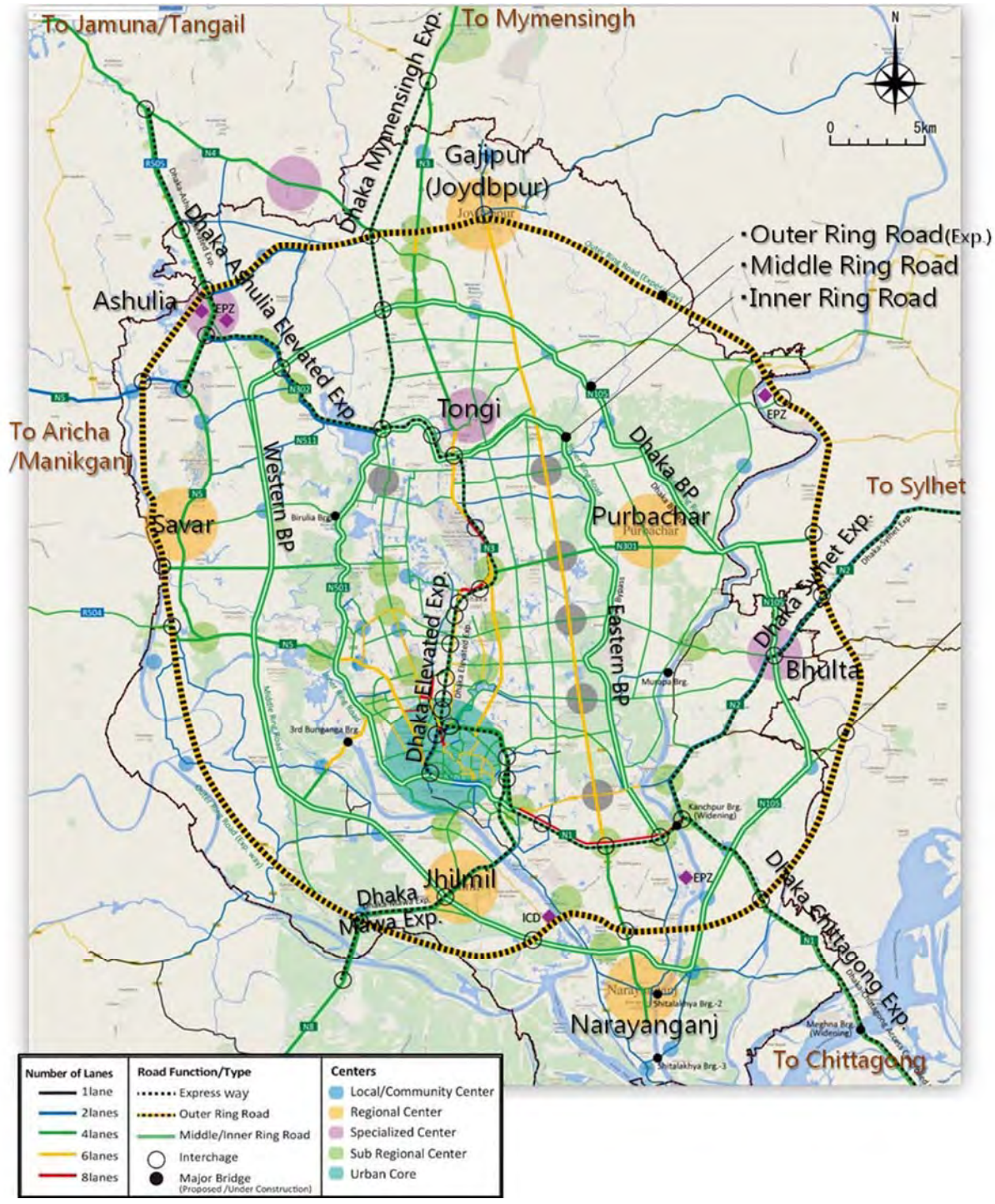
Source: Geometric Design Standards for Roads and Highway Department, RHD, 2000

Figure 12.8 Typical Cross Section (2)

(4) Road Network Development Plan

1) Proposed Road Network in RAJUK area

Figure 12.9 illustrates the proposed future road network in RAJUK area based on "Planning Concept for Road Network Development." The proposed network has also taken into account the road projects in STP, currently on-going projects, future projects proposed by the relevant authorities.



Source: JICA Study Team

Figure 12.9 Proposed Road Network in RAJUK area

2) Proposed Road Network in DMA

Figure 12.10 illustrates the enlarged figure of DMA in Figure 12.9. DMA will be surrounded by the Inner Ring Road, mainly built on the embankment of Trug River and Balu River. New traffic axles placed into a ladder form are proposed to properly promote the development of the Eastern fringe area.

Source: JICA Study Team

Figure 12.10 Proposed Road Network in DMA

(5) Proposed Road Development Projects

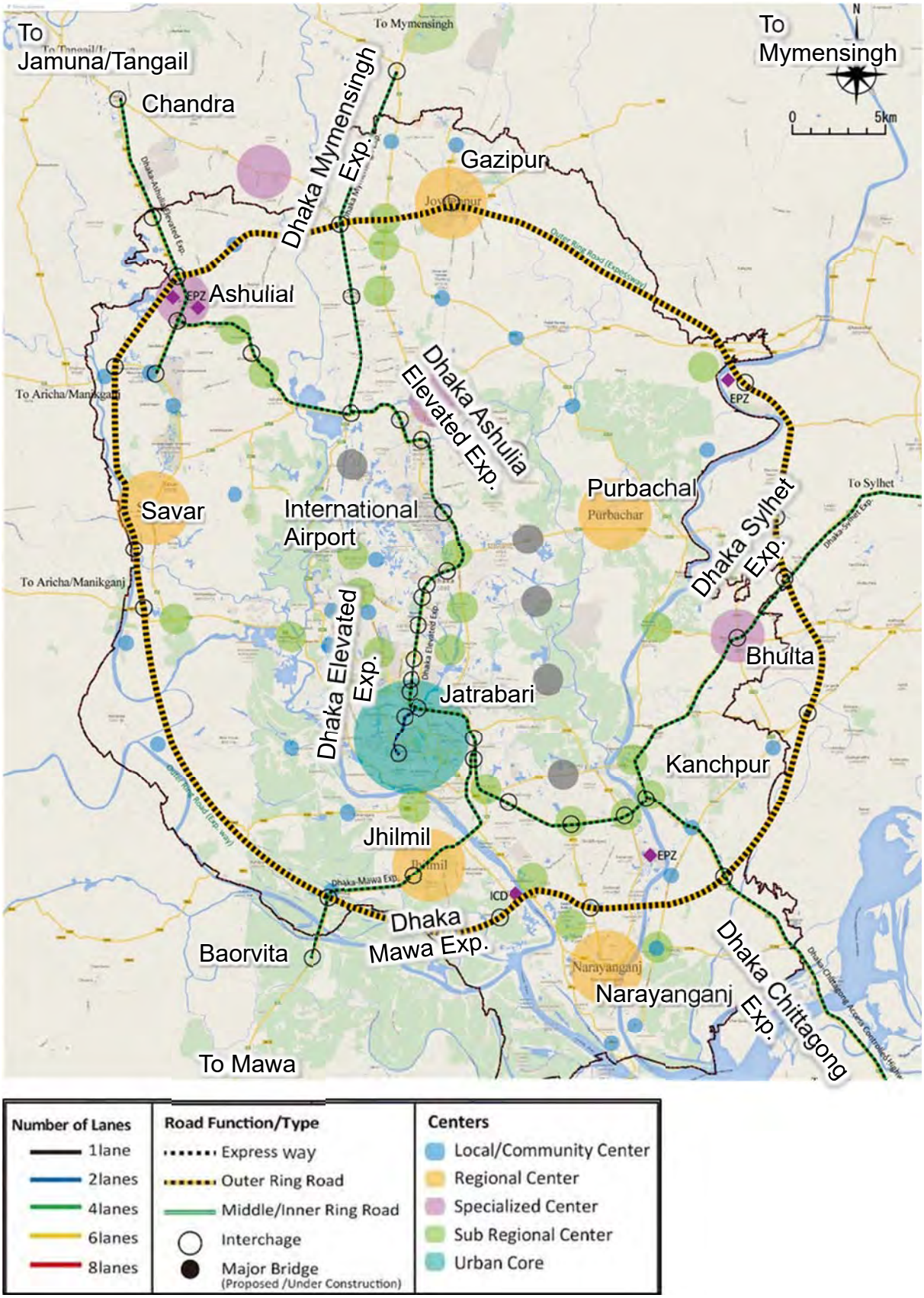
1) Proposed Road Project List and Preliminary Cost

Table 12.2 shows the summary of proposed road development projects. The detailed road projects are described and listed up in Figure 12.11, Figure 12.12, Figure 12.13, Figure 12.14, Table 12.3, Table 12.4, Table 12.5 and Table 12.6.

Table 12.2 Proposed Road Development Projects (Summary)

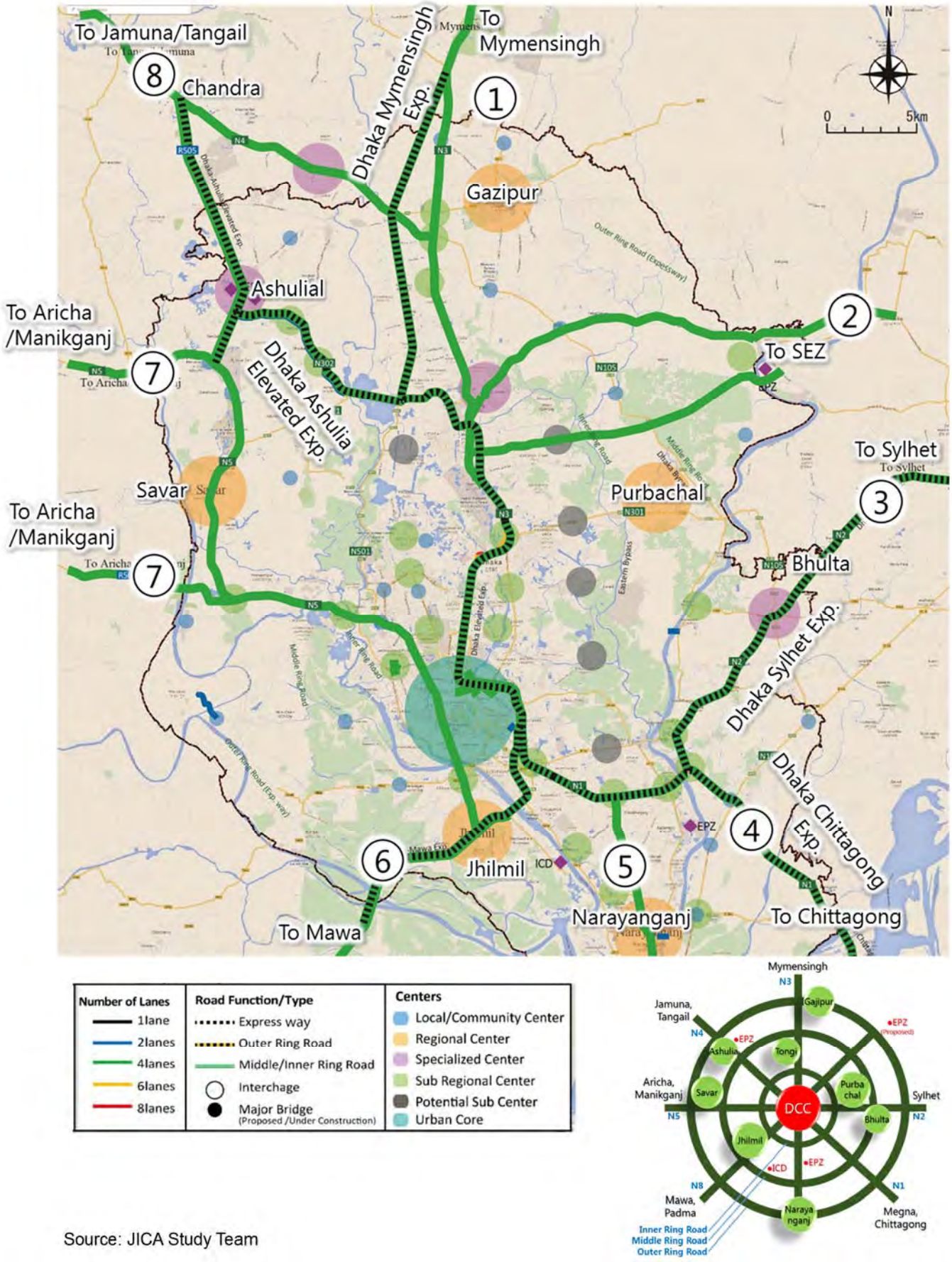
Project Components	Length (km)				Project Cost (BDT, Crore)
	Total	New Road	Wid-ening	Com-pleted	
1. Expressway	126	*126*	*0*	*0*	31,042
1.1 Dhaka Elevated Expressway	20	*20*	*0*	*0*	8,940
1.2 Dhaka Ashulia Elevated Expressway	38	*38*	*0*	*0*	13,654
1.3 Dhaka Chittagong Expressway	16	*16*	*0*	*0*	1,501
1.4 Dhaka Sylhet Expressway	16	*16*	*0*	*0*	795
1.5 Dhaka Mawa Expressway	18	*18*	*0*	*0*	5,169
1.6 Dhaka Mymensingh Expressway	19	*19*	*0*	*0*	983
2. Ring Roads	310	*208*	*98*	*4*	35,335
2.1 Inner Ring Road	73	*31*	*38*	*4*	11,319
2.2 Middle Ring Road	108	*48*	*60*	*0*	4,065
2.3 Outer Ring Road	129	*129*	*0*	*0*	19,951
3. Primary Roads	290	*65*	*225*	*0*	10,984
4. Secondary Roads	471	*185*	*286*	*0*	18,962
Total	1,198	*585*	*609*	*4*	96,324

Note 1: Expressway excludes Outer Ring Road.
Note 2: Project costs are given from the relevant organization or estimated based on the average unit price obtained from several reports of the feasibility study on projects in RAJUK area by JICA Study team.
Source: JICA Study Team



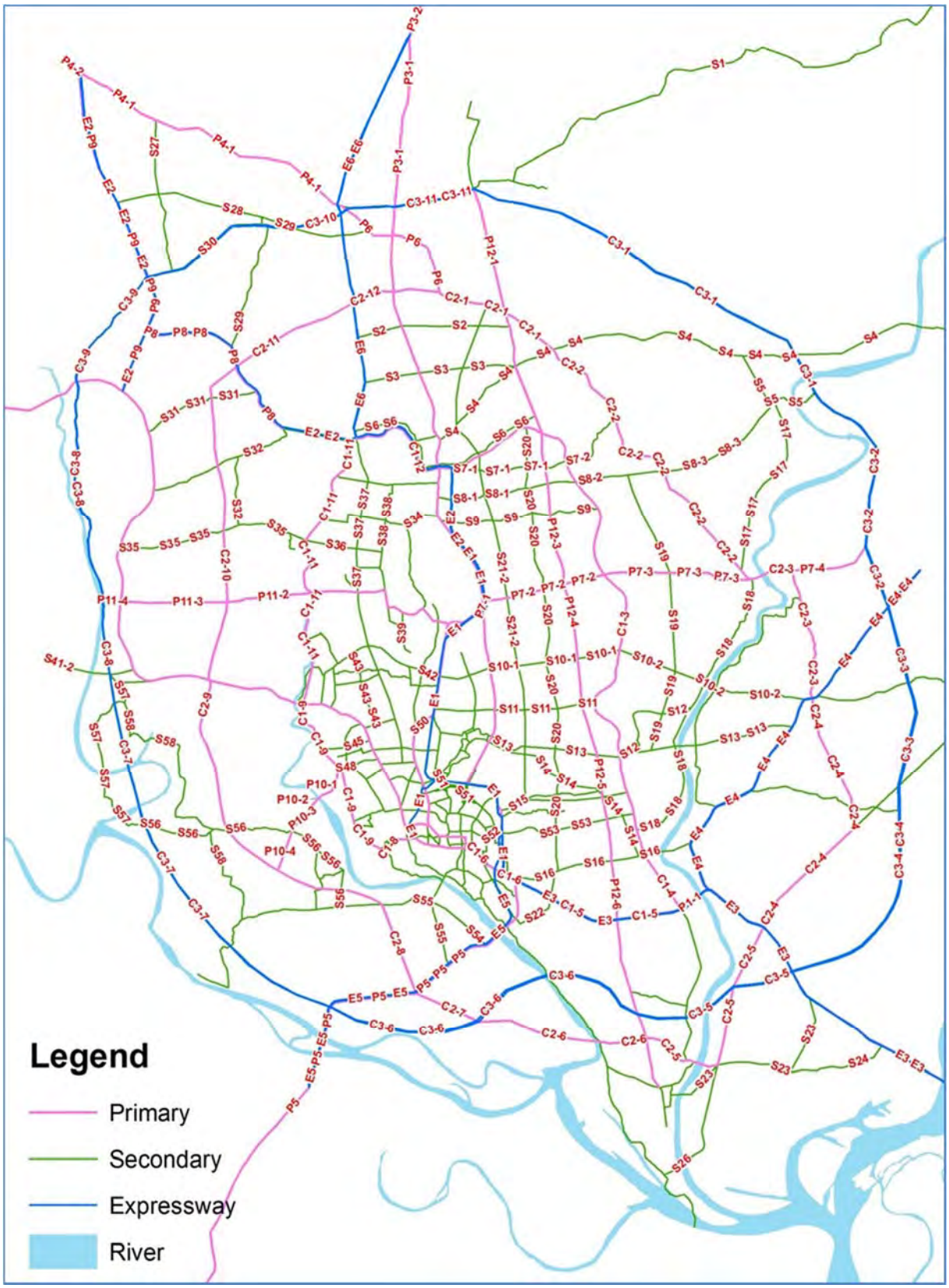
Source: JICA Study Team

Figure 12.11 Proposed Expressway and Outer Ring Road



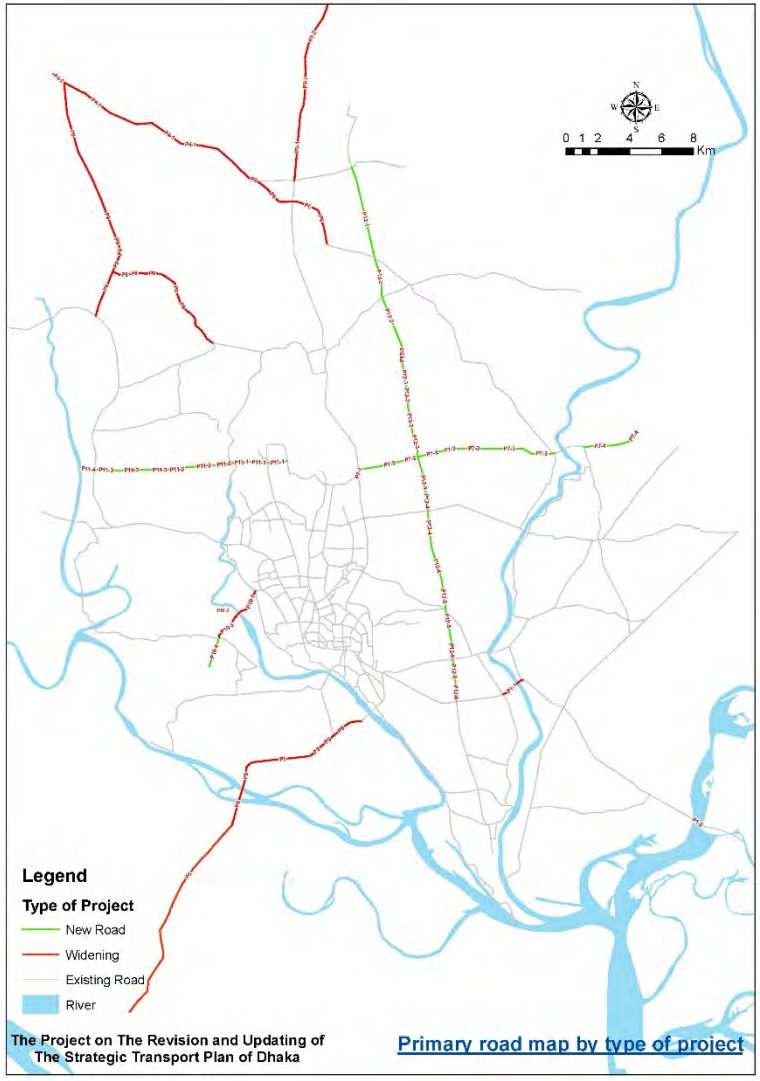
Source: JICA Study Team

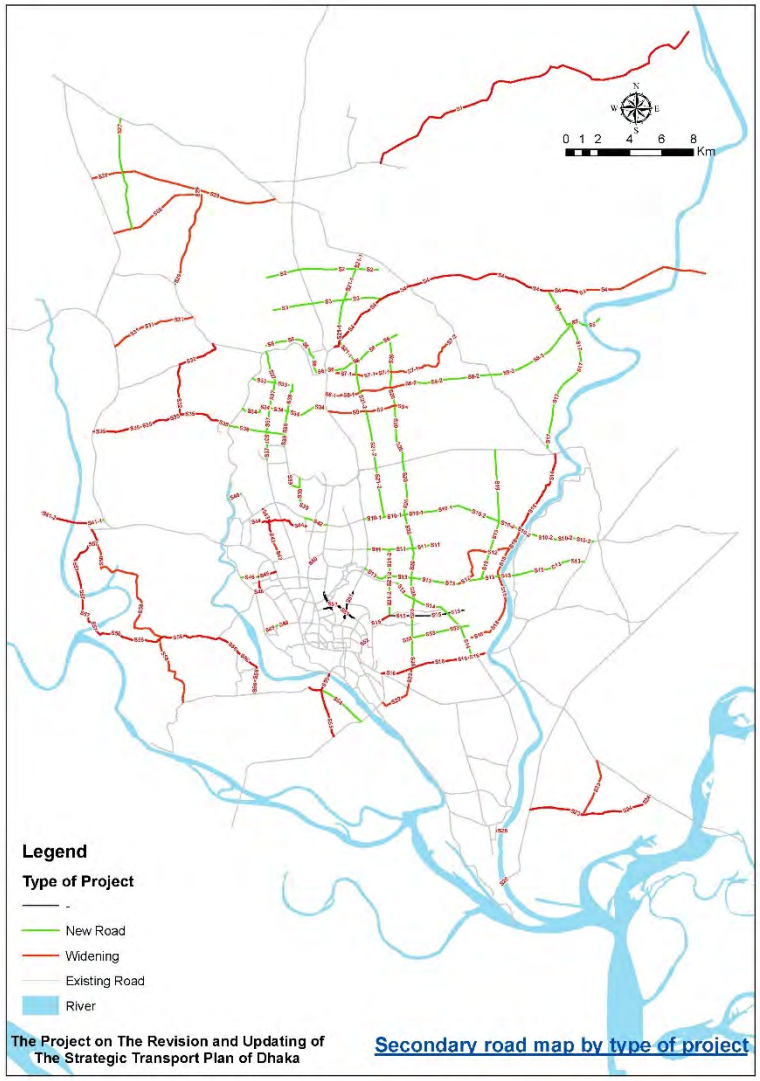
Figure 12.12 Proposed 8 Radial Roads



Source: JICA Study Team

Figure 12.13 Location of Proposed Road Development Projects





Source: JICA Study Team

Figure 12.14 Project Type of Primary Road and Secondary Road

Table 12.3 Proposed Road Development Projects (1)

Sl. No.	Description	Main Area	Road Category	Type of Project	Lane Number (Existing)	Lane Number (Proposed)	Length (km)	Road Specification	Project Cost (Tk. Crore)	2035 Traffic Flow (pcu/day per both directions)	
C1-1	Inner Ring Road / Dhaka Eastern BP (N3 to Termukh Rayerdia Link Rd.)	DMA	Primary Road	New Road	0	4	7.4	Limited-access Highway	2,029	63,900	B
C1-2	Inner Ring Road / Dhaka Eastern BP (Termukh Rayerdia Link Rd. to N301)	DMA	Primary Road	New Road	0	4	5.8	Limited-access Highway	1,590	58,700	C
C1-3	Inner Ring Road / Dhaka Eastern BP (N301 to R201)	DMA	Primary Road	New Road	0	4	14.5	Limited-access Highway	3,976	54,800	C
C1-4	Inner Ring Road / R110 (R201 to N1)	DMA	Primary Road	Widening	2	4	3.0	Limited-access Highway	83	42,500	C
C1-5	Inner Ring Road / N1 (R110 to Toll Gate) / Jatrabari - Khanchpur bridge (widening of polder road to 8 lane)	DMA	Primary Road	Widening	4	8	8.5	Limited-access Highway	396	107,600	A
C1-6	Inner Ring Road / Jatrabari-Gulistan FO (Toll Gate to Chankhar Pul Bus Stop)	DCC	Primary Road	Completed	4	4	4.0	Controlled Access Highway (Toll Road)	-	66,700	B
C1-7	Inner Ring Road / Zahir Raihan Rd. (Chankhar Pul Bus Stop to Eden Girls College)	DCC	Primary Road	Widening	1	4	1.2	Type 2a	170	47,300	C
C1-8	Inner Ring Road (Rasulpur Bridge (Embankment) - Peelkhana road - Azimpur Old	DCC	Primary Road	New Road	0	4	1.5	Type 2a	252	88,600	B
C1-9	Inner Ring Road / Circular Road over embankment (Rasulpur Brg. to N5)	DCC	Primary Road	Widening	2	4	8.2	Limited-access Highway	811	67,400	B
C1-10	Inner Ring Road / Circular Road over embankment (N5 to N501/Diabari Bot Tola :Flyover)	DCC	Primary Road	New Road	0	4	1.8	Limited-access Highway	302	41,900	C
C1-11	Inner Ring Road / N501:Circular Road over embankment (Diabari Bot Tola to N302)	DCC	Primary Road	Widening	2	4	11.9	Limited-access Highway	1,177	95,300	A
C1-12	Inner Ring Road / N302:Circular Road over embankment (N302 to N3)	DCC	Primary Road	Widening	2	4	5.4	Limited-access Highway	534	50,600	C
C2-1	Middle Ring Road (Near Dhirashrom Rd. to R301) / N105:Dhaka BP	RAJUK	Primary Road	Widening	2	4	5.9	Limited-access Highway	186	44,900	C
C2-2	Middle Ring Road / N105:Dhaka BP (R301 to N301)	RAJUK	Primary Road	Widening	2	4	14.9	Limited-access Highway	469	64,600	B
C2-3	Middle Ring Road / N105:Dhaka BP (N301 to N2)	RAJUK	Primary Road	Widening	2	4	8.1	Limited-access Highway	253	40,300	C
C2-4	Middle Ring Road / N105:Dhaka BP (N2 to N1)	RAJUK	Primary Road	Widening	2	4	12.6	Limited-access Highway	397	43,800	C
C2-5	Middle Ring Road (N1 to R111)	RAJUK	Primary Road	Widening /New Bridge	1	4	10.5	Limited-access Highway	877	44,000	C
C2-6	Middle Ring Road (R111 to Zazira IC)	RAJUK	Primary Road	Widening /New Bridge	1	4	7.9	Limited-access Highway	836	56,800	C
C2-7	Middle Ring Road (Zazira IC to N8)	RAJUK	Primary Road	New Road	0	4	3.1	Limited-access Highway	67	54,600	C
C2-8	Middle Ring Road (N8 to 3rd Briganga Brg. access Rd.)	RAJUK	Primary Road	New Road	0	4	9.4	Limited-access Highway	204	55,700	C
C2-9	Middle Ring Road (3rd Briganga Brg. access Rd. to N5)	RAJUK	Primary Road	New Road	0	4	10.2	Limited-access Highway	222	55,400	C
C2-10	Middle Ring Road (N5 to N302)	RAJUK	Primary Road	New Road	0	4	15.1	Limited-access Highway	329	64,000	B
C2-11	Middle Ring Road (N302 to Dhaka-Mymensingh Exp.)	RAJUK	Primary Road	New Road	0	4	6.2	Limited-access Highway	135	41,900	C
C2-12	Middle Ring Road (Dhaka-Mymensingh Exp. to Near Dhirashrom Rd.)	RAJUK	Primary Road	New Road	0	4	4.1	Limited-access Highway	89	36,700	C
C3-1	Outer Ring Road (R310 to R301)	RAJUK	Expressway	New Road	0	6	18.9	Expressway (Toll Road)	2,023	82,900	B
C3-2	Outer Ring Road (R301 to N2)	Outside RAJUK	Expressway	New Road	0	6	11.4	Expressway (Toll Road)	1,288	72,700	B
C3-3	Outer Ring Road (N2 to R114)	Outside RAJUK	Expressway	New Road	0	6	8.4	Expressway (Toll Road)	1,136	33,200	C
C3-4	Outer Ring Road (R114 to N1)	Outside RAJUK	Expressway	New Road	0	6	11.3	Expressway (Toll Road)	1,283	33,100	C
C3-5	Outer Ring Road (N1 to R111)	RAJUK	Expressway	New Road	0	6	7.7	Expressway (Toll Road)	1,988	62,600	B
C3-6	Outer Ring Road (R111 to N8)	RAJUK	Expressway	New Road	0	6	15.8	Expressway (Toll Road)	2,399	29,800	D
C3-7	Outer Ring Road (N8 to R504)	RAJUK	Expressway	New Road	0	6	19.3	Expressway (Toll Road)	1,688	87,300	B
C3-8	Outer Ring Road (R504 to N5)	RAJUK	Expressway	New Road	0	6	13.8	Expressway (Toll Road)	1,410	97,300	A
C3-9	Outer Ring Road (N5 to R505)	RAJUK	Expressway	New Road	0	6	6.0	Expressway (Toll Road)	1,014	67,900	B
C3-10	Outer Ring Road (R505 to N4/N105)	RAJUK	Expressway	New Road	0	6	9.8	Expressway (Toll Road)	3,505	33,900	C
C3-11	Outer Ring Road (N4/N105 to R310)	RAJUK	Expressway	New Road	0	6	6.2	Expressway (Toll Road)	2,217	78,100	B

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000

Source: JICA Study Team

Table 12.4 Proposed Road Development Projects (2)

Sl. No.	Description	Main Area	Road Category	Type of Project	Lane Number (Existing)	Lane Number (Proposed)	Length (km)	Road Specification	Project Cost (Tk. Crore)	2035 Traffic Flow (pcu/day per both directions)	
E1	Dhaka Elevated Expressway	DCC	Expressway	New Road	0	4	19.7	Expressway (Toll Road)	8,940	96,500	A
E2	Dhaka - Ashulia Elevated Expressway	RAJUK	Expressway	New Road	0	4	38.2	Expressway (Toll Road)	13,654	83,500	B
E3	Dhaka - Chittagong Access Controlled Highway (Kutubkhali - Outer Ring Road)	RAJUK	Expressway	New Road	0	4	15.6	Expressway (Toll Road)	1,501	63,000	B
E4	Dhaka - Sylhet Expressway (N1 - Outer Ring Road)	RAJUK	Expressway	New Road	0	8	15.7	Expressway (Toll Road)	795	47,600	C
E5	Dhaka - Mawa Expressway	RAJUK	Expressway	New Road	0	4	17.7	Expressway (Toll Road)	5,169	76,000	B
E6	Dhaka - Mymensingh Expressway	RAJUK	Expressway	New Road	0	4	19.4	Expressway (Toll Road)	983	83,100	B
P1-1	N1 / 2nd Kanchpur Bridge and rehabilitation of existing Bridge	DMA	Primary Road	Widening (Bridge)	4	8	0.4	Bridge	-	84,000	B
P1-2	N1 / 2nd Meghna Bridge and rehabilitation of existing Bridge	Outside RAJUK	Primary Road	Widening (Bridge)	2	6	0.9	Bridge	-	Unknown	
P1-3	N1 / 2nd Gomoti Bridge and rehabilitation of existing Bridge	Outside RAJUK	Primary Road	Widening (Bridge)	2	6	1.4	Bridge	-	Unknown	
P2	N2 / 4-Lane Flyover at Bhulta – Sylhet National Highway	RAJUK	Primary Road	Grade Separation	0	4	-	Grade Separation	-	Unknown	
P3	N3 / Improvement of Joydevpur – Mymensingh Highway	Outside RAJUK	Primary Road	Widening	2	4	87.2	Type 2a	1,951	74,800	B
P4-1	N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC	Outside RAJUK	Primary Road	Widening	2	4	13.7	Type 2a	657	67,800	B
P4-2	N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC	Outside RAJUK	Primary Road	Widening	2	4	56.3	Type 2a	2,698	Unknown	
P5	N8 / Improvement into 4-lanes from 1st Buriganga Bridge to Padma Bridge Mawa link	Outside RAJUK	Primary Road	Widening	2	4	25.8	Type 2a	359	72,200	B
P6	N105 / Upgrading of Dhaka Bypass to 4 Lane (Joydevpur – Debogram – Bhulta – Madanpur)	RAJUK	Primary Road	Widening	2	4	7.0	Type 2a	219	59,400	C
P7-1	Kuril Flyover	DCC	Primary Road	Grade Separation	0	4	3.1	Grade Separation	303	96,200	A
P7-2	N301 / From Airport Road near Khilkhet to First Balu Bridge (Isapura) via Baruna	DMA	Primary Road	New Road	0	4	6.5	Under Construction	270	67,900	B
P7-3	N301 / From first Balu Bridge near Tek Noadda to Sitalakhya River near Kanchan	RAJUK	Primary Road	New Road	0	4	6.0	Under Construction	250	9,300	D
P7-4	N301 / Extension from Dhaka BP to Outer Ring Road	Outside RAJUK	Primary Road	New Road	0	4	3.8	Type 2a	83	10,800	D
P8	N302 / Ashulia to Aricha Road (C & B More)	RAJUK	Primary Road	Improvement	2	2	8.8	Type 2	13	30,400	C
P9	R505 / Nabinagar - EPZ - Chandra road improvement	RAJUK	Primary Road	Widening	2	4	16.0	Type 2a	131	43,400	C
P10-1	Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (East side)	DCC	Primary Road	Widening	2	4	1.6	Type 2a	121	85,200	B
P10-2	Construction of Buriganga 3rd bridge near Basila	DCC	Primary Road	Widening (Bridge)	2	4	0.7	Type 2a	710	85,200	B
P10-3	Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (West side)	RAJUK	Primary Road	Widening	2	4	2.0	Type 2a	28	85,200	B
P10-4	Extension of Buriganga 3rd Bridge access roads to Middle Ring Road	RAJUK	Primary Road	New Road	0	4	1.9	Type 2a	41	34,800	C
P11-1	Mirpur to Outer Ring Road (Kalshi Road to West embankment)	DCC	Primary Road	New Road	0	4	3.4	Type 2a	571	56,200	C
P11-2	Mirpur to Outer Ring Road (West embankment to Middle Ring Road)	RAJUK	Primary Road	New Road	0	4	3.9	Type 2a	85	64,800	B
P11-3	Mirpur to Outer Ring Road (Middle Ring Road to N5)	RAJUK	Primary Road	New Road	0	4	4.9	Type 2a	107	49,000	C
P11-4	Mirpur to Outer Ring Road (N5 to Outer Ring Road)	RAJUK	Primary Road	New Road	0	4	0.7	Type 2a	16	64,600	B
P12-1	Joydebpur - Narayanganj Highway (Joyedbupur to N105/Dhaka BP)	RAJUK	Primary Road	New Road	0	6	5.9	Type 1	174	73,800	B
P12-2	Joydebpur - Narayanganj Highway (N105/Dhaka BP to Inner Ring Road)	RAJUK	Primary Road	New Road	0	6	5.8	Type 1	171	63,500	B
P12-3	Joydebpur - Narayanganj Highway (Inner Ring Road to N301)	DMA	Primary Road	New Road	0	6	7.1	Type 1	634	63,600	B
P12-4	Joydebpur - Narayanganj Highway (N301 to Khilgaon)	DMA	Primary Road	New Road	0	6	8.0	Type 1	715	55,600	C
P12-5	Joydebpur - Narayanganj Highway (Khilgaon to R110)	DMA	Primary Road	New Road	0	6	4.9	Type 1	437	49,100	C
P12-6	Joydebpur - Narayanganj Highway (R110 to N1)	DMA	Primary Road	New Road	0	6	2.7	Type 1	242	36,500	C

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000
Source: JICA Study Team

Table 12.5 Proposed Road Development Projects (3)

Sl. No.	Description	Main Area	Road Category	Type of Project	Lane Number (Existing)	Lane Number (Proposed)	Length (km)	Road Specification	Project Cost (Tk. Crore)	2035 Traffic Flow (pcu/day per both directions)	
S1	Gazipur – Azmatpur – Itakhola Road (revised)	Outside RAJUK	Secondary Road	Widening	1	2	41.0	Type 4	300	Unknown	
S2	Gacha - Jiraitali Road	RAJUK	Secondary Road	Widening/New Road	1	2	7.0	Type 4	39	45,600	C
S3	Sataish - Karamtola Road	RAJUK	Secondary Road	Widening/New Road	1	2	6.9	Type 4	38	45,800	C
S4	4-lanes road from S.A.M. (Shahid Ahsanullah Master) Flyover to Kaliganj Bypass along the railway line	RAJUK	Secondary Road	Widening	2	4	25.0	Type 2	252	25,800	D
S5	New EPZ Link Road (R301 to New EPZ)	RAJUK	Secondary Road	New Road	0	4	4.7	Type 2	86	43,400	C
S6	Tongi Embankment (Dhaka - Mymensing Exp. to Joydebpur - Narayanganj Hwy.)	RAJUK	Secondary Road	New Road	0	4	10.4	Type 2	191	52,800	C
S7-1	Improvement of Abdullahpur – Teromukh – Ulukhola Road (Uttara Sector-8 to Balu river embankment)	DMA	Secondary Road	Widening	1	2	5.5	Type 4	68	23,600	D
S7-2	Improvement of Abdullahpur – Teromukh – Ulukhola Road (Balu river embankment to Dhaka BP)	RAJUK	Secondary Road	Widening	1	2	3.6	Type 4	20	17,500	D
S8-1	Azampur - Kaliganj Road (N3 to Joyedbupur - Narayanganj Hwy.)	DMA	Secondary Road	Widening	1	4	5.2	Type 2	165	61,000	B
S8-2	Azampur - Kaliganj Road (Joyedbupur - Narayanganj Hwy. to Dhaka BP)	RAJUK	Secondary Road	New Road	0	4	5.4	Type 2	99	53,400	C
S8-3	Azampur - Kaliganj Road (Dhaka BP to New EPZ Link Road)	RAJUK	Secondary Road	New Road	0	4	6.3	Type 2	115	20,000	D
S9	Uttara Sector-4 - Dakhinkhan - Khordi	DMA	Secondary Road	Widening	1	2	7.4	Type 4	91	Unknown	
S10-1	Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj)	DMA	Secondary Road	New Road	0	4	6.0	Type 2	886	85,200	B
S10-2	Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj)	RAJUK	Secondary Road	New Road	0	4	9.0	Type 2	3,752	23,700	D
S11	Badda - Baru river Embankment Road	DMA	Secondary Road	New Road	0	4	4.5	Type 2	170	68,700	B
S12	Majhina – Koetpara – Trimohini connecting Road	RAJUK	Secondary Road	Widening	1	2	5.3	Type 4	53	17,300	D
S13	Badda - Golakandial Road (Merul Badda - Babur Jaiga - Balirpar - Parain -	DMA	Secondary Road	New Road	0	4	14.2	Type 2	536	72,600	B
S14	Rampura - Demra Road	DMA	Secondary Road	New Road	0	4	10.0	Type 2	141	34,900	C
S15-1	Bashaboo Jame Mosque to Trimohini Ghdaraghat via Shekker Jaiga Bridge	DMA	Secondary Road	Widening	1	4	6.3	Type2	156	51,600	C
S15-2	Construction of bridge over Balu river at Keodata	DMA	Secondary Road	New Bridge	0	4	0.04	Bridge	13	Unknown	
S16	Jatrabari crossing to Demra Ghat (Tarabo bridge) road	DMA	Secondary Road	Widening	2	6	7.5	Type 2	331	76,600	B
S17	New EPZ Link Road to Dhaka BP	RAJUK	Secondary Road	New Road	0	4	8.6	Type 2	157	31,700	C
S18	Dhaka BP - Demra Road along Shitalakhya River	RAJUK	Secondary Road	Widening	1	4	13.9	Type 2	230	37,900	C
S19	S8 (Azampur - Kaliganj Road) to S13 (Badda - Golakandial Road)	RAJUK	Secondary Road	New Road	0	4	13.2	Type 2	241	52,600	C
S20	Uttara ABM city - Matuali Road	DMA	Secondary Road	New Road	0	4	20.7	Type 2	781	68,500	B
S21-1	Dhirasram - Basabo Road (Dhaka BP to Inner Ring Road)	RAJUK	Secondary Road	New Road	0	4	7.5	Type 2	138	67,400	B
S21-2	Dhirasram - Basabo Road (Inner Ring Road to Basabo Madertek Road)	DMA	Secondary Road	New Road	0	4	16.0	Type 2	604	70,800	B
S22	Improvement of Matuail (Mridhabari) – Shayampur (Dhaka – Narayanganj) Road	DMA	Secondary Road	Widening	1	2	3.5	Type 4	43	27,800	D
S23	Improvement of Langolbandh – Kaikertek – Nabiganj Road	RAJUK	Secondary Road	Widening	1	2	9.6	Type 4	53	22,000	D
S24	Improvement of Sonargaon Museum link Road along with Baidderbazar–Sonargaon –Mograpara-Kaikertek–Road	RAJUK	Secondary Road	Widening	1	2	4.6	Type 4	25	21,400	D
S25	2nd Shitalakkhya Bridge at Narayanganj	RAJUK	Secondary Road	New Bridge	0	2	0.3	Bridge	107	Unknown	
S26	3rd Shitalakkhya Bridge at Narayanganj Bandar Upazila	RAJUK	Secondary Road	New Bridge	0	2	1.3	Bridge	458	22,900	D

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000
Source: JICA Study Team

Table 12.6 Proposed Road Development Projects (4)

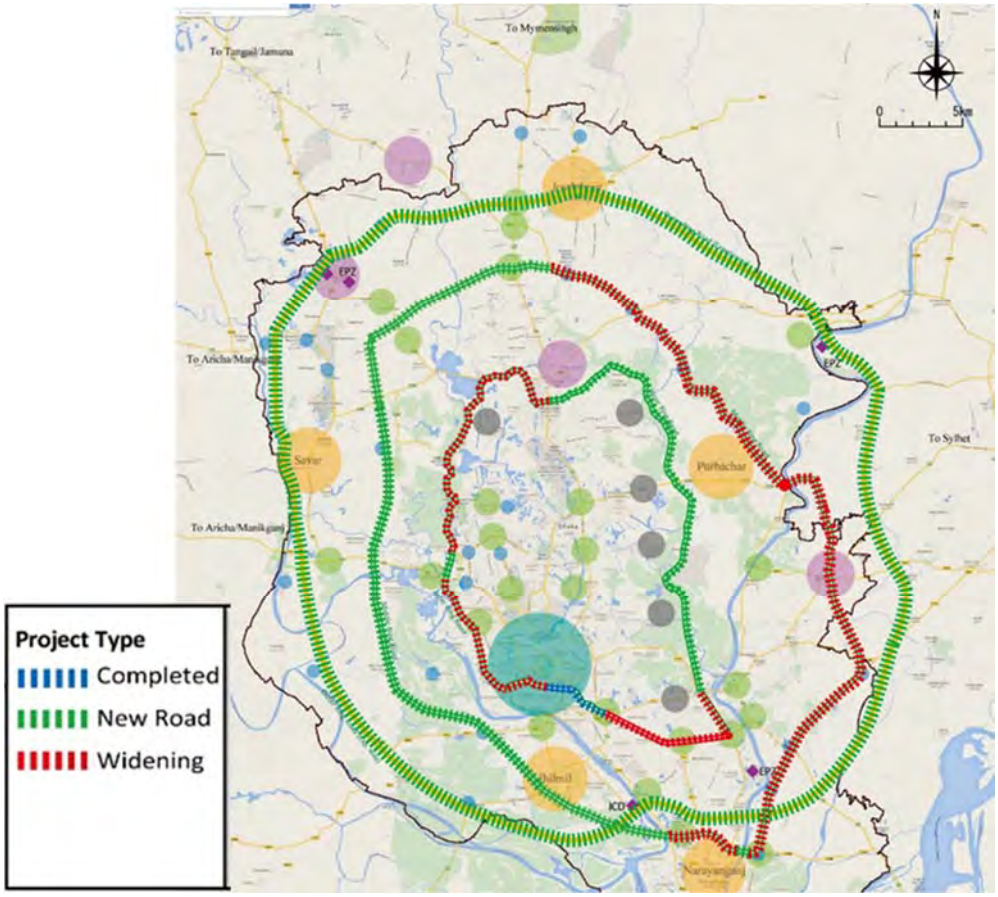
Sl. No.	Description	Main Area	Road Category	Type of Project	Lane Number (Existing)	Lane Number (Proposed)	Length (km)	Road Specification	Project Cost (Tk. Crore)	2035 Traffic Flow (pcu/day per both directions)	
S27	Baipay1 - Mouchak Road	RAJUK	Secondary Road	Widening/New Rd	1	2	7.1	Type 4	39	30,000	C
S28	Improvement of Zirani Kashimpur Road	RAJUK	Secondary Road	Widening	1	2	6.8	Type 4	38	26,000	D
S29	Naojora (Kodda) – Kashimpur – Narsinghapur Road	RAJUK	Secondary Road	Widening	1	2	11.7	Type 4	64	25,200	D
S30	Sreepur - Kashimpur Road	RAJUK	Secondary Road	Widening	1	2	6.1	Type 4	34	17,100	D
S31	Dewan Idris Sarak	RAJUK	Secondary Road	Widening	1	2	5.4	Type 4	30	60,100	B
S32	Berulia (Dhour) - Ashulia - EPZ road	RAJUK	Secondary Road	Improvement	2	2	6.1	Type 3	34	25,500	D
S33	Uttara Sector-10 to West Embankment road to the West	DCC	Secondary Road	New Road	0	4	3.0	Type 2	382	58,500	C
S34	Uttara Sector-3 to West Embankment road to the West	DCC	Secondary Road	New Road	0	4	5.8	Type 2	738	50,900	C
S35	West Embankment(Birulia Bridge) to Savar	RAJUK	Secondary Road	Widening	1	4	9.0	Type 2	149	61,700	B
S36	Pallabi to west Embankment via North Rupnagar	DCC	Secondary Road	New Road	0	4	3.5	Type 2	445	46,100	C
S37	Pallabi (Mirpur) to Uttara 3rd Phase	DCC	Secondary Road	New Road	0	4	6.5	Type 2	827	55,400	C
S38	Pallabi (Mirpur) to Uttara Sector 11	DCC	Secondary Road	New Road	0	4	4.0	Type 2	509	58,600	C
S39	Mirpur Road to Matikata Road	DCC	Secondary Road	New Road	0	4	3.2	Type 2	408	15,700	D
S40	Mirpur Zoo to Embankment (Berry Bund) to the west	DCC	Secondary Road	New Road	0	2	1.0	Type 3	95	Unknown	
S41-1	Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane	RAJUK	Secondary Road	New Road	0	4	1.1	Type 2	77	15,900	D
S41-2	Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane	Outside RAJUK	Secondary Road	Widening	1	4	30.9	Type 2	2,150	15,900	D
S42	Mirpur-14 (Sagorika) to Airport Road (Banani Railway Station) along the fringe of	DCC	Secondary Road	New Road	0	4	1.6	Type 2	204	52,700	C
S43	Argagaon Road (Bangladesh Betar) to Mirpur Section 2 through Senpara Parbata	DCC	Secondary Road	Widening	2	4	3.6	Type 2	212	41,400	C
S44	Bangla College to Kafrul intersecting Rokeya Sharoni	DCC	Secondary Road	Widening	1	4	3.7	Type 2	787	8,400	D
S45	Mohammadpur Krishi Market to Mirpur Road (Sohrawardy Hospital)	DCC	Secondary Road	Widening	1	2	1.2	Type 4	51	14,200	D
S46	Krishi Market & Baitul Aman (Y Junction) to Embankment to the west	DCC	Secondary Road	New Road	0	2	1.5	Type 4	107	21,700	D
S47	Mohammadpur Shia Mosque (near Japan Garden City) - Mohammadpur Bus Stand (Widening)	DCC	Secondary Road	Widening	1	4	0.6	Type 2	61	25,800	D
S48	Mohammadpur Bus Stand Embankment Berry Bandh) - upgradation	DCC	Secondary Road	Widening	1	4	0.7	Type 2	51	60,800	B
S49	Zikatala - Hazaribagh (Sikder Medical College) road	DCC	Secondary Road	New Road	0	4	1.6	Type 2	204	22,100	D
S50	Flyover and underpasses at Jahangir gate area	DCC	Secondary Road	Grade Separation	0	4	0.6	Grade Separation	441	44,500	C
S51	Mogbazar and Mouchak Flyover	DCC	Secondary Road	Grade Separation	0	4	5.8	Grade Separation	-	58,400	C
S52	Motijheel Shapla Chattar to Kamlapur Railway Station (Widening)	DCC	Secondary Road	Widening	1	2	0.5	Type 3	22	Unknown	
S53	Bashabo Kadamtola Road up to Manikdi	DMA	Secondary Road	New Road	0	4	4.2	Type 2	159	25,400	D
S54	Road connecting Buriganga 1st and 2nd bridges via Subhadia & Zinjira (South of	RAJUK	Secondary Road	New Road	0	4	3.5	Type 2	64	17,900	D
S55	Improvement of Z.K.D (Zinzira-Keraniganj-Dohar) Link Road into 4-lanes from 2nd Buriganga Bridge approach to Mawa link	RAJUK	Secondary Road	Widening	2	4	4.9	Type 2	50	56,300	C
S56	Konakhola to Hazratpur	RAJUK	Secondary Road	Widening	1	2	12.7	Type 4	70	31,300	C
S57	Hazratpur to Hemayetpur	RAJUK	Secondary Road	Widening	1	2	8.3	Type 4	46	14,400	D
S58	Improvement of Keraniganj (Konakhola) – Kholamura – Hazratpur – Itabhata – Mirpur (Hemayetpur) Road	RAJUK	Secondary Road	Widening	1	2	14.5	Type 4	80	14,700	D

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000
Source: JICA Study Team

2) Current Construction Status of Ring Roads

Three kind of ring roads are proposed in RSTP. The alignment of inner ring road is along the Balu River and the Buriganga River, located inside current urban area, while the alignment of middle ring road shares with the Dhaka Bypass Road and the outer ring road is a newly proposed alignment which falls along the boundary of RAJUK area.

