7.5 Master Plan Network

7.5.1 Planning Considerations

In formulating an affordable Transport Master Plan for the Study Area, it was assumed that with additional funding sources, US$ 10 billion or ₱ 400 billion would be realistic. Although there are some possible new fund sources for the TDM, it is unwise to rely too much on these. Besides, social consensus must also be obtained.

On this ground, the do-maximum network was reviewed and reassessed to downsize it without decreasing much its performance and balance. Within the assumed budget constraints, the Master Plan network was formulated and traffic across mini-screenlines and classified areas assessed.

The principles adopted here are the following:

1) The total cost should be around US$ 10 billion.
2) The N-S corridors should be provided with ample transport infrastructure to guide the planned urbanization.
3) The balance between corridors and areas should be considered.
4) Expensive railways were excluded from the do-maximum network due to the possibility of sharing railways between corridors.

7.5.2 Planned Network

Figures 7.7 to 7.10 present the initial master plan network for primary and secondary roads, expressway and railway, respectively. The network's transport capacity is a little lower than that of the do-maximum case, but it provides a larger capacity than the present.

Table 7.14
Summary of MMUTIS Master Plan (Road)

		Length (km)			Estimated Cost[1/] (₱ billion)
		Metro Manila	Outer Areas	Total	
Expressway	Existing	34	49	83	2
	Ongoing/Committed	9	–	9	20
	MMUTIS Proposal	103	12	115	136
	Subtotal	146	61	207	158
Primary Arterial	Existing	211	–	211	–
	Ongoing/Committed	8	–	8	8
	MMUTIS Proposal	112	241	353	170
	Subtotal	331	241	572	178
Secondary	Existing	307	21	328	–
	MMUTIS Proposal (existing)	2	81	83	10
	MMUTIS Proposal (new)	108	85	193	65
	Subtotal	417	187	604	71
Total		894	489	1,383	407

Source: MMUTIS Study Team
1/ Estimated by the MMUTIS

Figure 7.7
Primary Road Network (Master Plan)

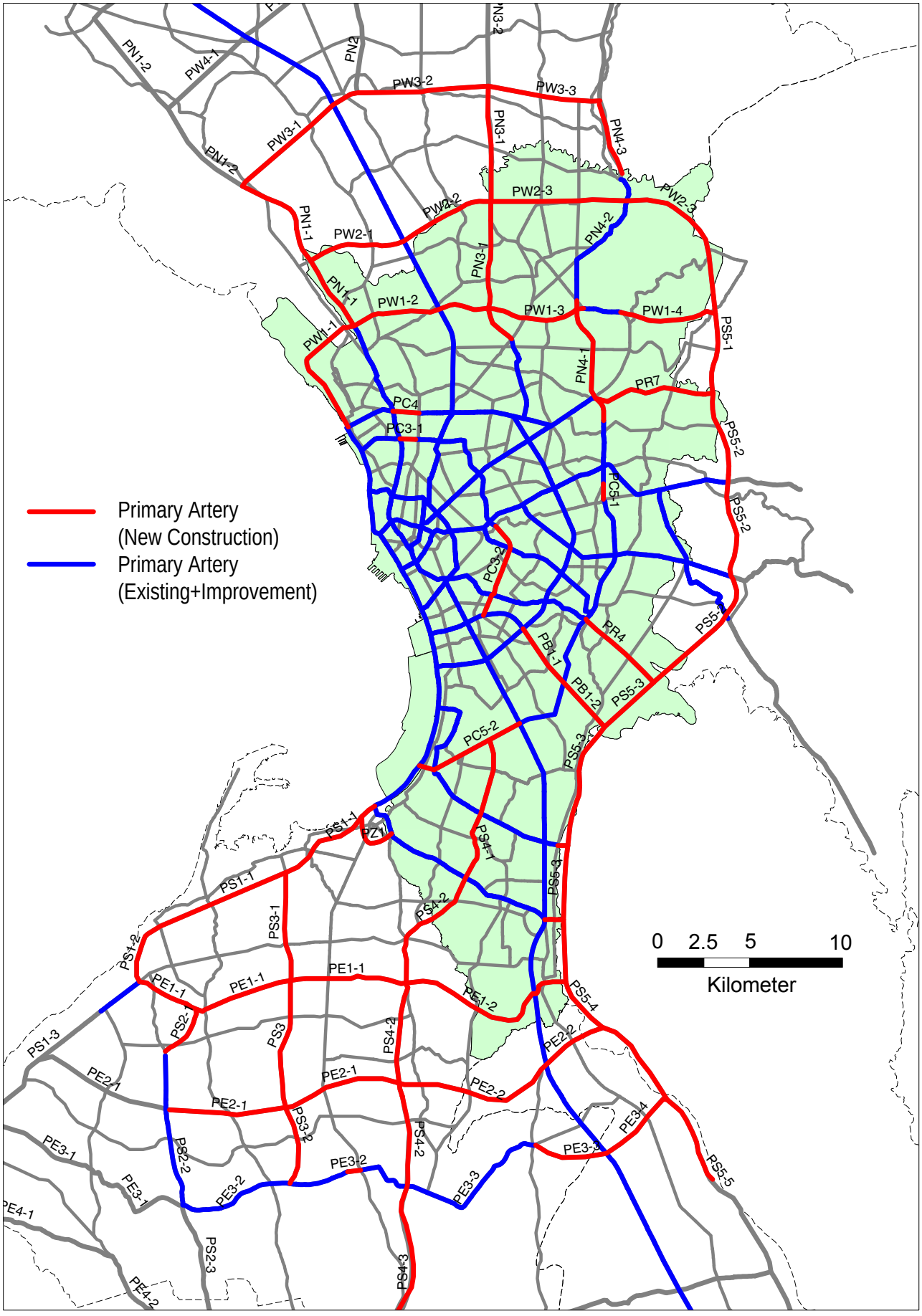


Figure 7.8
Secondary Road Network (Master Plan)

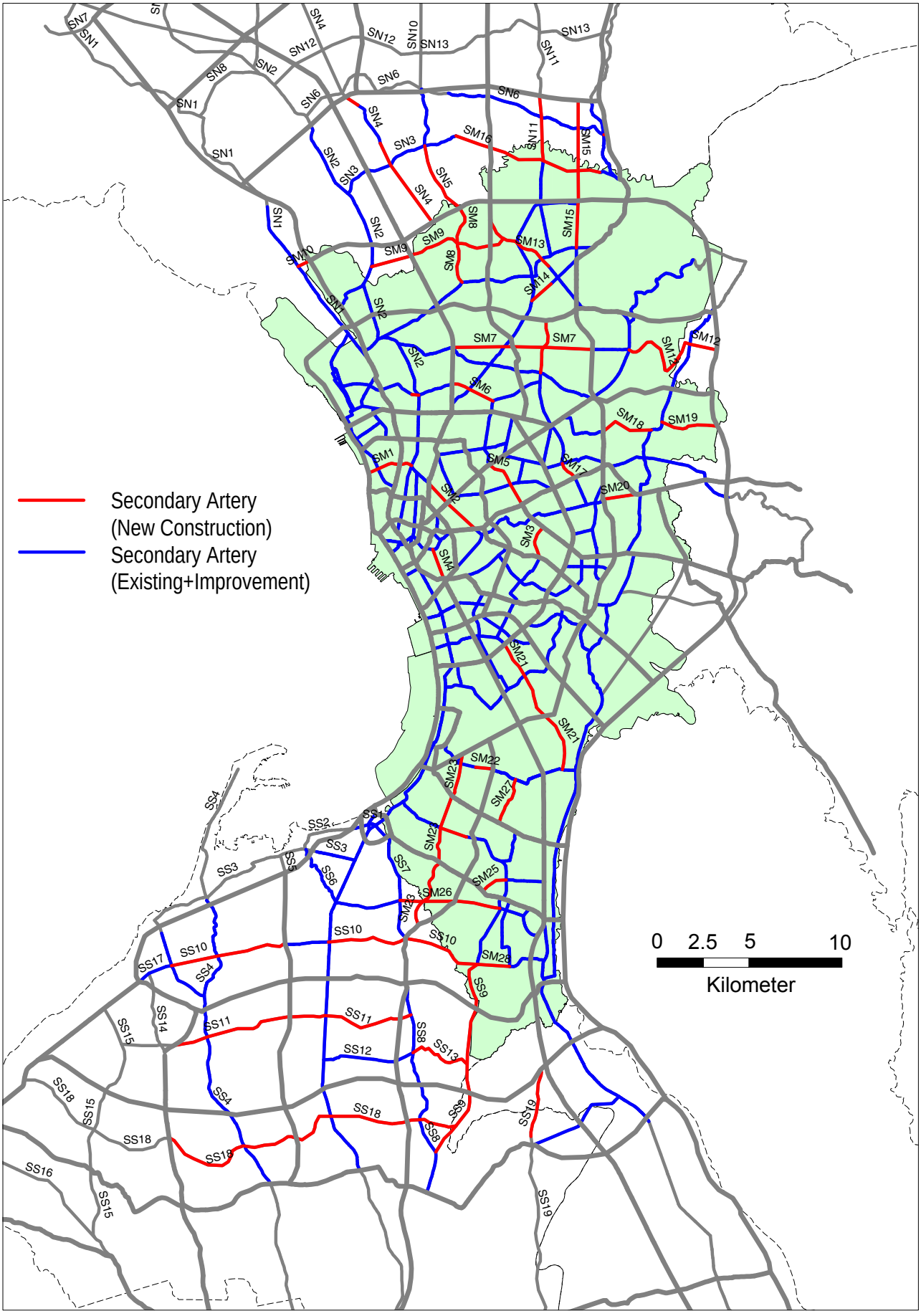


Figure 7.9
Expressway Network (Master Plan)