The table below outlines the current status of those three ring roads.



Source: JICA Study Team

Figure 12.15 Current Constriction Status of the Three Ring Roads

Table 12.7 Current Constriction Status of the Three Ring Roads

(unit: km)

	Inner Ring Road	Middle Ring Road	Outer Ring Road
Completed	4.0 *(5.5%)*	0.0	0.0
Widening/ Improvement	38.2 *(52.2%)*	59.9 *(55.5%)*	0.0
New Road	31.0 *(42.3%)*	48.1 *(44.5%)*	129.0 *(100.0%)*
Total	73.2 *(100.0%)*	108.0 *(100.0%)*	129.0 *(100.0%)*

Source: JICA Study Team

Inner Ring Road (73.2km)

Locations;

- Teromukh
- Abdullahpur
- Gubtoli
- Rayerbazar
- Babu Bazar
- Sadarghat
- Fatullah
- Chashara
- Signboard (Dhaka-Chittgong Road)
- Shimrail
- Demra
- Balu River side (Eastern Bypass)

Middle Ring Road (108.0km)

Locations;

- Autpura
- Dhaka Bypass
- Bhulta
- Kanchpur
- Narayanganj
- Jhilmil
- Western Bypass

Outer Ring Road (129.0km)

Locations;

- Hemayetpur
- Kalakandi
- Madanpur
- Danga
- Bypail
- Gazipur

Source: JICA Study Team

Figure 12.16 Location of the Three Ring Roads

3) Prioritization of Proposed Road Project

The proposed road projects are prioritized on the basis of assessment from the following aspects.

a) Current status of the project
b) Urgency (Degree and scale of problems)
c) Building a missing link
d) Composing rings and radials road system
e) Providing main traffic axis in development area
f) Contributing to proper formation in urban area
g) Compatibility with relevant development plans
h) Traffic demand
i) Project cost

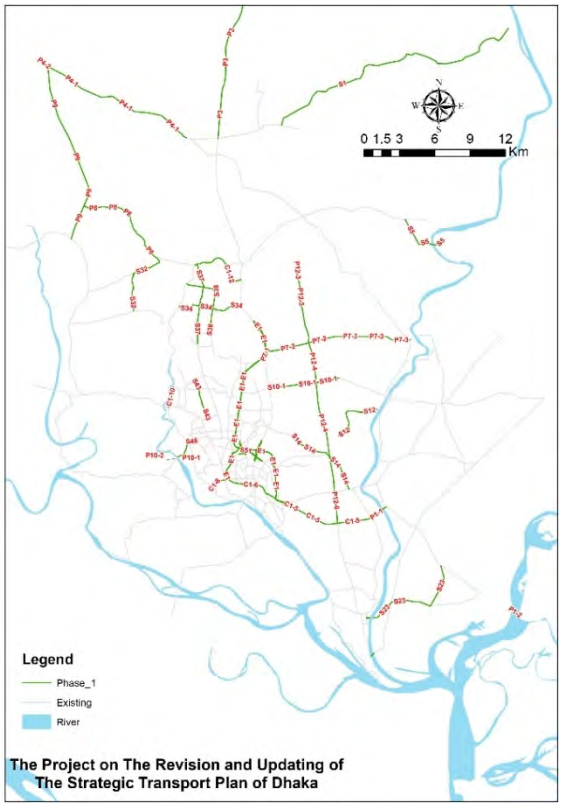
Each road project is given the priority in the following terms and summarized in Table 12.8. Details are described and listed up in Table 12.9 to Table 12.12

Phase 1: 2016 to 2020
Phase 2: 2021 to 2025
Phase 3: 2026 to 2030
Phase 4: 2031 to 2035

Table 12.8 Prioritization of Proposed Road Projects (Summary)

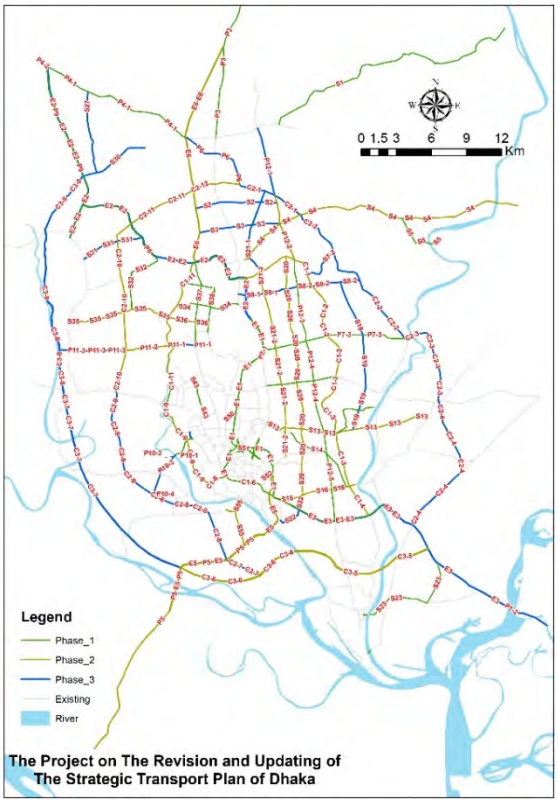
Implementation Phase	Project Length	Project Cost
Phase 1 (2016 to 2020)	380 km (31.7%)	23,759 Crore (24.7%)
Phase 2 (2021 to 2025)	274 km (22.8%)	24,542 Crore (25.5%)
Phase 3 (2026 to 2030)	256 km (21.3%)	24,317 Crore (25.2%)
Phase 4 (2031 to 2035)	288 km (24.1%)	23,706 Crore (24.6%)
Total	1,198 km (100.0%)	96,324 Crore (100.0%)

Note 2: Project costs are given from the relevant organization or estimated based on the average unit price obtained from several reports of the feasibility study on projects in RAJUK area by JICA Study team.
Source: JICA Study Team

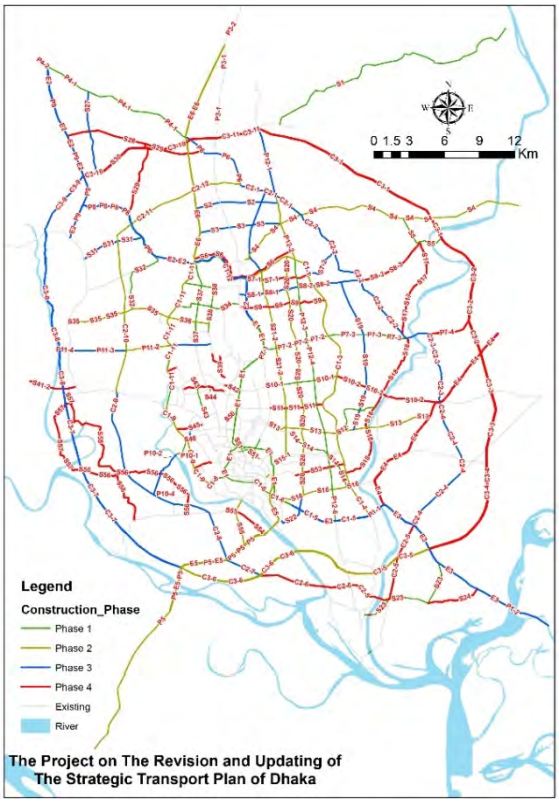


Phase 1 (2016 – 2020)

Phase 1 + 2 (2016 – 2025)



Phase 1 + 2 + 3 (2016 – 2030)



Phase 1+ 2 + 3 + 4 (2016 – 2035)

Figure 12.17 Investment Schedule for Urban Roads

Table 12.9 Prioritization of Proposed Road Projects (1)

Sl. No.	Description	Project Cost (Tk. Crore)	2035 Traffic Flow (pcu/day per both directions)		Ongoing Project	Urgency	Missing Link	Rings & Radials Roads	Provision of Traffic Axis	Urban Formation	Relevant Development Plan	Traffic Demand	Construction Phase
C1-1	Inner Ring Road / Dhaka Eastern BP (N3 to Termukh Rayerdia Link Rd.)	2,029	63,900	B				●				●	Phase 2
C1-2	Inner Ring Road / Dhaka Eastern BP (Termukh Rayerdia Link Rd. to N301)	1,590	58,700	C		●Disaster Prevention		●					Phase 2
C1-3	Inner Ring Road / Dhaka Eastern BP (N301 to R201)	3,976	54,800	C		●Disaster Prevention		●					Phase 2
C1-4	Inner Ring Road / R110 (R201 to N1)	83	42,500	C				●					Phase 2
C1-5	Inner Ring Road / N1 (R110 to Toll Gate) / Jatrabari - Khanchpur bridge (widening of polder road to 8 lane)	396	107,600	A	●			●				●	Phase 1
C1-6	Inner Ring Road / Jatrabari-Gulistan FO (Toll Gate to Chankhar Pul Bus Stop)	-	66,700	B				●				●	
C1-7	Inner Ring Road / Zahir Raihan Rd. (Chankhar Pul Bus Stop to Eden Girls College)	170	47,300	C		●Bottleneck		●					Phase 1
C1-8	Inner Ring Road (Rasulpur Bridge (Embankment) - Peelkhana road - Azimpur Old	252	88,600	B			●	●				●	Phase 1
C1-9	Inner Ring Road / Circular Road over embankment (Rasulpur Brg. to N5)	811	67,400	B				●				●	Phase 2
C1-10	Inner Ring Road / Circular Road over embankment (N5 to N501/Diabari Bot Tola :Flyover)	302	41,900	C		●Bottleneck	●	●					Phase 1
C1-11	Inner Ring Road / N501:Circular Road over embankment (Diabari Bot Tola to N302)	1,177	95,300	A				●				●	Phase 2
C1-12	Inner Ring Road / N302:Circular Road over embankment (N302 to N3)	534	50,600	C		●Bottleneck		●					Phase 1
C2-1	Middle Ring Road (Near Dhirashrom Rd. to R301) / N105:Dhaka BP	186	44,900	C				●					Phase 3
C2-2	Middle Ring Road / N105:Dhaka BP (R301 to N301)	469	64,600	B				●				●	Phase 3
C2-3	Middle Ring Road / N105:Dhaka BP (N301 to N2)	253	40,300	C				●					Phase 3
C2-4	Middle Ring Road / N105:Dhaka BP (N2 to N1)	397	43,800	C				●					Phase 3
C2-5	Middle Ring Road (N1 to R111)	877	44,000	C				●					Phase 4
C2-6	Middle Ring Road (R111 to Zazira IC)	836	56,800	C				●					Phase 4
C2-7	Middle Ring Road (Zazira IC to N8)	67	54,600	C				●					Phase 3
C2-8	Middle Ring Road (N8 to 3rd Briganga Brg. access Rd.)	204	55,700	C				●					Phase 3
C2-9	Middle Ring Road (3rd Briganga Brg. access Rd. to N5)	222	55,400	C				●					Phase 3
C2-10	Middle Ring Road (N5 to N302)	329	64,000	B				●	●			●	Phase 2
C2-11	Middle Ring Road (N302 to Dhaka-Mymensingh Exp.)	135	41,900	C				●	●				Phase 2
C2-12	Middle Ring Road (Dhaka-Mymensingh Exp. to Near Dhirashrom Rd.)	89	36,700	C				●	●				Phase 2
C3-1	Outer Ring Road (R310 to R301)	2,023	82,900	B				●				●	Phase 4
C3-2	Outer Ring Road (R301 to N2)	1,288	72,700	B				●				●	Phase 4
C3-3	Outer Ring Road (N2 to R114)	1,136	33,200	C				●					Phase 4
C3-4	Outer Ring Road (R114 to N1)	1,283	33,100	C				●					Phase 4
C3-5	Outer Ring Road (N1 to R111)	1,988	62,600	B				●	●		●Padma	●	Phase 2
C3-6	Outer Ring Road (R111 to N8)	2,399	29,800	D				●	●		●Padma		Phase 2
C3-7	Outer Ring Road (N8 to R504)	1,688	87,300	B				●				●	Phase 3
C3-8	Outer Ring Road (R504 to N5)	1,410	97,300	A				●				●	Phase 3
C3-9	Outer Ring Road (N5 to R505)	1,014	67,900	B				●				●	Phase 3
C3-10	Outer Ring Road (R505 to N4/N105)	3,505	33,900	C				●					Phase 4
C3-11	Outer Ring Road (N4/N105 to R310)	2,217	78,100	B				●				●	Phase 4

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000, When traffic demand is high, ● is marked in the box.
Source: JICA Study Team

Table 12.10 Prioritization of Proposed Road Projects (2)

Sl. No.	Description	Project Cost (Tk. Crore)	2035 Traffic Flow (pcu/day per both directions)		Ongoing Project	Urgency	Missing Link	Rings & Radials Roads	Provision of Traffic Axis	Urban Formation	Relevant Development Plan	Traffic Demand	Construction Phase
E1	Dhaka Elevated Expressway	8,940	96,500	A					●			●	Phase 1
E2	Dhaka - Ashulia Elevated Expressway	13,654	83,500	B				●				●	Phase 3
E3	Dhaka - Chittagong Access Controlled Highway (Kutubkhali - Outer Ring Road)	1,501	63,000	B								●	Phase 3
E4	Dhaka - Sylhet Expressway (N1 - Outer Ring Road)	795	47,600	C				●					Phase 4
E5	Dhaka - Mawa Expressway	5,169	76,000	B				●			●Padma	●	Phase 2
E6	Dhaka - Mymensingh Expressway	983	83,100	B				●				●	Phase 2
P1-1	N1 / 2nd Kanchpur Bridge and rehabilitation of existing Bridge	-	84,000	B	●			●				●	Phase 1
P1-2	N1 / 2nd Meghna Bridge and rehabilitation of existing Bridge	-	Unknown		●			●					Phase 1
P1-3	N1 / 2nd Gomoti Bridge and rehabilitation of existing Bridge	-	Unknown		●			●					Phase 1
P2	N2 / 4-Lane Flyover at Bhulta – Sylhet National Highway	-	Unknown		●	●Bottleneck		●					Phase 1
P3	N3 / Improvement of Joydevpur – Mymensingh Highway	1,951	74,800	B	●			●				●	Phase 1
P4-1	N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC	657	67,800	B	●			●				●	Phase 1
P4-2	N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC	2,698	Unknown		●			●					Phase 1
P5	N8 / Improvement into 4-lanes from 1st Buriganga Bridge to Padma Bridge Mawa link	359	72,200	B				●			●Padma		Phase 2
P6	N105 / Upgrading of Dhaka Bypass to 4 Lane (Joydevpur – Debogram – Bhulta – Madanpur)	219	59,400	C								●	Phase 3
P7-1	Kuril Flyover	303	96,200	A	●				●		●Purbachar	●	Phase 1
P7-2	N301 / From Airport Road near Khilkhet to First Balu Bridge (Isapura) via Baruna	270	67,900	B	●				●		●Purbachar	●	Phase 1
P7-3	N301 / From first Balu Bridge near Tek Noadda to Sitalakhya River near Kanchan	250	9,300	D	●			●	●		●Purbachar		Phase 1
P7-4	N301 / Extension from Dhaka BP to Outer Ring Road	83	10,800	D				●					Phase 4
P8	N302 / Ashulia to Aricha Road (C & B More)	13	30,400	C				●			●DAEE		Phase 1
P9	R505 / Nabinagar - EPZ - Chandra road improvement	131	43,400	C	●			●					Phase 1
P10-1	Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (East side)	121	85,200	B	●			●				●	Phase 1
P10-2	Construction of Buriganga 3rd bridge near Basila	710	85,200	B				●				●	Phase 3
P10-3	Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (West side)	28	85,200	B				●				●	Phase 3
P10-4	Extension of Buriganga 3rd Bridge access roads to Middle Ring Road	41	34,800	C				●					Phase 3
P11-1	Mirpur to Outer Ring Road (Kalshi Road to West embankment)	571	56,200	C						●			Phase 3
P11-2	Mirpur to Outer Ring Road (West embankment to Middle Ring Road)	85	64,800	B				●					Phase 2
P11-3	Mirpur to Outer Ring Road (Middle Ring Road to N5)	107	49,000	C				●					Phase 3
P11-4	Mirpur to Outer Ring Road (N5 to Outer Ring Road)	16	64,600	B				●				●	Phase 3
P12-1	Joydebpur - Narayanganj Highway (Joyedbupur to N105/Dhaka BP)	174	73,800	B				●				●	Phase 3
P12-2	Joydebpur - Narayanganj Highway (N105/Dhaka BP to Inner Ring Road)	171	63,500	B				●				●	Phase 2
P12-3	Joydebpur - Narayanganj Highway (Inner Ring Road to N301)	634	63,600	B					●		●BRT	●	Phase 1
P12-4	Joydebpur - Narayanganj Highway (N301 to Khilgaon)	715	55,600	C					●		●BRT		Phase 1
P12-5	Joydebpur - Narayanganj Highway (Khilgaon to R110)	437	49,100	C					●		●BRT		Phase 1
P12-6	Joydebpur - Narayanganj Highway (R110 to N1)	242	36,500	C					●		●BRT		Phase 1

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000, When traffic demand is high, ● is marked in the box.

Source: JICA Study Team

Table 12.11 Prioritization of Proposed Road Projects (3)

Sl. No.	Description	Project Cost (Tk. Crore)	2035 Traffic Flow (pcu/day per both directions)		Ongoing Project	Urgency	Missing Link	Rings & Radials Roads	Provision of Traffic Axis	Urban Formation	Relevant Development Plan	Traffic Demand	Construction Phase
S1	Gazipur – Azmatpur – Itakhola Road (revised)	300	Unknown		●								Phase 1
S2	Gacha - Jiraitali Road	39	45,600	C						●			Phase 3
S3	Sataish - Karamtola Road	38	45,800	C						●			Phase 3
S4	4-lanes road from S.A.M. (Shahid Ahsanullah Master) Flyover to Kaliganj Bypass along the railway line	252	25,800	D				●			●EPZ		Phase 2
S5	New EPZ Link Road (R301 to New EPZ)	86	43,400	C				●			●EPZ		Phase 1
S6	Tongi Embankment (Dhaka - Mymensing Exp. to Joydebpur - Narayanganj Hwy.)	191	52,800	C						●			Phase 4
S7-1	Improvement of Abdullahpur – Teromukh – Ulukhola Road (Uttara Sector-8 to Balu river embankment)	68	23,600	D						●			Phase 4
S7-2	Improvement of Abdullahpur – Teromukh – Ulukhola Road (Balu river embankment to Dhaka BP)	20	17,500	D						●			Phase 3
S8-1	Azampur - Kaliganj Road (N3 to Joyedbupur - Narayanganj Hwy.)	165	61,000	B						●		●	Phase 3
S8-2	Azampur - Kaliganj Road (Joyedbupur - Narayanganj Hwy. to Dhaka BP)	99	53,400	C				●		●			Phase 3
S8-3	Azampur - Kaliganj Road (Dhaka BP to New EPZ Link Road)	115	20,000	D				●		●			Phase 4
S9	Uttara Sector-4 - Dakhinkhan - Khordi	91	Unknown							●			Phase 4
S10-1	Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj)	886	85,200	B	●					●		●	Phase 1
S10-2	Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj)	3,752	23,700	D						●			Phase 4
S11	Badda - Baru river Embankment Road	170	68,700	B								●	Phase 4
S12	Majhina – Koetpara – Trimohini connecting Road	53	17,300	D	●								Phase 1
S13	Badda - Golakandial Road (Merul Badda - Babur Jaiga - Balirpar - Parain -	536	72,600	B						●		●	Phase 2
S14	Rampura - Demra Road	141	34,900	C	●					●			Phase 1
S15-1	Bashaboo Jame Mosque to Trimohini Ghdaraghat via Shekker Jaiga Bridge	156	51,600	C						●			Phase 4
S15-2	Construction of bridge over Balu river at Keodata	13	Unknown		●					●			Phase 1
S16	Jatrabari crossing to Demra Ghat (Tarabo bridge) road	331	76,600	B								●	Phase 2
S17	New EPZ Link Road to Dhaka BP	157	31,700	C						●			Phase 4
S18	Dhaka BP - Demra Road along Shitalakhya River	230	37,900	C						●			Phase 4
S19	S8 (Azampur - Kaliganj Road) to S13 (Badda - Golakandial Road)	241	52,600	C						●			Phase 3
S20	Uttara ABM city - Matuali Road	781	68,500	B						●		●	Phase 2
S21-1	Dhirasram - Basabo Road (Dhaka BP to Inner Ring Road)	138	67,400	B						●		●	Phase 3
S21-2	Dhirasram - Basabo Road (Inner Ring Road to Basabo Madertek Road)	604	70,800	B						●		●	Phase 2
S22	Improvement of Matuail (Mridhabari) – Shayampur (Dhaka – Narayanganj) Road	43	27,800	D						●			Phase 3
S23	Improvement of Langolbandh – Kaikertek – Nabiganj Road	53	22,000	D	●								Phase 1
S24	Improvement of Sonargaon Museum link Road along with Baidderbazar–Sonargaon –Mograpara-Kaikertek–Road	25	21,400	D						●			Phase 4
S25	2nd Shitalakkhya Bridge at Narayanganj	107	Unknown				●						Phase 4
S26	3rd Shitalakkhya Bridge at Narayanganj Bandar Upazila	458	22,900	D	●								Phase 1

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000, When traffic demand is high, ● is marked in the box.
Source: JICA Study Team

Table 12.12 Prioritization of Proposed Road Projects (4)

Sl. No.	Description	Project Cost (Tk. Crore)	2035 Traffic Flow (pcu/day per both directions)		Ongoing Project	Urgency	Missing Link	Rings & Radials Roads	Provision of Traffic Axis	Urban Formation	Relevant Development Plan	Traffic Demand	Construction Phase
S27	Baipayl - Mouchak Road	39	30,000	C						●			Phase 3
S28	Improvement of Zirani Kashimpur Road	38	26,000	D						●			Phase 4
S29	Naojora (Kodda) – Kashimpur – Narsinghapur Road	64	25,200	D						●			Phase 4
S30	Sreepur - Kashimpur Road	34	17,100	D						●			Phase 3
S31	Dewan Idris Sarak	30	60,100	B						●		●	Phase 3
S32	Berulia (Dhour) - Ashulia - EPZ road	34	25,500	D	●								Phase 1
S33	Uttara Sector-10 to West Embankment road to the West	382	58,500	C							●Uttra III		Phase 1
S34	Uttara Sector-3 to West Embankment road to the West	738	50,900	C							●Uttra III		Phase 1
S35	West Embankment(Birulia Bridge) to Savar	149	61,700	B						●		●	Phase 2
S36	Pallabi to west Embankment via North Rupnagar	445	46,100	C						●			Phase 2
S37	Pallabi (Mirpur) to Uttara 3rd Phase	827	55,400	C	●						●MRT 6		Phase 1
S38	Pallabi (Mirpur) to Uttara Sector 11	509	58,600	C							●Uttra III		Phase 1
S39	Mirpur Road to Matikata Road	408	15,700	D						●			Phase 4
S40	Mirpur Zoo to Embankment (Berry Bund) to the west	95	Unknown				●						Phase 4
S41-1	Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane	77	15,900	D				●					Phase 4
S41-2	Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane	2,150	15,900	D				●					Phase 4
S42	Mirpur-14 (Sagorika) to Airport Road (Banani Railway Station) along the fringe of	204	52,700	C			●						Phase 4
S43	Argagaon Road (Bangladesh Betar) to Mirpur Section 2 through Senpara Parbata	212	41,400	C	●					●			Phase 1
S44	Bangla College to Kafrul intersecting Rokeya Sharoni	787	8,400	D						●			Phase 4
S45	Mohammadpur Krishi Market to Mirpur Road (Sohrawardy Hospital)	51	14,200	D						●			Phase 4
S46	Krishi Market & Baitul Aman (Y Junction) to Embankment to the west	107	21,700	D						●			Phase 4
S47	Mohammadpur Shia Mosque (near Japan Garden City) - Mohammadpur Bus Stand (Widening)	61	25,800	D						●			Phase 3
S48	Mohammadpur Bus Stand Embankment Berry Bandh) - upgradation	51	60,800	B	●							●	Phase 1
S49	Zikatala - Hazaribagh (Sikder Medical College) road	204	22,100	D						●			Phase 4
S50	Flyover and underpasses at Jahangir gate area	441	44,500	C		●Bottleneck							Phase 3
S51	Mogbazar and Mouchak Flyover	-	58,400	C	●								Phase 1
S52	Motijheel Shapla Chattar to Kamlapur Railway Station (Widening)	22	Unknown								●BRT		Phase 2
S53	Bashabo Kadamtola Road up to Manikdi	159	25,400	D						●			Phase 4
S54	Road connecting Buriganga 1st and 2nd bridges via Subhadia & Zinjira (South of	64	17,900	D						●			Phase 4
S55	Improvement of Z.K.D (Zinzira-Keraniganj-Dohar) Link Road into 4-lanes from 2nd Buriganga Bridge approach to Mawa link	50	56,300	C							●Padma /Jhilmil		Phase 2
S56	Konakhola to Hazratpur	70	31,300	C						●			Phase 4
S57	Hazratpur to Hemayetpur	46	14,400	D						●			Phase 4
S58	Improvement of Keraniganj (Konakhola) – Kholamura – Hazratpur – Itabhata – Mirpur (Hemayetpur) Road	80	14,700	D						●			Phase 4

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000, When traffic demand is high, ● is marked in the box.
Source: JICA Study Team

(6) Major Highway Project

1) Dhaka Elevated Expressway (E1)

Progress: Contract signed

Total Estimated Cost: Tk. 89,400 million

Main Route: Hazrat Shahjalal International Airport – Kuril – Mohakhali – Tejgaon - Moghbazar- Kamlapur – Saidabad – Jatrabari - Dhaka Chittagong Highway (near Kutubkhali)

2) Dhaka – Ashulia Elevated Expressway (E2)

Progress: RFQ Process is ongoing.

Total Estimated Cost: Tk. 136,540 million

Main Route: Hazrat Shahjalal International Airport – Ashulia – EPZ – Chandra – connecting Savar Martyrs Monument.

3) Kanchpur – Bhulta – Bhairab – Ashuganj – Sarail (N2) Road Improvement into 4-lane Expressway (E4)

Progress: PPP Cell, RHD has sent the proposal to obtain NOC (No Objection Certificate) from DTCA

Total Estimated Cost: Tk. 42,606 million

Main Route: Kanchpur – Bhulta – Bhairab – Ashuganj – Sarail (N2)

4) Upgrading of Dhaka Bypass to 4 lane, Middle Ring Road (P6, C1-C4)

Progress: Detailed Feasibility has been completed

Total Estimated Cost: Tk. 15,242 million

Main Route: Joydevpur – Debogram – Bhulta – Madanpur

5) Hemayetpur – Singair – Manikganj 4 Lane road (S41)

Progress: Detailed Feasibility is ongoin

Total Estimated Cost: Tk. 22,270 million

Main Route: Hemayetpur – Singair – Manikganj

6) Construction of Flyover and Underpass at Jahangir gate area (S50)

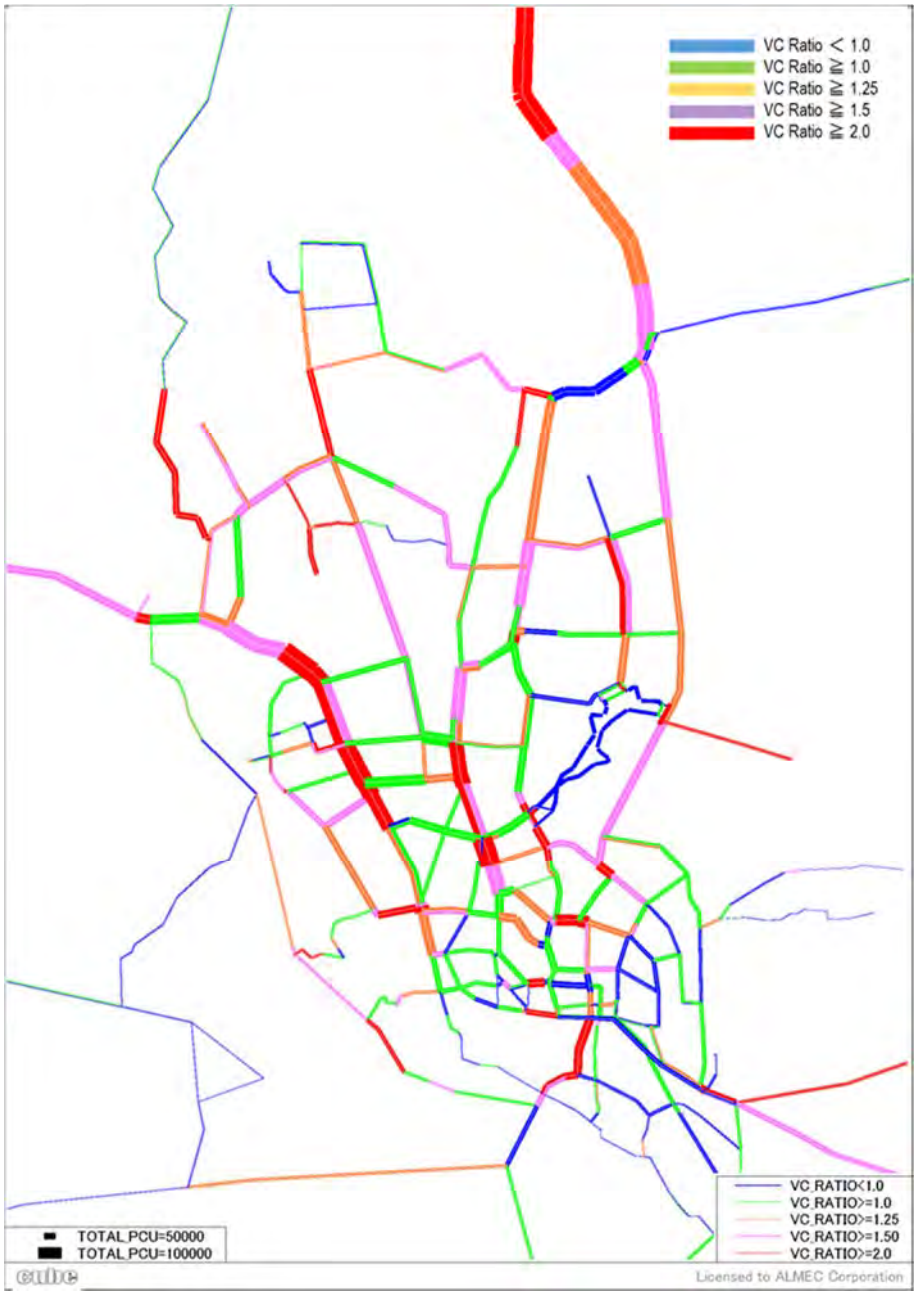
Progress: PDPP has been sent to the Planning Commission

Total Estimated Cost: Tk. 4,406 million

Main Route: Mohakhali flyover – Shahinbag – Kazi Nazrul Islam Avenue – Agargaon connecting link road

(7) 2014 and 2035 Road Network Performance

The road network performance under the current situation is summarized as follows. The average travel speed is 6.4 km/h in RAJUK area while 6.1 km/h in DMA and V/C (volume-to-capacity ratio) is 1.2. In RAJUK area alone, excluding DMA, average travel speed is 6.8 km/h which is a little bit faster than in DMA.



Source: JICA Study Team

Figure 12.18 Current Road Network Performance (2014)

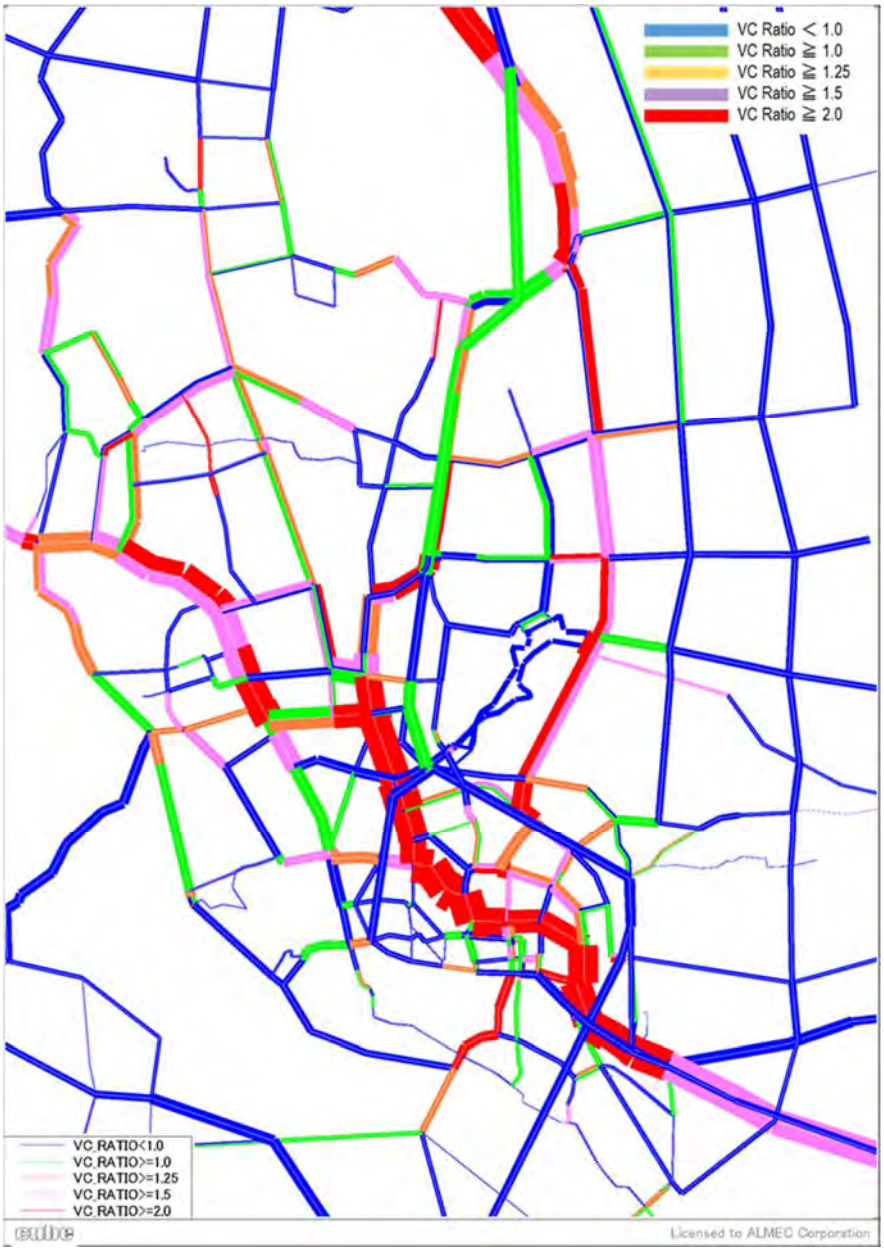
And in “Do-nothing Case”, the traffic is expected to worsen at an average travel speed of 4.7 km/h in RAJUK area and 5.0 km/h in DMA while V/C will be 3.7.

RSTP travel demand model runs were carried out considering the entire proposed roads and highways network. The entire network was tested for its operational

performance until 2035 and it showed an acceptable and sustainable level of service in the Study Area. The 2035 road traffic volumes and resulting average speed are depicted as shown in Figure 12.20 and Table 12.13.

Source: JICA Study Team

Figure 12.19 Current Road Network Performance (2035)



Source: JICA Study Team

Figure 12.20 Proposed Road Network Performance (2035)

Table 12.13 Road Network Performance

	Ave. V/C	Ave. Speed (kph)		Total VOC (mil. TK/day)	Total TTC (mil. TK/day)	VOC/trip (TK/day)	TCC/trip (TK/day)
		DMA	RAJUK				
2014	1.2	6.1	6.4	174	2,324	11.3	150.9
2025 Do-Nothing	2.1	5.1	5.1	338	8,594	14.8	375.3
2025 Master Plan	0.8	11.3	10.2	325	4,651	14.2	203.1
2035 Do-Nothing	3.7	5.0	4.7	692	11,587	25.6	429.1
2035 Master Plan	0.8	11.7	13.7	579	4,942	21.4	183.0

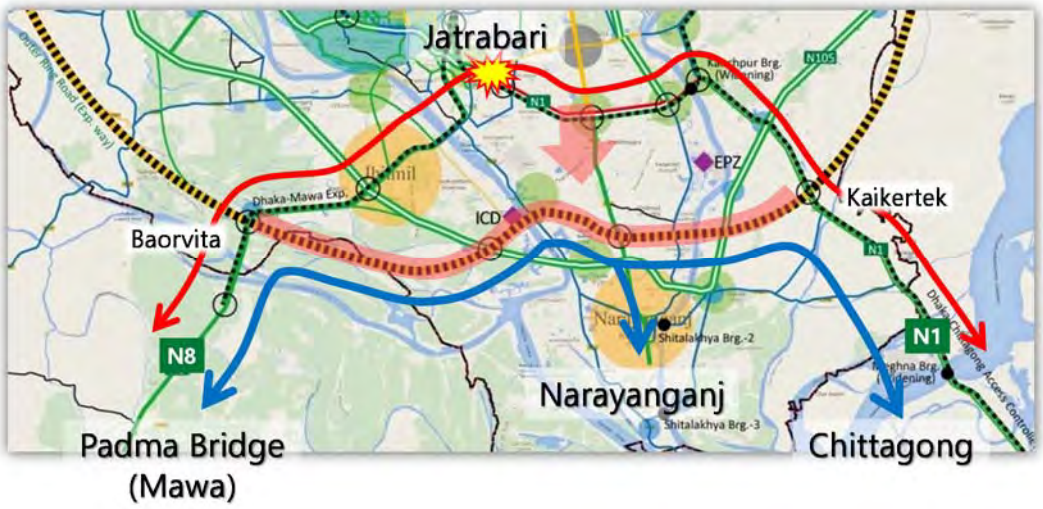
Source: JICA Study Team

(8) The High Priority Project

1) Southern Part of the Outer Ring Road

The Padma Multipurpose Bridge will be opened to traffic by 2018 that will connect Louhajong, Munshiganj to Shariatpur and Madaripur, linking the south-west of the country to northern and eastern regions. Once the bridge is opened, expected huge number of vehicles will flow from southern-west side to Jatrabari area.

Jatrabari is currently famous for the traffic congestion and after the opening of Padma Bridge, traffic situation will come to worst. Therefore, southern part of the middle or outer ring road should be constructed as soon as possible.



Source: JICA Study Team

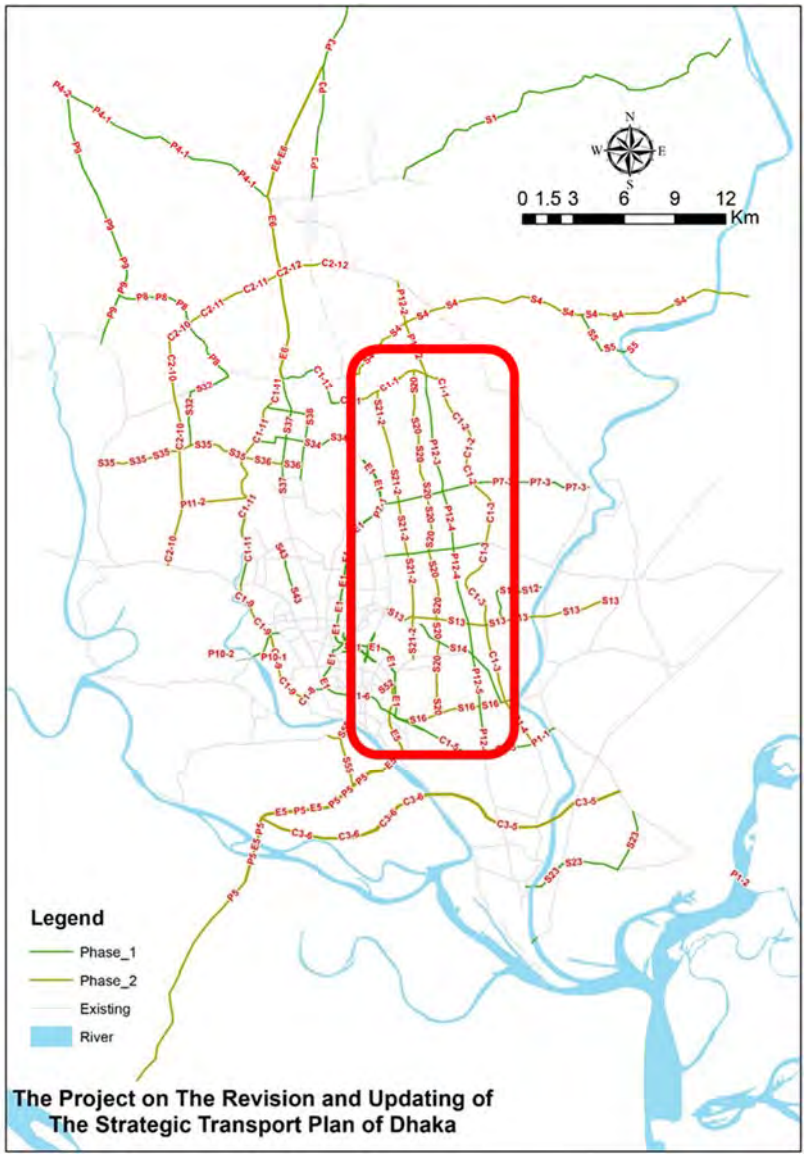
Figure 12.21 The High Priority Project

2) Road Network in the Eastern Fringe Area

In RSTP, road network development in the Eastern Fringe Area is listed as the short- and mid- term project for promoting the designed urban development and reducing congestions of DIT road during the construction period of MRT Line 1.

At the Eastern Fringe Area including Purbachal, RAJUK and many private developers have a new housing development plan, but for a long time, little progress has been made in the development of this area, because social infrastructures including public transport services and roads still does not supply. On the other hand, at the northwest area of RAJUK area including Gazipur, Ashulia and Savar where social infrastructures had already been developed, housing land has been further development without any control. So a quick and effective social infrastructures development are needed in the eastern fringe area. On the other hand, if one private developer has fulfilled the standard requirements for road ratio for housing area, they have sole discretion to development roads. So in order to realize the ideal urban structure proposed in RAJUK Structure Plan and RSTP, the Government needs take a strong initiative and negotiate with private developers to build the social infrastructures for the Eastern Fringe Area development.

With the start of development of MRT Line 1 around 2020, heavy traffic congestion will occur on DIT road including Pragati Avenue and Bir Uttam Rafiqul Islam Avenues. So new road netowrks need to be constructed in the eastern fringe area as the bypass road.