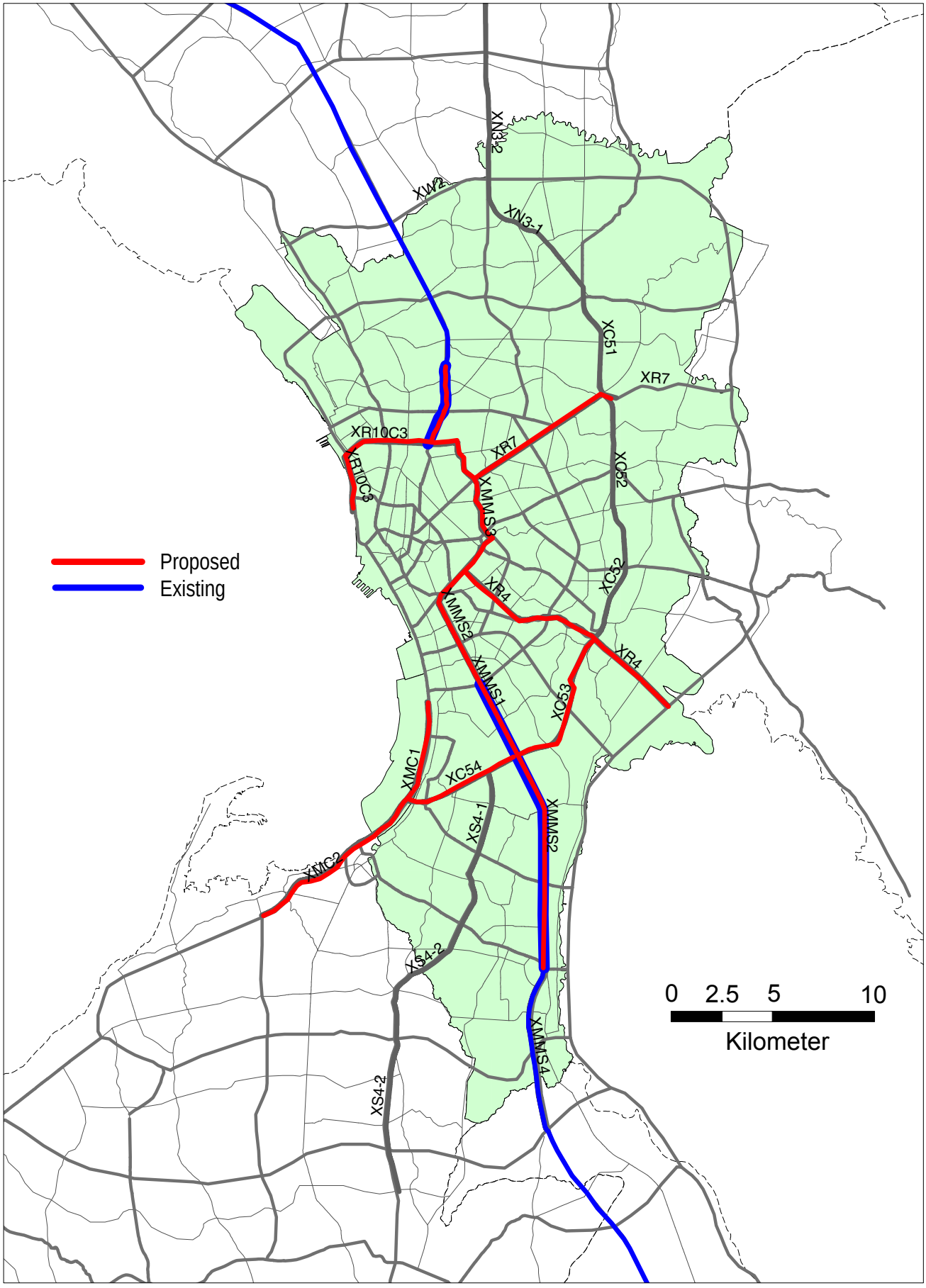
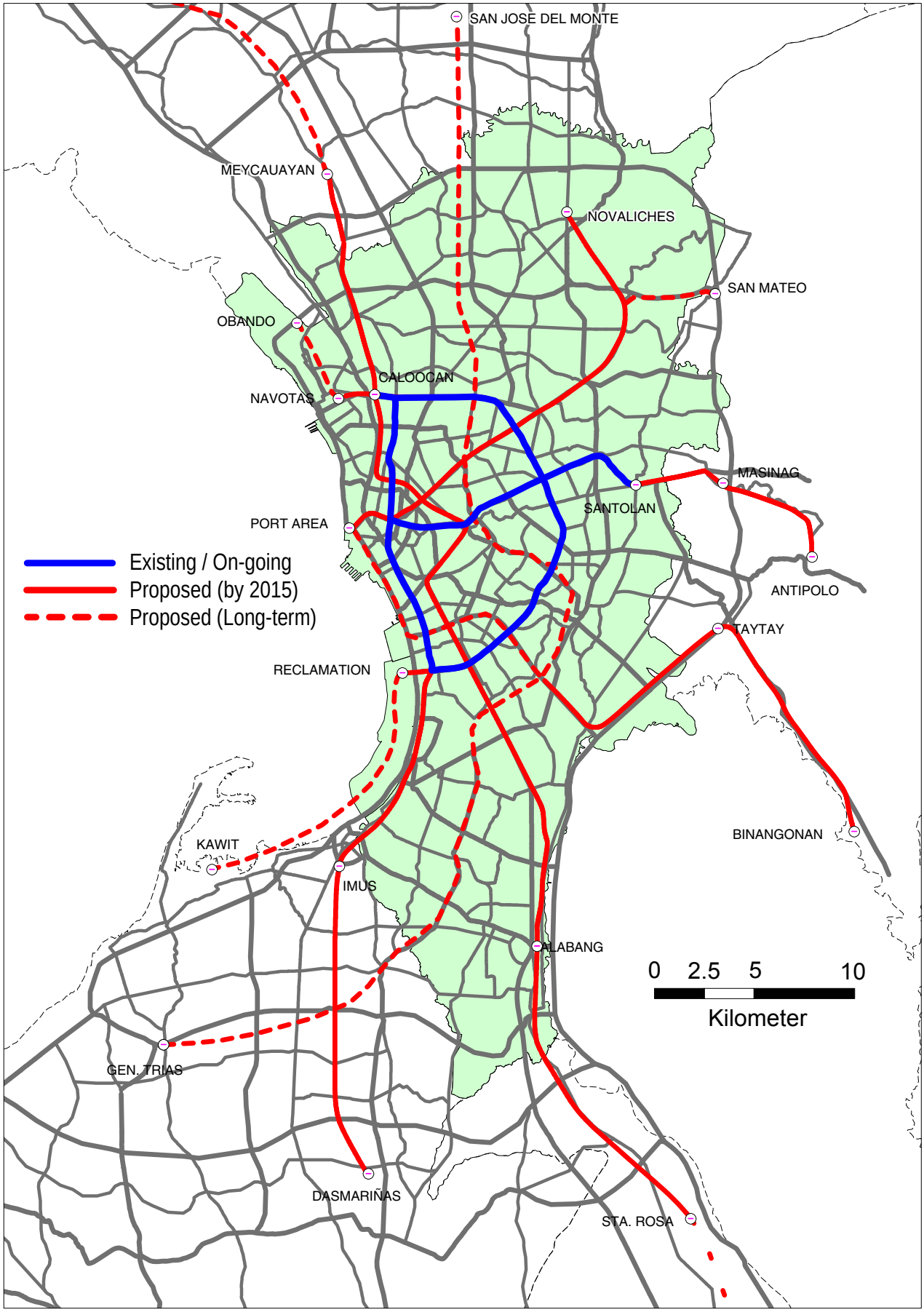


Figure 7.10
Railway Network (Master Plan)



7.5.3 Traffic Flows

Road

Network performance is assessed based on the demand-supply gap across the screenlines set in major corridors. The assigned traffic volume and assessment results are shown in Figures 7.11-7.12 and Tables 7.15-7.17, respectively, with the following characteristics:

1) Although in most corridors, the traffic situation is considered within tolerable range, some corridors such as EDSA (KK, SSH), SLE (IS2 and OS3), Aurora Boulevard (IE2), Mindanao/Quirino Highway (IN1), and McArthur Highway (IN3) are highly congested.

2) In general, the network capacity will be so fully utilized daily that the network would likely be heavily congested during peak hours. Therefore, traffic demand management as well as intervention in urban development/land-use control would be important policy options to effectively use the provided infrastructure.

3) For these corridors, policy options other than infrastructure development include road pricing, color coding, HOV schemes (introduction of higher-capacity road and public transport, enforcement of higher passenger occupancy of private cars, etc.), and maximum use of rail transit capacities.

Table 7.15
VCR of Roads by Area, Master Plan, 2015

Zone No.	Area	Capacity		Assigned		VCR
		PCU × km (Million)	Ratio to 1996	PCU × km (Million)	Ratio to 1996	
1	W/in EDSA	14.4	1.4	15.8	1.8	1.1
2	MMNorth1	7.3	2.3	7.3	2.7	1.0
3	MMNorth2	14.3	2.6	13.2	2.8	0.9
4	OutNorth3	7.1	4.8	6.8	4.7	1.0
5	OutNorth4	4.0	1.2	6.0	3.7	1.5
6	OutNorth5	4.3	3.6	5.2	7.2	1.2
7	MMEast1	5.9	1.6	5.6	1.8	0.9
8	MMEast2	5.7	2.7	6.2	3.5	1.1
9	OutEast3	1.5	1.6	3.1	3.6	2.1
10	OutEast4	3.6	1.5	5.8	3.6	1.6
11	MMSouth1	6.3	2.4	5.3	2.5	0.8
12	MMSouth2	9.5	2.0	10.2	2.5	1.1
13	OutSouth3	9.7	7.6	7.3	5.1	0.8
14	OutSouth4	9.2	6.0	3.0	4.7	0.3
15	OutSouth5	9.3	4.9	5.7	3.9	0.6
16	OutSouth6	6.9	1.3	6.7	4.5	1.0
Total		119.1	2.3	113.3	2.9	1.0

Figure 7.11
Traffic Volume and VCR of Highways, Master Plan, 2015

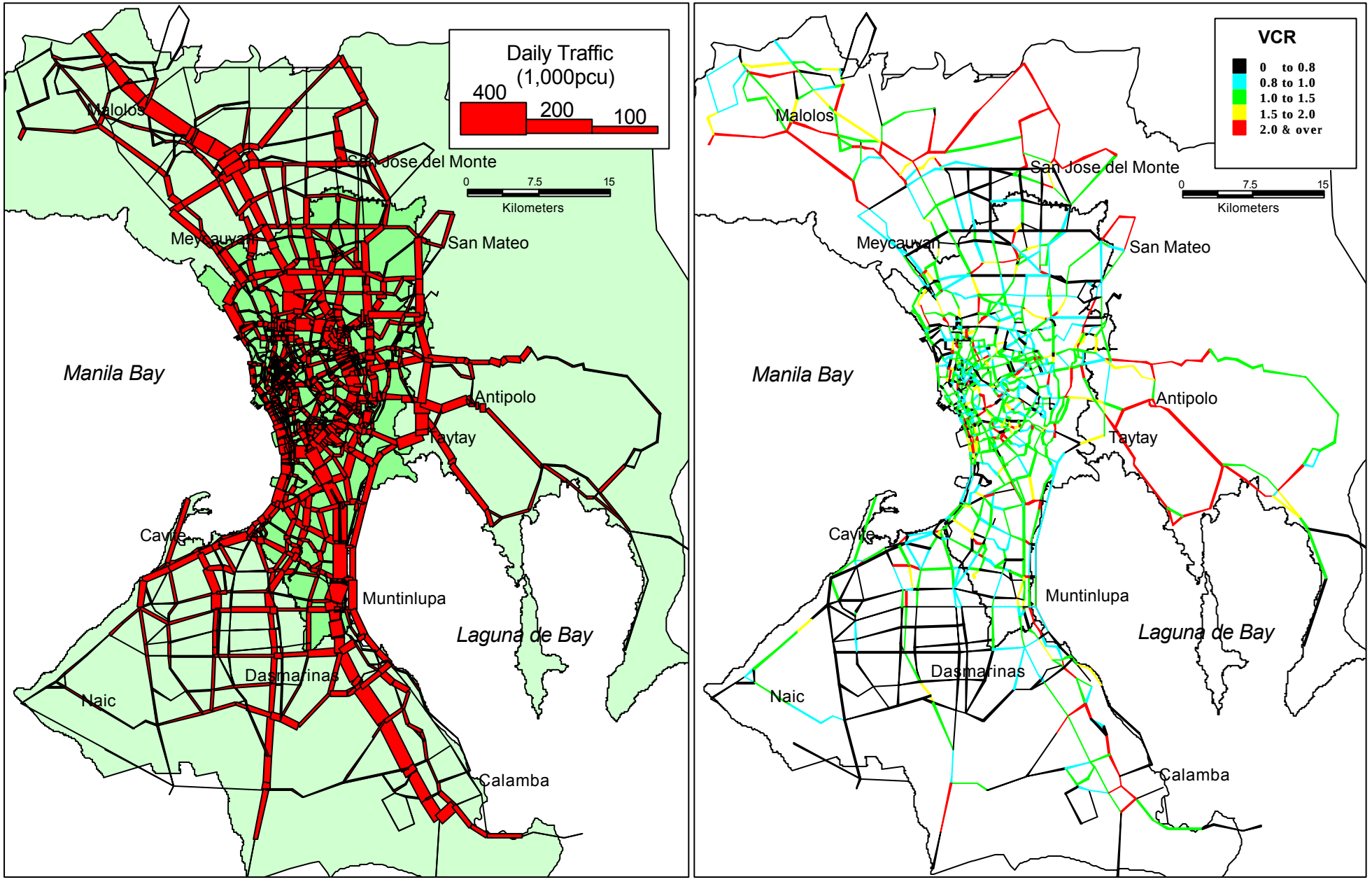


Figure 7.12
Expressway Traffic and Railway Passenger Flow, Master Plan, 2015

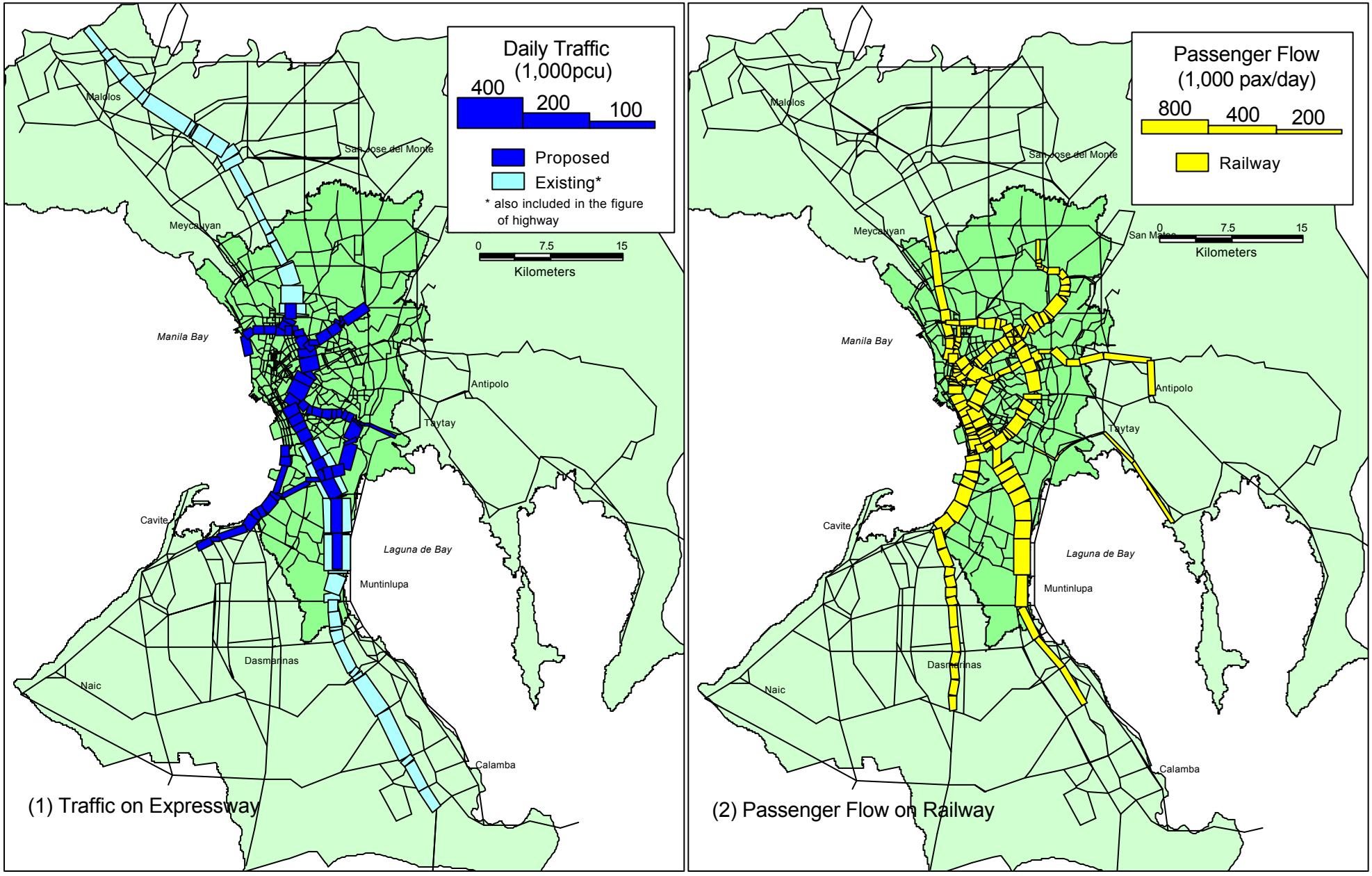


Table 7.16
Transport Capacity and Required Capacity Across Mini-Screenlines by Corridor
Master Plan, 2015

Corridor/ Mini-Screenline		Transport Capacity				Required Capacity				VCR on Roads
		Rail[1)] (No. of lanes)	Road (000 PCUs/day)			Rail[1)] (No. of lanes)	Road (000PCUs/day)			
			Highway	Express-way	Total		Highway	Express-way	Total	
Cavite Coastal	IS1	1.0	270	148	418	1.1	253	77	331	0.8
	OS1	-	187	148	335	-	135	103	239	0.7
	OS2	1.0	258	-	258	0.7	227	-	227	0.9
Laguna	IS2	1.0	469	148	617	1.2	533	147	680	1.1
	OS3	1.0	368	148	516	1.2	379	134	514	1.0
Rizal	IE1	1.0	362	148	510	-	380	120	501	1.0
	IE2	1.0	218	-	218	0.7	267	-	267	1.2
	OE	2.0	381	148	529	0.6	343	42	385	0.7
North East	INE	1.0	77	148	225	1.1	79	133	212	0.9
	ONE	1.0	370	-	370	0.1	276	-	276	0.7
North Plateau	IN1	-	253	-	253	-	277	-	277	1.1
	ON1	-	389	-	389	-	359	-	359	0.9
North Coastal	IN2	-	0	296	296	-	0	331	331	1.1
	IN3	1.0	233	-	233	0.6	306	-	306	1.3
	ON2	-	358	-	358	-	368	-	368	1.0
EDSA	KK	2.0	156	-	156	0.9	184	-	184	1.2
	GLP	2.0	185	-	185	1.0	188	-	188	1.0
	SSH	2.0	156	-	156	0.6	175	-	175	1.1

Table 7.17
Assessment of Demand Magnitude by Corridor/Mini-Screenline
Master Plan, 2015

Corridor/ Mini-Screenline		Demand (000 pax/day)				Required Capacity				VCR on Roads
		Rail	Road			Rail[1)] (No. of Lines)	Road (000PCUs/day)			
			Public	Private	Total		Public	Private	Total	