Source; JICA Study Team

Figure 12.22 Proposed Road Network in the Eastern Fringe Area

12.3 Public Transportation Plan

(1) Planning Considerations

The Study surveys analysis showed that Public transport (PT) mode share in Dhaka is ranging between 60-80% depending on the corridor and time of the day. It is significant to note that many Asian cities are spending hundreds of million Dollars to achieve even just 10% PT mode share. Thus, Dhaka's public transport system could be vastly improved at no great cost to the public purse and simultaneously reduced the subsidy or even removed it once and for all. This has been done in other big cities of Asia and the World and can also be done in Dhaka in view of the high mode share of buses.

For large urban areas such as Dhaka, the only way to effectively meet transport demand is to provide the city with a high quality public transport system that must be developed in integration with urban development. The core network will be composed of MRT and BRT while secondary and feeder services will be by buses with different sizes and types of services. However, establishing a good public transport system is not an easy task, it requires huge amount of funds as well as operation and management capacities over a long period of time. Fares that can be collected from users will hardly pay the investment cost and poorly developed system will attract only a limited number of passengers. Experiences of successful cities clearly indicate that mass transit networks serve as the backbone of the urban structure and are integrated with urban land use and development.

A public transport-oriented city cannot be realized solely by introducing mass transit as a mode of transportation, it must also be associated with efficiently integrated urban areas and a parallel lifestyle shift by the people. Key considerations must be given to the following:

(a) Integrated Urban Development: Land use and urban development must be re-organized along the mass transit corridors in such a way that socio-economic activities are more effectively articulated with mass transit. This requires a review of the existing urban master plan which is rather road-transportation-based.

(b) Adequate Role-sharing with Private Transport: Private transport which includes cars, motorcycles and bicycles, is also an equally important mode as the society becomes affluent and demands diversify. Private transport modes also play as an important feeder services to mass transit systems.

(c) Long-term Commitment: A successful mass-transit-based city cannot be achieved in a short period of time as this needs to be long-termed and requires consistent policy intervention and people's good understanding and support.

(2) Components of the Public Transportation System

The recommended structure of the public transportation system in Dhaka is shown in Figure 12.23. The system will have four basic components, namely:

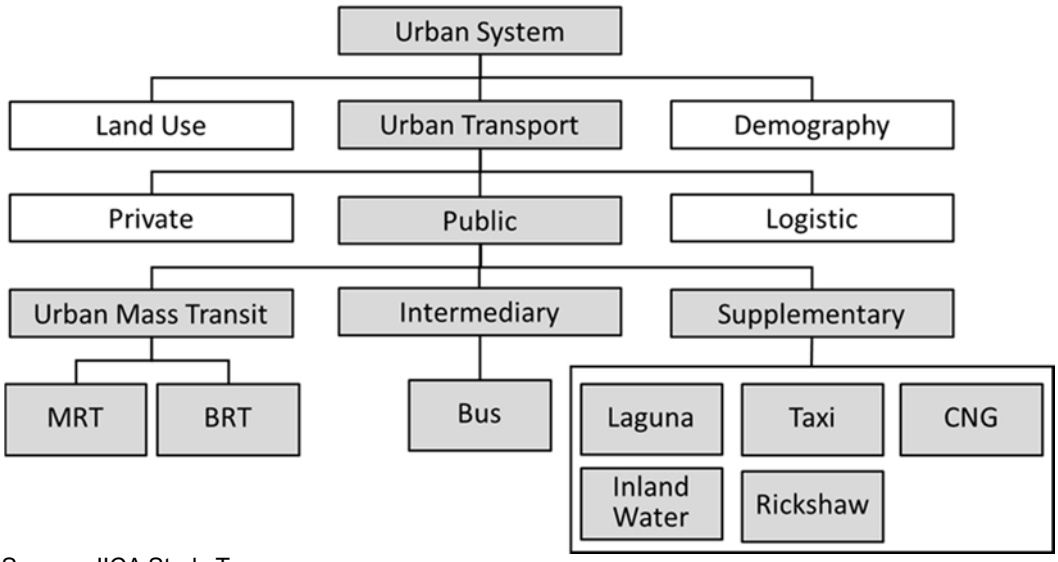
a) A high-capacity public transport network composed of both BRT and MRT in a dedicated guideway (with partly at-grade, elevated or underground alignments).

b) An intermediate bus network composed of primary and secondary (feeder), bus routes using existing road infrastructures.

c) A supplementary system made up of small vehicles and operated basically by the private sector.

d) A network of multimodal interchange stations strategically located at all major public transportation intersections around CBD and its suburbs.

These four hierarchal components of the proposed public transportation system for Dhaka are described in this section of the report.



Source: JICA Study Team

Figure 12.23 Components of the Proposed Public Transportation System for Dhaka

(3) Urban Mass Transit System

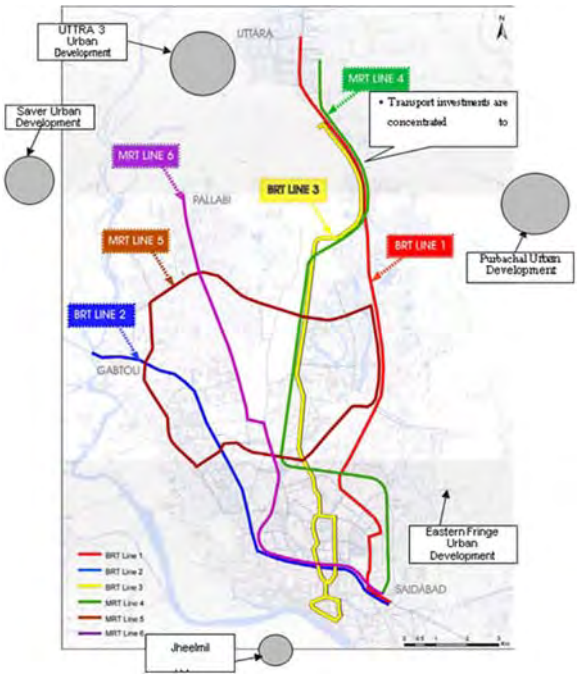
Based on the two previously identified projects and the passenger demand forecasts, the conceptual master plan for the MRT/BRT system has consolidated the number of previously proposed lines into three BRT lines and three MRT lines as described briefly below and a more detailed discussion in succeeding sections.

1) Overall Network in STP

In the STP plan, there are two major problems or issues that can be pointed out. The first issue is that, three transport investment plans proposed by STP are just concentrated to Airport Avenue namely BRT Line 3, MRT Line 4 and Urban Expressway. Although there is a large amount of traffic demand within the Airport Road, but this seems to be too much transport investment concentrated in one area. The other is that, the public transport services are not provided for new urban communities such as Purbachal, UTTARA Phase 3, Savar, Jheelmil and Eastern Fringe area where it is expected to accommodate over 5 million from 2010 toward 2050. However, the STP has not considered any transport system covering these areas.

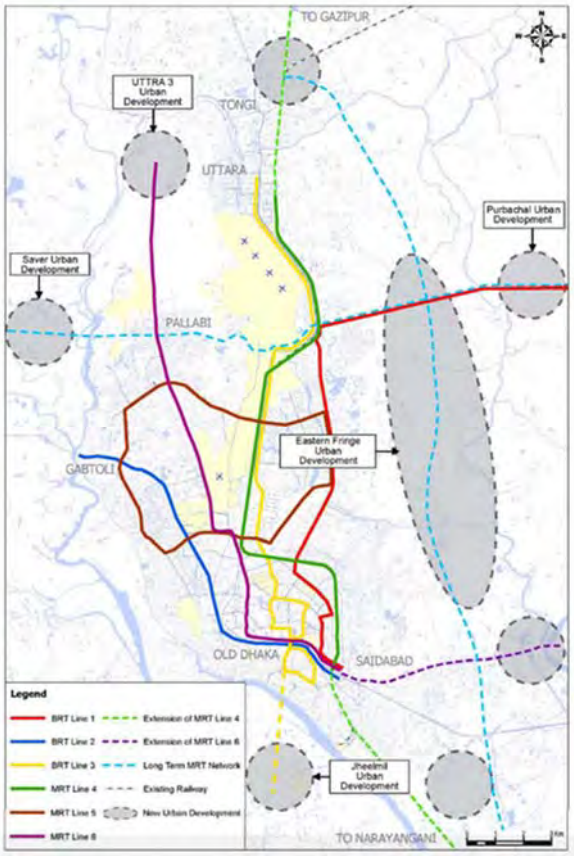
2) Overall Network in DHUTS

The future urban structure of making multi-core mega region in Greater Dhaka Area toward 2050 is proposed and presented in DHUTS. This structure plan proposed the three (3) development axis with mass transit corridors, namely a) Existing North-South Development Corridor, i.e., Tongi – Mirpur – City Center – Nayangaji, b) East-West Development Corridor, i.e., Purbachal – Uttra –Savar, c) Eastern Fringe Development Corridor. Based on the above-mentioned urban structure and major issues of the STP Plan, the future MTS network plan toward 2050 is proposed in Figure 12.25. The proposed MRT development plan is eight (8) lines, of which five (5) lines are proposed for MRT system and the remaining three (3) lines are BRT Line.



Source: STP

Figure 12.24 Public Transport Network Proposed by STP



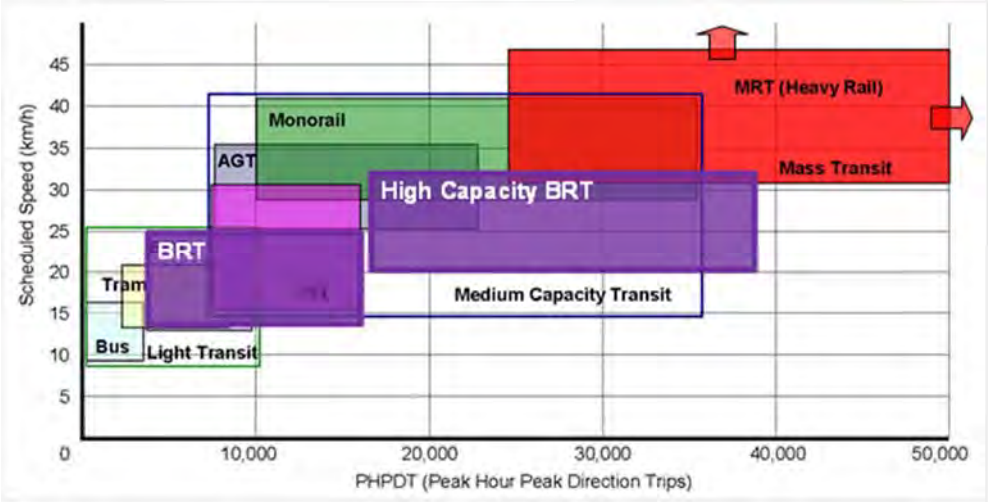
Source: DHUTS

Figure 12.25 Public Transport Network Proposed by DHUTS

3) Introduction of Mass Transit System based on Hierarchy of Public Transport System

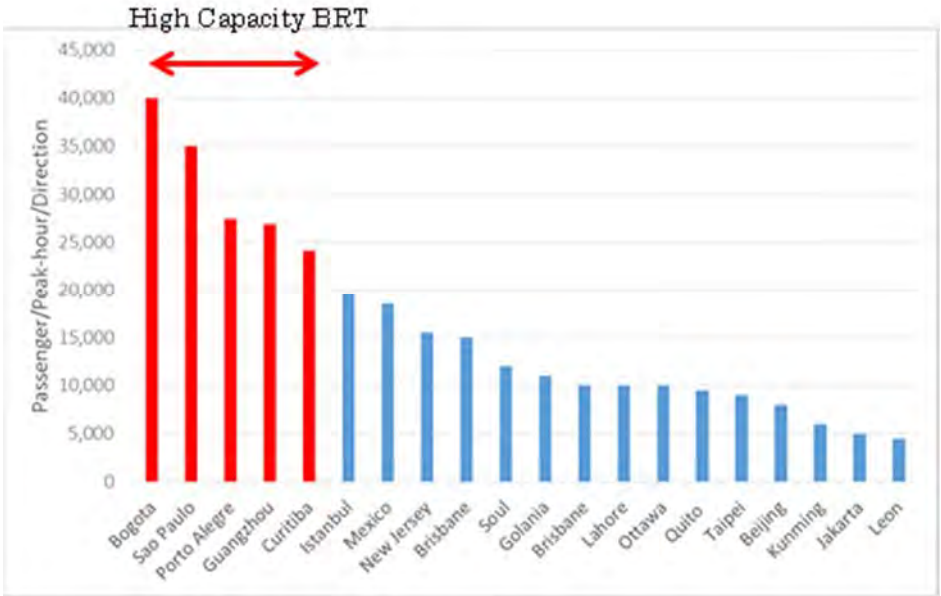
The keys of public transport to function are speed and capacity. BRT can carry 10,000 to about 16,000 PPHPD (passengers per hour per direction). But high capacity BRT operating in Curitiba, Sao Paulo, Bogota and others can carry more than 20,000 PPHPD. MRT, on the other hand, can accommodate 25,000-50,000 PPHPD at much higher speeds.

And STP proposed a bus-based rapid transit system, BRT as the backbone of the service in the first ten years with the eventual service based on Metro rail systems as demand increases. And after ten years traffic demand in the study area has grown along with rising economy. After few years, traffic demand will overtake capacity of BRT network services.



Source: JICA study Team

Figure 12.26 Capacity of Urban Public Transports

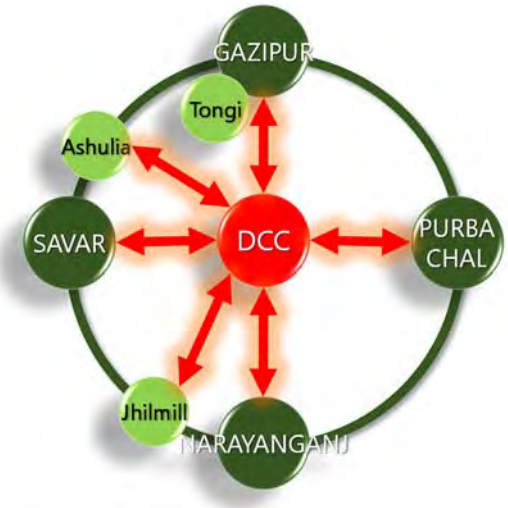


Source: Modified by JUCA Study Team based on “Bus Rapid Transit Systems – a comparative assessment”, David A. Hensher, and Thomas F. Golob, University of Sydney

Figure 12.27 Actual Peak Ridership of Various BRT Systems

4) Network Descriptions

From the initial passenger demand forecasts based on the existing public transportation network, there appears to be six distinct public transportation corridors serving Dhaka. These transportation corridors are indicated in Figure 12.28. And in RSTP, high capacity public transport system, like MRT or BRT will be proposed in each corridors.



(1) CBD – Tongi, Gazipur Corridor

(2) CBD – Purbachal Corridor

(3) CBD – Narayanganj Corridor

(4) CBD – Jhimil Corridor

(5) CBD – Savar Corridor

(6) CBD- Ashulia Corridor

Source: JICA Study Team

Figure 12.28 Transport Corridors in RAJUK Area

i. **CBD – Tongi, Gazipur Corridor (N3):** Gazipur area is a rapidly expanding towns in the north of Dhaka. This corridor is the main gateway to the north serving the northern suburbs of RAJUK area and beyond to Maymensingh.

ii. **CBD – Purbachal Corridor:** Purbachal is the biggest Planned township in Bangladesh. This new town area comprise of about 6150 acres land located in between the Shitalakhya and the Balu River at Rupgonj thana of Narayangonj district and at Kaligonj Thana of Gazipur district, in the north-eastern side of Dhaka. The Township will be linked with 8(eight) lane wide expressway from the Airport Road/Progati swarani crossing with the distance of only 6.8 km.

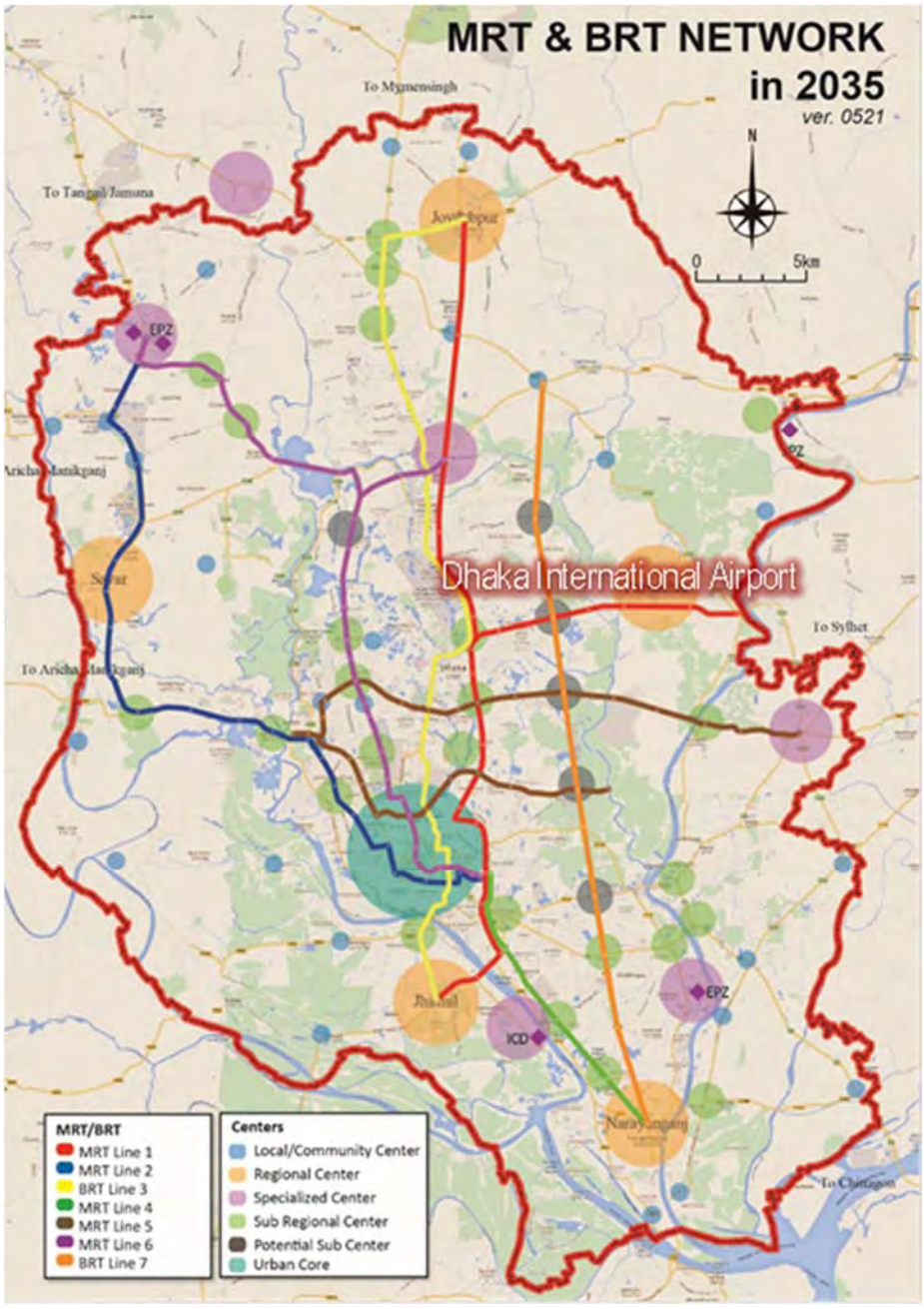
iii. **CBD – Narayanganj Corridor:** Narayanganj is a center of business and industry, particularly trading and processing plants of jute and the textile sector of the country. This corridor comprises of a four-lane road and BR single-track rail line is on the transport corridor with several stations and grade crossings.

iv. **CBD – Jhilmil Corridor:** Jhilmil new town project is located at Keranigonj across the Burigonga River. The Project area comprises of 381.11 acres of land. There will be about 1,740 residential plots and 9,500 apartments for lower and middle income groups with available necessary infrastructure and urban services. This transport corridor will play as an important logistic corridor after the opening of the Padma Bridge.

v. **CBD – Savar Corridor:** Savar is a new center of industry, specifically jute trade and processing plants and considered to be the textile center. There is a major bus terminal, Gabtoli Bus Terminal on Dhaka – Aricha Highway and this area is one of the most congested area in Dhaka.

vi. **CBD- Ashulia Corridor:** Ashulia is a suburban area near Dhaka with nearby areas like Savar and Tongi. Environmentalists and some NGOs in Bangladesh have expressed concern over the rapid urbanization of Ashulia especially in the context of the ongoing real estate development projects and happens to be the most affected city around Dhaka area. Believe it or not only a few places are left for new industries as most of the places are now owned by a garment factory or any land developer.

Based on the above-mentioned urban structure and major issues of the STP Plan, the future MRT/BRT network plan toward 2025 is proposed in Figure 12.29 and Table 12.14. The proposed MRT/BRT development plan is seven (7) lines, of which five (5) lines are proposed for MRT system and the remaining two (2) lines are BRT Line.



Source: JICA Study Team

Figure 12.29 MRT/BRT Network in 2035

Table 12.14 Summary of MRT/BRT System Plan

	Section	Proposed System	Length (km)	notes
Line 1	Gazipur - Airport - Kamalapur - Jhimill Purbachal - Khilkhet	MRT	52	
Line 2	Ashulia - Savar - Gabtali - Dhaka Unv. – DSCC - Kamalapur	MRT	40	
Line 3	Gazipur – International Airport - Jhimill	BRT	42	On-going
Line 4	Kamalapur - Narayanganj	MRT	16	
Line 5	Bulta - Badda – Mirpur Road – Mirpur 10 – Gabtoli Bus Terminal – Dhanmondi – Bashundhara City – Hatir Jheel Link Road	MRT	35	
Line 6	Ashulia - Uttara North – Pallabi – Tejigaon –Motijheel - Kamalapur	MRT	41.8	On-going
Line 7	Eastern Fringe Area	BRT	36	

Source: JICA Study Team

MRT Line 1

From the passenger demand forecasts for this line, it has been identified that this one has the highest passenger demands with nearly 1.9 million passengers per day and 37,770 PPHPD in 2035.

This 52-kilometer-long MRT line will serve the northern and southern suburbs of Dhaka via CBD including International Airport and Kamalapur Station and as well serve the Purbachal new town.

The alignment of northern part will generally follow the existing railway line but will be grade-separated. And southern part will run along the DIT road to Kamalapur station.

There are 8 multimodal stations including major interchange facilities at Airport, Natun Bazar (MRT Line 5), and Kamalapur Station.

Depot/workshop and stabling area will be located at the eastern part of Purbachal Newtown.

Figure 12.30 Proposed MRT Line1

Until the MRT Line 1 is operational in 2025, the short term corridor passenger demand will be served by the existing and new bus networks or possibly a new primary or priority bus route along the eastern corridor (Purbachal – Kuril).

MRT Line 2

This line has been identified to have the higher passenger demands with nearly 1.1 million passengers per day and 23,020 PPHPD in 2035 as per the passenger demand forecasts.

This 40-kilometer-long MRT line will serve the western suburbs of Dhaka via CBD including Gabtoli Bus Terminal and Kamalapur Station.

There are 3 multimodal stations including major interchange facilities at the station of Circular Waterway (Gabtoli) and Kamalapur Station.

Depot/workshop and stabling area will be situated at the eastern part of Savar or Ashulia.

Until the MRT Line 2 is operational in 2035, the short term corridor passenger demand will be served by the existing and new bus networks or possibly a new primary or priority bus route along the western corridor.

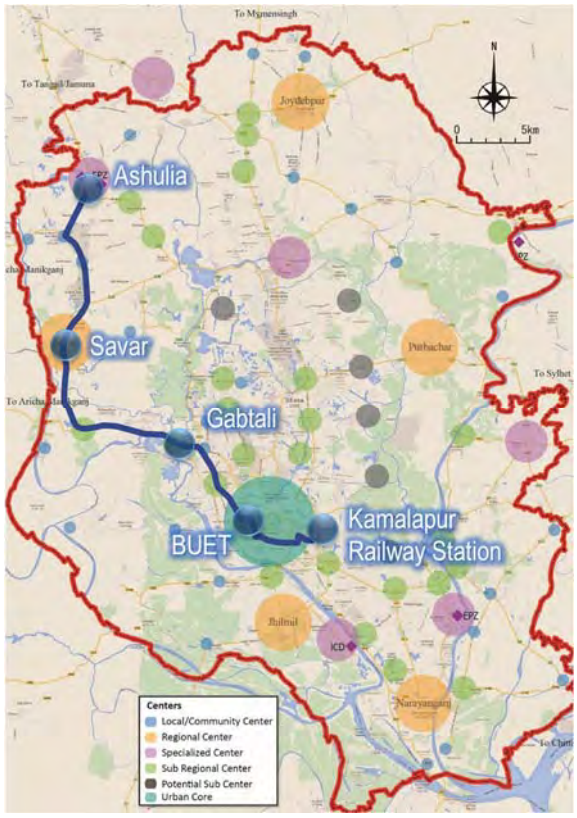


Figure 12.31 Proposed MRT Line2

MRT Line 4

Passenger demand forecasts showed that this line has low passenger demand with nearly 0.3 million passengers per day and 17,930 PPHPD in 2035.

This 16-kilometer-long MRT line will serve the southern suburbs of Dhaka from Kamalapur station to Narayanganj.

The alignment will generally follow the existing railway line.

There are 2 multimodal stations including major interchange facilities at Kamalapur Station.

Bangladesh Railway has the double Tracking and Commuter Service Project of this same alignment and if BR implements the Commuter Service, MRT Line 4 need not to be implemented.

Figure 12.32 Proposed MRT Line4

MRT Line 5

In order to provide a high-capacity, high-speed and frequent public transport system to the city for trips which do not commence or end in the CBD and which will be served by the radial MRT Line 1, MRT Line 2, BRT Line 3, MRT Line 6 and BRT Line 7, the Study Team has identified the need for a circumferential MRT Line 5 that would provide a "bypass" public transportation service for the city's suburban areas and provide good connectivity between suburban zones.

This line has been forecasted to have a high passenger demands with nearly 1.5 million passengers per day and 28,340 PPHPD in 2035 as per the passenger demand forecasts.

This 35-kilometer-long MRT line will serve the eastern and western suburbs of Dhaka crossing the cantonment area.

There are 9 multimodal stations including major interchange facilities at the station of Circular Waterway. Especially the Gabtoli terminal has a potential to become the western transportation terminal with MRT line 5 (northbound), MRT line 5 (northbound) and MRT line 2. So the Gabtoli needs to be planned at the multi modal station in Dhaka..

The MRT Line 5 is scheduled to open by 2035. However, Dhaka's corridor running through east to west needs to be developed to reduce traffic congestion. Thus, in the early stages, northern or southern part of this line needs to be developed to serve the east-west corridor demands.

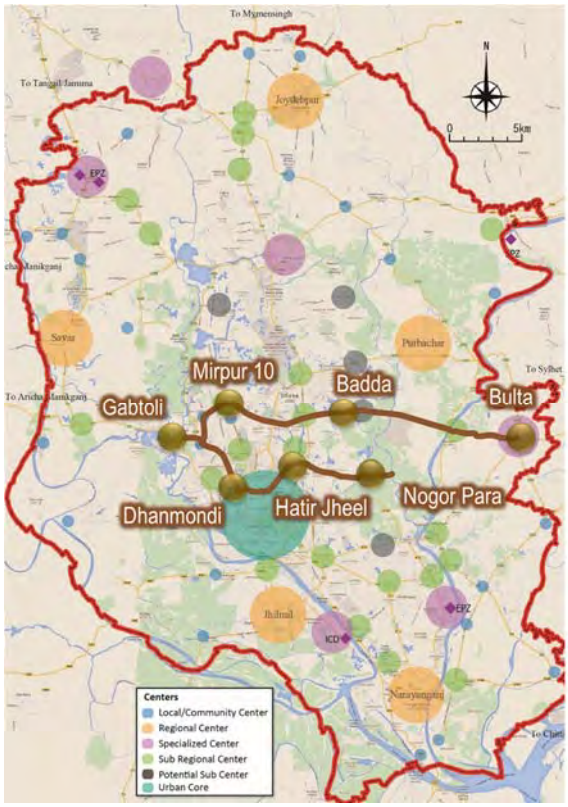


Figure 12.33 Proposed MRT Line5

MRT Line 6 (Extension)

This line has been forecasted as one with the highest passenger demands with nearly 1.9 million passengers per day and 45,860 PPHPD in 2035 according to the passenger demand forecasts.

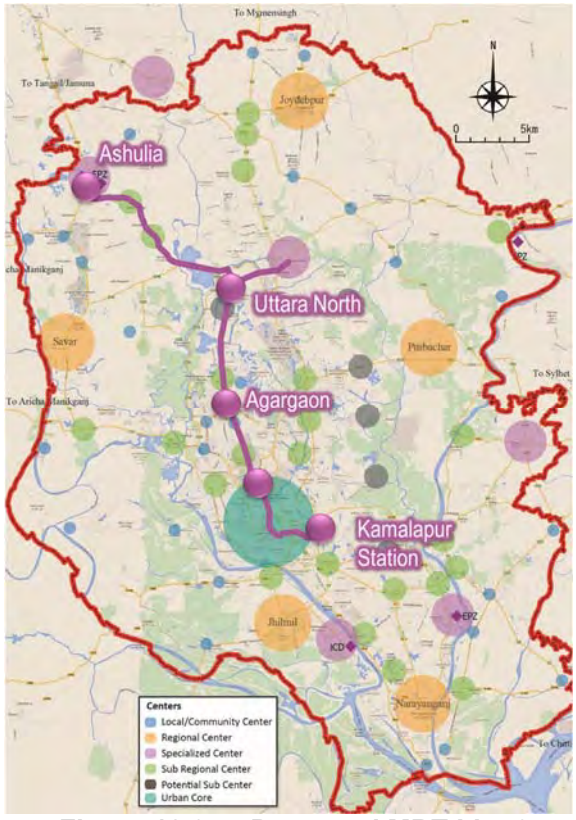


Figure 12.34 Proposed MRT Line6

The current phase of this line will serve from Uttara Phase 3 to Bangladesh Bank until 2025 and in 2035 this 41-kilometer-long MRT line will serve the northwestern suburbs of Dhaka via Mirpur to Kamalapur Station.

The extension phase from Bangladesh Bank to Kamalapur Station is located in built-up area and therefore land acquisition has to be implemented by land re-adjustment project, re-development project or urban renewal project.

There are 6 multimodal stations including major interchange facilities at the station of Circular Waterway (Ashulia), Mirupur, and Kamalapur Station.

Depot/workshop and stabling area is located at the Uttara Newtown.

BRT Line 7

This line has been identified from the passenger demand forecasts to have a high passenger demands with nearly 0.5 million passengers per day and 22,330 PPHPD in 2035.

This 36-kilometer-long MRT line will serve the eastern fringe area and the alignment of northern part will generally follow the existing railway line but will be grade-separated.

There are 4 multimodal stations. Depot/workshop and stabling area will be located at the eastern part of RAJUK area.

The role and function of this BRT line is to support the eastern fringe area development. Meanwhile, this corridor passenger demand will be served by public bus networks while the demand is less than BRT's demand. And ROW for future BRT needs to be ensured before urban development in the eastern fringe area.

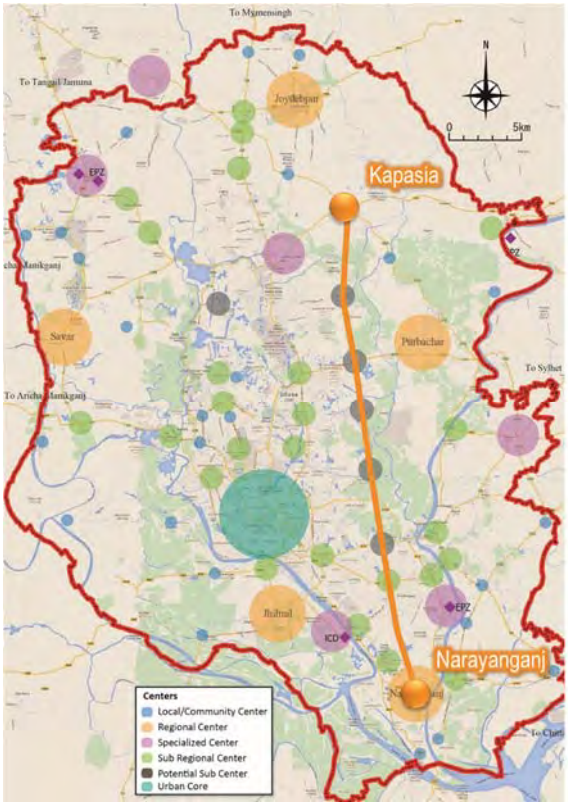


Figure 12.35 Proposed BRT Line7

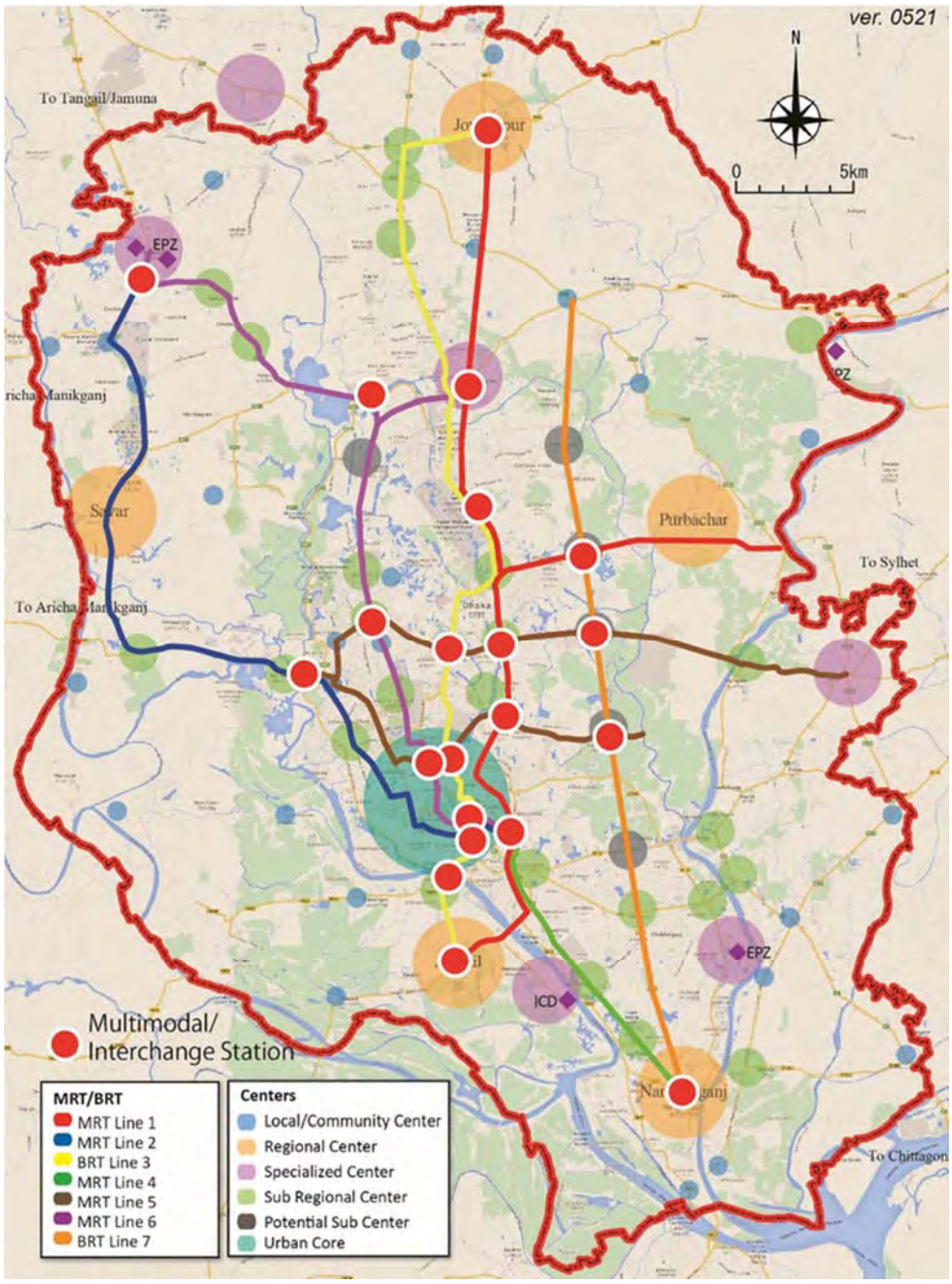
5) Transportation Hubs or Multimodal Stations

Based on the proposed MRT and BRT network, the Study Team has identified 21 transportation hubs or multimodal stations throughout Dhaka and its suburbs as indicated in Figure 12.36.

The primary existing multimodal transportation interchanges include: Dhaka International Airport, Kamalapur Station, Mohakhali bus Terminal, Jatra Bari Bus Terminal, Gabtoli Bus Terminal, Gabtoli Circular Waterway Station, and Shdarghat Boat Terminal. In addition, there are other locations where interchange facilities between transportation modes can be developed in RAJUK area. Other potential transportation hubs that can be developed at major interchanges between the various urban transit systems have been identified.

In the master plan, the size of each multimodal will be dependent on the results of the patronage demand forecasts for the final urban transit network and the facilities to be provided at each multimodal site. These facilities will include drop-off and pick-up points for rickshaws, taxis, cars, and motorcycles, circular waterway, as well as parking and bus interchanges with primary and feeder bus systems. At each of these sites, facilities will be provided to allow the smooth transfer of passengers from one transportation mode to another, together with other passenger facilities and possibly residential, commercial, and retail development opportunities.

In addition to the multimodal connections to other MRT and BRT lines, facilities at stations will also be coordinated with existing and proposed bus interchanges along the route.



Source: JICA Study Team

Figure 12.36 Multimodal and Interchange Station

Table 12.15 Multimodal Connections

	Urban Mass Rapid Transit (UMRT)								Bus					Pickup		Parking	
	MRT 1	MRT 2	BRT 3	MRT 4	MRT 5	MRT 6	BRT 7	BR	Provincial	Bus	Feeder	Waterway	Airport	Taxi & RS	Car & MC	Car	MC
MRT/BRT	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
BR	*	*		*	*	*	*		*	*	*		*	*	*	*	*
Bus	*	*	*	*	*	*	*	*	*	*	*	*	*				
Waterway	*	*	*		*	*				*	*	*		*	*	*	*
Airport			*			*		*		*				*	*	*	*

Source: JICA Study Team
RS: Rickshaw, MC: Motorcycle

6) MRT/BRT Development Cost

The project cost to develop the MRT and BRT network is as follows:

Table 12.16 Estimated Development Cost of MRT/BRT lines

Unit: for Distance (km), for cost (Million)

		At-Grade	Elevated	Under Ground	Total	Cost
MRT Line 1	2025	0	20.6	6.0	26.6	BDT 219,846 (USD 2,827)
	2035	0	42.7	9.3	52	BDT 456,256 (USD 5,867)
MRT Line 2	2035	0	40.0	0	40.0	BDT 285,636 (USD 3,673)
MRT Line 4	2035	0	16.0	0	16.0	BDT 129,170 (USD 1,661)
MRT Line 5	2035	0	24.9	9.1	35.0	BDT 326,619 (USD 4,200)
MRT Line 6 *(extension)*	2035	0	21.8	0	41.8	BDT 162,454 (USD 2,089)
BRT Line 7	2035	36.0	0	0	36.0	BDT 19,986 (USD 257)

Source: JICA Study Team
Note: 1) Cost estimated by unit cost assumption
2) Excluding land acquisition and compensation

7) Railway System Requirements

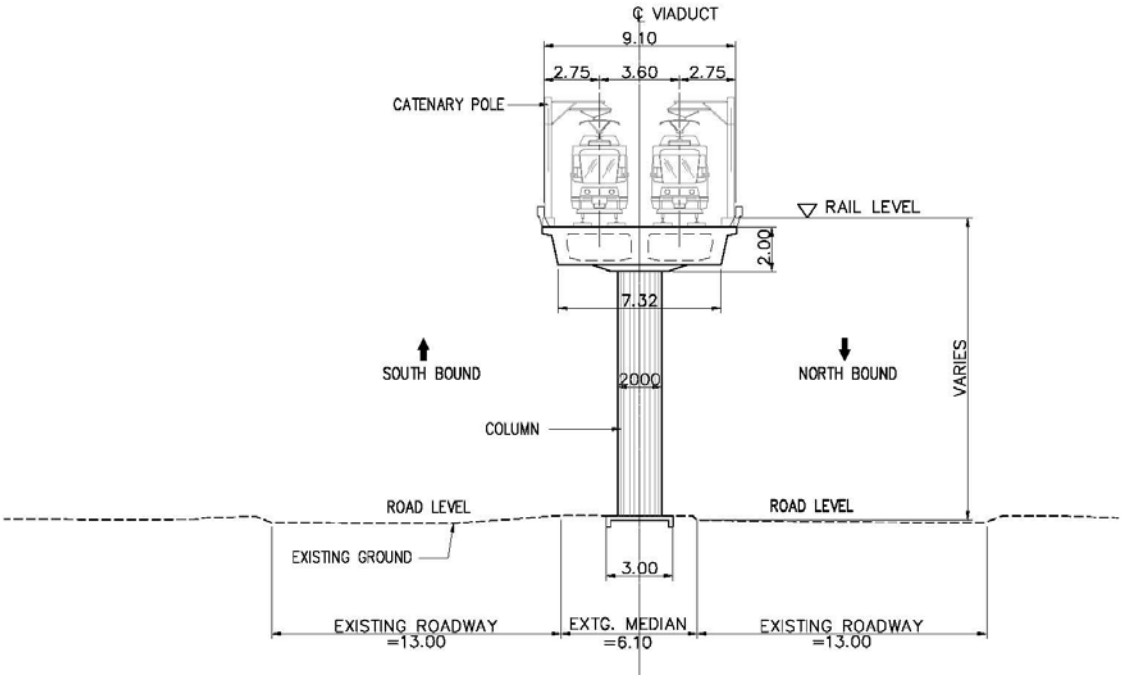
The JICA Study Team recommends adopting the same system standards in order to maintain compatibility between MRT Line 6 and proposed MRT Line 1. Major technical design features are shown in Table 12.17 below.

General Designs are shown in Figure 12.37 (Elevated Structure (Viaduct)), Figure 12.38 (Construction Gauge) and Figure 12.39 (Rolling Stock Gauge).

Table 12.17 Major Design Features

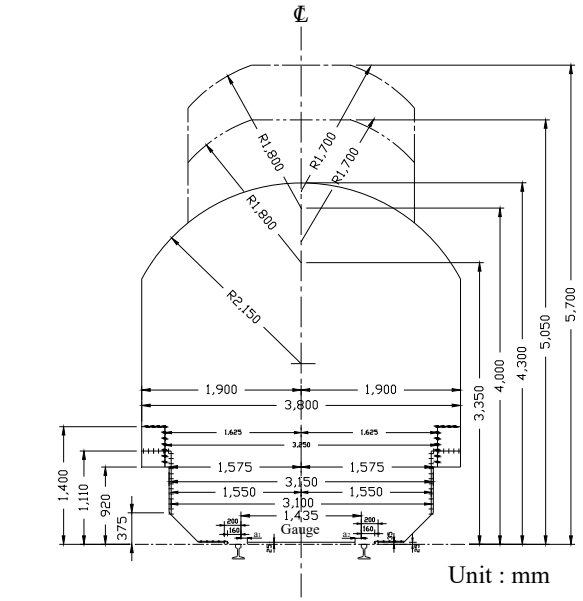
（General）	
Rail Gauge	Standard Gauge ；1,435 mm
Rolling Stock & Construction Gauges	As shown below
In case of Fire	No-stopping between stations, No evacuation path, but provide path for maintenance work
Earthquake	Seismic design
（Alignment）	
Minimum Radius	R=600m、(In depot and where not avoidable R=200m)
Minimum Radius along platform	Straight（Not avoidable stations R=600m）
Distance between two track centerlines	3.6 m（main track）approach track from/to depot 3.4m
Vertical gradient	Between stations；i=3.5% (not avoidable i=4.0%) Station；i=0.0%（not avoidable i=1.0%）
(Structure)	
Viaduct	PC Box Girders
Underground	TBM
（track）	
Rail	UIC 54kg (main track), UIC 50kg (loop line & depot)、CRW
Fastening system	Round Bar Steel
Turnout	No.10（main track）, No.8 or No.10（loop line & depot)
（elevated station）	
Platform	Lateral type、Train length＋5 m x 2、
Design	Universal Design, Barrier Free
Structures	1st Floor Concourse and station operation rooms、3rd F Train runs
(underground station)	
Platform	Island type train length +5m x 2
Design	Universal design, barrier free
Structure	Soil cover 2m, -1st floor concourse, and station operation rooms, mechanical rooms, toilets, -2nd floor platform;
Platform Screen Door	Full height
Disaster Prevention	Japanese MLIT notification
Construction	Cut & Cover
（Electrical Power Supply）	
Traction Power	DC 1,500 V
Power Supply	Overhead Catenary
（Signaling）	
Block System	Moving Block (CBTC)
（Rolling Stock）	
Body	Mild Stainless Steel or Aluminum.
Brake	Re-energize、air and electrical
Motor control	VVVF
Design speed	100km/hr

Source: JICA Study Team



Source: JICA Study Team

Figure 12.37 General Design of Elevated Structure (Viaduct)



Basic structure gauge

Structure gauge for those other than overhead contact lines, their suspension equipment, and insulated reinforcing materials on railway tracks operated with DC electric power supplied through contact lines.

Structure gauge required for those other than overhead contact lines, their suspension equipment and insulated reinforcing materials in tunnels, bridges, over bridges, and platform roofing as wellas the sections before and after those structures on railway tracks operated with DC electric power supplied through overhead contact lines.