Cavite Coastal	IS1	961	465	574	1039	1.1	29	302	331	0.8
	OS1	-	618	381	999	-	38	200	239	0.7
	OS2	611	83	423	507	0.7	5	222	227	0.9
Laguna	IS2	1034	217	1267	1485	1.2	13	667	680	1.1
	OS3	1036	148	959	1107	1.2	9	504	514	1.0
Rizal	IE1	41	846	852	1698	-	52	448	501	1.0
	IE2	565	485	450	935	0.7	30	237	267	1.2
	OE	538	496	673	1170	0.6	31	354	385	0.7
North East	INE	895	282	370	652	1.1	17	194	212	0.9
	ONE	47	234	498	732	0.1	14	262	276	0.7
North Plateau	IN1	-	545	462	1008	-	34	243	277	1.1
	ON1	-	919	574	1493	-	57	302	359	0.9
North Coastal	IN2	-	1078	501	1580	-	67	263	331	1.1
	IN3	498	581	512	1094	0.6	36	269	306	1.3
	ON2	-	962	585	1547	-	60	308	368	1.0
EDSA	KK	802	589	280	870	0.9	36	147	184	1.2
	GLP	862	379	313	692	1.0	23	164	188	1.0
	SSH	483	505	273	778	0.6	31	143	175	1.1

1/ Capacity of railway was assumed to be 850,000 passenger per day for both directions at any cross-section.

Table 7.18
VCR of Roads Across Mini-Screenlines by Corridor, 2015

Corridor	Mini-Screenline	1996	Do-nothing	Do-committed	Do-maximum	Master Plan
Cavite Coastal	IS1	0.8	2.0	1.7	0.7	0.8
	OS1	1.6	6.1	6.1	0.6	0.7
	OS2	1.9	10.6	10.6	0.6	0.9
Laguna	IS2	1.1	3.6	3.6	0.9	1.1
	OS3	1.1	3.3	3.2	1.0	1.0
Rizal	IE1	0.7	1.6	1.5	0.8	1.0
	IE2	1.1	2.6	2.4	1.1	1.2
	OE	0.6	2.4	2.4	0.7	0.7
Northeast	INE	1.2	3.0	2.7	0.9	0.9
	ONE	0.4	1.5	1.5	0.6	0.7
North Plateau	IN1	1.1	3.5	3.5	0.9	1.1
	ON1	2.0	6.3	6.3	0.6	0.9
North Coastal	IN2	1.0	2.9	2.7	0.8	1.1
	IN3	1.6	3.9	3.9	1.0	1.3
	ON2	1.2	5.2	5.0	0.9	1.0
EDSA	KK	1.0	2.2	1.8	1.0	1.2
	GLP	0.9	2.3	2.0	1.0	1.0
	SSH	0.9	1.9	1.6	1.1	1.1

Table 7.19
VCR of Roads by Area, 2015

Zone No.	Area	1996	Do-nothing	Do-committed	Do-maximum	Master Plan
1	W/in EDSA	0.8	1.7	1.6	1.0	1.1
2	MMNorth1	0.8	2.3	2.2	0.8	1.0
3	MMNorth2	0.9	2.3	2.2	0.8	0.9
4	OutNorth3	1.0	4.2	4.2	0.6	1.0
5	OutNorth4	0.5	1.8	1.9	0.6	1.5
6	OutNorth5	0.6	3.5	3.5	0.3	1.2
7	MMEast1	0.8	2.0	1.9	0.9	0.9
8	MMEast2	0.8	2.1	1.8	1.0	1.1
9	OutEast3	0.9	3.4	3.4	2.0	2.1
10	OutEast4	0.7	2.5	2.5	1.6	1.6
11	MMSouth1	0.8	2.2	2.0	0.7	0.8
12	MMSouth2	0.9	2.7	2.4	0.9	1.1
13	OutSouth3	1.1	5.1	5.2	0.6	0.8
14	OutSouth4	0.4	1.7	1.7	0.1	0.3
15	OutSouth5	0.8	3.2	3.2	0.4	0.6
16	OutSouth6	0.3	1.3	1.3	0.7	1.0
Total		0.7	2.3	2.2	0.7	1.0

Railway

Passenger flow by railway is summarized in Table 7.20. The number of railway passengers will amount to nine million a day, and total passenger-km will be 105 million a day. Each line will carry over a million passengers daily except for Line 2 and North Rail. The MCX will carry nearly three million passengers daily, which means the enormous demand on the north-south axis will largely depend on the railway system.

Table 7.20
Railway Passengers, 2015

Line	Passenger No.	Section		Passenger Hours	(000/day) Passenger-km	Average Trip Length (km)
		Maximum	Average			
Line 1	1,100	870	640	300	9,000	8
Line 2	830	570	350	200	7,100	9
Line 2 South	220	180	110	20	900	4
Line 3	1,600	910	600	460	16,200	10
Line 4	1,340	890	620	390	13,700	10
Line 6	1,560	960	640	460	18,500	12
North Rail	750	570	490	130	5,300	7
MCX	2,900	1,230	800	890	35,600	12
Total	10,300			2850	106,300	11

The share of railway in public transport is expected to be 35% only in terms of passenger-km, indicating that buses will play an important role in public transportation.

Table 7.21
Share of Public Transport, 2015

Mode	Passenger		Passenger × Hour		Passenger × Km	
	No.	%	No.	%	No.	%
Bus (including busway)	24.8	50.4	9.0	63.5	181.0	58.7
Jeepney	14.1	28.6	2.3	16.3	20.8	6.8
Railway	10.3	21.0	2.9	20.2	106.5	34.5
Total	49.3		14.2		309.5	

7.5.4 Supportive Measures

The initial network Master Plan is not yet sufficient to attain a satisfactory level of service for road traffic. However, if some supportive measures are implemented coupled with the proposed infrastructure projects, traffic situation will largely improve. Table 7.22 lists these measures, mainly of the TDM type, for each corridor depending on the magnitude of the demand-supply gap. A "3-in-1" scheme intends to increase the current average occupancy of private mode (1.9) to at least 3.0 to reduce vehicular traffic. Additional infrastructures, such as expressway extension and railway upgrading, should be implemented using private sector funds or revenue-generating measures such as road pricing and raised tolls.

Table 7.22
Modal Policy by Mini-Screenline/Corridor

Corridor/Mini-Screenline		Recommended Policies
Cavite Coastal	IS 1	• Capacity increase of railway • High toll
	OS 1	• HOV Scheme (Jeepney to bus)
	OS 2	• HOV Scheme (3 in 1) →Road pricing • Capacity increase of railway
Laguna	IS 2	• HOV Scheme (3 in 1) • High toll • Capacity increase of railway
	OS 3	-
Rizal	IE 1	-
	IE 2	• HOV scheme (3 in 1) →Road pricing • Capacity increase of railway
	OE	-
Northeast	INE	• HOV scheme (Jeepney to bus)
	ONE	-
North Plateau	IN 1	• HOV scheme (3 in 1) →Road pricing
	ON 1	• HOV scheme (3 in 1) →Road pricing
North Coastal	IN 2	• Extension of expressway • High toll
	IN 3	• HOV scheme (3 in 1) →Road pricing • Capacity increase of railway
	ON 2	• Extension of expressway • High toll
EDSA	KK	• HOV scheme (3 in 1) →Road pricing
	GLP	• HOV scheme (3 in 1) →Road pricing
	SSH	• HOV scheme (3 in 1) →Road pricing

7.6 Profile of the Plan Components

7.6.1 Road

The components of the Master Plan for Road are enumerated in Tables 7.23-7.25.

Table 7.23
Project List for Expressways

CODE	Name	Length (km)	Type of Work	Implementation Period 1999-2005	2005-2010	2010-2015	Project Cost (₱ million) Capital Cost Total	Public	Recurrent (₱/Year)	Agency
XMMS	Skyway	33.0	N				60,400	12,080	2.52	BOT-PMO
XR10C3	Port Access	7.5	N				12,732	2,546	0.50	BOT-PMO
XC5	C-5 Express	13.4	N				22,748	4,550	0.90	BOT-PMO
XR4	R-4	12.5	N				21,220	4,244	0.90	BOT-PMO
XR7	R-7	8.3	N				14,000	2,800	0.90	BOT-PMO
XMC	Manila-Cavite	14.5	N				24,612	4,922	0.97	BOT-PMO
XNL	North Luzon Expressway	32.3	I				1,683	1,683	2.15	Region III
TOTAL		123.8					157,395	31,142	6.69	