Structure gauge for platform

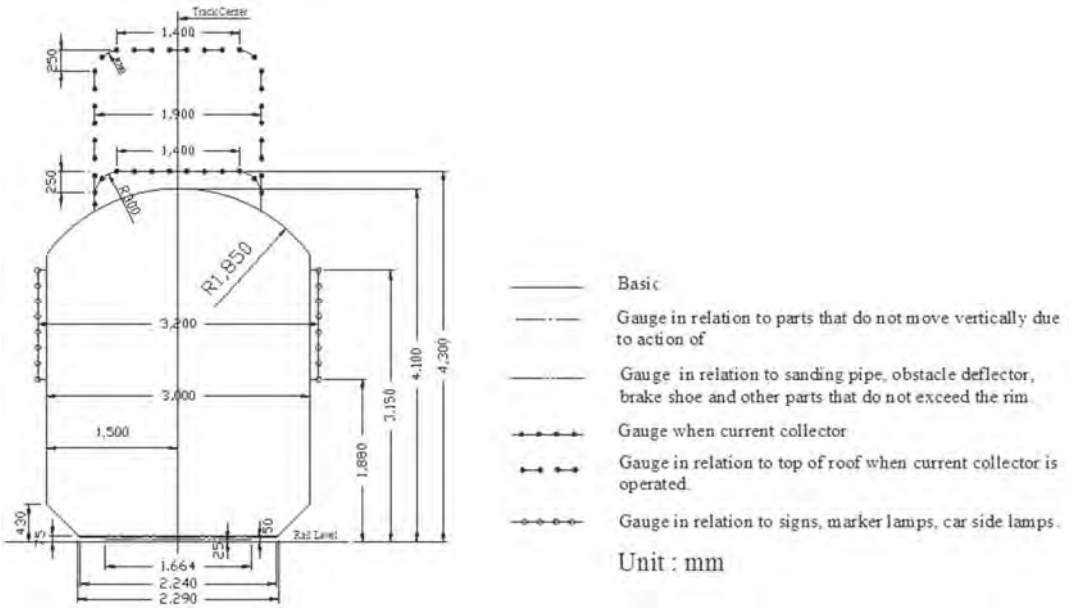
Structure gauge for signals, markers, signs, and special tunnels and bridges

Structure gauge for run-over type turnouts

Structure gauge for shunt and crossing

Source: General Consultants for MRT Line 6

Figure 12.38 Construction Gauge



Source: General Consultants for MRT Line 6

Figure 12.39 Rolling Stock Gauge

12.4 Bus Transport System

(1) General

At present, bus system is the main transport mode in Dhaka. Based on the demand forecast, modal share of bus will remain high. Modal share of MRT and BRT is about 20%, thus bus transport system needs to reform as soon as possible.

Since bus network integrated with MRT/BRT will be implemented by stages until 2035, the network will tend to have shorter bus routes that intersect with MRT/BRT service corridors, hence not overlap with them. Consequently, the quality of the future public transport network will highly rely on the adequacy of its connections with MRT/BRT system.

In order to enhance connecting conditions, some affordable measures are recommended:

i. First priority around the MRT/BRT stations, particularly in case of a connection with bus services, is to have an enhanced pedestrian environment with wide footpaths.

ii. As long as no major traffic disruptions are created, the bus stop should be located near the MRT/BRT station accesses with an objective of minimizing transfer times.

iii. If there's no any connectivity between MRT/BRT and bus network, bus services shouldn't pose a potential obstruction to MRT operation in addition to a minimized impacts of these interchanges on traffic condition.

As the transport demand model has the capacity to provide forecasts for the number of passengers interchanging between bus, BRT and MRT, the Consultants have identified the main interchanging points of the study area.

The proposed bus system is composed of a primary network and a secondary network. Moreover, within the primary network is a priority bus network, wherein buses are given precedence over other modes – public and private.

(2) Bus Route Network

1) Primary Bus Route Network

The primary bus route network will initially form the backbone of the system and will thus fulfill the role until the completion of the future MRT/BRT network. This consists of bus routes providing a medium capacity and acceptable levels of line speeds. As much as possible, the primary route network will use the priority infrastructure described above. After the completion of MRT/BRT system, the primary bus route network will be modified so that passengers can be channeled to the MRT/BRT system. The primary bus network will then be connected to multimodal stations although it will not necessarily be a feeder network and will be operated by standard and articulated buses.

The purpose is to create an integrated network where public transportation mobility is secured–-not just for one or two corridors but as part of an integrated public transportation network for Dhaka which will augment the proposed high capacity MRT/BRT network on major public transportation corridors. In this infrastructure, different route network configurations can then be applied to meet particular passenger demands in specific sections of the network.

2) Secondary Bus Route Network

The secondary bus network will consist of feeder and local routes providing dense coverage and accessibility. This network won't normally use the bus priority infrastructure but will operate in streets with mixed traffic and will be operated with standard and smaller buses. Accordingly, commercial speeds and performance levels will be lower.

(3) Priority Bus Implementation

The method to achieve a bus priority network differs, depending on specific characteristics of routes. The preferred solution would be to provide a two-way busway in the center of the road, physically separated from other modes of traffic. Though this may be possible in some sections, elsewhere route specific options will have to be identified and implemented.

In addition to physical separation, time separation can be applied with buses being given priority at traffic lights. This can be done in several ways. Signaling can be influenced by priority buses, hence; if a bus is behind the schedule, it can get a green light. Also, streets can be designed in such a way that buses come in the first line when traffic light changes.

Another possible approach to secure mobility for buses could be to link the bus priority infrastructure network to a road pricing scheme especially designed for Dhaka. Since a conventional area level system based on entrance fees (Singapore, London) may be unpopular in a city like Dhaka, road pricing could instead be implemented on the street level. Motorcycles and cars would pay a monthly or annual fee for the privilege of using designated parts of a street network during peak hours. Traffic management and policing measures should be added, for example, decreasing green light times for crossing traffic at some intersections and the rigorous enforcement of traffic regulations.

Leicester (England) introduced a 4.5km bus priority lane over a 6km route in 1997, under the objective of promoting bus transit with high quality service to and from the city center.

- Continuous inbound bus lane (towards the city center);
- Outbound bus lane provided at critical locations;
- Red paint applied on bus lanes;
- Minor junction improvements;
- Park & Ride facility;
- Taxies and bicycles allowed to use bus lane;
- $2.2 million project cost.

Results: Morning peak hour vehicle traffic into the city experienced a reduction of 17%. Bus trip time was cut from 23 minutes to 18 minutes. The reduced peak hour vehicle traffic and faster and reliable bus travel are the successful outcomes of the project.

Kunming (China) opened China's first bus exclusive lane in 1999 over a 5km route in the city center.

- Exclusive bus lanes in the middle of carriageway;
- Bus stations located after intersections and designed to accommodate six buses;
- General traffic lanes narrowed down to 2.8-3m;
- Truck ban (daytime);
- Intersection improvements;
- $900,000 project cost and 3-month roadway space reconfiguration.

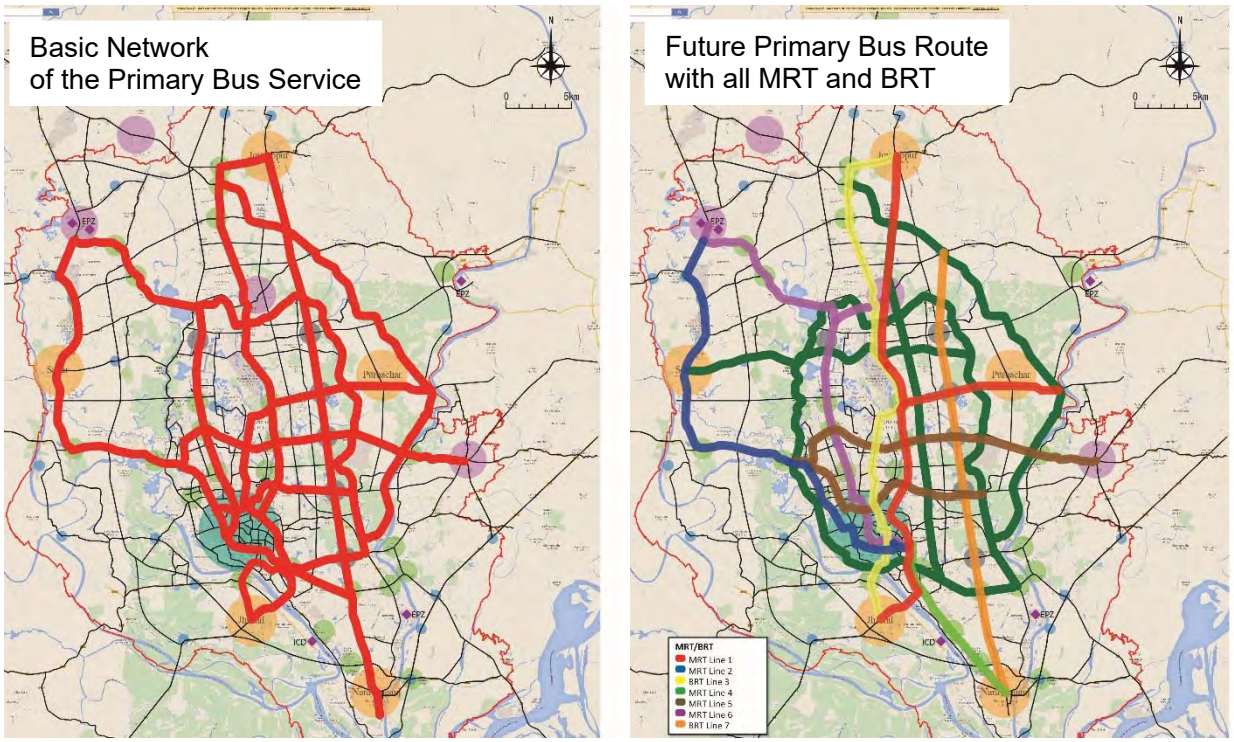
Results: Both bus travel time and ridership experienced significant improvements. Peak hour bus operating speed increased from 10km/hr to 15km/hr and ridership grew 21% over 2 years. The public is highly supportive of bus priority and as a result the second 10km bus lanes opened in 2002.

Source: JICA Study Team

Figure 12.40 Example of Bus Priority Lanes

(4) Phased Primary Bus Route Network

As previously explained, the primary bus route network will initially form the backbone of the system and will thus fulfill the role until the completion of the future MRT/BRT network. So when MRT/BRT start service in some corridor, the primary bus service will stop in the same corridor. And when the whole shape of the MRT/BRT network will be modeled, the primary bus routes need to be modified as the connection between each MRT/BRT lines.



Source: JICA Study Team

Figure 12.41 Primary Bus Route Network (draft)

(5) Bus Terminals

A large-scale transport facility like an inter-district bus terminal should be developed in planning future land use, urban structure and urban transport system. There are presently three inter bus terminals in Gabtoli, Mohakali and Saidabad. These bus terminals are located in urbanized area and terminal capacities are limited which causes huge traffic jams around those areas.

Dhaka is currently having about 14,000 inner-city buses (bus and minibus) and about 8,000 inter-district buses in operation. If ridership goals are to be met, then the number of buses should be substantially increased. Development of service, maintenance facilities and terminal capacity will be essential which requires current bus terminal to be expanded and streamlined. In addition to buildings and equipment, there is a need for technical assistance, training and management development.

1) Phase I: Improvement/expansion of inter-district bus terminal at present locations (2016~)

An improvement/expansion plan of three bus terminals at their present respective locations already exists. An improvement/expansion work will be conducted as soon as possible in this phase.

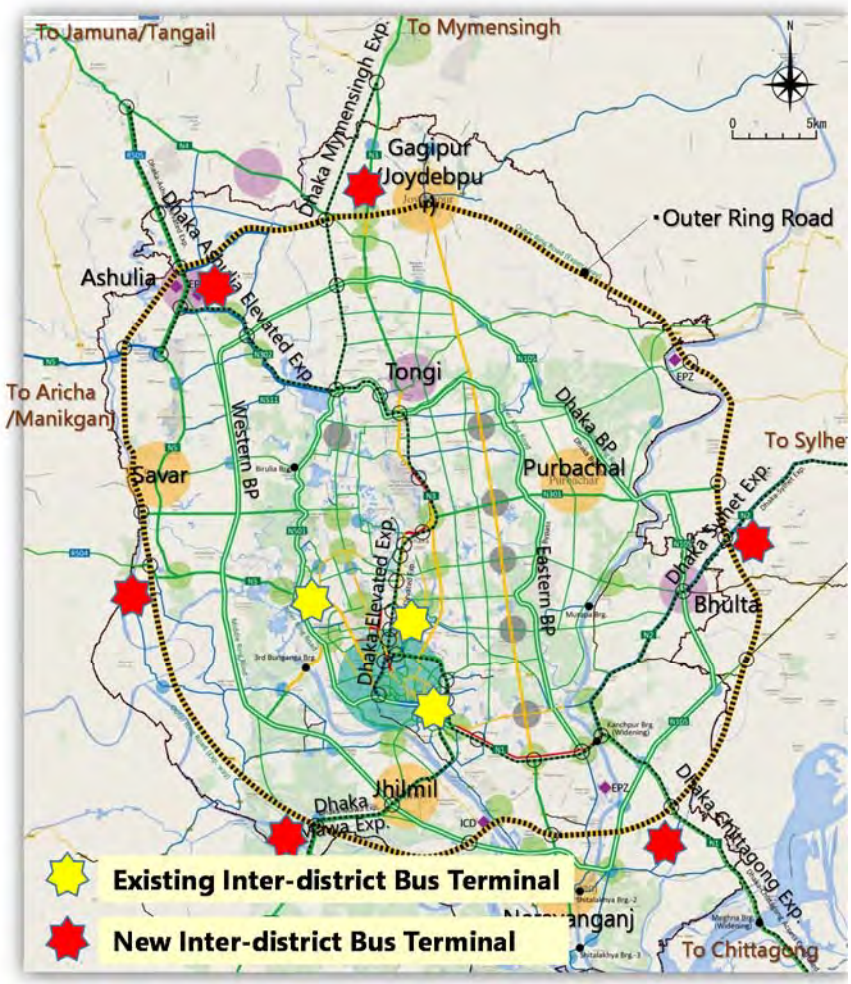
2) Phase II: Study/planning on relocation of inter-district bus terminal (2020 ~)

Study on finding suitable land/area along highways or ring roads and planning for three bus terminals at a new location will be implemented.

3) Phase III: Construction of new inter-district bus terminal

Six inter-district bus terminal will be constructed based on the plan in Phase 2.

The critical factor is the presence of many inter-district bus operators who do not use bus terminals and collect passengers by themselves. This activity should be strictly controlled. It is also recommended that an advisory committee which will consist of BRTA and DTCA, district and local governments, representative of residents, and bus operators should be convened. Project cost will be 300 million USD.



Source: JICA Study Team

Figure 12.42 Locations of the Proposed New Bus Terminals

(6) Bus System Modernization

This builds on the current model bus scheme of the city, which focuses on fleet expansion, and eventually will broaden it towards the creation of modern forms of managing and operating the bus fleet. Based on the experience of other cities, bus operation is better accomplished by the private sector than by the government. However, there are too many private operators which the government are not fully managing as they are operating buses without proper timetable, no fixed bus stops, non-agreeable environment and so on. One reason for such condition is probably due to cheap rate which private operators are opted to use un-maintained or old buses that leaves passengers no choice but to use current bus services.

Public transport strategy for Dhaka will involve three to five large bus fleet companies operating in exclusive transport corridors which would require a huge number of private bus operators to be merged or abolished. These large bus fleet companies are

expected to manage 500 to 1,000 standard buses each. However, no existing operators in Dhaka has the track record nor the resources to handle such task. The external advisory assistance will be formed to assist in the formation of large fleet operators as well as assist these companies in adapting modern transit practices and advise the government on policy reforms conducive for long-term private sector participation. This project is intended to accomplish the following:

- Define in more detail the set of bus routes to be included in each corridor and assignable to one of the bus operators;
- Determine the demand of each route and the factors that will push growth of such demand;
- Determine the appropriate combination of bus services and fleet in order to meet the demand by year 2035. Required number of bus fleets are estimated;
- Conduct engineering studies for depot sites, and other transit infrastructure such as bus sheds/stops, and ticketing systems;
- Design the organization and staffing model, including modern IT-enabled management systems, in providing these bus services;
- Provide financial management advice to the large fleet operators;
- Conduct economic analysis from the Government's point of view;
- Prepare business or promotional materials to convince private investors to take over and assume a bigger role in the management of bus system; and,
- Provide technical assistance to BRTA, BRTC, DTCA and the other fleet operators in the performance of their respective roles.

The WB Project "Dhaka Bus Network and Regulatory Reform Implementation Study and Design Work" has been done in 2004 and the follow up study is currently conducted. Outputs of this WB project is very important and useful which needs DTCA's continuous revision and modification.

(7) Bus System Development Cost

All elements discussed above are taken into account to derive an estimated total cost for the provision of bus priority design, infrastructure development, depot, terminal and institutional development, as shown in table below.

Table 12.18 Priority Bus Development Projects

Area	Item	Cost (US$ mil.)
Bus Priority Design	Design of a contiguous network of reserved lanes and traffic signal priority for buses. Technical assistance to coordinate with traffic management actions. Consultants, local consultants, staff, office, etc.	1
Infrastructure Development	Construction of bus lanes. Signal priority scheme. Bus stops and interchange bus terminals.	10 10 10
Depot Development	Buildings and equipment for 10 bus depots. Technical and management assistance.	10 3
Institutional Development	Establishment of a Public Transportation Authority, technical assistance, equipment.	2
Bus Termials Development	Replacemand and redevelopment of current three bus termians.	300
Bus System Modernization	Replacement buses, new bus stop developmnt and others	300
Subsidies		6 per year
Total Cost		+ 646

Source: JICA Study Team

12.5 Traffic Management and Traffic Safety

(1) General

Traffic management is the fundamental action to maximize capacities and use of available infrastructure in the most efficient and effective manner. Increase in road traffic demand lessens the existing road infrastructures capacity, decreases traffic safety, increases air pollution, hampers smooth and comfortable movement and spoils the city's image.

There are various measures of traffic management. These involve the so called 3Es, i.e., engineering, education and enforcement. Engineering measures include signalling, intersection improvement, safety facilities, pedestrian facilities, flyovers, parking facilities, and others. Education covers safety education, safety campaign and others. Enforcement not only covers traffic enforcers but also includes traffic surveillance, traffic control, vehicle inspection and so on. One of the effective ways in managing traffic demand are color coding (number coding scheme), staggered work hours and pricing (e.g., road pricing). However, implementing a comprehensive traffic management study is highly recommended to determine the effective and efficient traffic management for Dhaka.

(2) Objectives and Approach

Objectives: Management of traffic and its safety is one of the serious weaknesses which limit the efficient use of available facilities as well as protection of life and property. Poor traffic management also causes environmental degradation and negative impacts on landscape and overall amenity in urban areas.

With the number of vehicles in the study area expected to grow in the coming years, traffic congestion will become severe. Road widening or constructing new roads will not solve this problem as there might even be an eventual issue if Dhaka can continue converting land into roads. This situation therefore calls for greater reliance to be placed on a more efficient use of existing road network. Traffic management plays an important role to achieve this and established an efficient and safe traffic. The objectives of traffic management are twofold: (i) enhance mobility, accessibility, and safety, and (ii) support public transportation for better and effective services. These objectives can be achieved through the traffic management process.

Traffic Management Process: The traffic management process is an ordered group of related tasks and activities performed sequentially and repetitively to solve or alleviate traffic problems. Traffic conditions are not a static phenomenon; they gradually change over time with more motorcycles and cars joining the traffic and with the road network improving and expanding. Thus, it is important to establish a mechanism in which the traffic management process can be regularly reexamined to cope with the changes in traffic.

Approach: Traffic management and safety issues were comprehensively assessed by corridor and area since infrastructure/facilities, travel characteristics, land use, enforcement, etc. are interactive. The nature of the problems also differs by area.

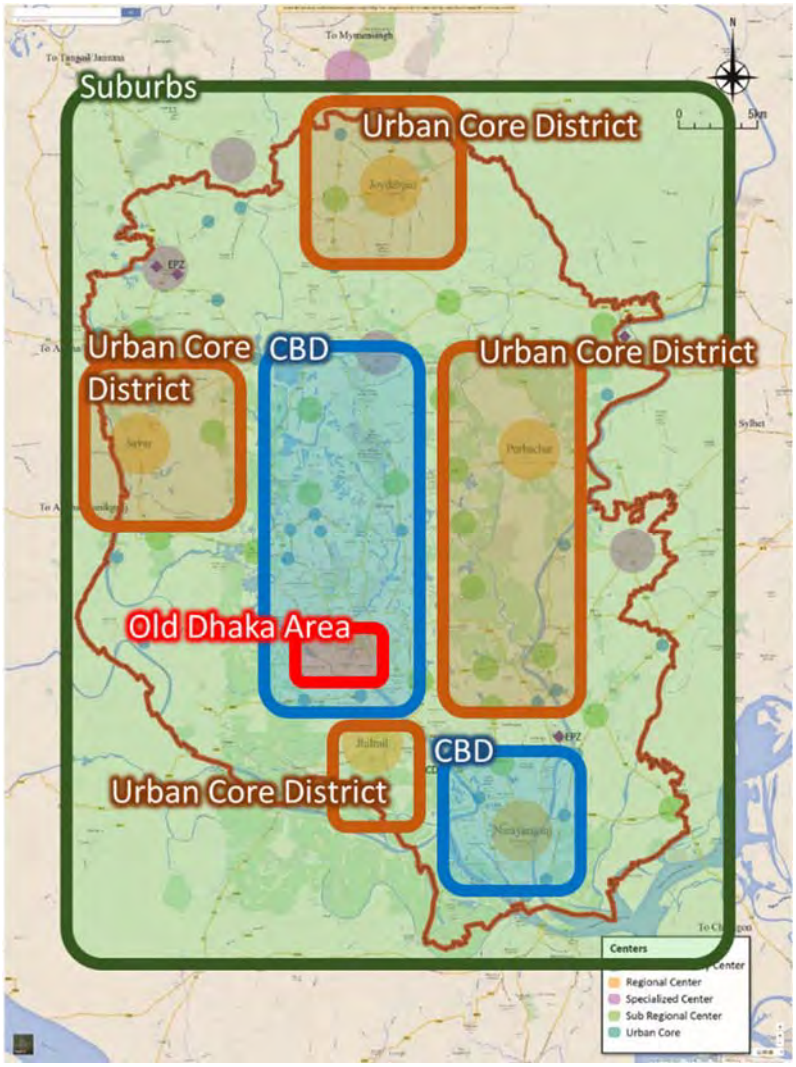
(3) Short-term Traffic Management Orientation

The most urgent business is to put more basic measures into traffic management which will manage and maximize existing resources. This will include control of traffic and vehicles, improvement of safety standards, formulation of parking policy and strengthening of enforcement and human resources.

Table 12.19 Traffic Management Improvement Directions by Area

Area	Direction	Key Intervention
Old Dhaka Area	Enhance mobility by walking, and using NMVs. Accessible by public transportation.	Eliminate through traffic. Prioritize public transportation. Enhance pedestrian environment.
CBD	Good mobility within the area. Accessible by public transportation.	Ensure efficient traffic operation at intersections. Maintain and upgrade existing traffic control facility. Manage parking.
Urban Core Districts	Secure maximum capacity while enhancing traffic safety. Prioritize public transportation.	Improve bottlenecks. Upgrade traffic control facilities. Segregate 2- and 4- wheel vehicles.
Suburbs	Provide basic traffic management facilities. Prioritize public transportation.	Provide basic facility. Segregate 2- and 4-wheel vehicles. Protect pedestrians and bicycle users. Analyze and improve accident-prone spots and sections.

Source: JICA Study Team



Source: JICA Study Team

Figure 12.43 Traffic Management Improvement Directions

Table 12.20 Short-term Traffic Management Policies

Short-term Policy	Action (Measure)	Remark
Control of Motorization Growth	・Garage registration for car owners.	・Development of the detail roles and regulations
	・Designated district for TDM.	・TDM for CBD
	・Traffic control ex. one way, no entry, etc.	
	・Increase of tax on vehicle ownership and operation (gasoline).	
	・Enhancement of public transportation system	・Including enhancement of the changes from motorcycle to public transport use
Effective Usage of the Limited Road Space by Traffic Control and Management Measures	・Strengthening of ban on illegal parking and vendors.	・Parking control on the sidewalk
	・Intersection improvement and effective signal operation.	
	・Improvement of pedestrian environment including provision of crossing facilities.	
	・Control of safety in traffic flows (no mixed traffic flows).	・Provision of the hard median and one-way system for narrow streets
	・Promotion of comprehensive traffic control and management measures.	・Corridor or area comprehensive traffic management system
Enhancement of the Traffic Safety Measures	・Elimination of accident black spots.	・Not only engineering improvement, also should coordinate with enforcement and education program
	・Strengthening of traffic enforcement	
	・Improvement of traffic education systems.	
	・Improvement of emergency medical services.	
	・Development of comprehensive traffic safety program.	・3Es or 4Es comprehensive approach (Engineering, Education, Enforcement and Emergency)
Development of Efficient Parking Systems	・Development of roadside parking plan.	・Development of the parking management system taking into consideration the road functional classification, particularly in the ancient and old urban areas. Parking ban for primary roads and secondary or tertiary roads with less traffic demand will be useful for the road side parking)
	・Imposition of parking fees and parking development fund.	
	・Encouragement of off-road parking facilities.	
	・Parking facility provision regulation for commercial buildings, institutions, etc.	
	・Development of parking information systems.	
Capacity Development	・Traffic Police	・Capacity for the planning and implementation for the comprehensive traffic management and safety, including institutional capability
	・Traffic inspectors	
	・Traffic engineers	
	・Traffic Safety Committee	
	・Improvement of the design standard, roles and regulations.	

Source: JICA Study Team

(4) Traffic Management Program for Narrow Road of Dhaka

As part of the Dhaka Urban Transport Project (DUTP) a Road Referencing Database of the Road Network of DCC, was prepared in 2002. The preparation of the database included the classification of 1,286 kilometers of survey roads into five categories, based upon a functional hierarchy as follows:

a. Primary Roads: Inter-zonal roads; access control; full restriction of non-motorized traffic and grade separation at major intersections.

b. Secondary Roads: Intra-zonal roads; access control; segregation of motorized and nonnotarized traffic. And total road

c. Connector Roads: Intra-zonal roads; full frontage access; partial segregation of motorized and non-motorized traffic; and segregation of opposing traffic flow.

d. Local Roads: Full frontage access; no segregation of traffic; and provision for the possibility of using some traffic calming measures.

e. Narrow Roads: Short segments providing access to small areas; predominantly for nonnotarized traffic and pedestrians; and bituminous, brick paved, and earthen surface. And the width of the other narrow road is defined to be less than 4.75m.

Table 12.21 Road Length b Type

Type of Road	Length (Km)	Composition (%)
Primary	61.45	4.78
Secondary	108.20	8.41
Connector	221.35	17.21
Local	573.75	44.61
Narrow	321.27	24.98
Total	1,286.02	100.00

Source: Road Maintenance Management System (RMMS) of RHD

The narrow road is barely wide enough for vehicles to pass each other and so this road needs to be restricted movement to a one-way route. If the width is less than 3 m, this narrow road should be a pedestrian road.

(5) Parking Management Policy

Parking demands in Dhaka may not be necessarily provided by the public sector alone but rather mostly by the private sector. In this context, a parking development policy must be formulated that clearly defines the roles of the public and private sectors. The basic rule is that parking facilities should be provided by the buildings or institutions from which the parking demand is generated. More specifically, the recommended basic parking policy can be stated as:

i. Exclusive parking must be provided by concerned buildings or institutions.

ii. Buildings of certain type and size must have adequate parking facility.

iii. Public parking is limited to short-term parking for the public.

Based on this policy, vehicles used for commuting to work places and schools must be provided by the respective institutions. Likewise, office buildings and commercial establishments that generate large parking demand must have adequate parking facility. Vehicle owners must also have their own parking places at home or in their respective bases.

If this principle is strictly followed, the demand for short-term parking would be less than 20% of the total parking demand since “to work”, “to school” and “to home” trips covers more than 80% of the total trips. However, in reality, parking facilities cannot be

developed in a short period of time and a shortage of parking supply will result in illegal, on-road parking. As for the short-term parking supply shortages, it is therefore necessary for public parking to address the issue.

The role of the public sector is to develop the following types of parking facilities:

i. Parking areas in high parking demand places where there is an urgent need for such facilities
ii. Parking areas using part of the land for road.
iii. Parking areas to be constructed within public facilities and parking using public land.

The share of public parking will depend on the area. The suggested target share is 10 - 30% of the total short-term parking demand, with a higher share for areas where sufficient supply by the private sector cannot be expected.

On the other hand, the private sector is requested to provide parking facilities for the demand generated from their activities. The existing building code sets the parking requirement for certain types of buildings. However, the definition of the terms used in the regulation is not clearly stated. Therefore, a clearer requirement and implementation guidelines must be formulated.

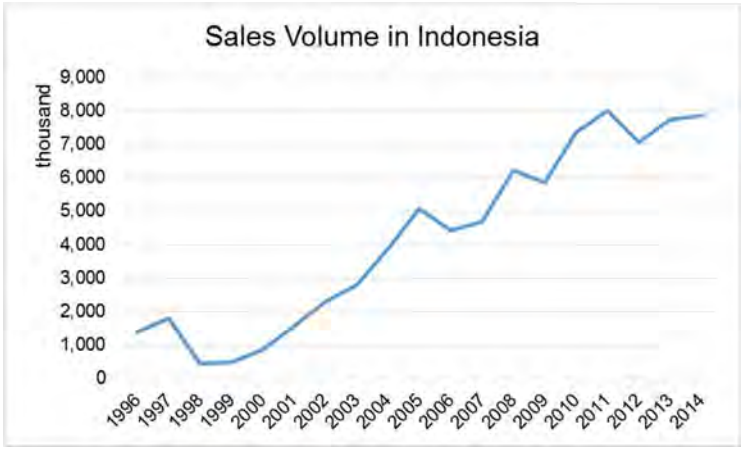
It is necessary to create an environment in which parking can be financially viable as private business. For this purpose some priority measures, such as property tax reduction or low interest loan can be considered to encourage the private sector to enter into the parking business. Under present circumstances, however, constructing office buildings is much more viable than venturing into the parking business.

Other measures necessary for efficient parking management include the following:

i. Enforcement of parking bans at prohibited places.
ii. Parking in public spaces, such as on the road and on sidewalks, must be managed by authorized organizations.
iii. All public parking must be charged.
iv. Time-based parking fee system must be introduced in high parking demand areas.
v. Introduction of a parking guideline system to efficiently operate parking facilities
vi. Designation of loading/unloading zones for goods and cargo in commercial areas separate from parking spaces.

(6) Traffic Demand Management

In Jakarta, capital city of Indonesia, motorbike sales have posted phenomenal growth over the past decade and the sector shows no signs of abating. Last year, there were 7 million new motorcycles on Indonesian roads. And the motorbike boom has dramatically changed the ability of young Indonesians to work and learn because they no longer have to use the country's unreliable public transport system. And with the finance easily available, almost anyone can afford a motorbike or scooter.



Source: AISI (Indonesia Motorcycles Industry Association

Figure 12.44 Number of Sales Volume of Motorbike in Indonesia

And huge number of motorbike is a primary cause of the serious traffic jams. And modal share of public transport have greatly reduced with increased amount of motorbike.

Source: JICA Study Team

Figure 12.45 Traffic Jams in Jakarta

It can be easily imagined that a rapid increase of the number of car and motorbike in Dhaka will likewise result to a same or serious traffic jam as in Jakarta.

Traffic demand management (TDM) is a restrictive measure to be applied to private modes of transportation, private cars and private motorbikes. The main purpose of TDM is to encourage the use of public transportation rather than the private modes. TDM measures can be classified into two types, namely economic measures and regulatory measures. They can be applied either to the use or ownership of vehicles. The table below classifies various TDM measures.

Table 12.22 Classification of TDM Measures

Restriction	Economic Measure	Regulatory Measure
Vehicle Ownership	• Various taxes levied upon purchase • Annual registration fee • Quota system	• Garage requirement • Restriction by domicile
Vehicle Use	• Fuel price • Parking fee • Area license	• Area license • High occupancy vehicle (HOV) • Number plate control

Source: JICA Study Team.

Area licensing is a traffic management scheme that restricts the use of private vehicles in designated areas to alleviate traffic congestion and at the same time promote the use of public transportation. The basic idea is that when an area is specified as restricted, charges are levied on vehicles entering that area during certain times of the day. The charge works as a disincentive for using private vehicles. People may choose to use other modes of transportation to avoid the charge, or change the time of travel to off-peak hours when the charge is smaller or none.

Road pricing adopts an economic rule wherein the higher the charge, the bigger the impact which results in a more traffic reduction on restricted areas. Collected charges can be used for the improvement of transportation facilities. However, this could create adverse effect on people's mobility, accessibility and social or economic activities. Thus careful study, planning and design are necessary. Table 12.23 listed the items to be considered.

It is not too early for Dhaka to study the feasibility of area licensing system since the success of the system depends not only on technical adequacy but also on social consensus as to the necessity of the system and all of these will take time to develop. An initial idea for area licensing in Dhaka is the designation of CBD as restricted area. Vehicles, including motorcycles, entering these restricted areas will be charged. As a future step, the restriction can be expanded outside of CBD. To complement the area licensing system, parking on public areas will be charged with higher parking fees.

Table 12.23 Study Items for Area Licensing System

Category	Subject	Item
Restriction	Area	Size Checkpoint Public service
	Day and time	
	Targeted vehicle	Applicable type (4 wheel/2 wheel) Number of vehicles affected Exemption Remedy for disabled
	Inner traffic	Restricted or not
	Impact on adjacent area	
Charge	Amount of charge	Applicable types of vehicle and amount Sensitivity
	Fixed or flexible	By day and time
	Collection method	Prepaid (sticker) Post paid (credit card)
Driver information	Guide sign	Location Contents and design Dynamic and static sign
	Media	Radio, TV, newspaper
Enforcement	Monitoring method	Automatic (gate and in vehicle unit) CCTV camera Manual surveillance
	Monitoring location	Boundary only Gate within the area
	Violator	Apprehension on the spot Responsibility of vehicle owner Penalty and punishment Recording Recursive violator
	Countermeasure against fraud	Technology Legal base
Operating Agency	Policy making	
	Systems administration	
	Operations monitoring	
	Enforcement	
	Logistics	
	Fee collection	

Source: JICA Study Team.

(7) Traffic Safety

1) Coverage

Currently, the DMP has enhanced the enforcement of traffic regulations and has apprehended drivers violating them such as running a red light, reckless driving and others. Traffic safety facilities, including traffic signals have been improved that has helped to stop the increasing trend of number of traffic accidents and fatalities in Dhaka.

Even though the number of traffic accidents has decreased, the rate of accidents per population size and number of vehicles is still very high. It is therefore very important to enforce traffic regulations and penalize violators. But more importantly for such effort to be effective, it must be in accordance with the changes in motorization, i.e. from bicycles to motorcycles, from motorcycles to cars, and so forth.

In response to social needs, traffic safety is made as one of the components of RSTP's urban transportation subsector. In this regard, the traffic safety master plan prepared by RSTP was based not only on the current accident situation but also on institutional conditions since traffic safety covers wide-ranging issues such as engineering, education, enforcement and emergency medical care. Consequently, the Dhaka Traffic Safety Master Plan will promote a comprehensive approach to traffic safety. Detailed programs and action plans, including a five-year safety program, will be elaborated further.

2) Es (Engineering, Education, Enforcement, and Emergency)

i. Traffic Safety Facility Development
   - Improve intersections.
   - Install guardrails, median, street lights, and other safety facilities.
   - Provide sidewalks and bicycle lanes.
   - Install road traffic markings and signs.

ii. Traffic Control and Enforcement
   - Strengthen enforcement on the accident black spots.
   - Provide sufficient equipment to strengthen traffic enforcement.

iii. Traffic Safety Education
   - Include practical, daily guidelines on traffic safety in school curriculum.
   - Promote driver education.

iv. Emergency Medical Care
   - Develop first-aid centers.
   - Promote a traffic accident insurance system.

3) Focus Areas for the Comprehensive Traffic Safety Program

Another significant aspect that will guarantee the success of a traffic safety program is public compliance with traffic safety regulations. Thus, it will be indispensable to have a comprehensive strategy on urban traffic safety for Dhaka which should be resolutely carried out in the long term. This strategy should include the following:

i. Strengthen safety planning and implementation capacity.
   - Improve accident databases and analytical capacity.
   - Develop adequate design standards.
   - Establish adequate costing/funding mechanisms for safety projects/programs.

ii. Build basic social infrastructure for safety enhancement, including;
   - Launch awareness campaigns on safety for the entire society including the public and private sectors, various industries and communities, on which social consensus will be built and a strong policy commitment can be established.
   - Establish a mechanism on traffic safety publicity, campaign, and education.
   - Strengthen enforcement and practice of basic traffic management.

iii. Develop/Improve safety measures and mechanism.
   - Improve vehicle safety by strengthening safety inspection and standards.
   - Improve driving and observation skills through training and testing.
   - Establish an effective safety audit system.

iv. Develop Institutions including:
- Enact necessary laws and regulations on traffic safety.
- Strengthen safety organizations and their management capacities (e.g. form a Comprehensive Traffic Safety Unit [tentative name]).
- Improve agency coordination on traffic safety.

v. Formulate a coordinated program and establish a workable mechanism at the local level.
- Provide stakeholders with a clear, long-term vision and targets (next 10 years) and specific medium-term (3 - 5 years) and short-term (1 - 3 years) action plans.
- Provide sufficient budget for the Comprehensive Traffic Safety Program.

(8) Institutional Arrangement and Capacity Building

There are five organizations directly involve in Dhaka's traffic management. These are DNCC, DSCC, DMP, BRTA and DTCA.

Traffic management process, as earlier presented, is a cycle to be pursued repetitively. A continuous effort must be exerted to consistently improve the traffic situation as traffic demand and pattern gradually changes with time. However, the existing institutional set-up seems to have no clear defined mechanism to trigger or initiate the process. DTCA undertakes planning and design but it is not clear how such tasks are initiated. The DMP deploys policemen to intersections and enforces traffic regulation but they do not take the initiative in formulating traffic management projects. It is therefore necessary to define the tasks of each organization in the traffic management process.

Another weakness in Dhaka's traffic management is human resources. Traffic engineering and management are relatively new areas of expertise in Bangladesh and experts in these fields are quite few. Likewise, staffs of related agencies do not receive adequate training and from the viewpoint of traffic engineering, existing road facilities are not being optimized. Traffic can be more efficient and safer if knowledge on traffic engineering and management is acquired and effectively applied.

In RSTP Traffic Management Plan, training is recommended for two target groups; traffic engineers and traffic police. Different subjects will be taught to these two groups.

Traffic Management Capability Building Project: This project will be carried out to enhance the capabilities of the staff of organizations responsible for traffic management.

A team of professionals in traffic management will be invited to conduct classroom training on various aspects of traffic management including intersection geometry, traffic survey and analysis, signal design, pavement marking design, traffic sign, etc. The training period will be 24 months with the first year spent mostly on classroom training while the application of improvement measures will be carried out during the second year.

(9) Sidewalk Space Improvement

1) Overview

Sidewalks are important not only as a component of road facilities to ensure smoother traffic flow but also as space for various socio-economic activities and as an urban landscape element. Sidewalks in the center of Dhaka have provided precious space for Dhaka's urban development and have played a key role in the lives of its people.

Today, as motorization and economic development progress, sidewalks have served various purposes. They have become parking area for motorcycles and excessively encroached upon by roadside businesses. Sidewalks are no longer comfortable space for pedestrians and residents.

Ensuring a good walking environment for Dhaka is very important in many ways, to wit:

i) Urban area should be designed for walking in order for the people to enjoy the distinct atmosphere they offer. Regeneration of urban area must accompany the restoration of a good walking environment.

ii) A public transportation-based urban area, which should be the basic future policy orientation of the city, must be supported with extensive and quality walking environment to facilitate easy access to public transportation by the people.

iii) Sidewalks planted with trees and other plants enrich Dhaka's urban landscape, a characteristic that many cities in Asia have lost or been unable to maintain.

2) Functions of Sidewalk Space

Sidewalks have two basic functions - traffic function and space function. For traffic function, sidewalks serve as: (i) space for pedestrian traffic, (ii) access to roadside facilities, and (iii) storage space for vehicles. As for the space function, sidewalks contribute to: (i) urban formation and landscape, (ii) disaster prevention, (iii) environment improvement, and (iv) provision of space for utilities.

While roadways are largely for traffic, sidewalk functions are quite extensive and diverse that they can significantly contribute to the development of attractive urban areas.

3) Sidewalk Improvement Measures

Measures to improve the sidewalk include the following:

i. Pavement
   - Type of pavement: Asphalt pavement, Concrete pavement, Concrete block pavement (Inter locking block).
   - Maintenance.

ii. Street Light
   - Type of illumination: Necessary lux.
   - Type of street light pole: Height, pitch, attachment.
   - Maintenance.

iii. Planting
   - Type of plant: Kind, height, life time.
   - Maintenance.

iv. Signboards
   - Type of signboards: Content, color, location, direction.
   - Maintenance.

Table 12.24 Sidewalk Improvement Measures

Measure	Strategy	Scope	Measure/Action
1. Improvement of Environment for Road Space	• Parking control	1. Provide sidewalks for pedestrians.	• Enforce orderly parking.
		2. Provide parking spaces for visitors. 3. Utilize limited road space.	• Provide parking spaces on carriageways.
		4. Utilize parking spaces efficiently. 5. Study parking as business.	• Introduce time-based parking systems.
		6. Improve disposal of goods.	• Provide loading and unloading spaces for goods.
	• Improvement of pedestrian environment	1. Provide walkable space.	• Regulate and reduce on-street shops.
			• Regulate displays on sidewalks.
		2. Install and utilize gathering spaces.	• Install free space on carriageways.
2. Improvement of Safety and Amenities for Road Users	• Traffic safety	1. Provide safe loading and unloading area for pupils/students. 2. Prevent traffic accidents.	• Provide loading/ unloading space for schools.
	• Provision of amenities	1. Improve landscape of roads.	• Install dust bins.
			• Clean road space.
			• Install flower beds.
			• Install information boards.

Source: JICA Study Team

(10) Traffic Management Measures for Rickshaws

Rickshaw is the most popular transport mode in Dhaka which people prefer for a short distance, 1-3 kilometer, travel. Actual number of rickshaw is not clear although an official 100,000 number of registered rickshaw has been recorded in Dhaka city.

Rickshaw is a functional pubic transport but it pose some problems in the aspect of urban traffic environment as follows:

- Due to rickshaw's low speed, travel speed of all transport modes in the road will consequently become low.
- Lack of willingness of the rickshaw puller to maintain line which creates disturbance to other motorized vehicles.
- No driving license is required for rickshaw driving, thus no proper traffic knowledge obtained by the rickshaw puller.
- As there is no parking space for rickshaws, in most cases, rickshaw pullers wait for the passengers at the intersection which is a common reason of traffic congestion.
- Rickshaw drivers make U-turn in the mid-block sections and create traffic congestion.

Some primary roads have been restricted from rickshaws since 2004 like New Airport Road, Mirpur Road and other main roads. In Delhi, for instance, the number of people using rickshaws has steadily increased after the opening of MRT services which might also be the future pattern of number of rickshaws in Dhaka. Therefore the government needs to work on further measures aside from Rickshaw-Free Project. In STP, some recommendations were proposed such as the licensing system, the numerical control, operating network and design improvements.

- The Licensing Systems: Establish a program for the re-licensing of rickshaw owners and operators and a means to improve the skills of the drivers and the quality of the vehicles.
- The Numerical Control: Rely upon travel demand and market forces to determine the number of rickshaws in operation, rather than through the control of license numbers.
- Operating Network: Continue with the planning and implementation of a gradual program that redefines the role for rickshaws as one of a neighborhood circulation system and a feeder service to mass rapid transit stations, including suitable facilities to provide such services.
- Design Improvements: Encourage and support efforts to improve the design of rickshaws as well as the associated maintenance facilities and procedures.

Even after the completion of MRT/BRT, the network will not function efficiently if related facilities are not available. It is essential to establish feeder services from/to station and station plaza as transfer facility in order to operate the railway properly. In fact, many people use rickshaws to access and egress from MRT/BRT stations and it is therefore expected that MRT/BRT stations will be flooded with MRT/BRT commuters, rickshaws and other modes of transport.

In this regard, the following measure is added in RSTP.

- MRT/BRT station designed with TOD policy including NMT

(11) Intelligent Transport Systems (ITS) Development

1) Rationale for ITS Development

Intelligent transportation systems (ITSs) refer to a wide range of applications of information and communication technologies (ICTs) to the transportation system. They are intended to make road traffic more efficient, safer, and user-friendly. Development of ICTs in the recent years has made it possible to realize a system which was considered as a dream before.

Development of ITSs has been active in USA and Japan, where a national ITS council has been established to formulate ITS development policy and support research and development activities. Coordinated development across the continent is underway in Europe to take advantage of the geographical nature of Europe where many vehicles travel beyond boundaries of countries.

Various ITS applications are called user services and they are grouped into several development categories. There are small differences between user services and their grouping in the countries mentioned above. The user services defined by ITS Japan are shown in Table 12.25 as example. It must be noted that user services are at different development stages; some user services, such as real-time route guidance systems, are already in commercial use, while automated highway systems are still at the research and development stage.

2) User Services for Bangladesh

Although the backbone technologies that support ITS are common among countries, user services in a country must be selected and prioritized, taking the traffic and transportation characteristics and national demand into consideration.

In order to develop the ITS policy for Bangladesh, the following factors must be considered:

Table 12.25 User Services Defined by ITS Japan

	Development Area		User Service
1	Advances in navigation systems	1	Provision or route guidance traffic information
		2	Provision of destination-related information
2	Electronic toll collection systems	3	Electronic toll collection
3	Assistance for safe driving	4	Provision of driving and road conditions information
		5	Danger warning
		6	Assistance for driving
		7	Automated highway systems
4	Optimization of traffic management	8	Optimization of traffic flow
		9	Provision of traffic restriction information in case of incident
5	Increasing efficiency in road management	10	Improvement of maintenance operation
		11	Management of specially permitted commercial vehicles
		12	Provision of roadway hazard information
6	Support for public transport	13	Provision of public transport information
		14	Assistance for public transport operations and operations management
7	Increasing efficiency in commercial vehicle operations	15	Assistance for commercial vehicle operation management
		16	Automated platooning of commercial vehicles
8	Support for pedestrians	17	Pedestrian route guidance
		18	Vehicle-pedestrian accident avoidance
9	Support for emergency vehicle operations	19	Automated emergency notification
		20	Route guidance for emergency vehicles and support for relief activities
		21	Utilization of information in the advanced information and telecommunications society

Source: ITS Japan

(i) Current status of ICT development and applications is not advanced in Bangladesh but the situation is changing rapidly so that use of ICT will become common in all aspects of the society together with the development of ICT infrastructure.

(ii) Currently, public transport modes are the dominant mode of transportation. But the number of private cars and motorcycles will grow quickly and could cause serious congestion in the near future if no actions are taken.

(iii) Substantial expansion of road network to accommodate the increased number of private vehicles and motorcycles can be neither expected nor economical in the urban core districts. The existing road network must be efficiently utilized.

(iv) To prevent undesirable growth of private cars and motorcycles, some kinds of traffic demand management measures, like area licensing system, must be implemented. At the same time, priority must be given to public transportation.

(v) In the context above, ITS development in Bangladesh must focus on user services that support the public transportation, contribute to the efficient use of the existing road network, and realize traffic demand management measures.