Source: MMUTIS Study Team

Table 7.24
Project List for Primary Roads

CODE	Name	Length (km)	Type of Work	Implementation Period 1999-2005	2005-2010	2010-2015	Project Cost (₱ million) Capital Cost Total	Public	Recurrent (₱/Year)	Agency
PC3	C-3 Missing Link	6.3	N				10,352	10,352	0.42	URPO
PC4	EDSA Missing Link	1.3	N				2,807	2,807	0.09	URPO
PC5	C-5 Missing Link	7.5	N				7834	7,834	0.50	URPO
PB1	Buendia Ave. ext.	7.0	N				12,849	12,849	0.47	URPO
PR7	R-7 East ext.	6.0	N				9,752	9,752	0.40	URPO
PR4	R-4 East ext.	5.0	N				5,351	5,351	0.34	URPO
PS5E	C-6 East Section	39.0	N				11,528	11,528	2.61	Region IV-A
PS1	Talaba – Maragondon Road	19.9	N/I				4,415	4,415	1.27	Region IV-A
PS2	Gen.Trias – Indang Road	11.0	N/I				1,496	1,496	0.74	Region IV-A
PS3	Kawit – Mabatang Road	16.5	N				3,064	3,064	1.11	Region IV-A
PS4	South Central Road	37.0	N				19,416	19,416	2.48	Region IV-A
PS5S	Laguna de Bay Coastal Road	12.5	N				5,020	5,020	0.84	Region IV-A
PE1	Tanza-Muntinlupa Road	24.5	N				7,104	7,104	1.64	Region IV-A
PE2	Calibuyo-San Pedro Road	22.9	N				6,470	6,470	1.63	Region IV-A
PE3	Naic-Biñan Road	29.0	N/I				5,312	5,312	1.94	Region IV-A
PZ1	Talaba/Zapote Ring Road	2.5	N				835	835	0.17	Region IV-A
PN1	Caloon-Malolos Road	9.0	N				4,649	4,649	0.60	Region III
PN3	North Central Road	14.0	N				10,293	10,293	0.94	Region III
PN4	C5 North Ext.	18.0	N/I				13,521	13,521	1.29	Region III
PW1	C5 North Section	27.0	N				17,852	17,852	1.81	Region III
PW2	C6 North Section	24.0	N				11,376	11,376	1.61	Region III
PW3	Taliptip-San Jose del Monte Rd	21.0	N				7,126	7,126	1.41	Region III
PA1	Airport Access	1.3	N/I				2,148	2,148	0.09	DPWH
GS1-5	Grade Separation, Central	---	N				2,400	2,400	0.21	URPO
GS6	Grade Separation, Southern	---	N				480	480	0.04	URPO
GS7,8	Grade Separetion, Eastern	---	N				960	960	0.09	URPO
TOTAL		360.9					184,408	184,408	24.74	

Source: MMUTIS Study Team

Table 7.25
Project List for Secondary Roads

CODE	Name	Length (km)	Type of Work	Implementation Period 1999-2005	Implementation Period 2005-2010	Implementation Period 2010-2015	Project Cost (P million) Capital Cost Total	Capital Cost Public	Recurrent (P/Year)	Agency
SM1	Aurora Ave. Ext.-R10	2.5	N				1,727	1,727	0.17	URPO
SM2	A.M.Maceda & Ext.-Aurora Blvd.	3.5	N				838	838	0.23	URPO
SM3	F. Martinez Ext.-Ortigas Ave.	1.7	N				523	523	0.11	URPO
SM4	SLE Ext.(Pres Quirino-J.P.Laurel)	1.8	N				2,709	2,709	0.12	URPO
SM5	Gilmore Ave. Ext.-Roosevelt	1.5	N				1,062	1,062	0.10	URPO
SM6	Victoneta Ave. Ext.-Congressional Ave.	2.5	N				865	865	0.17	URPO
SM7	Sampaguita Ave. West Ext.	7.5	N				2,375	2,375	0.50	URPO
SM8	Prenza-Kaybiga Rd.	4.5	N				882	882	0.30	URPO
SM9	Meycauayan-Deparo	7.0	N				1,878	1,878	0.47	URPO
SM10	C6 Ext.-J.P.Rizal	0.3	N				92	92	0.02	URPO
SM11	Visayan Ave. North Ext.	2.7	N				855	855	0.18	URPO
SM12	Sampaguita Ave. East Ext.	8.8	N				3,309	3,309	0.59	URPO
SM13	Don M.Marcos Ave. Ext.-North Central Rd	4.5	N				2,116	2,116	0.30	URPO
SM14	Quirino Highway Novaliches Bypass	1.5	N				418	418	0.10	URPO
SM15	Regalado Ave. North Ext.	8.0	N				1,764	1,764	0.54	URPO
SM16	Marilao-Quirino Rd.(Prenza-Quirino Hwy)	9.0	N				2,407	2,407	0.60	URPO
SM17	Kalayaan Ave. Ext.-29th Ave.	1.0	N				725	725	0.07	URPO
SM18	New Marikina Rd.	3.2	N				1,242	1,242	0.21	URPO
SM19	Bayan-Bayanan Ave.	3.0	N				976	976	0.20	URPO
SM20	Col.B.Serrano Ave. Ext.-Marcos Hwy	2.0	N				1,438	1,438	0.13	URPO
SM21	Passay Rd. Ext. (EDSA-Gen.Santos)	7.5	N				6,552	6,552	0.50	URPO
SM22	Jerusalem Ext.-Doña Soledad Ave.	0.8	N				190	190	0.05	URPO
SM23	New Las Piñas Rd.	10.5	N				4,354	4,354	0.70	URPO
SM24	Naga Rd. Ext.-A.Aguirre Ave.	0.8	N				221	221	0.05	URPO
SM25	Dr. J. Laurel & Ext.	1.3	N				359	359	0.09	URPO
SM26	Imus-Filinvest Rd.	4.0	N				956	956	0.27	URPO
SM27	France Ave. & Ext.	2.5	N				694	694	0.17	URPO
SM28	Tanza Alabang Rd.(Acacia Ave.-National Highway)	4.0	N/I				1,528	1,528	0.27	URPO
SN1	Panghulo Rd./J.P.Rizal/Baiwas	6.7	I				406	406	0.45	Region III
SN2	McArthur Highway	17.4	I				1,055	1,055	0.47	Region III
SN3	Marilao-Quirino Rd.(McArthur Hwy-Prenza)	6.0	I				486	486	0.40	Region III
SN4	Iba-Liciado Rd.	6.7	N				952	952	0.45	Region III
SN5	Kaybiga-Prenza Rd.	4.5	N				1,050	1,050	0.30	Region III
SN6	Bocaue-Tunkong Manga Rd.	7.1	I				434	434	1.21	Region III
SN10	Prenza-Magasawang Sapa Rd.	2.9	N/I				444	444	0.19	Region III
SN11	Camarin Road Ext.	3.7	N/I				435	435	0.25	Region III
SS1	Las Piñas-Talaba Diversion Road	1.0	I				84	84	0.07	Region IV-A
SS3	Highway 25/Gen. Trias National Rd.	2.7	I				1,682	1,682	0.18	Region IV-A
SS4	J.Felipe Blvd./Gen.P.Alvarez/Bacao Ave.	16.3	I				2,444	2,444	1.07	Region IV-A
SS6	Imus River East Road	3.5	I				401	401	0.23	Region IV-A
SS7	Moleno National Road	6.5	I				715	715	0.44	Region IV-A
SS8	Moleno National Road Ext.	11.0	I				804	804	0.74	Region IV-A
SS9	Acacia Ave. Ext.	10.5	N				2,502	2,502	0.70	Region IV-A
SS10	Tanza–Alabang Rd.(Tanza–Acacia Ave.)	17.0	N/I				3,913	3,913	1.14	Region IV-A
SS11	Sout Tanza - South Pag – Asa Road	13.4	N				3,946	3,946	1.07	Region IV-A
SS12	Salitran – Salawag Road.	5.0	I				392	392	0.34	Region IV-A
SS13	New Salawang Road.	3.5	N				1,474	1,474	0.23	Region IV-A
SS17	A.S. Soriano Highway	1.7	I				134	134	0.11	Region IV-A
SS18	Naic – Das Mariñas Road	16.7	N				5,263	5,263	1.14	Region IV-A
SS19	West Carmona Road	4.5	N				2,612	2,612	0.30	Region IV-A
TOTAL		276.1					74,677	74,677	18.69	