ITS development in Bangladesh must thus focus on the following areas:

(i) Support for public transportation.

(ii) Optimization of traffic management.

(iii) Electronic toll collection system.

More specifically, user services listed below will be given a priority.

(i) Provision of public transportation information (user service No. 13).

(ii) Assistance for public transportation operations and operations management (user service No. 14).

(iii) Provision of route guidance traffic information (user service No. 1).

(iv) Optimization of traffic flow (user service No. 8).

(v) Electronic toll collection (user service No. 3).

3) Provision of Public Transportation Information

If information on public transportation is easily available, it can attract more passengers. Two types of public transportation information will be given by the system; static information and dynamic information. The former includes the information regarding bus route, time table, fare, transfer, etc., while the latter refers to real-time bus operating information.

Static information is relatively easy to collect and disseminate. But timely updating must be made so as not to provide obsolete information. They can be given as brochures and posters, and through the Internet. Two versions of an Internet web site will be prepared; one for viewing by personal computers and another for web-enabled mobile phones.

Real-time bus operating information refers to the location of the buses on the route and expected travel time to a destination. In order to collect real-time information, bus operation must be monitored in real time. All buses must be equipped with a GPS (global positioning system)-based transmitter, which sends the bus location at regular intervals.

The bus location information is sent to the bus management center and processed into bus operation data. The location of the next bus by bus route will be displayed at bus stops as a service to passengers to inform them about waiting times for the next bus. If expected waiting time is too long, potential passengers can take other modes of transportation, or use the waiting time for other purposes and come back to the bus stop in time for the next bus.

4) Assistance for Public Transportation Operations and Operations Management

Two systems are envisioned in the user services; transit signal priority and bus operations information.

Transit signal priority is a function of a traffic signal system that offers preferential treatment to buses. It detects bus approaching a signalized intersection and adjusts the signal timing so as to minimize the delay that the bus incurs at the intersection. Thus effective running speeds of buses can be increased. The system and its mechanism are explained elsewhere in the report.

Real-time bus location data collected for the information of bus passengers are also very valuable information for bus operators. They provide bus operators with information that can help in bus scheduling, fleet management, maintenance management, staff management, and cost management. If data are effectively utilized, bus service levels can be upgraded, while the operation costs can be reduced.

5) Provision of Route Guidance Traffic Information

Currently, drivers in Dhaka operate their vehicle, whether it is motorcycle or passenger car, without any knowledge about traffic conditions. They choose their route based on past experiences only. Such situation is not efficient as they could face traffic congestion that could have been avoided if they knew there is congestion. Route guidance system provides real-time traffic information to drivers already on the road or have plans of doing so. The system is capable of displaying

on the in-vehicle unit the suggested route to a destination, taking congestion locations into consideration. It has been proved very useful by the fact that sales of in-vehicle units have been very vigorous. There are now more than 10 million units in use in Japan.

It must be pointed out that key to the success of any route guidance traffic information is the precise information on traffic condition in the whole area to be covered by the system. If information is not correct or old, drivers would not use the system. Area traffic control (ATC) system is a very important source of such information, as it collects traffic condition data using vehicle detectors. Thus an ATC system is a prerequisite for a real-time traffic information system to function effectively.

6) Optimization of Traffic Flow

Traffic flow can be managed more efficiently if intelligent traffic signals are introduced. An ATC system is the system that realizes this. It collects traffic condition data at many points in the control area and controls signals in real-time with the optimum timing to minimize delay and congestion. Signal development plan to introduce consolidated ATC system has been proposed elsewhere in the report.

7) Electronic Toll Collection

Electronic toll collection system can be used in two ways; toll collection at expressway and toll collection for area licensing system. For both applications, toll collection technologies have been already established and there are international standards for major system components such as DSRC (Dedicated Short Range Communication) system between vehicle and toll gate. Thus from the technological point of view, area licensing system can be introduced without much development. Study and preparation work are however required for the non-technical aspects of the system such as applicable area, amount of fee to be collected, alternative mode of transport, social acceptance, institutional set-up for operation and maintenance, etc.

(12) Project Costs of Short-term Traffic Management and Traffic Safety Projects

Table 12.26 is the estimated project costs for the short-term projects of the traffic management and traffic safety programs.

Table 12.26 Project Costs of short-term Traffic Management and Traffic Safety

Project	Project Item	Cost (million US$)
Signals and Associated Systems	Intersection Improvement Traffic Signal System Installation and Replacement	150 – 200
Parking Management and Development	New parking slot development Parking management	300
Sidewalk and Pedestrian Way Development		50
Traffic Management Capacity Building	Almost 2 years training period for DMP, DTCA and other related agencies	0.5
Traffic Safety Program	Around 10 programs	50
Traffic Enforcement	Illegal parking, Rickshaw control	n/a
TOTAL		**600+** **About 47 billion TK**

Source: JICA Study Team

12.6 Transit Oriented Development (TOD)

(1) General

Although the concept of TOD itself has been originated in USA, as counter idea against auto-centered development, Japan started its original railway-oriented development schemes which urban development integrated with railway development, even before motorization had started.

In Japan, suburban residential areas and suburban commuter railway had been developed in an integrated manner by private railway companies, which started in the 1910s. They, along with terminal station development in the central areas shaped an urban spatial structure in metropolitan areas. On the other hand, the profits accrued from such suburban development have been reinvested to the railway development, as cross-subsidy in the companies.

Dhaka is suitable to TOD due to its densely inhabited urban areas with more than 800 per hectare in the inner urbanized districts, 500 per hectare in Gulshan area and 400 per hectare in other areas compared to 86 in Paris, 62 in London, 145 in Tokyo and 370 in Hong Kong. With the increasing income and lifestyle change, there is a move towards suburban living – pushed by crammed conditions in the urban core and pulled in by modern residential complexes emerging on the outskirts of Dhaka.

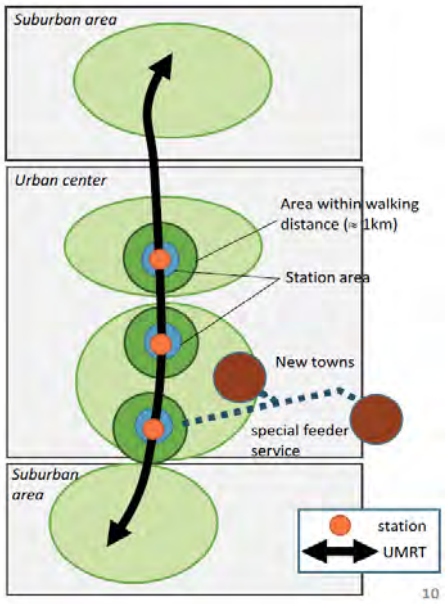


Figure 12.46 Station Influence Area

As envisioned in the General Plan, the challenge for Dhaka is to revitalize the CBD into well-designed areas in close proximity to good public transport and with convenient access to a mix of retail, personal services, health and recreational facilities while maintaining cultural and historical values and depopulating the district to make it less congested. Inner city infill sites can offer an ideal setting to promote TOD but require a political commitment to establish a development style enterprise that can implement land readjustment activities and redevelop around MRT/BRT stations.

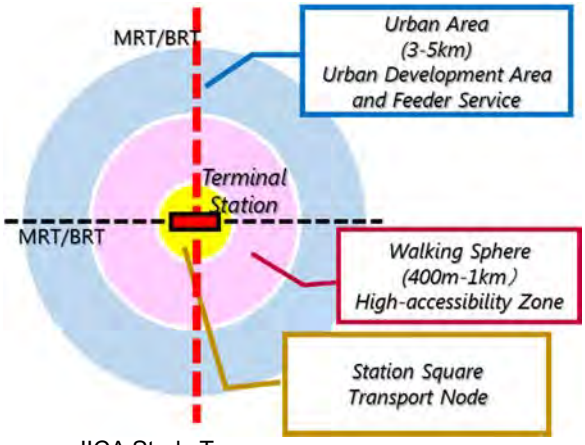
The urbanizing fringes of Dhaka offer the greatest potential for applying the TOD concept − because they are less hampered by existing land uses and ownership. These greenfields or new sites can be planned and designed with a clear transit focus. In order to succeed, these greenfield sites must be provided with high quality, fixed guideway public transport systems with regular connections to the CBD and other regional centers and other TOD nodes. This concept of urbanism seeks to bring together modern lifestyles, housing, and places of employment, retail activity and leisure time in a compact pedestrian-dominated neighborhood with linkages by transit to other points of interests in the greater Dhaka metropolitan region.

(2) Station Influence Area

MRT Line 1 and Line 6 will give a big impact on socio-economic activities and land use along the corridors. For MRT Line 1 and Line 6 to efficiently manage the planning process, the clear definition of the influence area of the MRT Line 1 and Line 6 is

essential. And depending on the purpose and scope of activities or related projects, the station influence area of MRT Line1 and Line 6 can be described as follows:

The influence areas along Line 1 and Line 6 lie broadly on the central area of Dhaka categorized as the inner urban area (historic inner city and expanded inner city) and newly developed central urban area. Most of the stations of Line1 and Line 6 are located in the inner urban area and the others in the newly developed central urban area. The outer centers of satellite urban areas will be connected to the MRT/BRT with expanded transit, including MRT/BRT or BRT, or other.



Source: JICA Study Team

Figure 12.47 Spatial Relation of Station Influence Area with MRT/BRT Station

1) Level 1 Project Influence Area: City / District:

This influence area is spread up to a large part of existing urbanized and expanding areas of Dhaka. The role of each urban transport system should be emphasized to manage urban growth as well as related plans and projects should be coordinated in relation to the MRT/BRT development. The influence area of the project at this level refers to the areas along MRT Line 1 and Line 6 which will be directly affected.

The provision of feeder bus services and the measures to encourage usage of public transport will be important.

2) Level 2 Project Influence Area: Area within Walking Distance

With regards to the perspective of railway use as a part of daily life, the catchment area can be regarded as a walking distance area which will cover about 1,000 m radius of the station. It is important to consider the provision of a walkable urban environment to commercial, business and community facilities. Some other important considerations will be the development of intermodal facilities, feeder transport facilities and services, improvement of urban environment for walking, development method and roles of government agencies during the planning and development stages.

3) Level 3 Project Influence Area: Area at and around MRT/BRT Station:

The railway station is not only a part of the transport facility but will also be a multi-functional facility which responds to various economic and commercial needs and public service. Accordingly, this area has a large potential to satisfy the various urban functions given its strategic location and potential socio-economic activities brought about by railway users.

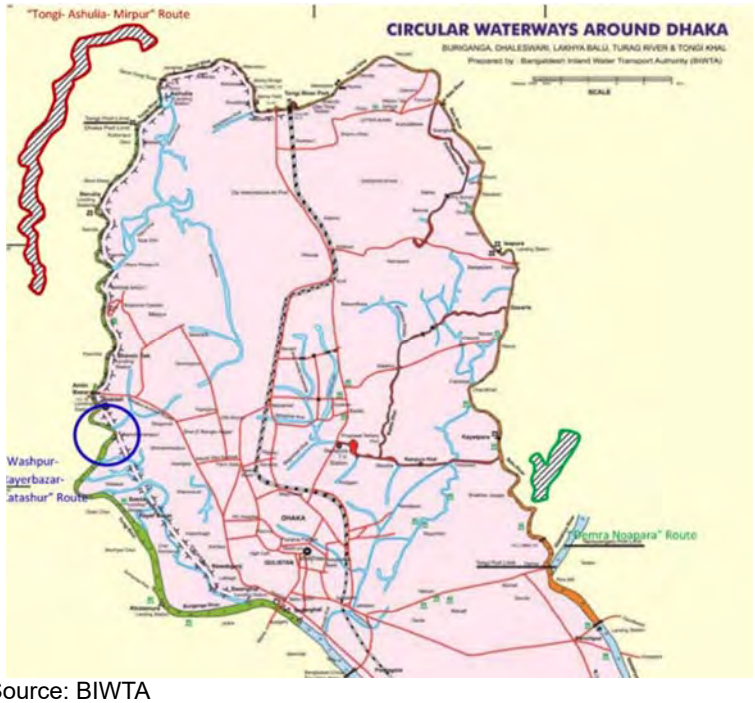
12.7 Inland Waterways

(1) Circular Waterway and Canal Waterway

Dhaka is endowed with pleasant characteristics because of its numerous canals and khals crisscrossing the city, thus creating naturally attractive environmental features. Despite this fact, the city is now left with just a few navigable water bodies such as Dhanmondi, Banani and Gulshan lakes, and the Begunbari khal up to Rampura inside the city. The deteriorating situation has arisen due to the indiscriminate infill of lakes and khals dating back to partition in 1947. These lakes and the Begunbari khal do not carry any significant passengers nor cargo traffic.

However, the city is surrounded by a circular waterway system consisting of the Buriganga, the Balu, the Turag, the Tongi and the Sitalakhya rivers even though the sub-standard clearance of the railway bridge at Tongi affects the through routing of some vessels. These waterways carry a sizeable amount of freight traffic from the adjoining areas bound for Dhaka. The BIWTA under its scheme called “The Development of the Circular Waterways of Dhaka”, is improving the navigability of the rivers and is also building landing stations along the waterways. It is expected that after the improvement of the circular waterways, freight and passengers will move more conveniently through the waterway system. Under the RSTP, these landing stations will be integrated with the land transport system of the city so that the freight and passengers from the waterways can move more easily into the city.

At present, an inland waterways project called “Introduction of Waterways around Dhaka City” has been conducted by Bangladesh Inland Water Transport Authority (BIWTA) with the 1st phase being completed at the cost of 36 core Taka (almost 4.7 million USD) providing 29.5 km of the river. Main objectives of this project is to improve navigability of 40 km waterways along the Balu River and Tongi Khal between Ashulia and Khachpur and to develop cargo and passenger facilities of inland river port at Tongi and three landing stations located at Khachpur, Isapura and Kayetpara. Moreover, stations of inland waterways need to be connected with MRT/BRT stations, bus stops and parking stations of rickshaw and CNG.



Source: BIWTA

Figure 12.48 Circular Waterways around Dhaka

(2) Sadarghat Boat Terminal

1) Short- and Mid-term Plan

There are some boat terminals of varying size along the river in the Sadarghat area and this area is the famous trafficy area in Dhaka, because this area is located in the old Dhaka and the roads is only 1.2 lanes wide around the pass, which is very narrow. And the Sadarghat River Boat Terminal is one of the largest river ports in Bangladesh. About 300 large and small passenger river boats depart and arrive with an average of 500 passengers every hour at the terminal every day. According to the officials at the terminal, 150,000 people, in average, use the terminal for departure and arrival every day.

In the short- and mid-term, traffic management measures, one-way-system, feeder bus service, parking management and others can help relive the congested area.

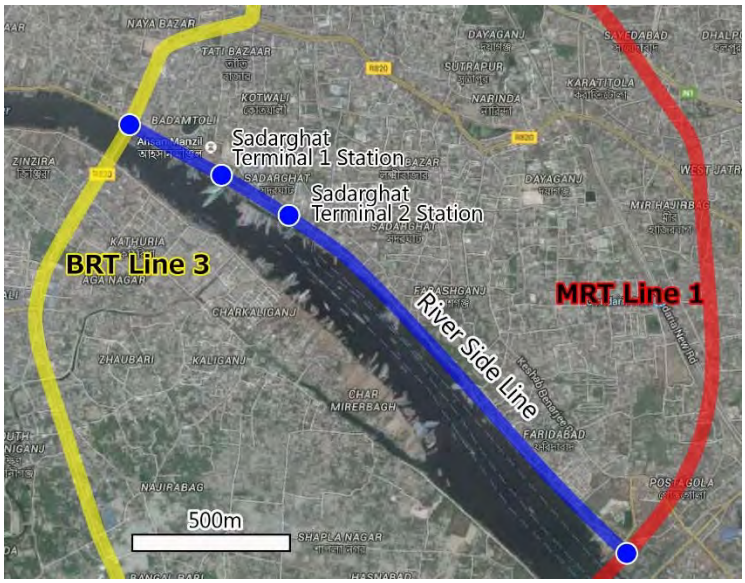
Source: JICA study Team

Figure 12.49 Road Network Improvement

2) Long-term Plan

From the aspect of Limited developable land and future demand, monorail system or AGT (Automated guideway transit) system is most suitable transport mode in this area. This river side line is around 4 kilometer long and will serve between BRT Line 3 and MRT Line 1. And the alignment will generally follow the existing road or river side but will be grade-separated on a viaduct structure.

Current boat and ferry terminals are located like a belt along the Buriganga River, so the future Sadarghat Boat Terminals need to be improved as the airport terminal.



Source: JICA Study Team

Figure 12.50 Concept of the River Side Line

Source: Haneda Airport Terminal Web Site

Figure 12.51 Images of the New Sadarghat Boat Terminal

Source: Tokyo Monorail Web Site and Tokyo Yurikamome Web Site

Figure 12.52 River Side Line (image)

12.8 Regional Transport Infrastructures

(1) General

Considering the rapid urbanization of RAJUK area, arising urban issues within the area will be difficult to resolve in the near future. In this regard, it is advisable to prepare a plan for a wider area, i.e., the Greater Dhaka Area (GDA) where the same concept of developing urban centers and corridors can be applied. In RAJUK area, introducing mass transit system along urban corridors is essential due to its existing congested traffic condition. On the other hand, at GDA level, developing the road network to include expressways is needed.

(2) Possible Scenario for the Regional Structure of GDA

1) Urbanization

The intensive urban developments at peripheral areas of DCC in recent years will generate more population to form conurbation with DCC. Consequently, this will create various types of critical issues both in urban activities and urban environment simultaneously. Nevertheless, RAJUK area will eventually be almost urbanized. Moreover, rapid urbanization will even happens at the cities located more than 20km from the center of DCC which is already shown on areas like Gazipur and Kaliacoir.

a) Within a 10-km radius from the central area of DCC: The area will almost be fully developed to form a conurbation including Purbachal. At the present, the population of DCC (North and South) is 7 million and the future population of the area is forecasted to be around 12－14 million.

b) 10km–20km: The area within a 20-km radius has almost the same size as the Rajuk area and will be urbanized in most parts including Savar and part of Gazipur and Narayanganj. The area from Gaziour to Narayanganj will be a conurbation.

2) Polar Cities

In order to ease the urban problems derived from the intensive concentration of population and urban functions in an expanded Dhaka conurbation, a need to develop cities with job opportunities is vital as well as functions for managing and servicing surrounding areas.

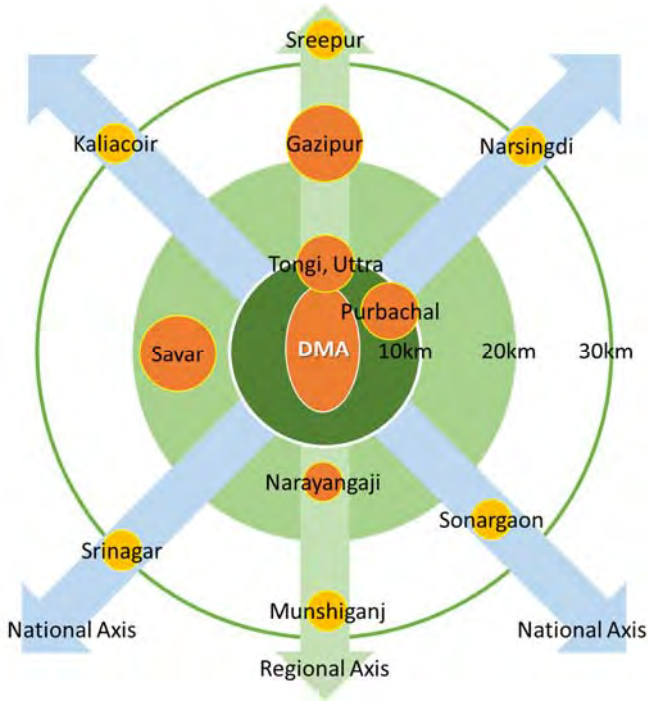
a) In between 10-20km radius, there are growing cities becoming known not only as bedroom suburbs but also employment centers. These cities are Narayanganj, Gazipur and Savar. Purbachal will eventually become one of them. If more urban functions will be added, those cities will shoulder some of the burden concentrated in the central area as the sub-center of Dhaka agglomeration.

c) If properly developed, cities located around 30 km from the central area can become regional centers that will share functions necessary to the metropolitan area.

d) Outside of Rajuk area; low-population settlements are located in every direction but densely distributed in the north-west part of GDA. The area has also the potential of attracting factories which will enhance urbanization through transforming settlements with higher population density and within these areas there will be growth centers.

3) Transport Axis

There are two major axes in the context of international and national network, i.e., Sirajganj–Comilla–Chittagong and Jessore–Padma Bridge–Sylet. These axes will support the growth of the cities. In this region, there is the regional axis from the north to the south passing through Gazipur and Narayanganj. At this moment the urbanization is found along this axis, however the development potential will depend on the improvement of transport systems coping with the increasing demand. Likewise, it will be indispensable to improve regional network not only connecting the central area and the suburbs but cities in GDA, especially connecting polar cities.



Source: JICA Study Team

Figure 12.53 Future Regional Structure of GDA

4) Future Road Network in GDA

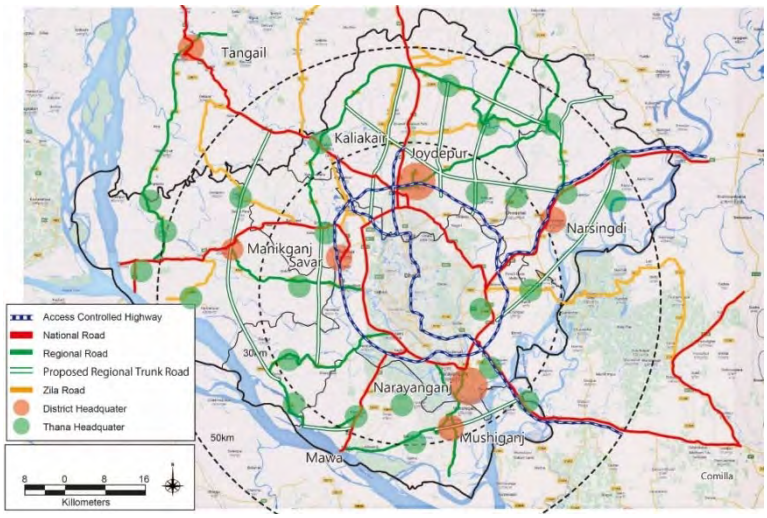
As per the data stated above, two kinds of future road network plan are proposed in RSTP as follows.

Plan A: Up-grade Current Road Network

- Future population in GDA will be 38 million in 2035
- Connectivity between regional cities
- Support for industrial activities in northern part of GDA

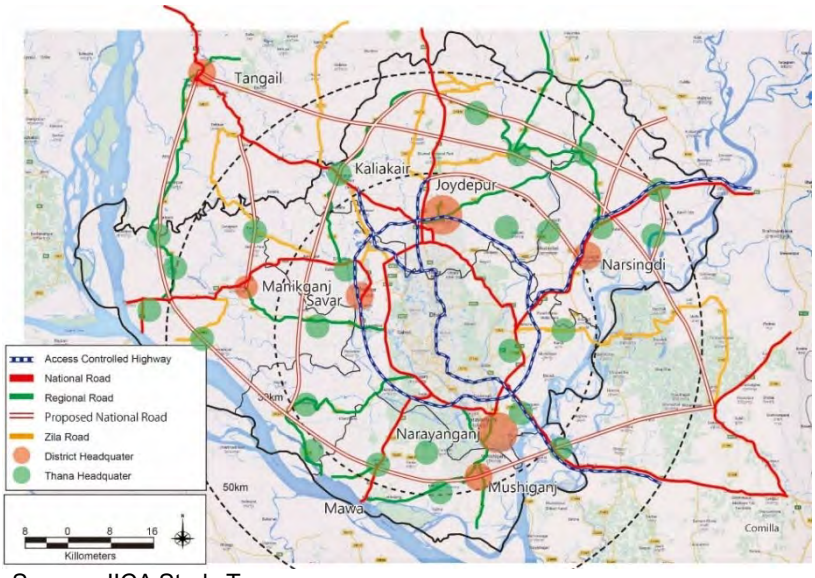
Plan B: High-Grade Road Network

- Future population in GDA will be 38 million in 2035
- Strong connectivity between regional cores by NH
- Support for industrial activities in northern part of GDA



Source: JICA Study Team

Figure 12.54 Future Road Network in GDA (Plan A)



Source: JICA Study Team

Figure 12.55 Future Road Network in GDA (Plan B)

13. EVALUATION OF THE MASTER PLAN

13.1 Approach

This chapter explains the evaluation of the proposed major urban transportation network and projects completely from the economic, financial, social and environmental aspects. This process is very important to clarify the nature of the projects and the priorities for its implementation. The evaluation was made both for the Master Plan as a network and for major individual projects after the joint network performance was considered sustainable, individual projects or project packages were evaluated.

13.2 RSTP 2035 Economic Evaluation of Projects

(1) Assumptions

The study team conducted a discounted cash flow analysis in order to assess all the public transport and road projects. The economic internal rate of return (EIRR) was calculated to determine the achievability of the projects. The following presumption and standardizations were adopted for the calculation of EIRR.

- The duration of the project was assumed to be 40 years, construction period of 10 years and operating period of 30 years.
- Traffic assignment was done for the year 2025 and 2035 and the economic benefits were estimated for the two years and an estimation was done for the in between years. The economic benefits are the savings due to the reduction in vehicle operation cost (VOC) and travel time cost (TTC) which are calculated from the result of traffic assignment. After 2035, economic benefit was assumed not to change
- Social discount rate was assumed at 12%.
- Economic cost of a project was assumed to be 80% of the financial cost of project.
- Exchange rate was set as 1 TK = 0.0130 US$ on July 2015.

(2) VOC and TTC

The unit cost of VOC and TTC were required to calculate the economic benefits. The following costs were applied as the unit of cost of VOCs. It was estimated by RHD. However the unit costs were converted to value of 2014 based on growth of GDP.

Table 13.1 VOC

Unit: TK / Vehicle / Km

Car	Motorcycle	CNG	Bus	Truck
15.0	2.0	3.7	23.0	21.5

Source: JICA study team estimated based on RHD Road User Cost Annual Report for 2004 - 2005

TTCs each mode were estimated based on household income and working/ business trip shares by using result of household interview survey. Unit TTCs was assumed to growth in line with GRDP per capita of the study area.

Table 13.2 VOT

Unit: TK / min / person

Year	Car	Motorcycle	CNG	Bus	Truck
2014	6.3	3.0	1.7	1.8	1.8
2025	8.9	4.2	2.4	2.5	2.5
2035	12.0	5.7	3.2	3.4	3.4

Source: JICA Study Team

(3) Results of Economic Evaluation

EIRR was shown in following tables. All projects are economically viable as the threshold of EIRR is 12%.

Table 13.3 Public Transportation Project Economic Evaluation Results

Projects	Capital Cost (US$ million)	O & M Cost in opening year (US$ million / year)	EIRR (%)
MRT1	5,869	97.8	22.1
MRT2	3,673	115.4	19.4
MRT4	1,661	46.2	13.2
MRT5	4,200	101.0	16.1
MRT6 extension	2,089	63.5	33.5
BRT7	257	40.0	47.9

Source: JICA Study Team

Table 13.4 Road Project Economic Evaluation Results

Projects	Capital Cost (US$ million)	O & M Cost in opening year (US$ million / year)	EIRR (%)
Dhaka - Ashulia Elevated Exp.	1,421.2	19.9	16.9
Dhaka - Chittagong Exp.	156.2	2.2	28.3
Dhaka - Sylhet Exp.	82.8	1.2	35.0
Dhaka - Mawa Exp.	538.0	7.5	16.2
Dhaka - Mymensingh Exp.	102.3	1.4	30.7
Inner - Ring Road	1,178.3	16.5	34.4
Middle - Ring Road	423.0	5.9	54.6
Outer - Ring Road	2,076.7	29.1	17.2
Primary - Road Package	1,143.5	16.0	29.5
Secondary - Road Package	1,076.2	27.6	41.7

Source: JICA Study Team

13.3 Financial Evaluation

(1) Assumptions

The discounted cash flow analysis was use to determine the financial activity of the proposed MRT and BRT projects Cash inflow of the project includes fare revenue while cash outflows of the project consists of repeated costs such as operation and maintenance expenses and capital expenditures. The main assumptions are described below

- The duration of the project was assumed to be 40 years; construction period of 10 years and operating period of 30 years.
- Traffic assignment was done for the year of 2025 and 2035, and the fare revenue was estimated for the two years and an estimation was done for the in between years.After 2035, fare revenue was assumed not to change.
- Fare revenue was calculated based on the following fare settings. As for MRT fare, the fare setting of MRT6 project by JICA was applied. In addition, the fare setting of BRT3 project by WB was applied as BRT fare.
- Discount rate was assumed at 12%.

Table 13.5 Fare Setting

Year	MRT	BRT
2014	16.0 + 2.0/km TK	7.0 + 3.2/km TK
2025	22.6 + 2.8/km TK	9.9 + 4.5/km TK
2035	30.6 + 3.8/km TK	13.4 + 6.1/km TK

Source: JICA Study Team, MRT6 project by JICA, BRT and Corridor Restructuring Implementation Study and Preliminary Design work for the Uttara – Mohakhali – Ramna – Sadar Ghat Corridor in Dhaka by World Bank

The results of financial evaluation were shown in following table.

Table 13.6 Public Transportation Project Economic Evaluation Results

Projects	Capital Cost (US$ million)	O & M Cost in opening year (US$ million / year)	FIRR (%)
MRT1	5,869	97.8	4.5
MRT2	3,673	115.4	3.0
MRT4	1,661	46.2	3.8
MRT5	4,200	101.0	4.0
MRT6 extension	2,089	63.5	9.7
BRT7	257	40.0	4.3

Source: JICA Study Team

13.4 RSTP 2035 Environmental Evaluation of Projects

(1) Procedure of IEE

The Environmental and social impacts are associated with proper planning. Thereby, proposed projects should be assessed and examined thoroughly right from the earliest planning stage and this could be realized through and in accordance from the viewpoint of Strategic Environmental Assessment (SEA). The implementation of effective alternative options and reduction measures is necessary to avoid or minimize the adverse impacts on the natural and social environment as well; these should be examined carefully and be incorporated into the specific plans and projects. Hence, the Initial Environmental Examination (IEE) is being formed for the priority projects of the urban transport development scenario.

Primarily, a comprehensive analytical study based on the viewpoints of environmental and social impacts should be made for the proposed projects of the urban transport development scenario and the selected impact items would be used for the proposed projects of (RSTP).To be followed by the scoping of the priority projects so as to determine the alternatives and the expected impacts respectively. Then, the draft of the environmental management plans will be presented to identify the specific reduction measures. The Terms of Reference (TOR) draft of the priority projects is needful for the succeeding feasibility study.

(2) Environmental Registration and Regulations in Bangladesh

The 1995 Environment Conservation Act (ECA) and the 1997 Environment Conservation Rules (ECR) are the legislative bases for the environmental assessment in Bangladesh. And the regulatory body responsible for enforcing the act and the rules is the Department of Environment (DOE), which is under the Ministry of Environment and Forest.

1) The Bangladesh Environment Conservation Act, 1995

The said Act is considered as the basic environmental law in Bangladesh, it provides for the conservation of the environment as well as the improvement of the environmental standards and the control and reduction of environmental pollution. The provisions stated in the Act are directed to protect the environment from any harmful pollutions and damage.

The aforementioned Act is authorizing the Department of Environment (DOE) to undertake any appropriate and effective measures for the conservation, enhancement of the quality of the environment and to control, prevent and reduce pollution. This department is also the regulatory body and enforcement agency responsible for all environmental related activities. This Act includes as well as addresses the following important main issues:

- Declaration of Ecologically Critical Areas;
- Procedure for obtaining Environmental Clearance Certificates;
- Regulation with respect to vehicles emitting smoke harmful for the environment;
- Environmental regulations for development activities;
- Standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Acceptable limits for discharging and emitting waste;

- Formulation of environmental guidelines to control and lessen environmental pollution, conservation and improvement of environment.
- All projects and activities under the RSTP shall comply with the provisions of this Act.

2) The Environment Conservation Rules, 1997

The Environment Conservation rules were issued as an enforcement law and exercises powers as granted by the 1995 Bangladesh Environment Conservation Act. The said Rules provides as well as the standards and guidelines for the following:

- Categorization of industries and development projects, including roads and bridges on the basis of actual and anticipated pollution load;
- Requirement for undertaking Initial Environmental Examination (IEE); and Environmental Impact Assessment (EIA), as well as formulating an Environmental Management Plan (EMP) according to categories of industries, development projects and activities;
- Procedure for obtaining Environmental Clearance Certificate (ECC);
- Environmental quality standards for air, surface water, groundwater, drinking water, industrial liquid waste , emissions, noise and vehicular exhausts;
- In Schedule 1, projects and activities are classified into four categories: Green, Orange A, Orange B and Red based on its location and impact on environment.

3) EIA System and Procedure by DOE

The EIA is conducted as a part of the process in issuing ECC in Bangladesh.

The Clearance Certificate is automatically granted to the Green categories and the Orange categories are required to submit more considerable information and plans and may be subject to further field inspection. While the Orange-B categories must undertake the Initial Environmental Examination (IEE) and prepare the Environmental Management Plan (EMP) to satisfactorily pass the standards of the Department of Environment (DOE). The Red categories should thoroughly conduct a detailed Environmental Impact Assessment (EIA) and must prepare the Environmental Management Plan (EMP).

Schedule 1 of the Rules provides classification of industrial units or projects based on its location and impact on environment.

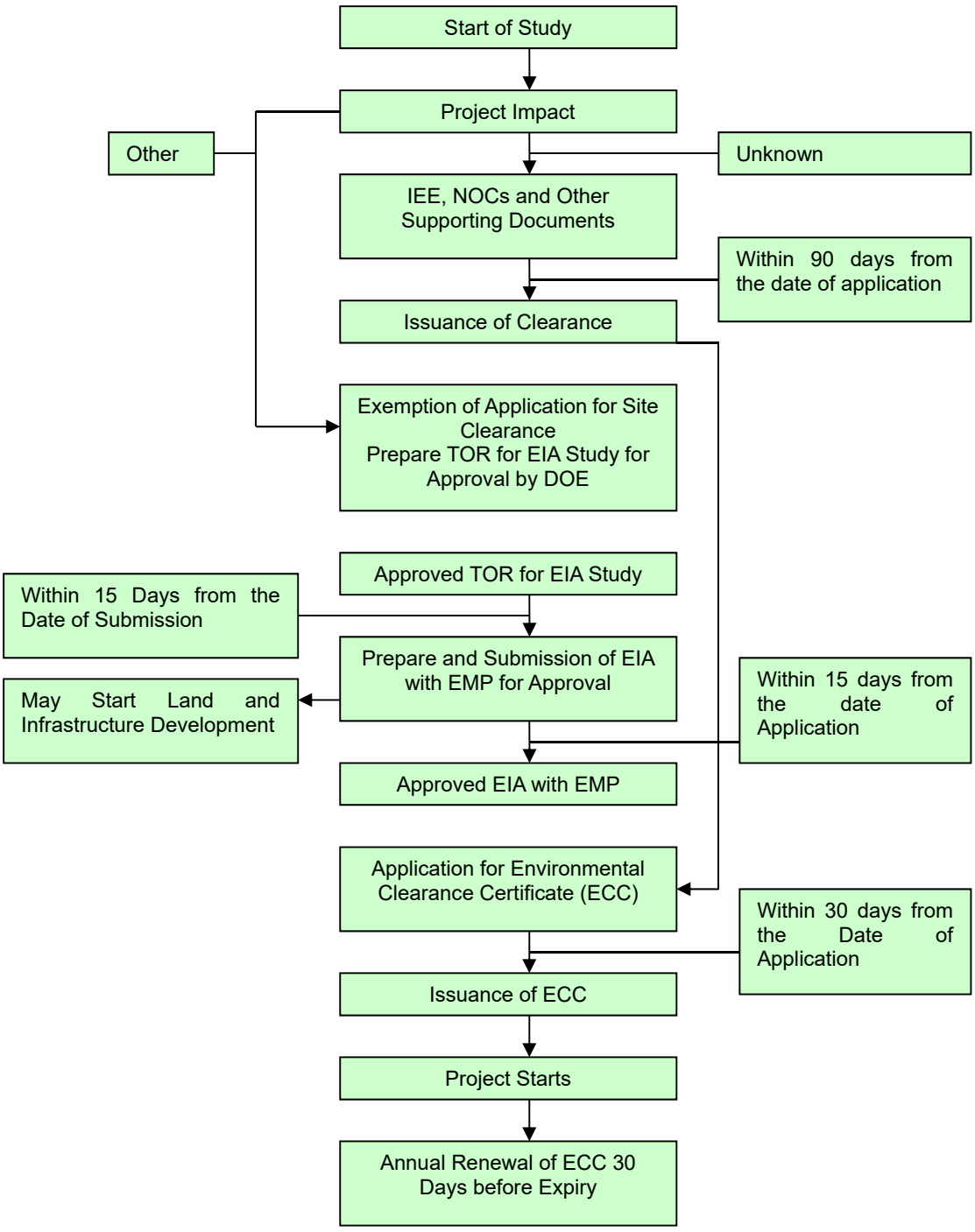
Orange-B category infrastructure projects include:

- Engineering works (up to 10 hundred thousand BDT capital.);
- Construction, reconstruction and extension of road (feeder road, local road); and,
- Construction, reconstruction and extension of bridge (length below 100 meters).

Red category infrastructure projects include:

- Engineering works (capital above10 hundred thousand BDT);
- Construction, reconstruction and expansion of road (regional, national and international); and,
- Construction, reconstruction and expansion of bridge (length100 meter and above).

- Most of the construction projects proposed of RSTP will be classified as Red categories. The procedure of EIA and ECC for Red category projects is shown in below.



Source: EIA for Padma Multipurpose Bridge, 2010

Figure 13.1 Steps to be followed for Environmental Clearance Certificate for Red Category

4) Bangladesh Land Acquisition and Resettlement Policy and Legal Framework

Bangladesh land acquisition and resettlement policy is based on the following legislations:

a) Acquisition and Requisition of Immovable Property Ordinance of 1982 (ARIPO)

b) Cash Compensation by Law (CCL)

c) Land Acquisition Act, 1994

Under the law and act, the formal titled owners are entitled for compensations for the loss of their lands, houses, structures affected, for the loss of their crops, trees and perennials and to the sharecroppers as well, if it is applicable.

The following are the issues of the present enforcement:

- No compensation is made for the people without formal title;
- The payment of the compensation is too slow, sometimes the payment is made after the completion of the project and,
- The amount paid is too small comparing to the market value since the amount is predetermined based on the tax and so with the assets to be acquired by the project. In the past years, the people were used to report excessive small value to minimize the taxes.
- Therefore, it is a common practice in the international donors' project that:
- People with no titles are also given due compensations, equal to those people who have titles if they stayed there peacefully for a long period of time without any claim or dispute.
- Compensation is made before the relocation and start of construction; and,
- Compensation is made based on the actual market value for them to be able to purchase other alternatives.

Thus, the necessary amount of compensations shall be made to all affected people regardless of titled or non-titled, except for those speculators and professional squatters, so that they may be able to restore their lives and livelihood lost by the project. The government agency (usually the Deputy Commissioner, DC) in charge of giving legal compensation will pay the excessive small amount of compensation as specified in the law only. The project executing agency shall pay the balance of the necessary amount and the predetermined amount by the Deputy Commissioner, Therefore, the affected people have to collect the money to both the Deputy Commissioner and the project executing agency.

5) JICA Guidelines for Environmental and Social Considerations

The proposed projects in the urban transport development scenario under the RSTP have to follow the JICA Guidelines for the Environmental and Social Considerations (April 2010), hereinafter referred to as the "JICA Guideline". The JICA Guidelines recognizes and addresses the impacts of all the affected persons regardless of their titles, and requires for the preparation of Resettlement Action Plan (RAP) in case involuntary resettlement occurs.

i. Avoid or minimize impacts if possible;
ii. Consultation with the stakeholders, affected people or group (including informal settlers), local NGOs, etc. who have views about the projects;
iii. Payments of compensation for acquired assets at the full replacement cost;
iv. Ensure that no one is less fortunate as a result of resettlement and would maintain their at least original standard of living;

v. Resettlement assistance to affected persons, including non-titled persons; and

vi. Special attention to helpless people/groups and ethnic minorities.

There are some gaps observed between Bangladesh Policy and the JICA Guidelines. The project policy and measures to fill in the gaps should be proposed based on the gap analysis.

(3) Scoping for IEE

In order to conduct IEE for the projects of the urban transport development scenario from the viewpoint of Strategic Environmental Assessment (SEA), the representative items are selected to compare the proposed projects. The impacts are assessed in terms of the impact indices shown in the table below.

Table 13.7 Representative Impact Items and Indices

Viewpoint	Impact Items	Impact Indices
Social environment	Land acquisition and Involuntary Resettlement	• Number of Affected household
Natural Environment	Protected Area	• National Park
	Biodiversity	• Wetland and Water Retention Area • Forest, Agricultural land
	Flood Risk	• Flood Flow Zone • Potential Flood Area where Elevation is less than 7.1m
Pollution Control	Noise and vibration	• Residential area (population density) • Sensitive receptors (Schools, Hospitals, Religious facilities)
	Air Pollution	• Residential area (population density) • Sensitive facilities (Schools, Hospitals, Religious facilities)
	Water pollution	• Surface water bodies (rivers, lakes, etc.)

Source: JICA Study Team

The MRT and BRT networks of the urban development scenario in 2035 are shown in Table 13.8.

Table 13.8 MRT and BRT Networks

Project	Length	Route	Description
MRT Line 1	52 km	• Gazipur - HSIA Airport -Badda - Kamalapur - Jhimill • Pulbachar - Khilkhet	• Backbone corridor of Dhaka Metropolitan Area • Connecting corridor between Purbachal and CBD
MRT Line 2	40 km	Ashulia - Savar - Gabtali - Dhaka Unv. - DSCC - Kamalapur	• Regional corridor in Savar area • Connecting corridor between Savar and CBD
MRT Line 4	16 km	Kamalapur - Narayanganj	• Commuter line between Kamalapur to Narayanganj
MRT Line 5	35 km	Bulta - Badda – Mirpur Road – Gabtoli Bus Terminal – Dhanmondi – Bashundahara City –Hatir Jheel Link Road	• Main corridor of East-West connection
BRT Line 7	36 km	Purbachal - Narayanganj	• Connection corridor in Eastern Fringe Area

Source: JICA Study Team

These MRT and BRT development projects are assessed and compared from the viewpoint of social and environmental impacts in Table 13.8.

It is then assumed that the required width of row of the MRT line will be 25 meters, considering the width of the constructing stations. Since the most alignment of the MRT networks will be built on the existing roads, the affected people that has to leave the area by land acquisition of 25 meters width along the whole route shall be estimated through the satellite images multiplied by the population densities.

On the Eastern Fringe Road, the BRT Line 7 will be built; however, presently there is no road row. The proposed number of lanes of this road will be (6) lanes with BRT and will have enough row corridor of 60m to allow (8) lanes of MRT. Thus, the affected people to leave the area by land acquisition of 60m width along the whole route will be estimated.

Note that the estimated number of affected households shown in the table below does not include those in the depot. The structure type for all MRT lines is assumed to be elevated.

Table 13.9 Comparative Analysis of MRT and BRT Networks

Impact Items	MRT Line1		MRT Line 2	MRT Line 4	MRT Line 5		BRT Line 7
Social Environment							
Land acquisition and Involuntary Resettlement	[All Elevated] In order to pass over Kuril Flyover and Moghbazar - Mouchak Link Flyover with elevated structure, a massive resettlement of affected persons due to additional ROW acquisition will be unavoidable. [Partial Underground] The tracks go partially underground in Kuril area and from Maribag to Kamulapur BR station and further Buriganga River.		[All Elevated] The route goes the narrow existing roads from Gabtali to Dhaka University. A large number of structures might be affected. The existing highway in Western Fringe area can accommodate the viaduct.	[All Elevated] The elevated structure will be built within the BR ROW. There are hundreds of informal settlers and illegal vendors in BR ROW. If the BR line will be double tracked, there might be no more informal settlers.	[All Elevated] The line 5 covers the center portion of Dhaka, congested area. Thus a large number of affected structures are expected. Eastern Fringe Area is not heavily populated. [Partial Underground] The tracks go partially underground at the section from Kachukhet to Notun Bazar (under cantonment), and from Dhanmondi to Bashundahara City.		[At Grade] Since there is no existing roads. The 60m width of ROW acquisition will be needed.
Number of Affected Households	Elevated	Underground	1,100	500	Elevated	Underground	1,000
	500	100			620	120	
Number of Affected Persons[*1]	Elevated	Underground	5,500	2,500	Elevated	Underground	5,000
	2,500	500			3,100	600	
Natural Environment							
Protected Area	The line will not go through any protected area.		The line will not go through any protected area.	The line will not go through any protected area.	The line will not go through any protected area.		The line will not go through any protected area.
Biodiversity (wetland)	Because the line will go through the existing road and BR ROW in the built-up area, wetlands will not be directly affected. There are some small swamps along the track around Tongi to Gazipur and Purbachar areas.		The line will go through the existing road in the built-up area from Gabtali to Kamalapur. From Gabtali to Hemayetpur the highway is surrounded by wetland. The wetland might be affected during construction.	The line will go through the existing BR ROW in the built-up area. There will be no impacts on wetlands.	Because the line will go through the existing road in the built-up area, there will be no direct impacts on wetlands. The route will extend to the Eastern Fringe area, therefore, wetland and agricultural land will be reclaimed.		Since the route will go through the wetland and agricultural land in Eastern Fringe area, a significant impact on biodiversity will be expected.
Flood Risk	The line will go through the existing road. The risk of		The line will pass through the flood flow zone in the	The line will go through the existing BR ROW. The risk	The route will extend to the Eastern Fringe water		Since the route will go through the flood flow

Impact Items	MRT Line1	MRT Line 2	MRT Line 4	MRT Line 5	BRT Line 7
	flooding is low.	western side of Dhaka city. There will be a high risk of inundation.	of flooding is very low.	retention area. There will be a high risk of inundation.	zone and water retention area in Eastern Fringe, there will be a high risk of flooding.
Pollution Control					
Noise and vibration	Because the line will go through the existing road and BR ROW in the built-up area, mitigation measures to abate the noise and vibration levels should be considered especially for sensitive receptors at the elevated section.	The line will go through the existing road in the built-up area of Dhaka CBD and Savar, mitigation measures to abate the noise and vibration levels should be considered especially for sensitive receptors.	Because the line will go through the BR ROW in the built-up area, the mitigation measures to abate the noise and vibration levels should be considered especially for sensitive receptors.	The line will go through the existing road in the built-up area, mitigation measures to abate the noise and vibration levels should be considered especially for sensitive receptors at the elevated section. There might be lesser impacts in the Eastern Fringe area.	There are a few communities in the Eastern Fringe area. Noise and vibration will not cause a significant impact.
Air Pollution	Because the line will go through the built-up area, dust generated during construction will cause a nuisance along the route, especially for residential areas.	The line will go through the built-up area of Dhaka CBD and Savar, dust generated during construction will cause a nuisance along the route, especially for residential areas.	Because the line will go through the BR ROW in the built-up area, dust generated during construction will cause a nuisance along the route, especially for residential areas.	The line will go through the built-up area dust generated during construction will cause a nuisance along the route, especially for residential areas. There might be fewer impacts in the Eastern Fringe area.	There are a few communities in the Eastern Fringe area generated during construction will not cause a significant impact.
Water pollution	Since the route will not pass though the wetland, turbid water will not directly deteriorate water quality of the wetland.	Water quality of wetland will be likely to be deteriorated by suspended solids discharged from construction sites.	Since the route will not pass though the wetland, turbid water will not directly deteriorate water quality of the wetland.	Water quality of wetland in the Eastern Fringe area will be likely to be deteriorated by suspended solids discharged from construction sites.	Water quality of wetland in the Eastern Fringe area will be likely to be deteriorated by suspended solids discharged from construction sites.
Overall Assessment	O: The lowest number of affected households both all elevated case and partial underground case O: Less impact on protected area and biodiversity O: Low risk of flooding X: Impact due to noise and vibration at the elevated section.	X: The largest number of affected households X: Impact on biodiversity in the wetland X:Risk of flooding X:Impact due to noise and vibration	△: A large number of informal settlers occupy the BR ROW. O: Less impact on protected area and biodiversity O: Low risk of flooding X: Impact due to noise and vibration	O: The second lowest number of affected households in the partial underground case. X: Impact on biodiversity in the wetland X:Risk of flooding X:Impact due to noise and vibration	X: The second largest number of affected households X: Impact on biodiversity in the wetland X:Risk of flooding O:Impact due to noise and vibration

Impact Items	MRT Line1	MRT Line 2	MRT Line 4	MRT Line 5	BRT Line 7
	The smallest number of affected households and fewer impacts on natural environment. Recommended as a priority project from the viewpoints of environmental and social considerations.	The largest number of affected households and moderate impacts on natural environment. The BRT should be considered for the short to midterm term plan in CBD.	A large number of informal settlers occupy the BR ROW. If the BR line will be double tracked, then the plan has to be reconsidered. Fewer impacts on natural environment.	The second lowest number of affected households. The extension to the Eastern Fringe will cause a significant impact on natural environment and increase the risk of flooding.	The large number of affected households. A significant impact on natural environment. The risk of flooding is very high. The eastern fringe road should be carefully planned to minimize the environmental impacts.

Source: JICA Study Team
Note: 1) The number of family members in one household is assumed to be five (5) based on the statistics.

13.5 Project Evaluation

(1) Evaluation of MRT/BRT Project

1) Demand Forecast

Initial results of the 2025/2035 patronage demand forecasts for the proposed four MRT and BRT have been prepared and are as noted in Figure13.2 and Table 13.10. Depending on the particular patronage demand forecast on each MRT/BRT corridor, the Study Team has selected the most appropriate technology be it MRT or BRT system.

A brief summary of the passenger demand forecasts would indicate that MRT Line 1, MRT Line 2, MRT Line 4, MRT line 5 and MRRT Line 6 daily passenger boarding would require a MRT system as the most appropriate technology, while BRT Line 7 would be more suited to be developed into a BRT project.

The patronage demand forecast results also indicate that the number of boarding and alighting increases significantly when good connectivity between the four systems through multimodal interchange stations is provided in the transportation model, therefore justifying the need to rationalize the original eight rail projects into four and providing multimodal interchange stations in the MRT and BRT network.

During the feasibility stage, a more detailed study of the selected MRT/BRT project will be required to determine the boarding and alighting at each of the MRT station in the network.

2025 2035

Source: JICA Study Team

Figure 13.2 Estimated MRT/BRT Traffic in 2025 and 2035

Table 13.10 Number of MRT/BRT passengers by Line, 2025 and 2035

	2025		2035	
	Daily Ridership (Pax/day)	PPHPD	Daily Ridership (Pax/day)	PPHPD
MRT Line 1	1,365,800	34,740	1,887,200	37,770
MRT Line 2	-	-	1,084,600	23,020
BRT Line 3	1,832,700	23,730	1,814,100	25,960
MRT Line 4	-	-	332,000	17,930
MRT Line 5	-	-	1,478,600	28,340
MRT Line 6	483,200	16,440	1,816,700	45,860
BRT Line 7	-	-	541,800	22,330
Total	3,681,700	-	8,955,000	-

Source: JICA Study Team

2) Evaluation

When the public sector invests in transport facilities, the primary purpose is “the public service”, or the social benefit. The proposed projects were evaluated for their economic IRRs to assign priority accordingly. The social benefit of a given project can be paraphrased as its impact in serving the two purposes of reducing the operational cost of all the available transport means and reducing the travel time of all passengers on the available transport means (both users and non-users).

In addition, the projects are evaluated on the following aspects of implementation.

A. Economic Achievability

B. Traffic Demand (Contribution to the improvement of transport capacity), Operational aspects

C. Consistency with Land Use

D. Financial Achievability

E. Environmental and Social Impacts

As a first step, the scores are aggregated per project and are used to prioritize. Each project is evaluated by the threshold defined in the following Table 13.11.

Table 13.11 Ranking Threshold by Evaluation Criteria

	Weight	Indicator	5	3	1
A. Demand in 2035	0.15	PPHPD	X>30,000	30,000>X >20,000	X<20,000
B. Economic Return	0.40	EIRR	X>20%	20%>X>13%	X<13%
C. Financial Return	0.15	FIRR	X>4%	4%>X>3%	X<3%
D. Consistency with Urban Development Scenario	0.15	-	Contribute	Supportive	No Relation
E. Environment	0.15	SEC result	No impact	Some impact	Serious Impact

Source: JICA Study Team

As the second step, the rankings by five criteria were combined into a single rank, taking such process as (1) to give five points to rank “A”, three points to rank “B” and one point to rank “C”, (2) to add up each point after multiplication with “weight”, and (3) Classify into the first priority project. Results of the evaluation are given in Table 13.12 for MRT/BRT project proposed in RSTP.

Table 13.12 MCA Evaluation Results of MRT/BRT projects

		MRT Line 1	MRT Line 2	MRT Line 4	MRT Line 5	BRT Line 7
A. Demand in 2035	0.15	5	3	1	3	3
B. Economic Return	0.40	5	3	1	3	5
C. Financial Return	0.15	5	3	3	5	5
D. Consistency with Urban Development Scenario	0.15	5	4	5	5	5
E. Environment	0.15	4	1	4	2	2
		4.9	2.9	2.4	3.5	4.3

Source: JICA Study Team

MRT Line 1 is the highest score and will be interpreted as the first priority project. And BRT Line 7 is the second highest score, but FIRR of this BRT Line is very high and will be implemented by PPP.

(2) Project Evaluation of Traffic Management Project

In STP, it was estimated that up to 50% of the capacity of the expressway system is wasted due to poor operating conditions. Based on this analysis, the effect of the traffic management measures are evaluated in the current traffic situation. As a result, average V/C, average speed, and total TTC become better than current situation.

Current Situation (2014)

Current Situation with Traffic Management (2014)

Source: JICA Study Team

Figure 13.3 Traffic Assignment of current situation and traffic management situation

Table 13.13 Effects of Traffic Management Measures

Indicators	Current Situation	Traffic Managed Situation
Ave. V/C	1.2	0.9
Ave. Travel Speed	6.4 km/h	8.2km/h
Total VOC	174 million TK/day	177 million TK/day
Total TCC	2,324 million TK/day	1.789 million TK/day
Total Cost	2,498 million TK/day	1,966 million TK/day

Source: JICA Study Team

Total benefit cost of traffic management situation will be 532 million TK/ day. And the RSTP project cost of the short-term traffic management and safety is estimated around 47 billion TK. If the short-term traffic management project is implemented in one year, the total benefit cost will be 194 million TK and the project benefit cost will be higher than project cost.

14. IMPLEMENTATION PROGRAM

14.1 Overall Implementation Strategy

The major components of the RSTP include the public transportation system, consisting of four 5 MRT lines and 2 BRT lines, and road projects consisting of 3 ring roads. Due to limited resources, these major projects cannot be developed at the same time, thereby necessitating a clear strategy of prioritization and ordering of projects so that the RSTP will be implementable and at the same time be able to efficiently and effectively meet the transportation demands of Dhaka resulting from the planned urban development scenario and even guide the development itself.

(1) Prioritization for Proposed Projects in RSTP

Because there are many components of the proposed projects and the scheduling of their developments compared with other projects is very important, the prioritization of the proposed projects were examined carefully. Initial prioritization among the RSTP proposed projects was carried out based on the economic analysis as mentioned in preceding sections. However, the final prioritization should be decided not only by a principal economic evaluation but by several indices such as continuity of network, coordination with the land-use plan, and so on. Especially, RSTP is a comprehensive Master Plan, and the integrated planning between urban and transportation is essential. The initial results by economic evaluation were reprioritized to ensure actual situation for implementation. Projects were reprioritized with reference to other essential factors of road implementation, as follows:

1) Coordination with Urban Growth

The forecasted wave of urbanization by the JICA Study Team is shown in Figure 14.1. The road network and MRT/BRT network should be developed in accordance with the expected/planned urban development.

Eastern Fringe Area Development

Development of the eastern fringe area including Purbachal is the first priority policy for reducing population densities in Old Dhaka, CO2 emissions, traffic congestions, travel cost and travel time, and for promoting more comfortable living environment as mentioned in preceding sections.

So in RSTP, road network developments and MRT Line 1 Project are listed as the first priority project.

Improvement of Traffic Environment in Built-up Area

Obviously, heavy traffic congestion occurs in built-up area, but it's very difficult to construct new roads and widen the existing roads for reducing traffic congestions. So in RSTP, traffic management measures for using existing infrastructures and low investment cost are proposed as the first priority project.

2) Required Antecedent Projects

Even though the project components are devised into small packages, some projects have strong relationships with others in terms of connectivity and continuity as a network. For example, an approach road should be developed together with MRT Line 1 project.

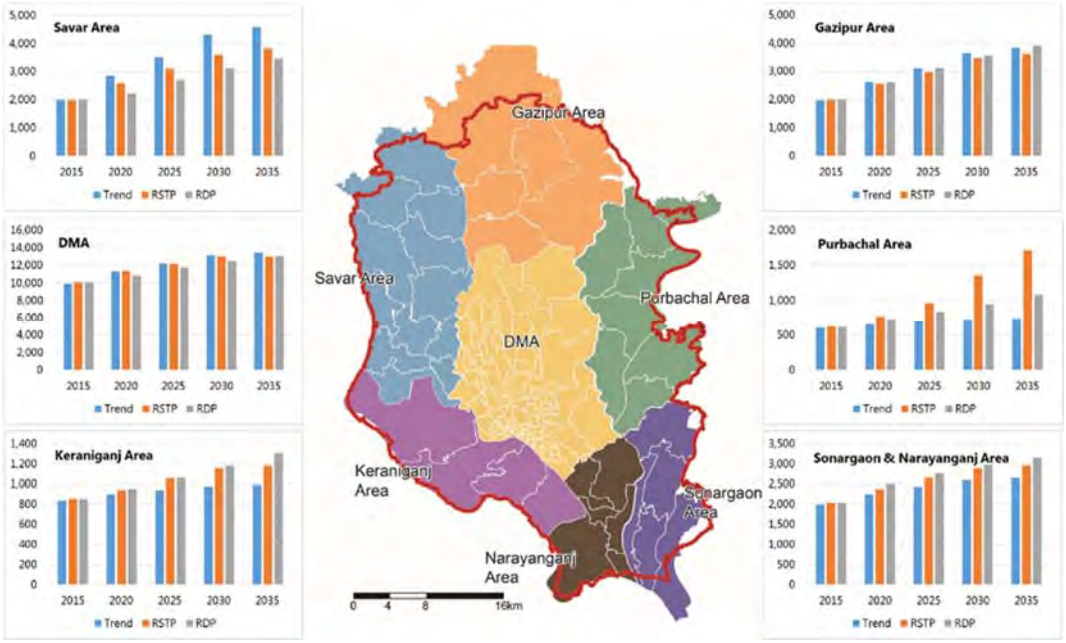
MRT Line 6

Uttara North area will be developed precipitously due to starting service of MRT Line 6. So road development in Uttara North area will be required at an early stage. And also bus network needs to be improved following the operation of MRT Line 6.

Padma Bridge

The main construction work of the Padma Bridge including piling and river training will begin in December 2015 and open by 2018.

When the Padma Bridge opens, the traffic from southwest area will increase and create massive traffic congestions at Jatrabari junction owing to its flow. So in RSTP, the southern part of outer ring road is proposed to relive the traffic bottleneck at Jatrabari junction.



Source: JICA Study Team

Figure 14.1 Forecasted Wave of Urbanization in RAJUK Area

(2) Concepts and Projects of Short-, Mid- and Long-term

1) Short-term Project (~2020)

The concepts of the short-term project in the first 5 years are (i) Control of through traffic, (ii) Control of urban development, (iii) Decentralization of population and (iv) Improvement of current infrastructures. And major projects are as follows;

- MRT Line 6 and BRT Line 3 to be opened
- Implementation of Traffic Management and Traffic safety
- Arterial road development at Mirpur and Eastern Fringe Area to support urban development
- South part of ring road to be opened before completion of Padma bridge
- Restructuring of bus network, BRF (bus route francization) & replacement of bus terminals

2) Mid- and Long-term Project (~2035)

The concepts of the mid- and long-term project are (i) Leading an appropriate urban development, (ii) Formation of urban development and transport framework and (iii) Traffic demand control. And major projects are as follows;

Medium Term (~2025)

- New MRT lines development in CBD
- Implementation of TDM measures
- Arterial road and ring road development outside DMA…

Long Term (~2035)

- East-West MRT line development
- Development of new MRT lines for connection between CBD and regional centers
- Redevelopment of inter-urban roads…

.

14.2 Implementation Schedule and Responsible Agency

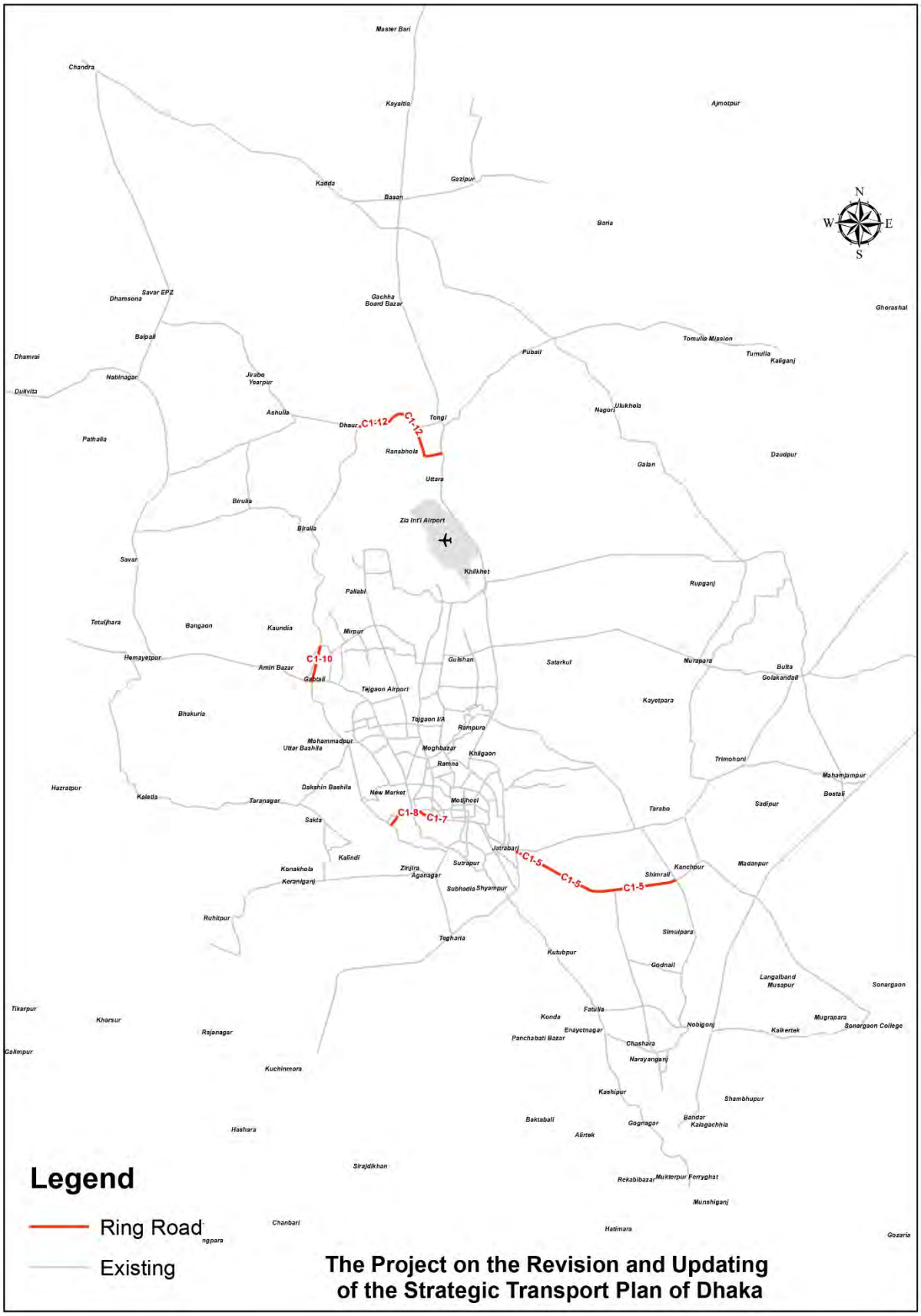
The major component of the RSTP includes the public transport system consisting of 7 MRT/BRT lines, public bus services, inland waterways and road development projects including expressways. Due to limited resources, these major projects cannot be developed at the same time; thereby a clear strategy of prioritization and ordering of projects is necessary so that the RSTP will be achievable and be able to efficiently and effectively meet the transport demands of Dhaka. This will result to the planned development scenario and even guide the development itself

The proposed major master plan projects are categorized into four (4) implementation stages on the basis of the overall project evaluation as described in Chapter 12. The implementation schedule and those responsible agencies are summarized as follows:

(1) Road Development Projects

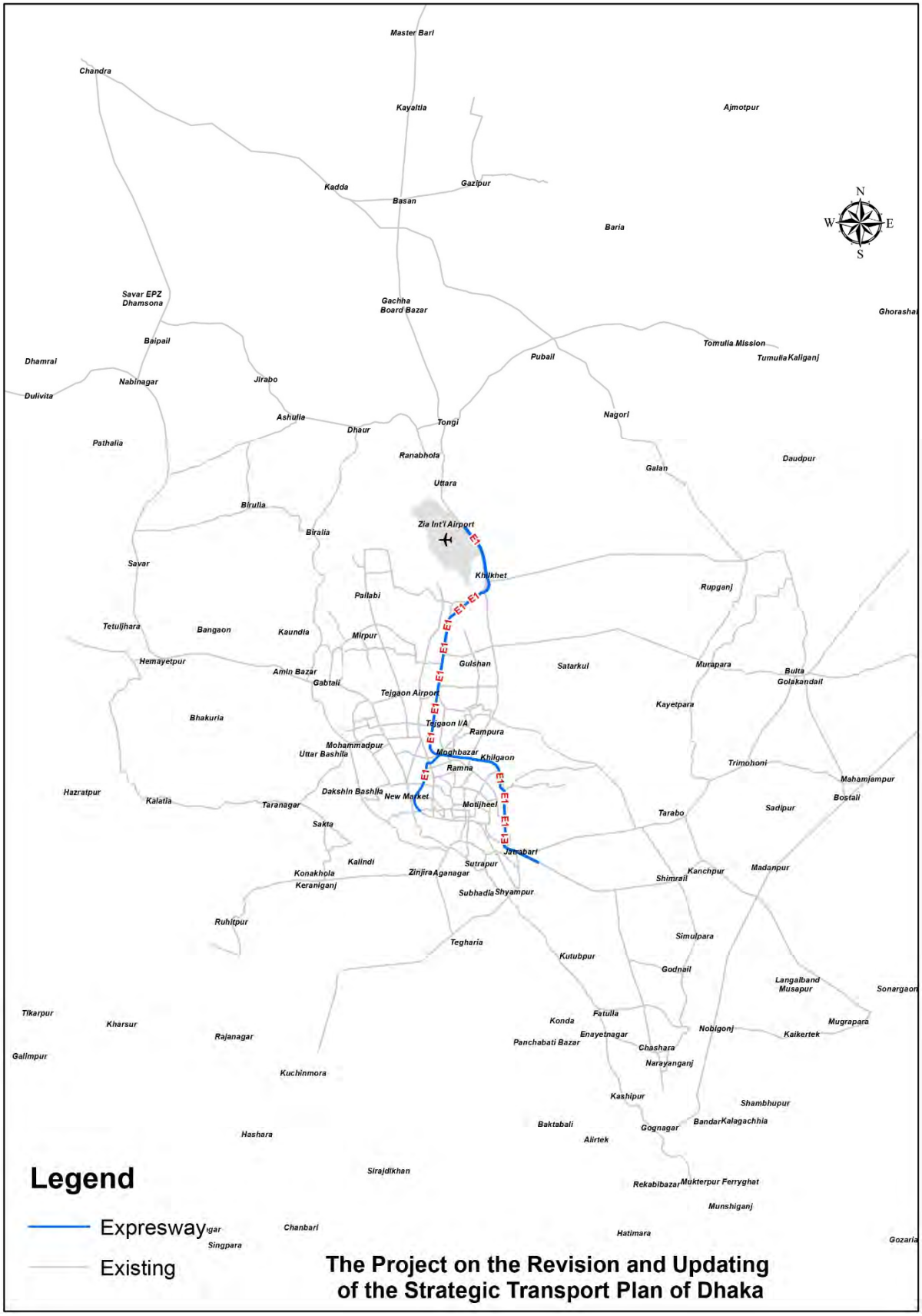
Since there are many parts of the road projects, the scheduling of their developments compared with other projects is very important. The prioritization of the road projects was examined carefully based on the method mentioned in Chapter 12. The proposed road projects are prioritized on the basis of assessment from the following aspects:

- Current status of the project
- Urgency (Degree and scale of problems)
- Building a missing link
- Composing rings and radials road system
- Providing main traffic axis in development area
- Contributing to proper formation in urban area
- Compatibility with relevant development plans
- Traffic demand
- Project cost



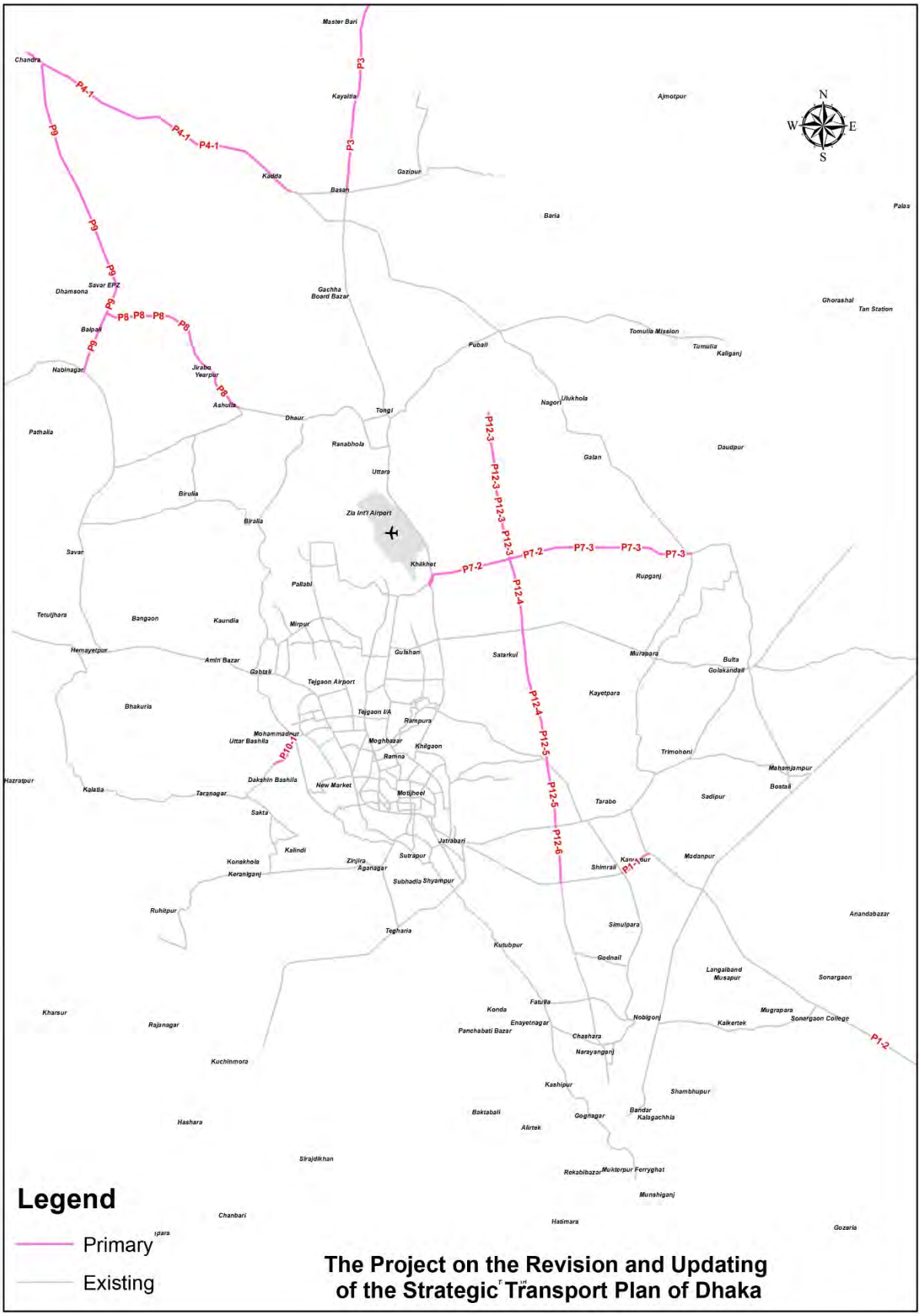
Source: JICA Study Team

Figure 14.2 Investment Schedule for Urban Roads (Phase1, Ring Road)



Source: JICA Study Team

Figure 14.3 Investment Schedule for Urban Roads (Phase1, Expressway)



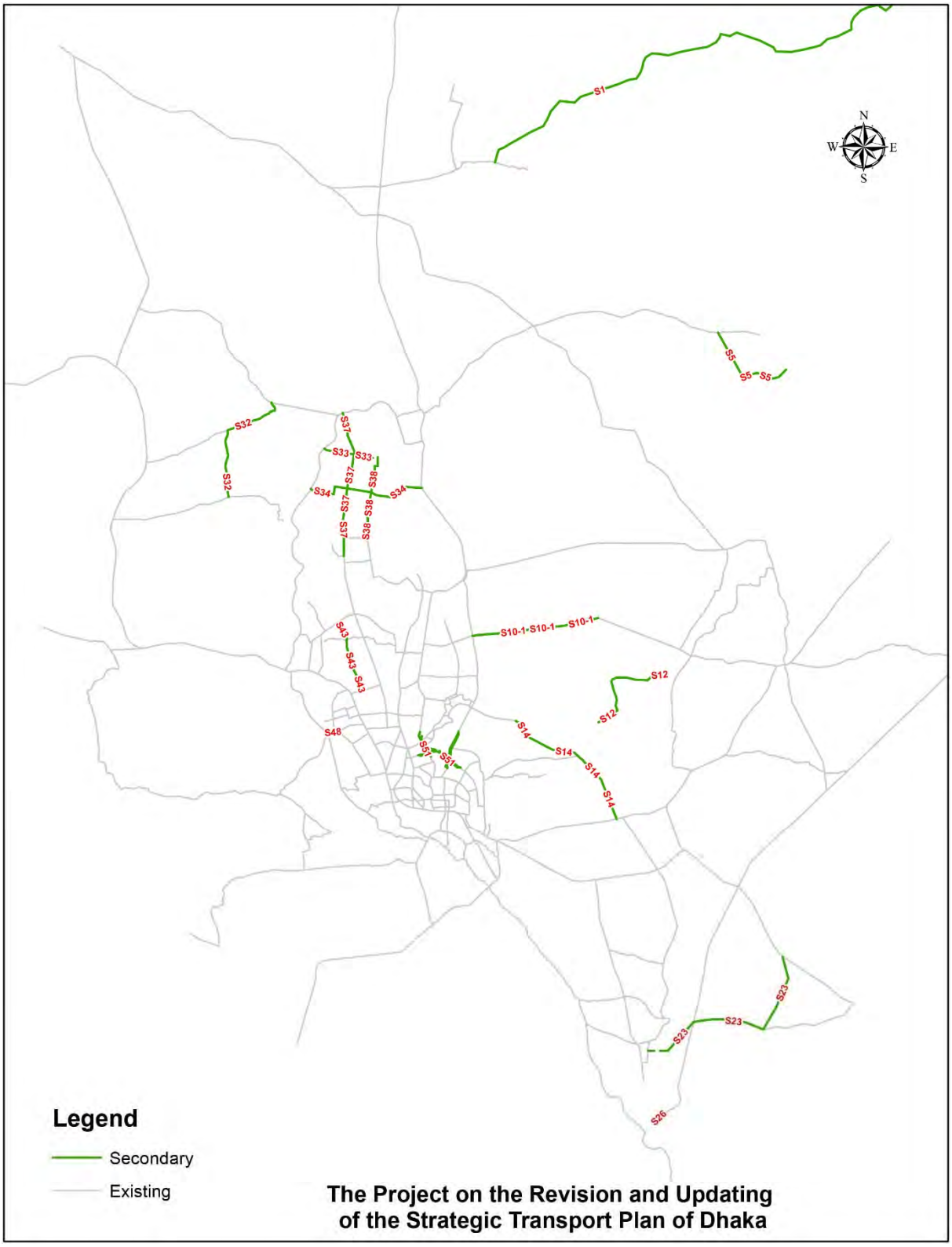
Source: JICA Study Team

Figure 14.4 Investment Schedule for Urban Roads (Phase1, Primary Road)

Table 14.1 Project List (Phase 1: Ring Road, Expressway and Primary Road)

Sl. No.	Description	Road Category	Type of Project	No. of Lane (Proposed)	Length (km)	Project Cost (Tk. Crore)
C1 05	Inner Ring Road / N1 (R110 to Toll Gate) / Jatrabari - Khanchpur bridge (widening of polder road to 8 lane)	Primary Road	Widening	8	8.5	396
C1 06	Inner Ring Road / Jatrabari-Gulistan FO (Toll Gate to Chankhar Pul Bus Stop)	Primary Road	Completed	4	4.0	-
C1 07	Inner Ring Road / Zahir Raihan Rd. (Chankhar Pul Bus Stop to Eden Girls College)	Primary Road	Widening	4	1.2	170
C1 08	Inner Ring Road (Rasulpur Bridge (Embankment) - Peelkhana road - Azimpur Old Grave yard Eden Girls College)	Primary Road	New Road	4	1.5	252
C1 10	Inner Ring Road / Circular Road over embankment (N5 to N501/Diabari Bot Tola :Flyover)	Primary Road	New Road	4	1.8	302
C1 12	Inner Ring Road / N302:Circular Road over embankment (N302 to N3)	Primary Road	Widening	4	5.4	534
E1	Dhaka Elevated Expressway	Expressway	New Road	4	19.7	8,940
P01 01	N1 / 2nd Kanchpur Bridge and rehabilitation of existing Bridge	Primary Road	Widening (Bridge)	8	0.4	-
P01 02	N1 / 2nd Meghna Bridge and rehabilitation of existing Bridge	Primary Road	Widening (Bridge)	6	0.9	-
P01 03	N1 / 2nd Gomoti Bridge and rehabilitation of existing Bridge	Primary Road	Widening (Bridge)	6	1.4	-
P02	N2 / 4-Lane Flyover at Bhulta – Sylhet National Highway	Primary Road	Grade Separation	4	-	-
P03	N3 / Improvement of Joydevpur – Mymensingh Highway	Primary Road	Widening	4	87.2	1,951
P04 01	N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC	Primary Road	Widening	4	13.7	657
P04 02	N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC	Primary Road	Widening	4	56.3	2,698
P07 01	Kuril Flyover	Primary Road	Grade Separation	4	3.1	303
P07 02	N301 / From Airport Road near Khilkhet to First Balu Bridge (Isapura) via Baruna (Nikunja - Yousufganj)	Primary Road	New Road	4	6.5	75
P07 03	N301 / From first Balu Bridge near Tek Noadda to Sitalakhya River near Kanchan	Primary Road	New Road	4	6.0	69
P08	N302 / Ashulia to Aricha Road (C & B More)	Primary Road	Improvement	2	8.8	13
P09	R505 / Nabinagar - EPZ - Chandra road improvement	Primary Road	Widening	4	16.0	131
P10 01	Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (East side)	Primary Road	Widening	4	1.6	121
P12 03	Joydebpur - Narayanganj Highway (Inner Ring Road to N301)	Primary Road	New Road	6	7.1	634
P12 04	Joydebpur - Narayanganj Highway (N301 to Khilgaon)	Primary Road	New Road	6	8.0	715
P12 05	Joydebpur - Narayanganj Highway (Khilgaon to R110)	Primary Road	New Road	6	4.9	437
P12 06	Joydebpur - Narayanganj Highway (R110 to N1)	Primary Road	New Road	6	2.7	242

Source: JICA Study Team



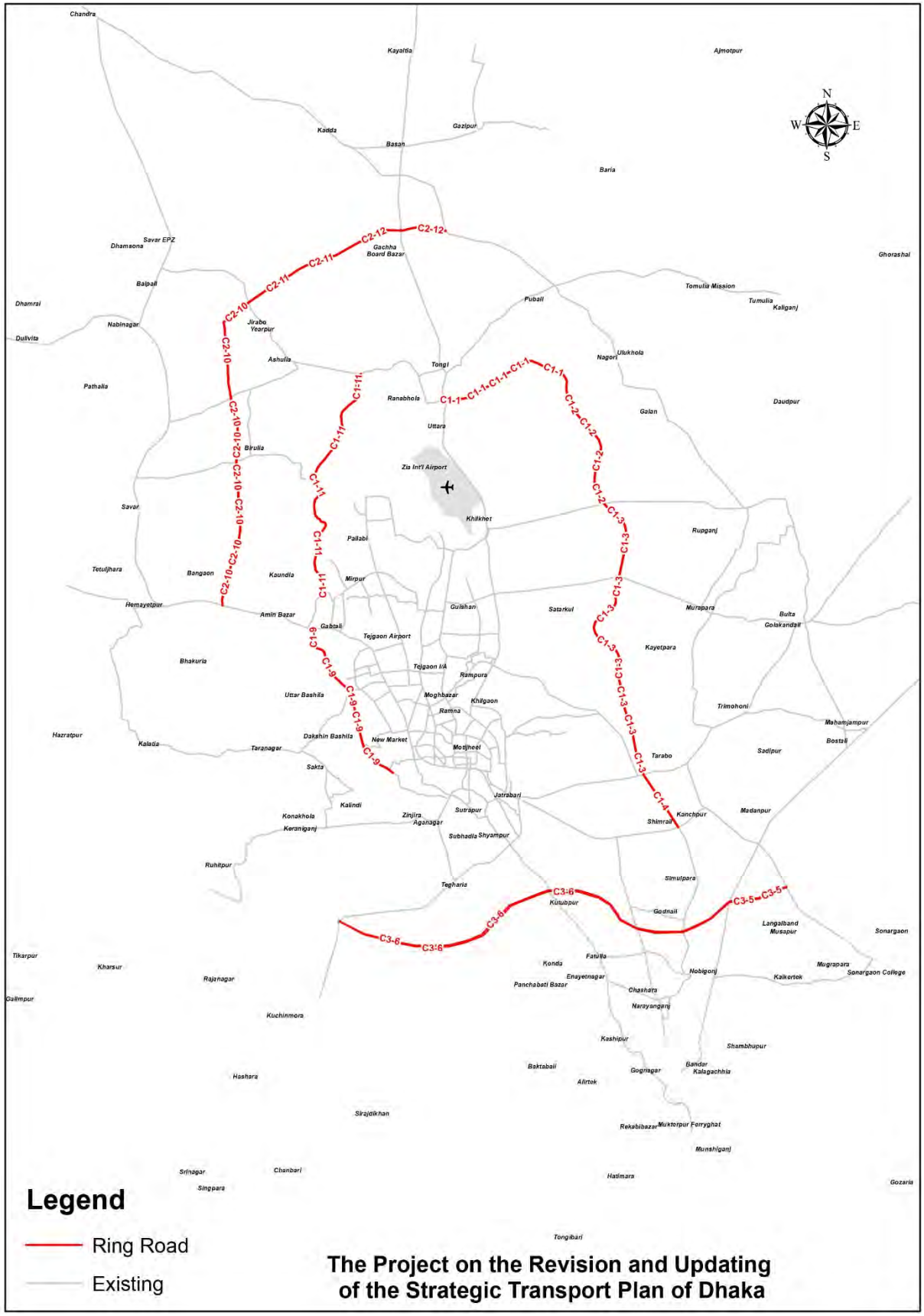
Source: JICA Study Team

Figure 14.5 Investment Schedule for Urban Roads (Phase1, Primary Road)

Table 14.2 Project List (Phase 1: Secondary Road)

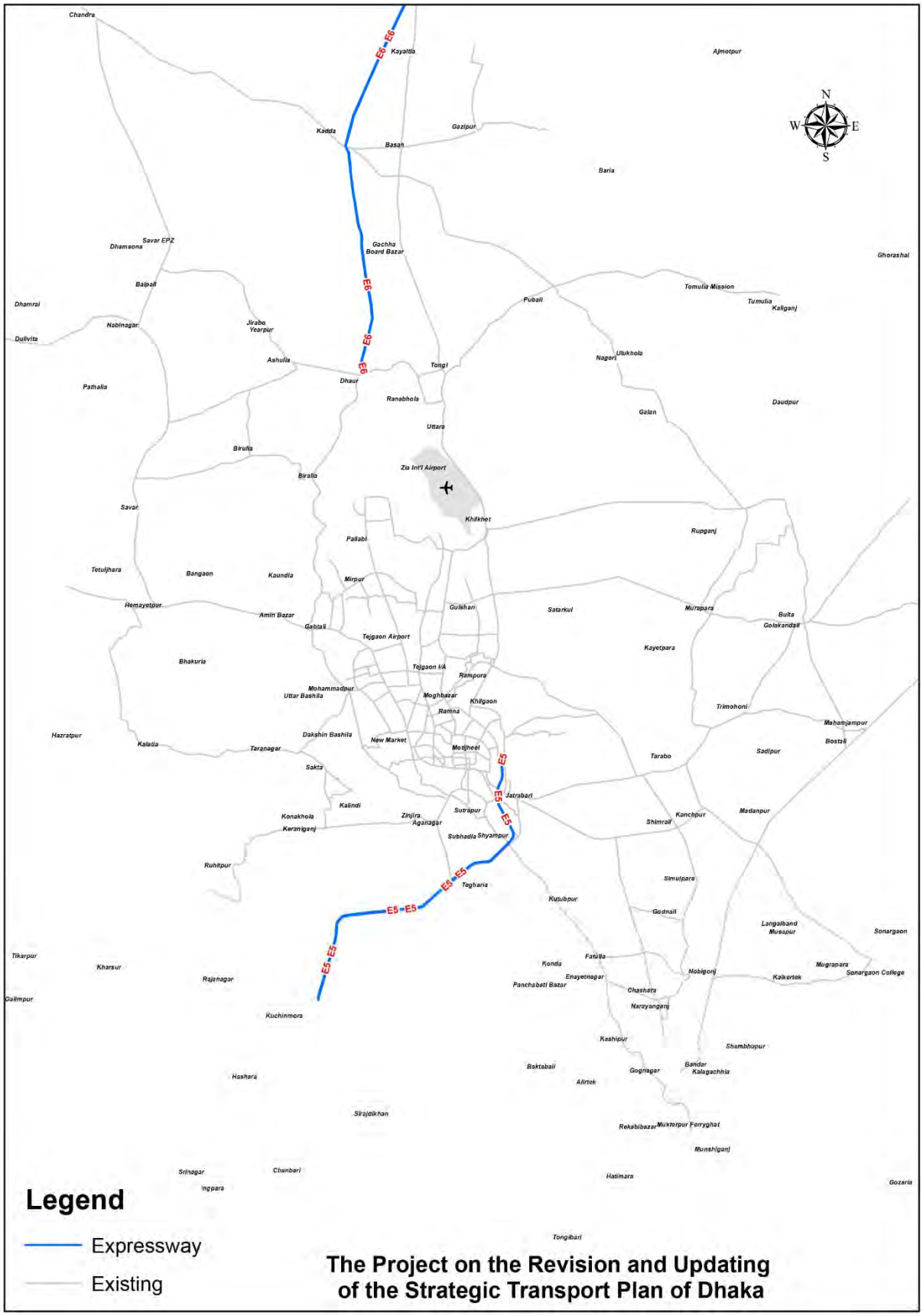
Sl. No.	Description	Road Category	Type of Project	No. of Lane (Proposed)	Length (km)	Project Cost (Tk. Crore)
S01	Gazipur – Azmatpur – Itakhola Road (revised)	Secondary Road	Widening	2	41.0	300
S05 00	New EPZ Link Road (R301 to New EPZ)	Secondary Road	New Road	4	4.7	86
S10 01	Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj) (DIT Rd. to Baru river)	Secondary Road	New Road	4	6.0	886
S12	Majhina – Koetpara – Trimohini connecting Road	Secondary Road	Widening	2	5.3	53
S14	Hati Jheel (Rampura) - Shekher Jayga - Amulia - Demra - Chittagong Road	Secondary Road	New Road	4	10.0	141
S15 02	Construction of bridge over Balu river at Keodata	Secondary Road	New Bridge	4	0.04	13
S23 01	Improvement of Langolbandh – Kaikertek – Nabiganj Road	Secondary Road	Widening	2	9.6	53
S26 00	3rd Shitalakkhya Bridge at Narayanganj Bandar Upazila	Secondary Road	New Bridge	2	1.3	458
S32 02	Berulia (Dhour) - Ashulia - EPZ road	Secondary Road	Improvement	2	6.1	34
S33 00	Uttara Sector-10 to West Embankment road to the West	Secondary Road	New Road	4	3.0	382
S34 00	Uttara Sector-3 to West Embankment road to the West	Secondary Road	New Road	4	5.8	738
S37 00	Pallabi (Mirpur) to Uttara 3rd Phase	Secondary Road	New Road	4	6.5	827
S38 00	Pallabi (Mirpur) to Uttara Sector 11	Secondary Road	New Road	4	4.0	509
S43 02	Argagaon Road (Bangladesh Betar) to Mirpur Section 2 through Senpara Parbata	Secondary Road	Widening	4	3.6	212
S48 01	Mohammadpur Bus Stand Embankment Berry Bandh) - upgradation	Secondary Road	Widening	4	0.7	51
S51 00	Mogbazar and Mouchak Flyover	Secondary Road	Grade Separation	4	5.8	-

Source: JICA Study Team



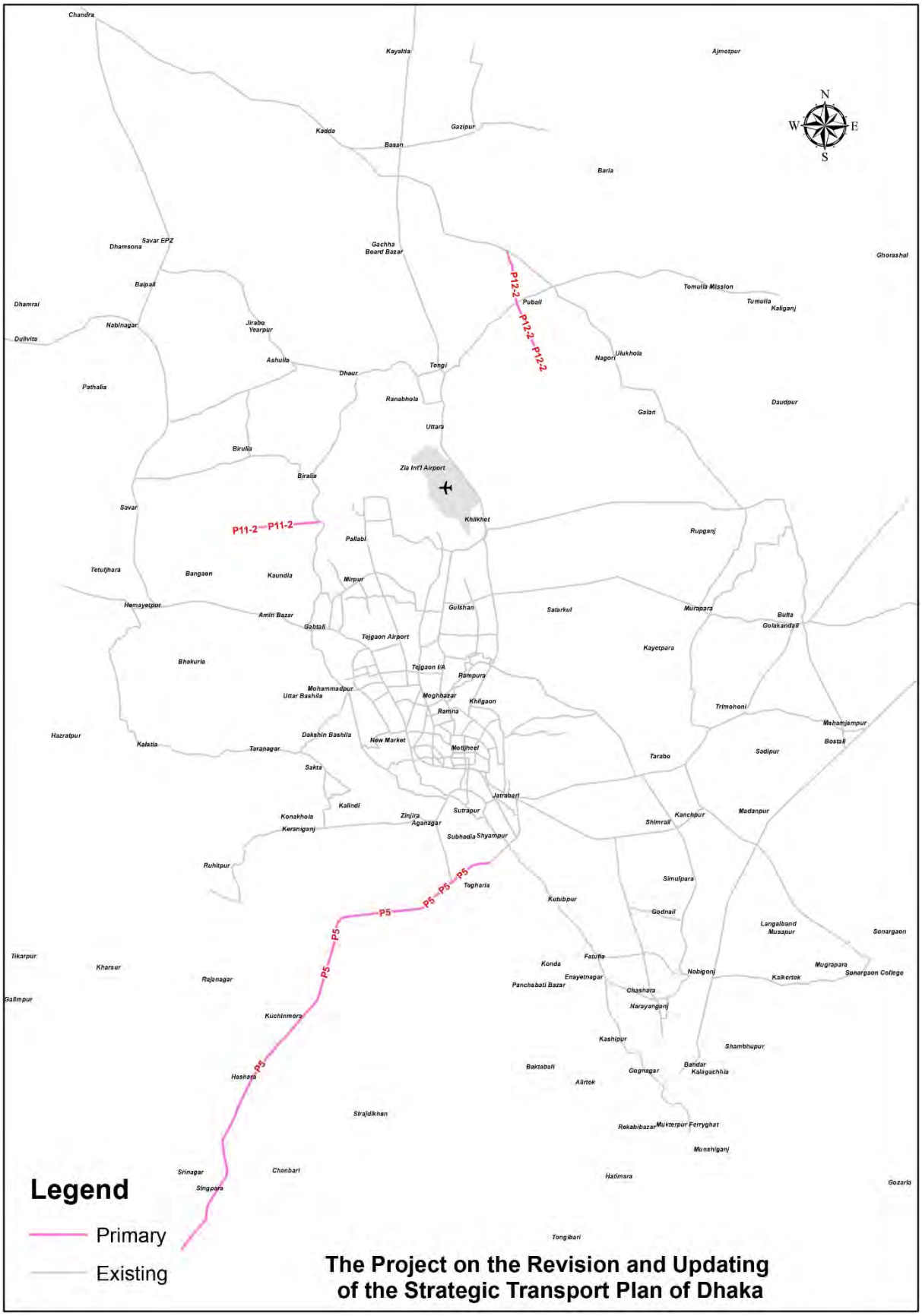
Source: JICA Study Team

Figure 14.6 Investment Schedule for Urban Roads (Phase2, Ring Road)



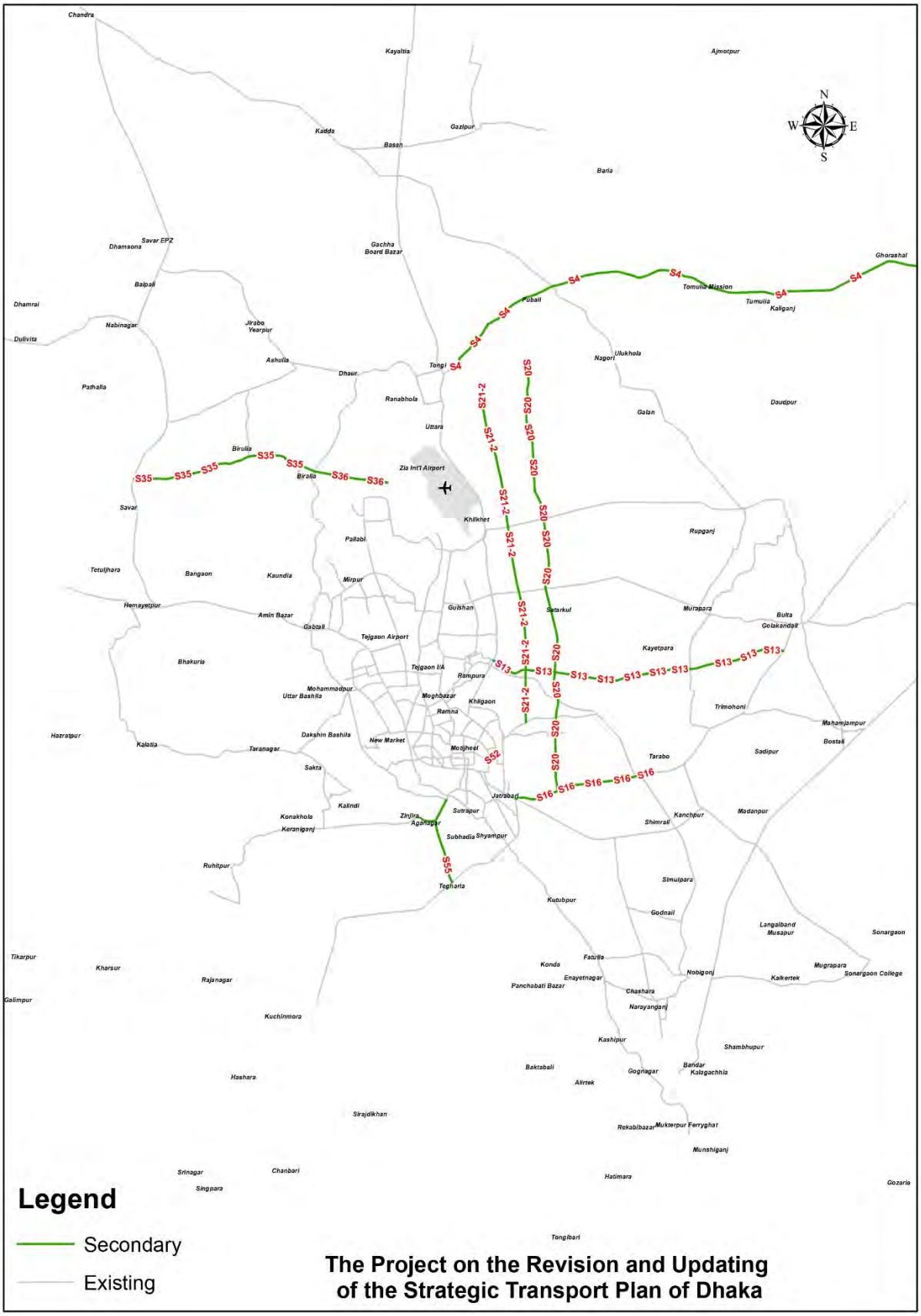
Source: JICA Study Team

Figure 14.7 Investment Schedule for Urban Roads (Phase2, Expressway)



Source: JICA Study Team

Figure 14.8 Investment Schedule for Urban Roads (Phase2, Primary Road)



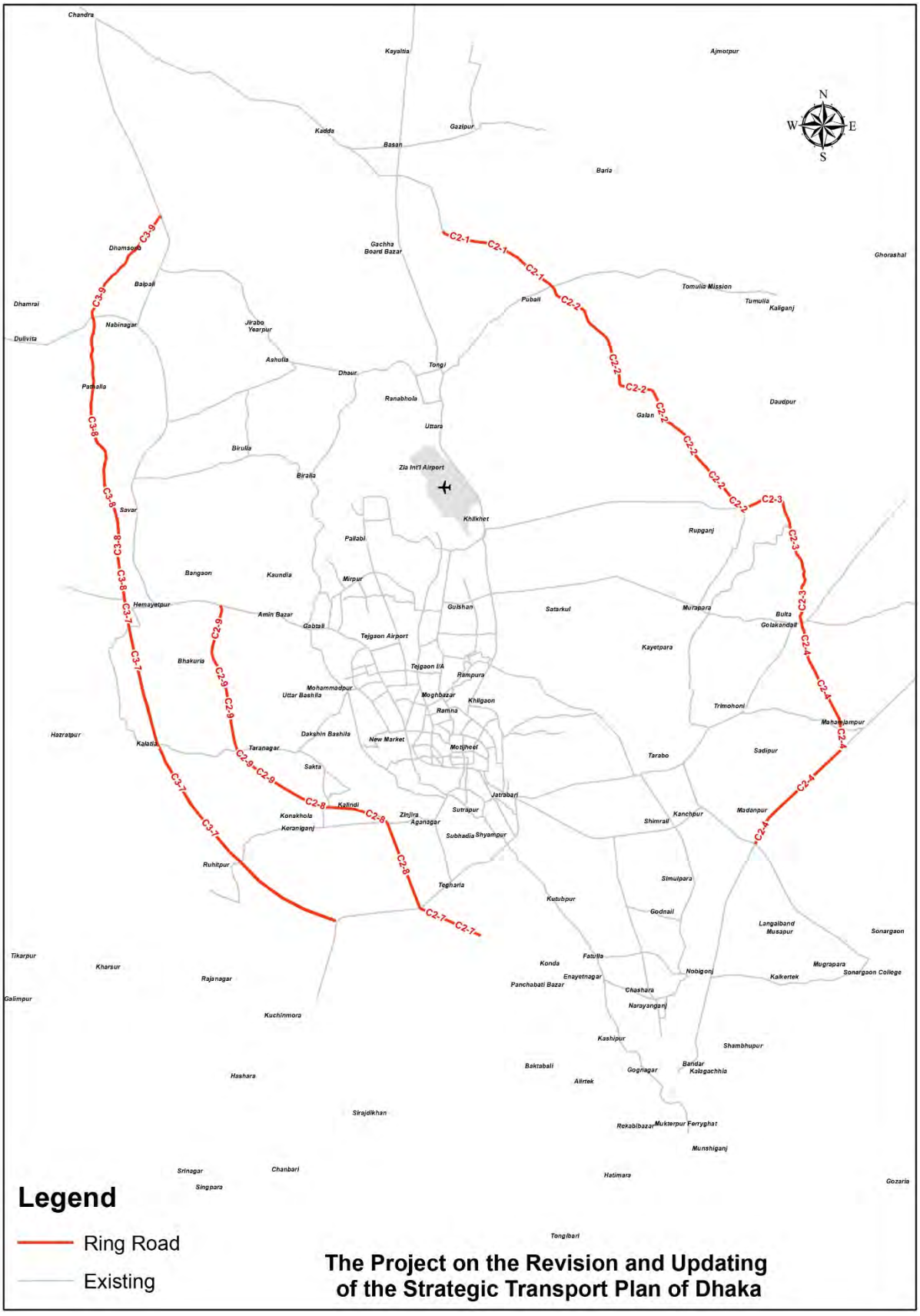
Source: JICA Study Team

Figure 14.9 Investment Schedule for Urban Roads (Phase2, Secondary Road)

Table 14.3 Project List (Phase 2)

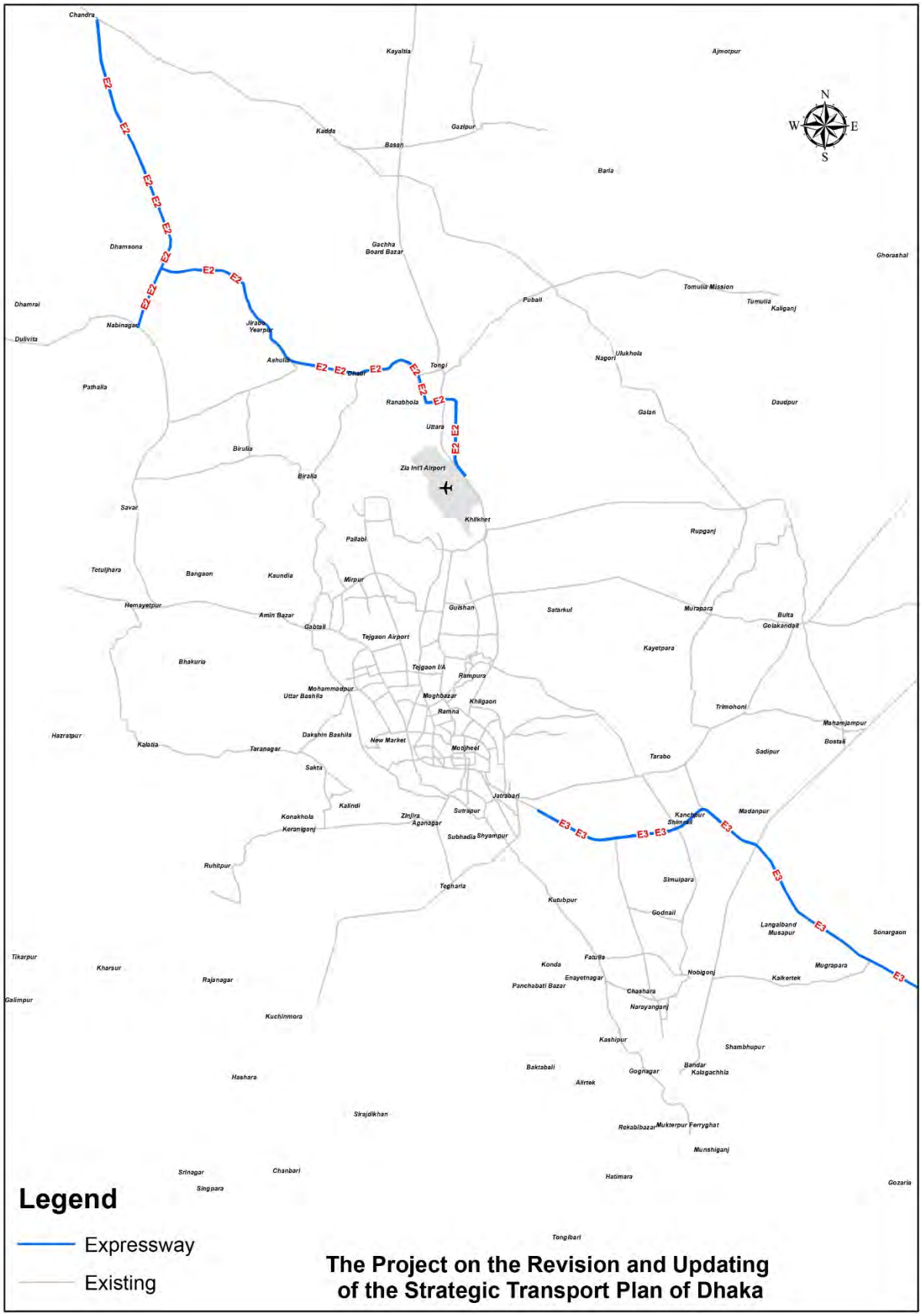
Sl. No.		Description	Road Category	Type of Project	No. of Lane (Proposed)	Length (km)	Project Cost (Tk. Crore)
C1	01	Inner Ring Road / Dhaka Eastern BP (N3 to Termukh Rayerdia Link Rd.)	Primary Road	New Road	4	7.4	21
C1	02	Inner Ring Road / Dhaka Eastern BP (Termukh Rayerdia Link Rd. to N301)	Primary Road	New Road	4	5.8	16
C1	03	Inner Ring Road / Dhaka Eastern BP (N301 to R201)	Primary Road	New Road	4	14.5	40
C1	04	Inner Ring Road / R110 (R201 to N1)	Primary Road	Widening	4	3.0	83
C1	09	Inner Ring Road / Circular Road over embankment (Rasulpur Brg. to N5)	Primary Road	Widening	4	8.2	811
C1	11	Inner Ring Road / N501:Circular Road over embankment Diabari Bot Tola to N302)	Primary Road	Widening	4	11.9	1,177
C2	10	Middle Ring Road (N5 to N302)	Primary Road	New Road	4	15.1	329
C2	11	Middle Ring Road (N302 to Dhaka-Mymensingh Exp.)	Primary Road	New Road	4	6.2	135
C2	12	Middle Ring Road (Dhaka-Mymensingh Exp. to Near Dhirashrom Rd.)	Primary Road	New Road	4	4.1	89
C3	05	Outer Ring Road (N1 to R111)	Expressway	New Road	6	7.7	1,988
C3	06	Outer Ring Road (R111 to N8)	Expressway	New Road	6	15.8	2,399
E5		Dhaka - Mawa Expressway	Expressway	New Road	4	17.7	5,169
E6		Dhaka - Mymensingh Expressway	Expressway	New Road	4	19.4	983
P05		N8 / Improvement into 4-lanes from 1st Buriganga Bridge to Padma Bridge Mawa link	Primary Road	Widening	4	25.8	359
P11	02	Mirpur to Outer Ring Road (West embankment to Middle Ring Road)	Primary Road	New Road	4	3.9	85
P12	02	Joydebpur - Narayanganj Highway (N105/Dhaka BP to Inner Ring Road)	Primary Road	New Road	6	5.8	171
S13		Badda - Golakandial Road (Merul Badda - Babur Jaiga - Balirpar- Parain - Golakandial)	Secondary Road	New Road	4	14.2	536
S16	02	Jatrabari crossing to Demra Ghat (Tarabo bridge) road	Secondary Road	Widening	6	7.5	331
S20	00	Uttara ABM city - Matuali Road	Secondary Road	New Road	4	20.7	781
S21	02	Dhirasram - Basabo Road (Inner Ring Road to Basabo Madertek Road)	Secondary Road	New Road	4	16.0	604
S35	01	West Embankment(Birulia Bridge) to Savar	Secondary Road	Widening	4	9.0	149
S36	00	Pallabi to west Embankment via North Rupnagar	Secondary Road	New Road	4	3.5	445
S4	02	4-lanes road from S.A.M. (Shahid Ahsanullah Master) Flyover to Kaliganj Bypass along the railway line	Secondary Road	Widening	4	25.0	252
S52	01	Motijheel Shapla Chattar to Kamlapur Railway Station (Widening)	Secondary Road	Widening	2	0.5	22
S55	02	Improvement of Z.K.D (Zinzira-Keraniganj-Dohar) Link Road into 4-lanes from 2nd Buriganga Bridge approach to Mawa link	Secondary Road	Widening	4	4.9	50

Source: JICA Study Team



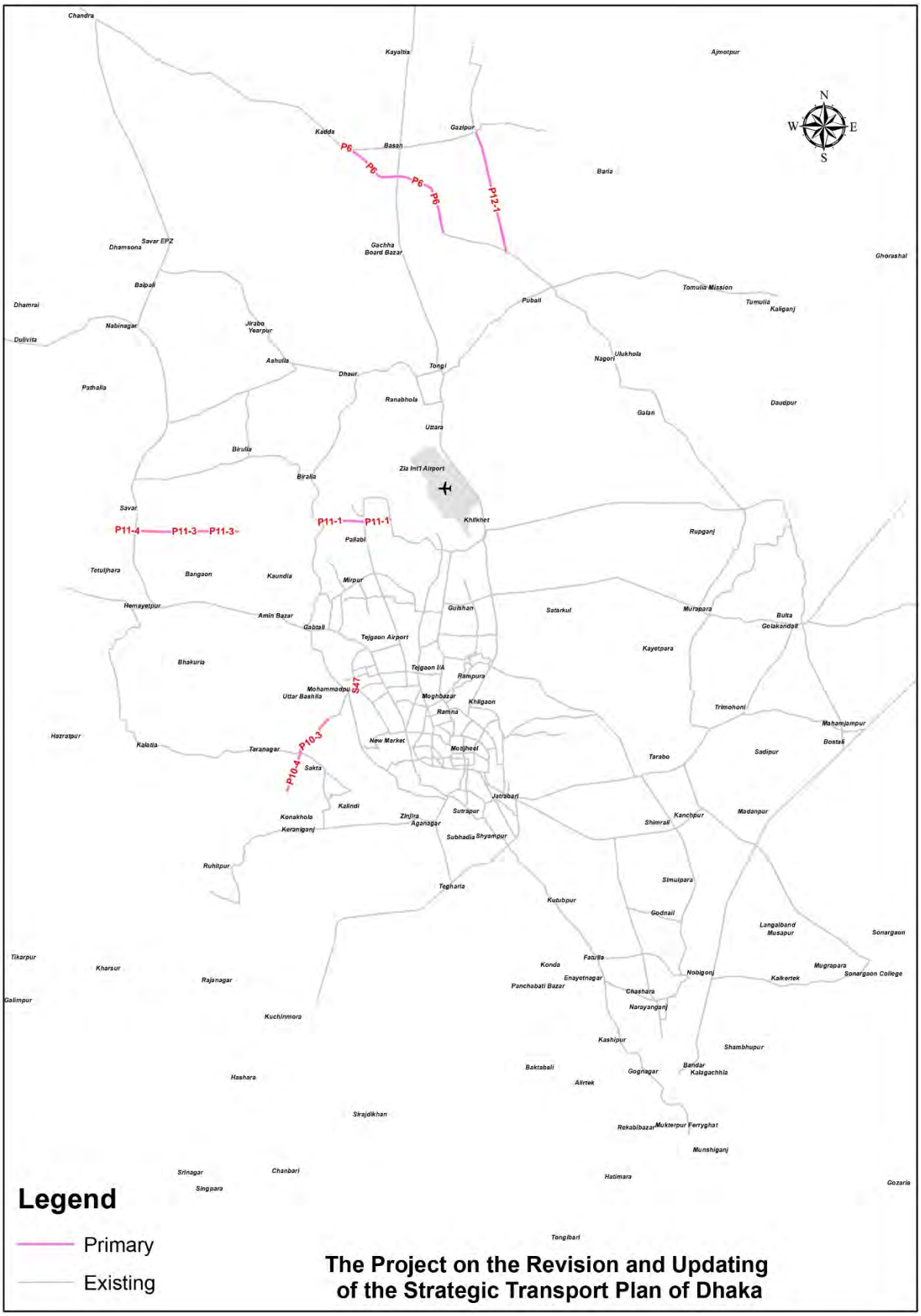
Source: JICA Study Team

Figure 14.10 Investment Schedule for Urban Roads (Phase3, Ring Road)



Source: JICA Study Team

Figure 14.11 Investment Schedule for Urban Roads (Phase3, Expressway)



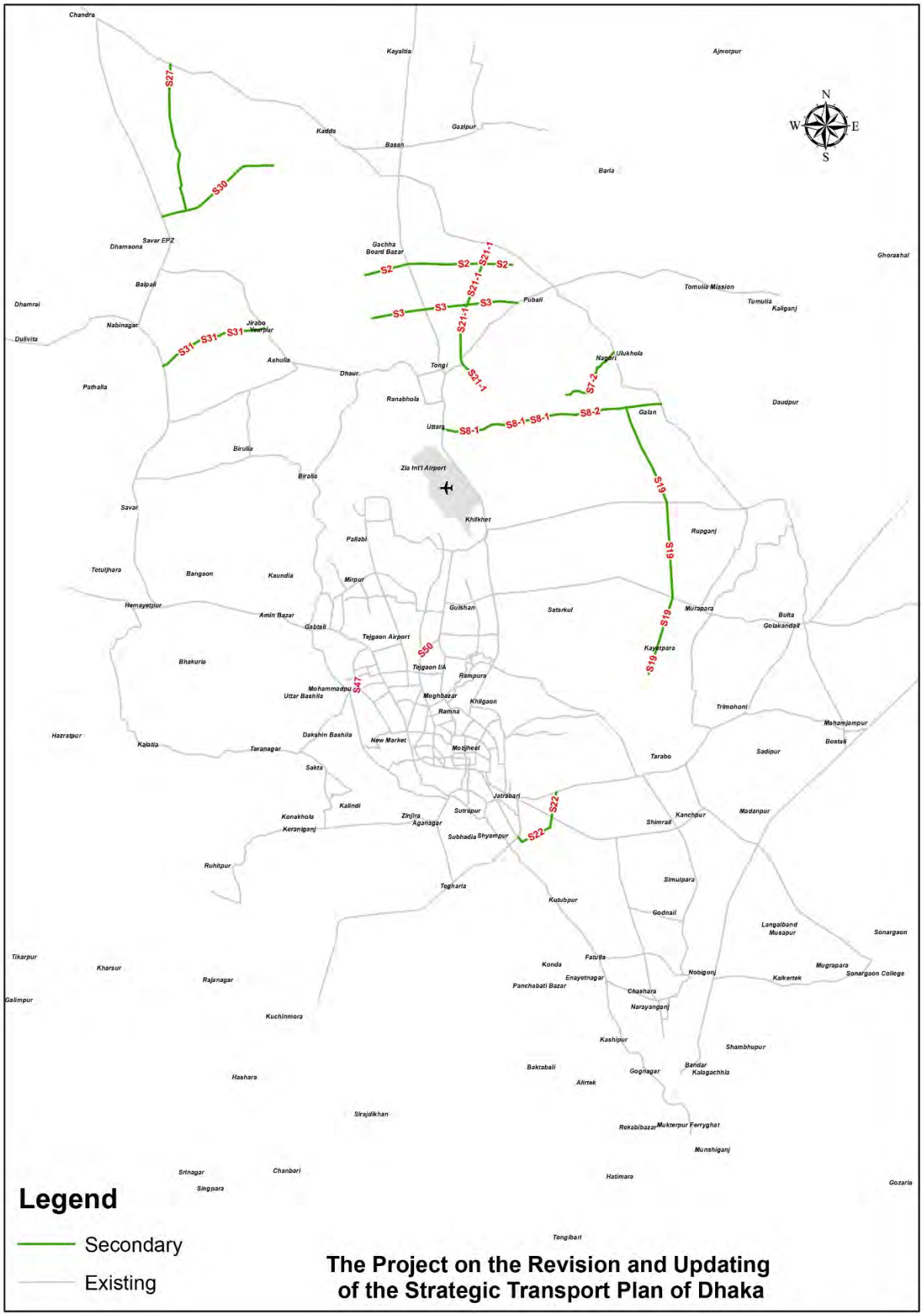
Source: JICA Study Team

Figure 14.12 Investment Schedule for Urban Roads (Phase3, Primary Road)

Table 14.4 Project List (Phase 3: Ring Road, Expressway and Primary Road))

Sl. No.		Description	Road Category	Type of Project	No. of Lane (Proposed)	Length (km)	Project Cost (Tk. Crore)
C2	01	Middle Ring Road (Near Dhirashrom Rd. to R301) / N105:Dhaka BP	Primary Road	Widening	4	5.9	186
C2	02	Middle Ring Road / N105:Dhaka BP (R301 to N301)	Primary Road	Widening	4	14.9	469
C2	03	Middle Ring Road / N105:Dhaka BP (N301 to N2)	Primary Road	Widening	4	8.1	253
C2	04	Middle Ring Road / N105:Dhaka BP (N2 to N1)	Primary Road	Widening	4	12.6	397
C2	07	Middle Ring Road (Zazira IC to N8)	Primary Road	New Road	4	3.1	67
C2	08	Middle Ring Road (N8 to 3rd Briganga Brg. access Rd.)	Primary Road	New Road	4	9.4	204
C2	09	Middle Ring Road (3rd Briganga Brg. access Rd. to N5)	Primary Road	New Road	4	10.2	222
C3	07	Outer Ring Road (N8 to R504)	Expressway	New Road	6	19.3	1,688
C3	08	Outer Ring Road (R504 to N5)	Expressway	New Road	6	13.8	1,410
C3	09	Outer Ring Road (N5 to R505)	Expressway	New Road	6	6.0	1,014
E2		Dhaka - Ashulia Elevated Expressway	Expressway	New Road	4	38.2	13,654
E3		Dhaka - Chittagong Access Controlled Highway (Kutubkhali - Outer Ring Road)	Expressway	New Road	4	15.6	1,501
P06		N105 / Upgrading of Dhaka Bypass to 4 Lane (Joydevpur – Debogram – Bhulta – Madanpur)	Primary Road	Widening	4	7.0	219
P10	02	Construction of Buriganga 3rd bridge near Basila	Primary Road	Widening (Bridge)	4	0.7	710
P10	03	Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (West side)	Primary Road	Widening	4	2.0	28
P10	04	Extension of Buriganga 3rd Bridge access roads to Middle Ring Road	Primary Road	New Road	4	1.9	41
P11	01	Mirpur to Outer Ring Road (Kalshi Road to West embankment)	Primary Road	New Road	4	3.4	571
P11	03	Mirpur to Outer Ring Road (Middle Ring Road to N5)	Primary Road	New Road	4	4.9	107
P11	04	Mirpur to Outer Ring Road (N5 to Outer Ring Road)	Primary Road	New Road	4	0.7	16
P12	01	Joydebpur - Narayanganj Highway (Joyedbupur to N105/Dhaka BP)	Primary Road	New Road	6	5.9	174

Source: JICA Study Team



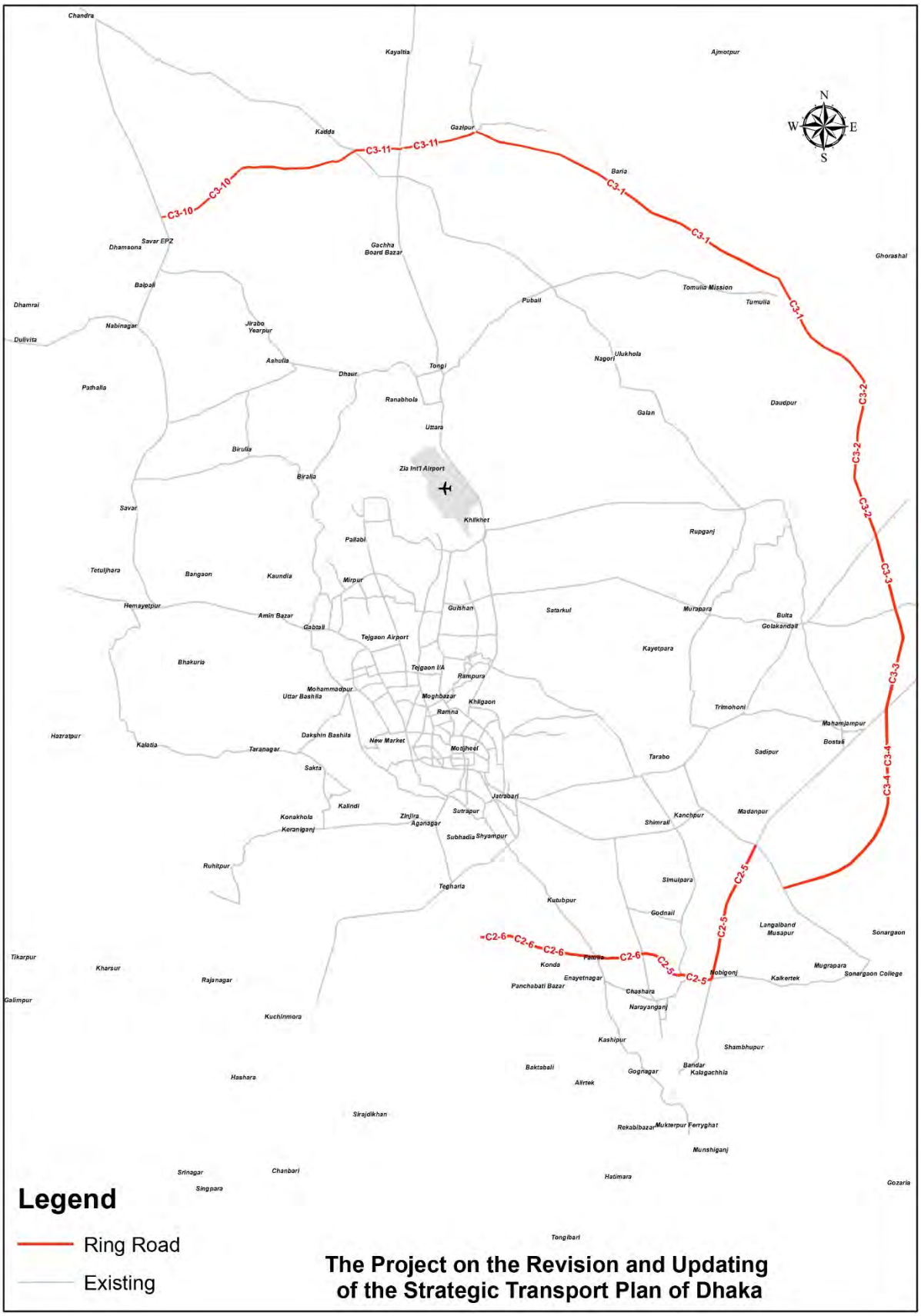
Source: JICA Study Team

Figure 14.13 Investment Schedule for Urban Roads (Phase3, Secondary Road)

Table 14.5 Project List (Phase 3: Secondary Road))

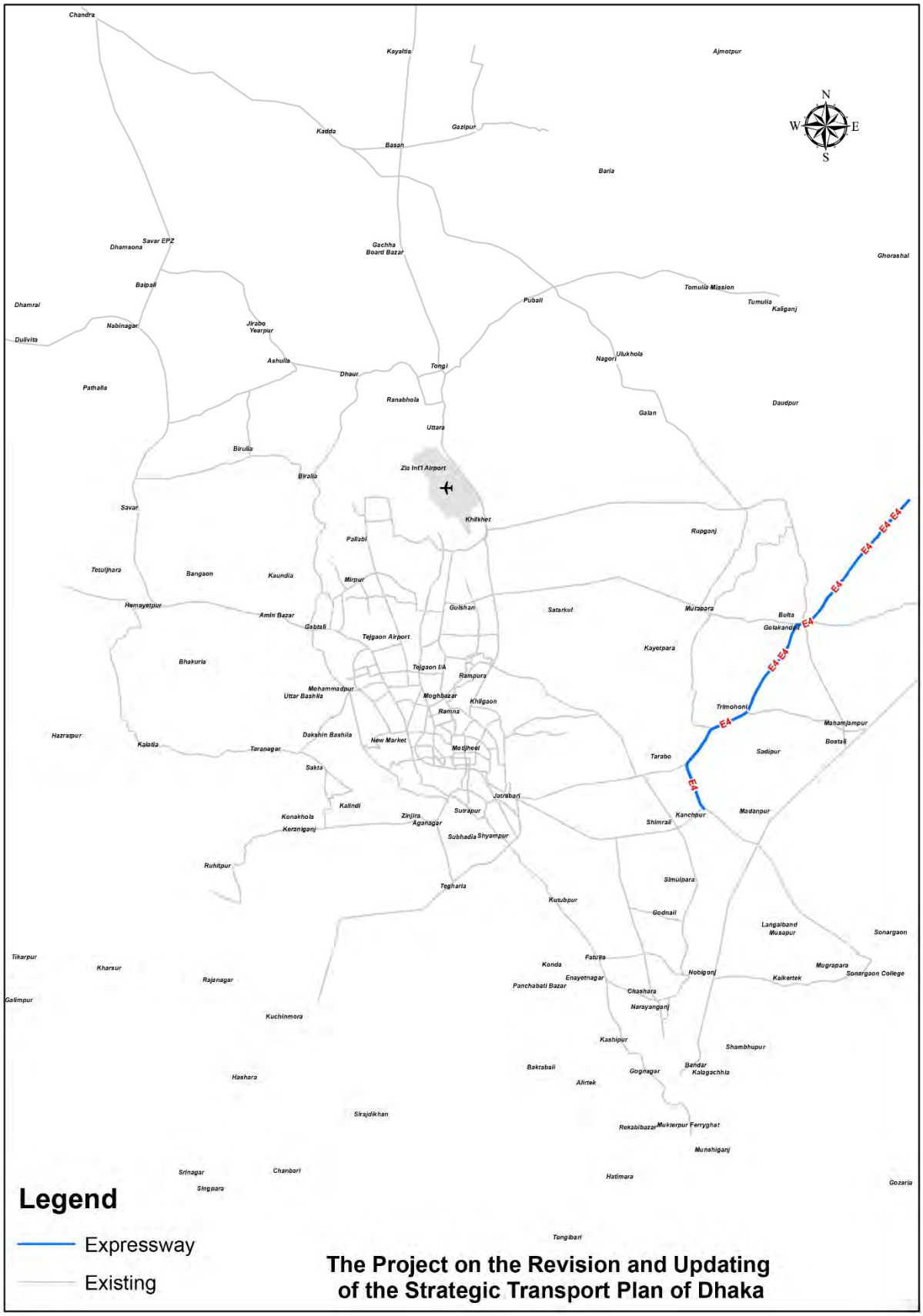
Sl. No.	Description	Road Category	Type of Project	No. of Lane (Proposed)	Length (km)	Project Cost (Tk. Crore)
S02	Gacha - Jiraitali Road	Secondary Road	Widening/New Road	2	7.0	39
S03	Sataish - Karamtola Road	Secondary Road	Widening/New Road	2	6.9	38
S07 02	Improvement of Abdullahpur – Teromukh – Ulukhola Road (Balu river embankment to Dhaka BP)	Secondary Road	Widening	2	3.6	20
S08 01	Azampur - Kaliganj Road (N3 to Joyedbupur - Narayanganj Hwy.)	Secondary Road	Widening	4	5.2	165
S08 02	Azampur - Kaliganj Road (Joyedbupur - Narayanganj Hwy. to Dhaka BP)	Secondary Road	New Road	4	5.4	99
S19 00	S8 (Azampur - Kaliganj Road) to S13 (Badda - Golakandial Road)	Secondary Road	New Road	4	13.2	241
S21 01	Dhirasram - Basabo Road (Dhaka BP to Inner Ring Road)	Secondary Road	New Road	4	7.5	138
S22 01	Improvement of Matuail (Mridhabari) – Shayampur (Dhaka – Narayanganj) Road	Secondary Road	Widening	2	3.5	43
S27 01	Baipayl - Mouchak Road	Secondary Road	Widening/New Rd	2	7.1	39
S30 01	Sreepur - Kashimpur Road	Secondary Road	Widening	2	6.1	34
S31 01	Dewan Idris Sarak	Secondary Road	Widening	2	5.4	30
S47 01	Mohammadpur Shia Mosque (near Japan Garden City) - Mohammadpur Bus Stand (Widening)	Secondary Road	Widening	4	0.6	61
S50 00	Flyover and underpasses at Jahangir gate area	Secondary Road	Grade Separation	4	0.6	441

Source: JICA Study Team



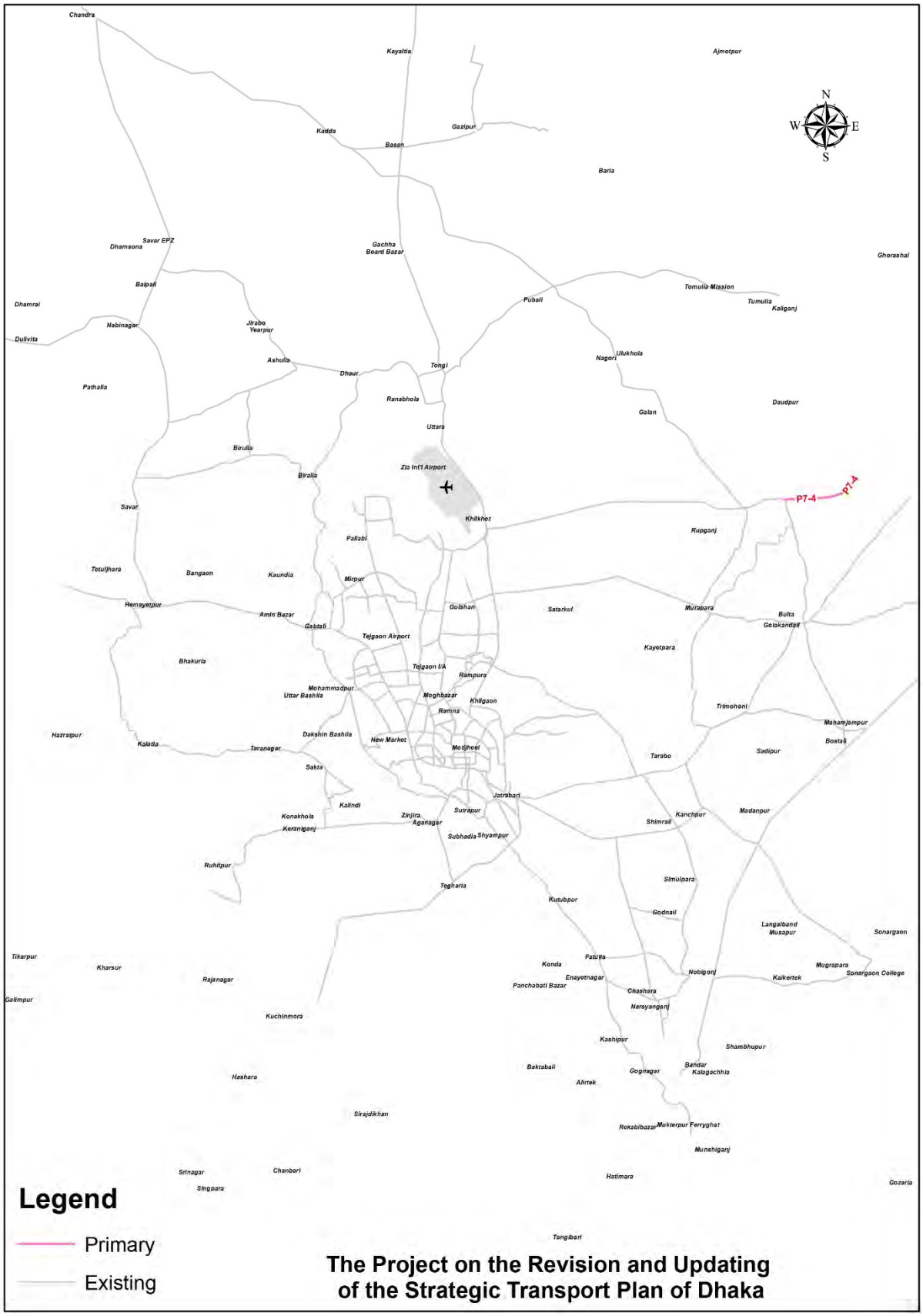
Source: JICA Study Team

Figure 14.14 Investment Schedule for Urban Roads (Phase4, Ring Road)



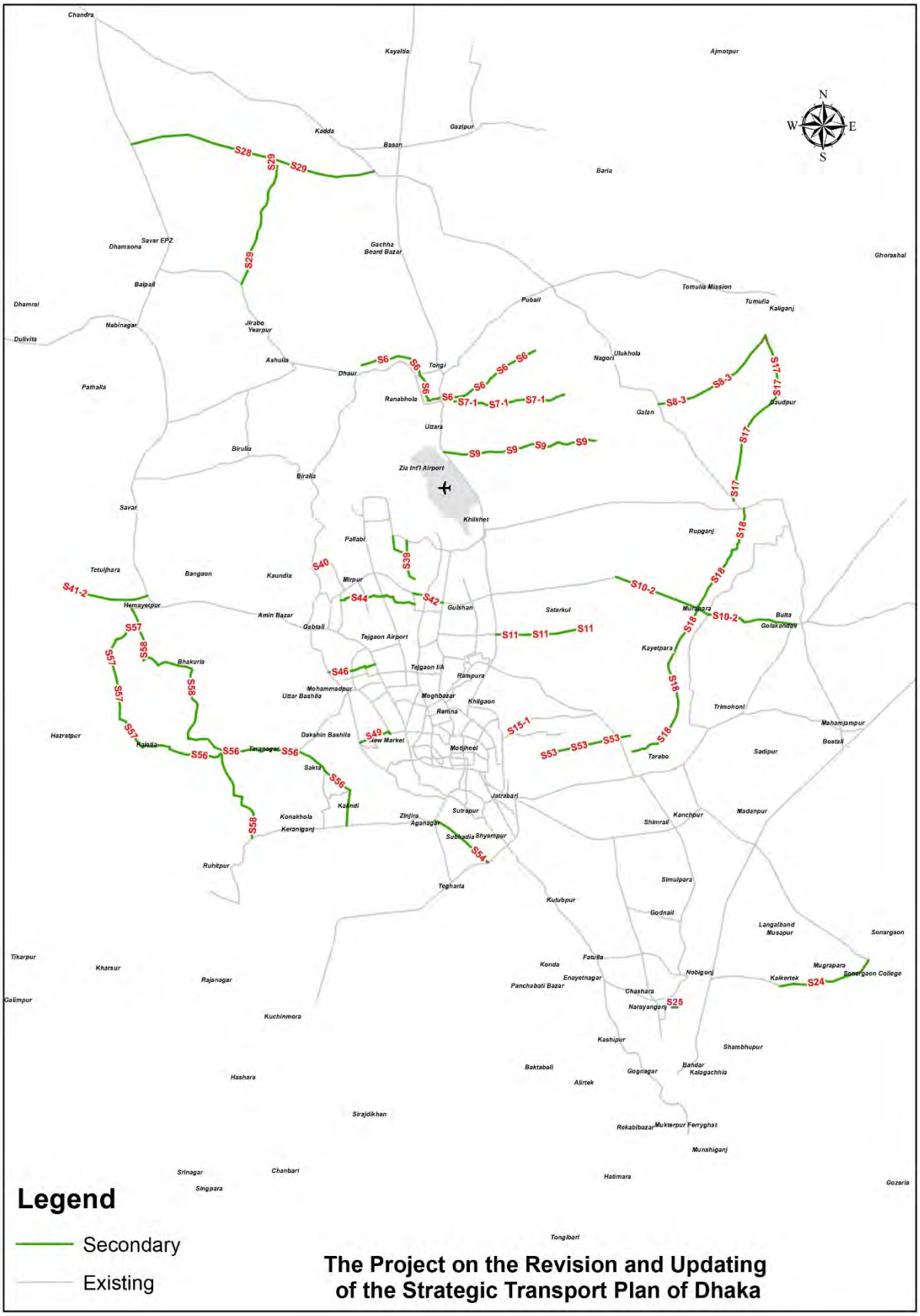
Source: JICA Study Team

Figure 14.15 Investment Schedule for Urban Roads (Phase4, Expressway)



Source: JICA Study Team

Figure 14.16 Investment Schedule for Urban Roads (Phase4, Primary Road)



Source: JICA Study Team

Figure 14.17 Investment Schedule for Urban Roads (Phase4, Secondary Road)

Table 14.6 Project List (Phase 4)

Sl. No.		Description	Road Category	Type of Project	No. of Lane (Proposed)	Length (km)	Project Cost (Tk. Crore)
C2	05	Middle Ring Road (N1 to R111)	Primary Road	Widening /New Bridge	4	10.5	877
C2	06	Middle Ring Road (R111 to Zazira IC)	Primary Road	Widening /New Bridge	4	7.9	836
C3	01	Outer Ring Road (R310 to R301)	Expressway	New Road	6	18.9	2,023
C3	02	Outer Ring Road (R301 to N2)	Expressway	New Road	6	11.4	1,288
C3	03	Outer Ring Road (N2 to R114)	Expressway	New Road	6	8.4	1,136
C3	04	Outer Ring Road (R114 to N1)	Expressway	New Road	6	11.3	1,283
C3	10	Outer Ring Road (R505 to N4/N105)	Expressway	New Road	6	9.8	3,505
C3	11	Outer Ring Road (N4/N105 to R310)	Expressway	New Road	6	6.2	2,217
E4		Dhaka - Sylhet Expressway (N1 - Outer Ring Road)	Expressway	New Road	8	15.7	795
P07	04	N301 / Extension from Dhaka BP to Outer Ring Road	Primary Road	New Road	4	3.8	83

Source: JICA Study Team

Table 14.7 Project List (Phase 4)

Sl. No.		Description	Road Category	Type of Project	No. of Lane (Proposed)	Length (km)	Project Cost (Tk. Crore)
S06		Tongi Embankment (Dhaka - Mymensing Exp. to Joydebpur - Narayanganj Hwy.)	Secondary Road	New Road	4	10.4	191
S07	01	Improvement of Abdullahpur – Teromukh – Ulukhola Road (Uttara Sector-8 to Balu river embankment)	Secondary Road	Widening	2	5.5	68
S08	03	Azampur - Kaliganj Rd. (Dhaka BP to New EPZ Link Rd.)	Secondary Road	New Road	4	6.3	115
S09		Uttara Sector-4 - Dakhinkhan - Khordi	Secondary Road	Widening	2	7.4	91
S10	02	Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj) (Baru river to Bhulta)	Secondary Road	New Road	4	9.0	3,752
S11		Badda - Baru river Embankment Road	Secondary Road	New Road	4	4.5	170
S15	01	Bashaboo Jame Mosque to Trimohini Ghdaraghat via Shekker Jaiga Bridge	Secondary Road	Widening	4	6.3	156
S17	00	New EPZ Link Road to Dhaka BP	Secondary Road	New Road	4	8.6	157
S18	01	Dhaka BP - Demra Road along Shitalakhya River	Secondary Road	Widening	4	13.9	230
S24	01	Improvement of Sonargaon Museum link Rd. along with Baidderbazar–Sonargaon–Mograpara-Kaikertek–Rd.	Secondary Road	Widening	2	4.6	25
S25	00	2nd Shitalakkhya Bridge at Narayanganj	Secondary Road	New Bridge	2	0.3	2
S28	01	Improvement of Zirani Kashimpur Road	Secondary Road	Widening	2	6.8	38
S29	01	Naojora (Kodda) – Kashimpur – Narsinghapur Road	Secondary Road	Widening	2	11.7	64
S39	00	Mirpur Road to Matikata Road	Secondary Road	New Road	4	3.2	408
S40	00	Mirpur Zoo to Embankment (Berry Bund) to the west	Secondary Road	New Road	2	1.0	95
S41	01	Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane	Secondary Road	New Road	4	1.1	77
S41	02	Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane	Secondary Road	Widening	4	30.9	2,150
S42	00	Mirpur-14 (Sagorika) to Airport Road (Banani Railway Station) along the fringe of Kurmitola Golf Course	Secondary Road	New Road	4	1.6	204
S44	01	Bangla College to Kafrul intersecting Rokeya Sharoni	Secondary Road	Widening	4	3.7	787
S45	01	Mohammadpur Krishi Market to Mirpur Road (Sohrawardy Hospital)	Secondary Road	Widening	2	1.2	51
S46	00	Krishi Market & Baitul Aman (Y Junction) to Embankment to the west	Secondary Road	New Road	2	1.5	107
S49	00	Zikatala - Hazaribagh (Sikder Medical College) road	Secondary Road	New Road	4	1.6	204
S53	00	Bashabo Kadamtola Road up to Manikdi	Secondary Road	New Road	4	4.2	159
S54	00	Road connecting Buriganga 1st and 2nd bridges via Subhadia & Zinjira (South of Buriganga river)	Secondary Road	New Road	4	3.5	64
S56	01	Konakhola to Hazratpur	Secondary Road	Widening	2	12.7	70
S57	01	Hazratpur to Hemayetpur	Secondary Road	Widening	2	8.3	46
S58	01	Improvement of Keraniganj (Konakhola) – Kholamura – Hazratpur – Itabhata – Mirpur (Hemayetpur) Road	Secondary Road	Widening	2	14.5	80

Source: JICA Study Team

Table 14.8 Prioritization of Proposed Road Projects (Summary)

Implementation Phase	Project Length	Project Cost (million USD)
Phase 1 (2016 to 2020)	380 km (31.7%)	3,041 (24.7%)
Phase 2 (2021 to 2025)	274 km (22.8%)	3,141 (25.5%)
Phase 3 (2026 to 2030)	256 km (21.3%)	3,113 (25.2%)
Phase 4 (2031 to 2035)	288 km (24.1%)	3,034 (24.6%)
Total	1,198 km (100.0%)	12,329 (100.0%)

Note 2: Project costs are given from the relevant organization or estimated based on the average unit price obtained from several reports of the feasibility study on projects in RAJUK area by JICA Study team.
Source: JICA Study Team

Table 14.9 Implementation Schedule of Public Transport Projects

(Unit: Million USD)

Project Component		Responsible Agency	Cost	Implementation Period			
				Phase 1 2016-2020	Phase 2 2021-2025	Phase 3 2026-2030	Phase 4 2031-2035
Expressway		BBA,RHD	3,973	1,144	787	1,940	102
Primary Road	Inner Ring Road	BWDB RHD	1,449	212	1,237	0	0
	Middle Ring Road	RHD	520	0	71	230	219
	Outer Ring Road	BBA, RHD	2,554	0	562	526	1,466
	Others	RHD	1,406	1,078	79	239	11
Secondary Road		RHD, LGED	2,427	607	406	177	1,237
Total			12,329	3,041	3,141	3,113	3,034

Source: JICA Study Team

(2) MRT/BRT Development Projects

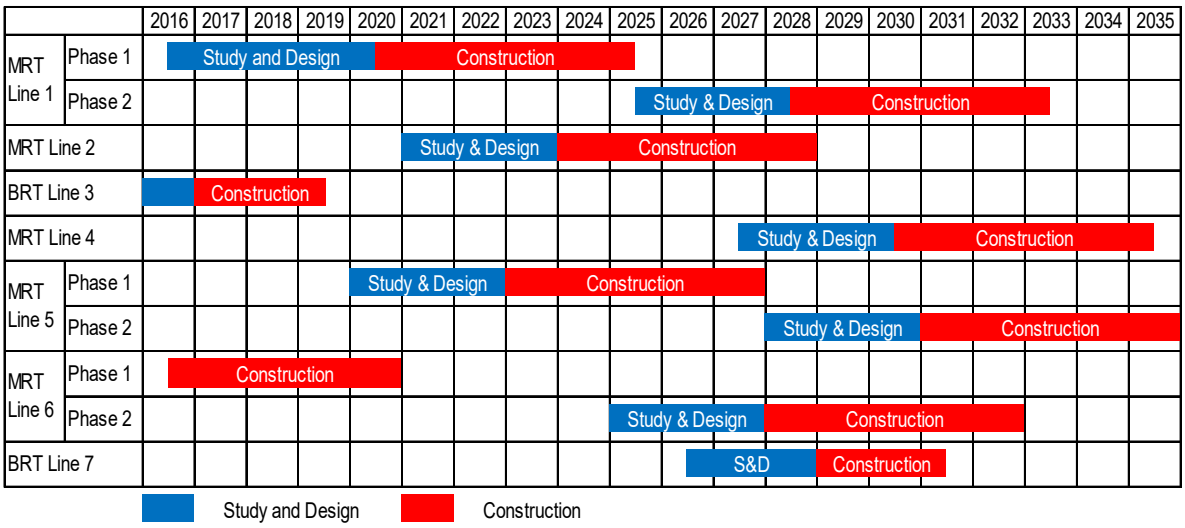
The implementation of MRT services takes more time than that of the public bus services with the duration between seven to nine years from the beginning to completion and the start of passenger revenue services, which is the standard for a modern urban mass rapid transit system. The implementation of BRT services will be earlier than the MRT services but it will still take longer time than the public bus services, but traffic demands will increase rapidly and continue to exceed in just a short time. Therefore, the recommendation is for a staged development of MRT system to be done in a gradual manner and with a bus system being used to start a passenger revenue service and develop the backbone of a high-capacity transit network using a rail-based technology.

The phased, or step by step, approach allows the possibility of developing a high-capacity urban mass rapid transit (MRT) network using a combination of improved public bus services which will provide the necessary passenger capacity to meet the

strategic goals of the city authorities which will serve the public transportation needs of Dhaka for 2035 and beyond.

The proposed MRT system for Dhaka will comprise a combination of two types of urban transit technology depending on passenger demands and the phased development of the respective transportation corridors serving Dhaka are as follows:

1) Stage 1 (-2020): In this stage, only BRT Line 3 will be operating. An improved public bus system is to be implemented using current bus technology during the initial development stage of the network, when passenger demand forecasts cannot warrant the higher-capacity rail-based transit system. The improved public bus service would be designed to allow future expansion to a higher capacity and MRT system when passenger demand warrants it.
2) Stage 2 (-2025): In this stage, BRT Line 3 and MRT Line 6 will be operating and construction of MRT Line 1 (1st phase) will be completed. And an intermediate stage with a mixture of improved public bus services and 2 MRT/BRT services which would initially be constructed on the busiest transportation corridors with fully integrated multimodal interchange stations to provide seamless transfer of passengers between different transit modes.
3) Stage 3 (-2030): In this stage, 3 MRT Lines and 1 BRT Lines will be operating. As a nearly-completed stage, completion of the high-capacity urban public transport network with both MRT/BRT and buses.
4) Stage 4 (-2035): In this stage, all proposed MRT/BRT Lines will be operating.



Source: JICA Study Team

Figure 14.18 Implementation Schedule of MRT/BRT Projects

Table 14.10 Implementation Schedule of MRT/BRT Projects

(Unit: US& Million)

Project	Responsible Agency	Cost	Implementation Period			
			Phase 1 2016-20	Phase 2 2021-25	Phase 3 2026-30	Phase 4 2031-35
MRT Line 1	DMTCL	5,867	283	2,544	1,520	1,520
MRT Line 2	DMTCL	3,673	0	1,469	2,204	0
BRT Line 3	Dhaka BRT	400	400	0	0	0
MRT Line 4	DMTCL	1,661	0	0	166	1,495
MRT Line 5	DMTCL	4,200	0	1,260	840	2,100
MRT Line 6	DMTCL	4,089	2,000	0	1,253	836
BRT Line 7	Dhaka BRT	257	0	0	206	51
Total		20,147	2,683	5,274	6,189	6,002

Source: JICA Study Team

(3) Other Public Transport Projects and Traffic Management Projects

In RSTP, Other public transport projects and traffic management projects are proposed as the important urban transport project in Chapter 13.

Restructuring and Improvement of Bus Service Project: They are (1) to restructure current bus network, (2) to design the priority bus service, (3) to replace and improve the current bus terminals, and (4) Institutional Development

Multimodal and Interchange Station Project: In RSTP, 21 multimodal and interchange station are proposed to allow the smooth transfer of passenger from one transport mode to another.

Traffic Management and Traffic Safety Project: In RSTP, some traffic management and traffic safety projects are proposed.

Inland Waterway Project: The main objectives of the project are (i) to improve navigability of 40km of waterways along the Balu River and Tongi Khat between Ashulia and Khanchpur, and (ii) to develop cargo and passenger facilities of one inland river port at Tongi and three landing stations located at Kanchpur, Isapura and Kayetpara. Estimated project cost will be 6,500 lakh Taka (almost 8.4million USD).

Table 14.11 Implementation Schedule of Traffic Management Projects

(Unit: Million UDS)

Project Name	Responsible Agency	Cost	Implementation Period			
			Phase 1 2016-20	Phase 2 2021-25	Phase 3 2026-30	Phase 4 2031-35
Improvement Project of Bus Services	DTCA, BRTA, BRTC	646	446	100	100	0
Traffic Management and Traffic Safety	DTCA, DMP, City Corp., Others	600	400	200	0	0
Inland Waterway	DIWATA	9	9	0	0	0
Total		1,255	855	300	100	0

Source: JICA Study Team

14.3 Investment Plan

(1) Budget for Transport Sector in GDA

In Chapter 12, the projected procurable budget for transport sector was estimated. According to the Strategy for Infrastructure Sector for 7th Five Year Plan, transport sector accounts for about 23% of total ADP .Case 1 is the current ration, and case 2 is the increasing tax revenues .And GRDP of GDA is almost 25% in Bangladesh, so urban transport development budget in GDA will be 25% of all transport sector. The following table is the projected procurable budget in each phase.

1) Case 1: Current rate of revenue collection (base scenario)

Revenue: 14% of GDP

Tax Revenue: 11% of GDP

Development Expenditure: 6.4% of GDP

Annual Development Plan: 6.0% of GDP

2) Case 2: Increase in Tax revenue (optimistic scenario)

Revenue: 17% of GDP

Tax Revenue: 13% of GDP

Development Expenditure: 8.0% of GDP

Annual Development Plan: 7.0% of GDP

Table 14.12 The Projected Budget for Transport Sector in GDA

(Unit:million USD)

	Phase 1 2016-20	Phase 2 2021-25	Phase 3 2026-30	Phase 4 2031-35
% of ADP	25%	25%	20%	20%
Case 1	19,776	19,392	22,208	28,416
in GDA (25%)	4,944	4,848	5,552	7,104
Case 2	23,245	23,616	28,864	37,888
in GDA (25%)	5,811	5,904	7,216	9,472

Source: JICA Study Team

(2) Investment Cost

Based on the previous section, investment requirement for the Major Master Plan Projects are summarized in Table 14.13.

Table 14.13 Investment Requirement for Major Master Plan Projects

(Unit: Million USD)

			2016-20	2021-25	2026-30	2031-35
Road	Expressway		1,144	787	1,940	102
	Primary	Inner RR	212	1,237	0	0
		Middle RR	0	71	230	219
		Outer RR	0	562	526	1,466
		others	1,078	79	239	11
	Secondary		607	406	177	1,237
	Total		3,041	3,142	3,112	3,035
UMRT	MRT Line 1		283	2,544	1,520	1,520
	MRT Line 2		0	1,469	2,204	0
	BRT Line 3		400	0	0	0
	MRT Line 4		0	0	166	1,495
	MRT Line 5		0	1,260	840	2,100
	MRT Line 6		2,000	0	1,253	836
	BRT Line 7		0	0	206	51
	Total		2,683	5,274	6,189	6,002
Others	Bus		446	100	100	0
	TM&TS		400	200	0	0
	IW		9	0	0	0
	Total		855	300	100	0
Grand Total			6,579	8,716	9,401	9,037

Source: JICA Study Team

Required investment cost for the major master plan projects is compared with the available future fund estimated in Chapter 11. As shown in the Table 14.12 and Table 14.13, available fund for transport sector is not enough to cover the required cost, particularly in the short/mid-term. Therefore, it is necessary to consider the potential fund sources such as surplus revenues from on/off street parking operation and urban expressways, and profit of TOD together with the effective use of unused government lands which is further discussed in the following section.

(3) New Funding

As the overview of the financial structure and budgeting in Bangladesh addressed in chapter 7, necessary costs for all the expected projects cannot be covered by the current budgeting system. Funding sources for the road maintenance has been in the discussion.

1) Traffic management

Many previous transport projects suggested the importance of the immediate implementation of the traffic management. STP report estimates that 50% of the capacity of arterial system is wasted due to the poor operation condition. Economic loss caused by the poor traffic management affected seriously the current poor traffic condition. From social and economic point of view, it cannot be helped without pointing out how many lives of the citizens were lost due to the delay of ambulance vehicles caused by the indifference of the drivers to ambulance. Many

lives and traffic jams can be solved by the implementation (education, enforcement) of proper traffic management and the authority in charge needs to take responsibility for the past failure in the implementation of traffic management. Before seeking the new resources of transportation projects, it is time for the government to take immediate actions to implement projects of traffic management such as; 1)Traffic engineering, 2)Traffic safety, 3)Traffic control, 4)Driver training and education, 5)Public awareness and 6)Enforcement.

2) Road funds

Road funds as a mechanism for securing dedicated funding for roads have been established for a long time. Since it is not possible to allocate sufficient funds for all road development and maintenance only from the government budget, road fund is considered as one of the main additional sources. The basic theory of the road funds is that those who benefit from having good roads will be required to pay for that benefit; It means that road users pay for the services they get from the road network.

For the road user taxes, the Ministry of Transport is not the sole government department in the determination of the tax level. In addition to transport economy, general considerations of public finance, industrial policy, trade policy etc. are often given greater weight. Road user taxes have been used for certain energy objectives, environmental policy objectives, trade and industrial concerns that includes distribution cost of goods, domestic vehicle manufacturing industry and of course transportation policy objectives. These factors generally influence decisions and the actual process of arriving at a tax rate is a political one. These complex factors are one of the difficult reasons to determine and implement the road funds.

In Bangladesh, road funds have been discussed and focused on the road maintenance objectives, while some countries use it also for the development of the road network. In Japan, a road fund was established to reconstruct the road network that was damaged by the World War II. It was a specific revenue sources for the road maintenance and development paid by the road users. However, after most of the road networks have been built in Japan, the argument of using the fund from the road user taxes for other purpose other than road development has started and the fund was abolished. It all depends on the policy of each government for which purpose the funds will be used.

Potential revenue sources discussed in the Road Fund Steering Committee in the Ministry of Communications, Government of Bangladesh in 2003 are as follows;

- Vehicle import duty
- Vehicle registration fee
- Driver Licenses
- Fitness Test Income
- Annual Road Tax
- Route Licenses
- Weighbridge Charges and Fines
- Fuel Levy
- International Transit Charges

As the conclusions of the recommended income sources for the road fund in Bangladesh, recommended road fund sources in the table below was proposed in the same report.

Table 14.14 Recommended Road Fund Income Domestic Sources

Income Source	Justification
Vehicle License Fees (Road Tax)	Charge for access to the road network
Fuel levy	Charge for use of the road network
Road and bridge tolls	Point of use charge at specific points on the road network
International Transit charges	Charge at point of entry to network (non-Bangladeshi vehicles only)

Sources: Report for the discussion on the operating modalities of a road fund for Bangladesh

Sources of the roads funds vary in countries and commonly discussed charging instruments are; fuel tax, vehicle excise duty, kilometer tax, axle tax, tolls, annual vehicle tax, etc. In case of Japan, fuel tax is divided into gasoline tax, local road tax, petroleum gas tax, diesel oil transaction tax and vehicle tax is divided into weight tax and acquisition tax.

3) Road Pricing

Road pricing (also road user charges) is direct charges levied for the use of roads, including road tolls, distance or time based fees, congestion charges and charges designed to discourage use of certain classes of vehicle, fuel sources or more polluting vehicles. It may be covered by the classical terms of road and bridge tolls but as the recent transportation demand management tools it is important to be addressed separately. In recent years, traffic demand management (TDM) measures to encourage a change in the traffic demand, among them, is the law for the purpose of congestion relief of the city center

These charges may be used primarily for revenue generation, usually for road infrastructure financing, or as a transportation demand management tool to reduce peak hour travel and the associated traffic congestion or other social and environmental negative externalities associated with road travel such as air pollution, greenhouse gas emissions, and visual intrusion, noise and road accidents.

In most countries toll roads, toll bridges and toll tunnels are often used primarily for revenue generation to repay long-term debt issued to finance the toll facility, or to finance capacity expansion, operations and maintenance of the facility itself, or simply as general tax funds. Road congestion pricing for entering an urban area, or pollution charges levied vehicles with higher tailpipe emissions are typical schemes implemented to price externalities. The application of congestion charges is currently limited to a small number of cities and urban roads, and the notable schemes include the Electronic Road Pricing (ERP) in Singapore, the London congestion charge, the Stockholm congestion tax, the Milan Area C, and High-occupancy toll lanes in the United States

Parking Deposit System

Road pricing is regarded as the most effective measure to solve the traffic congestion in urban area. However, the difficulty of forming a public consensus has become an obstacle to the implementation of road pricing. There is an immediate effect in terms of vehicle use suppression, and is to be effective, these can be confirmed from actual example in London, which introduced road pricing (Congestion Charge) in February 2003.

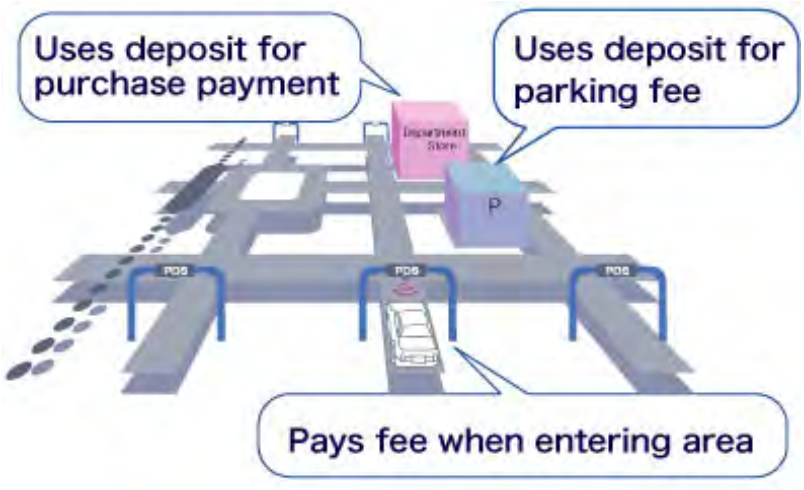
However, actual introduction of the current road pricing city is limited such as London, Singapore and Oslo. The main factor against road pricing is the low

acceptability to the community (some cities such as Edinburgh rejected the proposal, and other cities like Trondheim, Norway, decided to discontinue the system after 15 years). The main concern in the central areas is about the decline of the central business activities. According to the interview survey, visiting frequency of shoppers in the central shopping area where road pricing is introduced is clearly reduced .It has shown the need for new measures to improve the downtown visit frequency. The scheme, which has a close effect on road pricing that reduces the concerns of central commercial areas and has more social acceptance as alternatives, is under study for the introduction.

In Dhaka city, very few establishments have parking lots and most drivers leave cars on the street without paying parking fees. This is the one and big cause of the traffic congestion in the central area. Unlike most of the cities in the developed countries, majority of the car owners in Bangladesh hire car drivers is thankful to the low labor cost. This makes the parking violation crackdown difficult because the drivers remain in the vicinity of the parked car and ready to move when the traffic police appear.

The PDS is an alternative to the road pricing, which aims to improve the social acceptability, that new research is underway toward realization. While the traditional road pricing charges all vehicles flowing into the charging area, the PDM return part or the full amount of money, which is imposed upon entering the area, as the user of the parking lots. As a result, it is a system to charge only to through traffic and illegal on-street parking vehicle, which brings a significant congestion to urban area, therefore to ease the traffic congestion in the city center. It is a system that will effectively realize the congestion alleviation of urban areas while contributing to the local economy.

Considering the serious traffic congestion of Dhaka City, it is necessary to consider introduction of one scheme of the road pricing system (include PDS).



Source: Nagoya University Transport and Environment Dynamics

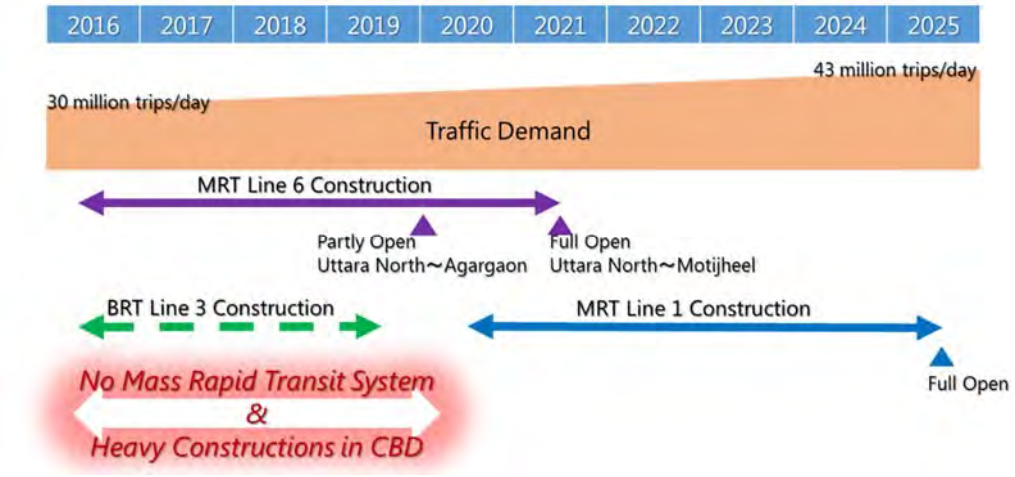
Figure 14.19 Images of the Pricing Schemes

14.4 Short-term Action Plan

(1) General

Many urban transport projects are proposed to reduce traffic congestions, improve the traffic environment and to provide affordable services in RSTP. But enormous amounts of time and money are required. Actually, construction of MRT Line 1 will began from 2016 and construction of BRT Line 3 will began until 2019, But MRT Line 1 between Uttara North and Agargaon will be opened in 2019. So during 5 years from 2016, large-scale constructions, like a Dhaka Elevated Expressway, MRT Line 6, BRT line 3 and other flyovers will began everywhere in Dhaka, but new public transport services and new roads will not be developed.

So what the government must compare is what should be done first or later within a limited time and budget.



Source: JICA Study Team

Figure 14.20 Shot-term Action Plan (Image)

(2) Approach of Plan Formulation

The Short-term Action Plan encompasses solutions to the current urban transport problems and lays the foundation for the long-term development plan. It sets out tasks that could and should be done over the next five years and which should be consistent with the long-term strategies of the Master Plan (RSTP). The criteria in selecting the short-term actions are as follows:

- Those which address urgent problems concerning road-based public transport;
- Those which do not require substantial financial resources other than the funds already mobilized or committed;
- Those which can be implemented within existing agencies and institutions of the city or national government; and,
- Those which clear obstacles and pave the path for the smooth realization of medium and long-term plans.

(3) Components of Short-term Action Plan

1) Impending urban transport issues

Traffic congestions are common in Dhaka but the situation will worsen in a short while. Major priority projects like MRT, BRT, Expressway and others require a considerable amount of time and money and needs time to take effect. And it will be harder than ever to manage and control mushrooming traffic demands resulting from the rapidly growing economy. The following issues are clear and present dangers.

- Rapid increase of population in RAJUK area
- Growing traffic demands resulting from the rapidly growing economy
- Rapid increasing private cars and motorbikes without any control
- Inflow of through traffic from the Padma Bridge into urban area

2) Countermeasures

The RSTP defines the three (3) components of the Short-term Action Plan: improvement of bus services (modernization and bus corridor management), traffic management & traffic safety improvement, and southern ring road development. Under these components, the following four focused issues are elaborated and concrete measures feasible for short-term implementation are proposed:

Improvement of Bus Services

- Resolving the problems being encountered by the Bus Modernization Project “Dhaka Bus Network and Regulatory Reform implementation Study and Design Work”.
- Redesigning the public transport route network beyond the routes selected for the Model Bus Project, in order to widen coverage, improve commuter access, widen the types of bus service offerings, and identify new routes for operators displaced by the Model Bus scheme.
- Managing primary bus corridors within the city and the metropolitan area through traffic engineering and bus priority measures to achieve safe and efficient operating environment for general traffic and bus services as well as road conditions supportive of transit promotion.

Traffic Management and Traffic Safety

- Implementing the traffic management and traffic safety measures immediately. Because if effective measures of traffic management and traffic safety are implemented, road capacity will be increased drastically and traffic congestions will be reduced.

Road Development by Gradual Approach

- Road development for achieving systematic urban development of the Eastern Fringe Area and Systematic and Its goal is to create residential areas rich in nature so as to revitalize urban area, which have an overconcentration of population.
- Developing the southern part of outer ring road as the bypass from Padma Bridge to Chittagong to reduce the through traffic to urban area.

(4) Short-term Action Plan

1) Stepwise Bus Route Network Development

In the future, with progress of suburbanization job opportunities will be created not only in urban areas but also in sub-urban areas. And this expansion leads to the necessity of expansion of public transport service network. In RSTP, total 7 MRT/BRT lines are proposed to connect CBD and sub-urban areas. But there is no MRT/BRT stations in some areas in sub-urban area, so affordable feeder services need to be developed t the area where there are great distances from MRT/BRT stations.

And also. Seven (7) MRT/BRT services will not be started at the same time, each line will be started in a stepwise fashion. So bus service networks needs to be developed and restructured following the development of the MRT/BRT lines.

Case of MRT Line 6

MRT Line 6 will be opened in a step by step manner until 2020. MRT line 6 will start is operation between Uttara North Station and Agargaon Station in 2019, and at the next phase the entire line will come into operation.

Source: JICA Study Team

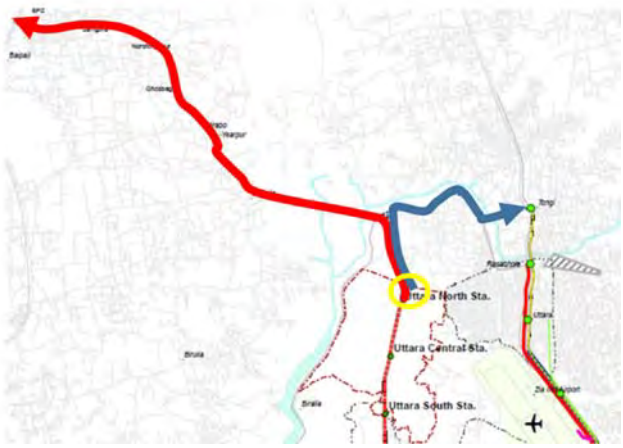
Figure 14.21 Feeder Bus Service for MRT Line 6

At the first phase, passengers of MRT Line 1 will suffer inconvenience to access CBD area from Uttara and Mirpur, because they need to break their journey on the way. So before when the 1st phase of MRT Line No.6 is completed, priority bus service should be provided from Agargaon Station to Motijheel/Kamalapur area.

And current bus route networks in this corridor should be restructured at the same time in order to make bus service more effective and reduce traffic congestions during construction periods of MRT Line 6.

And before extension of MRT Line 6 to the north, priority bus services should be provided from Uttara North to Ashulia/ Savar and Tongi. And Station plaza shall be developed at Uttara North station for the improvement of convenience of changing trains between MRT Line 6 and Bus.

And feeder bus services between Uttara North Station and Tongi Station will make connection between MRT Line 6 and BRT line 3 more efferent and easier.



Source: JICA Study Team

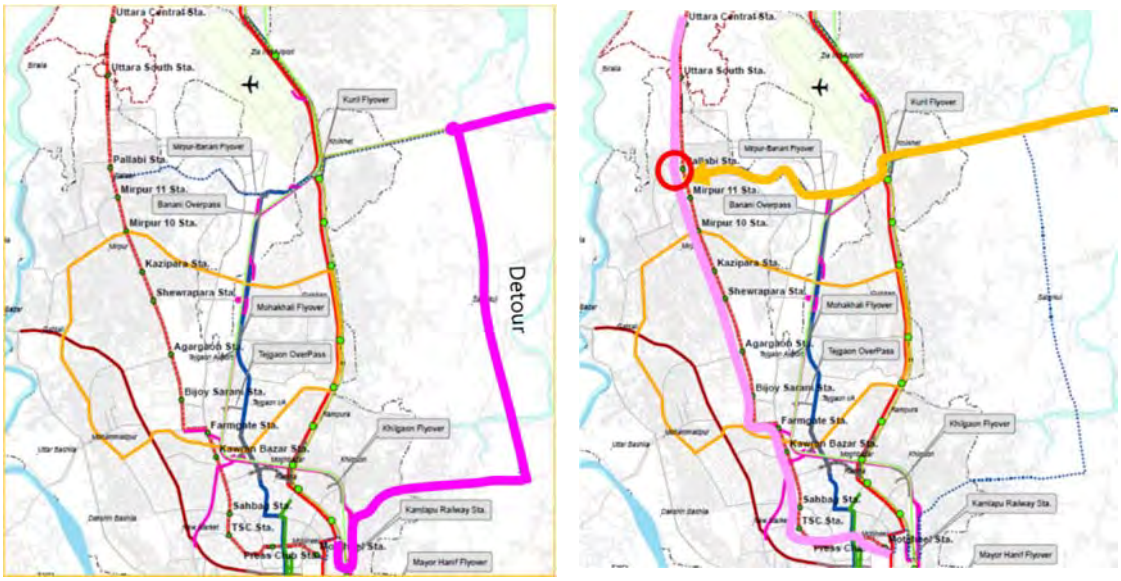
Figure 14.22 Feeder Bus Service for MRT Line 6

Case of MRT Line 1

In 2025, MRT Line 1 has 2 service line, one line is from Kamalapur station to Airport station, and another line is from Kamalapur Station to Purbachal Terminal Station. And at the next phase 2035, the alignment of MRT line 6 will be extended from Airport Station to Gazipur Station via Tongi, and from Kamalapur Station to Jhilmil Station.

Traffic management during the construction of MRT Line 1 should be implemented in the short-term. During the construction of MRT Line No.1, two lanes will be used for construction works on DIT Road, and reduction of lanes would lead to serious traffic congestion on the road. So it is important to manage traffic demand and to alleviate expected traffic congestion.

To avoid traffic congestion on the DIT road, bus service can be operated on new Purbachal road and extended from Kuril Intersection to Pallati station in order that passengers may transfer to MRT Line No.6 at the point.



Source: JICA Study Team

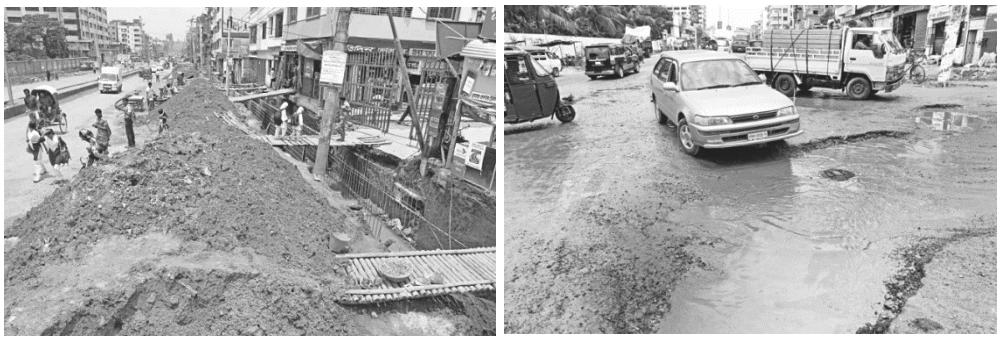
Figure 14.23 Feeder Bus Service for MRT Line 6

During construction period on DIT road, serious traffic congestion will be expected. A new bus route shall be provided plying on the proposed road for BRT No. 7. And priority project should be given to development of the arterial road between Gazipur and Narayanganj since this road shall provide space for detour of bus operation during construction period of MRT Line 1. New bus operation with quality service shall be provided on DIT road to replace the existing bus services.

Suspension of Rickshaw operation on DIT road shall be taken into account.

2) Traffic Management during Construction Period

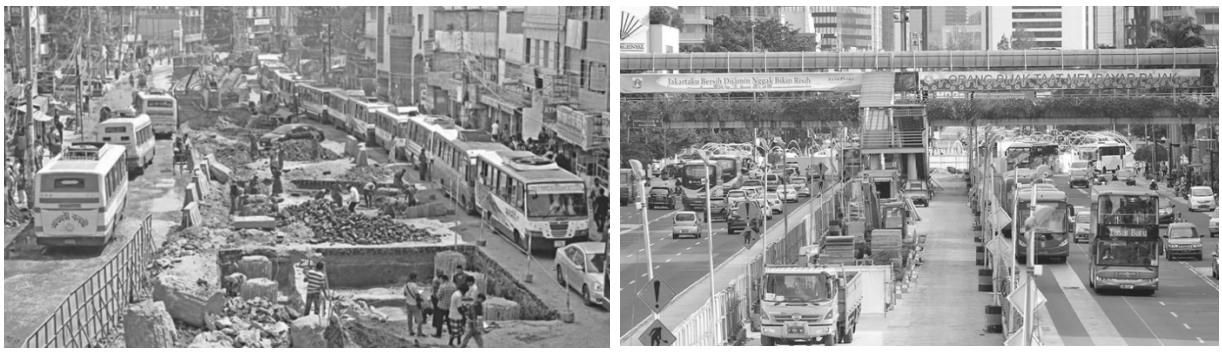
Current traffic management during construction period is very poor. The results in a lack of management, making illegally left construction materials left on the street or other paces a traffic congestion or traffic accident.



Source: JICA Study Team

Figure 14.24 Poor Construction Management in Dhaka

And also construction site and materials occupy unnecessary large spaces and reduce the road capacities by poor construction management. Road capacity of 2 lanes are 4,400 pcu per hour, but 1 lane's road capacity is 1,700 pcu per hour and not a half a capacity. So temporary two-lane and two-way traffic road needs to be served during the construction period.



Source: JICA Study Team

Figure 14.25 Construction Management in Dhaka and Jakarta

3) Traffic Management and Safety

As already mentioned in chapter 13, in STP, it was estimated that up to 50% of the capacity of the expressway system is wasted due to poor operating conditions. Based on this analysis, the effect of the traffic management measures are

evaluated in the current traffic situation. As a result, average V/C, average speed, and total TTC become better than current situation.

Total benefit cost of traffic management situation will be 532 million TK/ day. And the RSTP project cost of the short-term traffic management and safety is estimated around 47 billion TK. If the short-term traffic management project is implemented in one year, the total benefit cost will be 194 million TK and the project benefit cost will be higher than project cost.

So there is no reason why the government doesn't implement any traffic management measures.

4) Road Developments

As already mentioned in chapter 12, Southern part of the Outer Ring Road and road network development in the Eastern Fringe Area are proposed as the short-term action plan. Road network development in the Eastern Fringe Area will promote the designed urban development and reduce congestion of DIT road (especially during the construction period of MRT Line 1). And southern part of ring road will respond to Padma Bridge Project

15. CONCLUSION AND RECOMMENDATIONS

15.1 Conclusion

RSTP proposes the overall goal of urban transport and 8 objective for achieving the overall goal as follows:

“Ensure mobility and accessibility to needed urban services for its people and society, through safety, amenity and equity – towards the development of a public-transport-based city with more than 60% share of the total urban transport demand.”

(1) Promotion of social understanding about urban transport problems and issues
(2) Effective management of urban growth and development
(3) Promotion and development of attractive public transport
(4) Efficient traffic control and management
(5) Effective management of transport demand
(6) Comprehensive development of transport space and environment
(7) Enhancement of traffic safety and reduced environmental impacts
(8) Strengthening of urban transport administrative and management capacities

The followings are conclusions and activities of each objective.

(1) Promotion of Social Understanding about Urban Transport Problems and Issues

Transport systems play a crucial role in urban development by providing access for people to education, markets, employment, recreation, health care and other key social–economic services. Urban transport services and infrastructures are closely related with urban citizens. But many people are unconscious of the fact that traffic congestions, traffic accidents and other transport issues are caused by human error or lack of knowledge.

In the RSTP, many urban transport measures are proposed to reduce traffic congestions and improve the urban transport environment, And not only RSTP, any other transport projects and studies has been proposed many useful urban transport measures. The Government has been working on those issues for a long time, and the Government hasn't been able to get very far with those. As one of the reasons, people have a lack of understanding toward urban transport policies and measures.

Transport policy and project would work effectively unless a wide and profound understanding of transport problems, issues and future directions is shared by the society. The formulation of the most efficient plan and the intervention by the Government in the planning process will not be enough on its own to ensure successful implementation. What is needed is the political will and determination of the Government supported by the people’s commitment to achieve the objective.

To achieve this objective, the following for strategies are suggested;

Activity 01: Conduct of consecutive transport campaigns;

Activity 02: Expansion of transport education;

Activity 03: Strengthening of transport studies;

Activity 04: Information Disclosure.

(2) Effective Management of Urban Growth and Development

The integration of transport planning and land use planning in the context of the development of metropolitan Dhaka is critical. It is considered that the only realistic approach for the successful control of growth of development involves an active commitment to policies integrating transport and land use planning. It is essential to recognize that the size, growth and distribution of the density of activity in metropolitan Dhaka have a crucial impact on the dependence on transit. Policies for increases in density around transit nodes and along transit corridors can achieve reductions in congestion and pollution and can maximize the use of the investment in transport infrastructure. Unfortunately, the pro-active commitment to such policies and the recognition of the importance of the integration of land use and transport planning has been lacking in the Dhaka area in recent years.

To achieve this objective, the following five policies are suggested:

Activity 05: Policy coordination within metropolitan area;

Activity 06: Integration of urban development Masterplan and urban transport Masteplan;

Activity 07: Development of hierarchical road network and road classifications to guide design (and parking provision);

Activity 08: Promotion of integrated urban and transport development, particularly Transit-Oriented Development (TOD);

Activity 09: Guidance for ideal urban development.

(3) Promotion and Development of Attractive Public Transport

Because of its comparative advantages in terms of speed, flexibility and accessibility, road transport has emerged as the most popular mode of transport in Bangladesh. The Dhaka metropolitan area is no exception to this trend. As a result, inland water transport and the railways have been facing marginalization with respect to the carriage of passengers and goods for many years. Consequently, the approaches to transport system development followed in the past decades need to be reviewed to create a balanced and multimodal transport system in Dhaka. Although there have been a number of transport studies in recent years, no serious effort has been made to forge a functional integration of different modes of transport. However, it is well known that without effective integration of transport systems, economic benefit, convenience and comfort from transport services cannot be derived. Dhaka is one of the least motorized cities in the world with a figure of about 127 motorized vehicles per 1,000 population. As an example, saturation levels in western cities are around 500/1,000 and Bangkok as an example of an Asian city has a motorization rate of 300 per 1,000 population.

Carefully throughout measures must be adopted for the automobile society that inevitably will come rear future. Without public transport, the city's future is untenable. Future public transport must be provided in sufficient quantity and quality. An attractive public transport system is the only solution which both city authorities and the people expect.

To achieve this objective, the following five policies are suggested:

Activity 10: Development of a hierarchal mass transit system;

Activity 11: Early introduction of an integrated public transport system in the effort to maintain public transport share;

Activity 12: Development and improvement of bus transport system, including reform of management systems and the business model;

Activity 13: Exploitation of para-transit and NMVs;

Activity 14: Exploitation of water transport system;

Activity 15: Promotion of public transport use and expansion of services;

Activity 16: Providing an Affordable Public Transport system.

(4) Efficient Traffic Control and Management

The current road capacity is not efficiently utilized due to widespread on-road parking, various types of encroachments and poor traffic control and management. Infrastructure capacity is largely dependent on how it is operated, managed and maintained. Better traffic management will improve capacity as well as improve safety, amenity, and environment of the city and its people. It is also reliant on better regulation, management and enforcement combined with facility improvement and ICT (Information and Communication Technology).

To achieve this objective, the following five policies are suggested:

Activity 17: Establishment of comprehensive traffic management system balanced with better facilities for essential NMT modes such as cycling and walking;

Activity 18: Strengthening of traffic regulation, enforcement and management;

Activity 19: Management of freight transport;

Activity 20: Establishment of parking policy and controls;

Activity 21: Development of well-coordinated traffic control system.

(5) Effective Transport Demand Management (TDM)

The problem of traffic congestion should not be addressed merely from the supply side, i.e. expansion of infrastructure capacity. To ensure smooth traffic as well as share in a more equitable manner the cost and benefit of traffic and transport among stakeholders, various demand management measures (TDM) would need to be introduced.

Traffic demand management (TDM) is a restrictive measure to be applied to private modes of transportation. The purpose of TDM is to discourage the use of private modes and encourage the use of public transportation. TDM measures can be classified into two types, namely economic measures and regulatory measures. They can be applied either to the use or ownership of vehicles.

To achieve this objective, the following five policies are suggested:

Activity 22: Integrating urban development and transport (TOD);

Activity 23: Providing efficient public transport alternatives;

Activity 24: Regulating motorized vehicle access and proper charging of road use and parking.

(6) Comprehensive Development of Transport Space and Environment

Transport infrastructure provides important public space for the use of traffic – comprising different modes including walking – and for various urban services and activities. For this, it is important to design and develop transport infrastructure and services comprehensively to enhance the quality of urban areas and activities.

To achieve this objective, the following five policies are suggested:

Activity 25: Management of transport corridors;

Activity 26: Improvement of a safe transport environment for pedestrians and cyclists;

Activity 27: Redistribution of transport space and improvement of traffic environment in the city center;

Activity 28: Alleviation of air pollution;

Activity 29: Establishment of township transport development strategy.

(7) Enhancement of Traffic Safety

Traffic accidents have profound socio-economic impact as they result in traffic congestion, loss of personal productivity, and health care cost which are all borne by the society. In Dhaka, road-based traffic accidents have steadily increased. The accident rate already ranks high compared with that of other Southeast Asian cities. Immediate redressing of traffic safety problems in Dhaka could limit, if not avoid, such grave personal, social, and economic consequences.

Opportunities exist to improve traffic safety and road infrastructure. Many of the preventive measures can be undertaken at marginal costs within a short time, including road safety planning, elimination of black spots, enforcement, and education.

High priority should be given to the revival of the computerized accident database and the elimination of accident-prone locations. Accurate accident data directs attention to traffic safety and assists the formulation of remedial and preventive solutions. In eliminating accident-prone locations, common traffic engineering measures, such as use of median barriers, signalization, and geometry modification, are implemented.

It should be borne in mind that traffic safety improvement, while critical for the short term, requires long-term commitment especially in the areas of traffic police enforcement and road user education.

Worsening traffic safety and an increase in traffic accidents are threatening the well-being of the city and its inhabitants; especially pedestrians. Road safety is also a priority issue at union government level.

To achieve this objective, the following five policies are suggested:

Activity 30: Establishment of traffic safety audit system;

Activity 31: Elimination of traffic accident black spots;

Activity 32: Improvement of licensing and vehicle inspection system;

Activity 33: Strengthening of traffic enforcement system;

Activity 34: Strengthening of first aid response system.

(8) Strengthening of Transport Sector Administrative and Management Capacities

The tasks to be accomplished for the city's present and future are enormous and require a comprehensive and coordinated approach involving a wider range of players. The role of the related authorities in leading the process is very important

To achieve this objective, the following five policies are suggested:

Activity 35: Strengthening of transport- related organizations;

Activity 36: Promotion of private sector participation;

Activity 37: Improvement of infrastructure development and management system

Activity 38: Strengthening of planning and management capacity;

Activity 39: Securing of development funds.

15.2 Recommendations

The recommendations by the consultant of RSTP to the Bangladesh Government is to realize the projects proposed in this master plan. Although every project is an integral part of the proposed master plan, the most essential are as follows; A. Traffic Management and Traffic Safety Management (short-term), B. Improvement of Bus Services (short-term), C. MRT Development (short to long-term), and D. Road Development (short to long-term).

Other related recommendations are as follows:

(1) Authorize and get the RSTP as the urban transport master plan of Dhaka duly approved by the concerned agencies and disseminate its content to all stakeholders and finally, the RSTP be approved by the Cabinet.

(2) Enhance the Dhaka Transport Coordination Authority (DTCA) to make decisions on various transport projects. Allocate the implementation of responsibilities of projects clearly to the concerned government agencies. The DTCA will oversee and monitor the implementation of these projects. The establishment of DTCA is crucial for Dhaka in order to have the basis to absorb various types of technical and financial assistance from donor organizations.

(3) Raise funding capability of the government by seeking various additional revenue sources and developing current revenue resources under the institutional arrangement of the government. The feasible fund source is to be implemented in the Traffic Management and to exist in the TOD (Transit Oriented Development)

(4) Take necessary actions the soonest time possible to launch the short-term projects as proposed in the master plan. Specifically for those projects that needs feasibility study or prior coordination among relevant organizations; initiatives from the Bangladesh Government to donate or other related organizations should be applied immediately.

(5) Service network of bus and mini-bus needs modification depending on the development progress of the proposed MRT and BRT. The public transport network should be formulated with MRT, BRT and Bus.

(6) In this master plan, the fare rate for MRT is assumed to be the same as the fare rate of MRT Line 6. Although it is assumed that the rate will increase in the future in proportion to per capita GDP, it is still very low compared to the international level, and this level cannot be easily raised due to the sensitive elasticity of demand against fare rate. This reveals as one of the reasons of the poor financial performance. Considering the promotion of the participation of the private sector and the possible greatness of public subsidy, the toll/ fare rate however should be carefully looked into in the feasibility study.

(7) This master plan assumes that normal situation will continue for a long period of time (20 years or more). If unusual situation occurs, such as long financial distress and war, this master plan cannot be used and will lose its validity. On the other hand, this master plan could be updated periodically if normal situation continues and a series of traffic

surveys are conducted again (except for the personal trip survey). The conclusion and methodology of the said master plan could be handed over to the future with the periodical updating (basically every 5 years).