Source: MMUTIS Study Team

7.6.2 Railway

The components of the Master Plan for the MRT, LRT and busway are enumerated in Table 7.26.

Table 7.26
MRT/LRT/Busway Line

Lines	Section	Code	Profile		Type[1/]	Estimated Capital Cost ($ Mil)		
			Length :Km	System		Infra[2/]	E & M[2/]	Total
Line 1 & Line 6	Existing (Mon.-Baclaran)	Rio	14.5	El-Lrt	U	-	-	-
	S. Extension (Imus)	Risa	15.0	El-Mrt	S	450	450	900
	S. Extension (Dasmariñas)	Risb	15.0	Ag-Mrt	S	150	300	450
	Subtotal		44.5			600	750	1,350
Line 2	E. Extension (Antipolo)	R2ea	7.7	Ag/El Busway	S	77	-	77
	E. Extension (Masinag)	R2e	4.0	El-Mrt	S	137	91	228
	Existing (Recto-Santolan) [3/]	R2o	14.0	El-Mrt	U/S	(488)	(368)	(856)
	W. Extension (N. Harbor)	R2w	4.0	El-Mrt	U	137	91	228
	Se. Extension (Taytay)	R2eb	19.8	Ag/El-Mrt	U/S	168	150	318
	Se. Extension (Binangonan)	R2ec	12.0	Ag/El Busway	S	120	-	120
	Subtotal		53.7			639	332	971
Line 3	Nw Extension (Navotas)	R3n	10.0	El-Mrt	U	258	216	474
	Existing (Q. C.- Pasay Rtd.) [3/]	R3o	16.8	El/Ag-Lrt	U	(235)	(420)	(655)
	S. Extension (Reclamation)	R3s	2.0	El-Mrt	U	48	45	93
	Subtotal		28.8			306	261	567
Line 4	Main (Recto-Batasan)	R4oa	15.1	El-Mrt	U	453	453	906
	Phase 2 (Novaliches)	R4ob	7.7	El-Mrt	U	231	193	424
	Branch Line (San Mateo)	R4oc	4.0	Ag/El Busway	S	40	-	40
	Subtotal		26.8			724	646	1,370
Pnr-N.Rail /MCX	Meycauayan (Caloocan)	R5n	18.0	Ag-Mrt	Ic,S	349	409	758
	Caloocan-Sta. Mesa	R5m	8.0	El-Mrt	Ic,U	240	240	480
	Sta. Mesa-Edsa	R6sa	8.6	El-Mrt	Ic,U	258	258	516
	Edsa-Alabang	R6sb	22.1	Ag-Mrt	Ic,U	177	442	619
	Alabang-Sta. Rosa	R6sc	14.8	Ag-Mrt	Ic,S	119	296	415
	Subtotal		71.5			1,143	1,645	2,788
	Total		196.5			3,412 (P136b)	3,634 (P145b)	7,046 (P281b)

Source: MMUTIS Study Team
1/ IC= intercity, S=suburban, U=intracity-type of operation/service.
2/ Infrastructure includes guideway, stations/terminals, depot, etc. while E&M includes rolling stock, power supply, catenary train control, signaling, depot equipment, track works, and other maintenance facilities, etc.
3/ Ongoing projects.

7.7 Investment Summary

In accordance with investment priorities, identified projects and schemes have been broadly categorized as follows:

1) Basic Program

- Low-cost management measures
- Maintenance, rehabilitation and minor improvements
- Improvement of existing road network

2) Committed Major Projects

- The portion of the costs of committed projects that have to be funded during the MMUTIS planning period

3) New Major Investments

- Primary roads
- Secondary roads
- Expressways
- MRT/LRT and busways

The initial project lists have been prepared for roads (see Tables 7.23-7.25), MRT/LRT and busway (see Table 7.26), traffic management, and transport nodes. Investment costs of components other than roads and rail/busway have been estimated based on the MMURTRIP and other assumptions and summarized in Table 7.27.

The Master Plan is expected to meet the future requirements of socio-economic activities in the Study Area. The proposed network, with alternative arterial systems of MRT/LRT, expressways and at-grade primary roads, will integrate the outer area with the existing urban area. Moreover, it will provide a base infrastructure in the outer areas where subcenters can be developed to disperse the population and urban function in a more balanced manner. It provides a reasonable level of transport infrastructure capacity even though the overall service capacity would only allow supply to meet demand narrowly. This implies that with the proposed level of infrastructure, there would still be traffic congestion during peak hours and along some corridors. Traffic and demand management measures as well as priority measures for public transport will remain important and have to be strengthened.

Table 7.27
Master Plan Investment Summary

		Total Cost ₱ Billion	Cost to Govt.	Remark
CORE	1) Basic Program	30	30	
	2) Ongoing/Committed Projects	181	153	
	3) MMUTIS Projects			
	a) Primary Road	153	153	Grade separation, airport access
	b) Secondary Road	75	75	Subdivision road
	c) Expressway	53	11	Skyway, Port Access
	d) MRT/LRT/Busway	175	84	Line 6 (Imus), Line 2 (Masinag), Line 3 Extension, Line 4, PNR Improvement
	Subtotal	**667**	**468**	
CORE PLUS	1) Primary Road	24	24	
	2) Expressway	84	17	
	3) MRT/LRT/Busway	47	26	
	Subtotal	**155**	**67**	
TOTAL		**822**	**535**	

Source: MMUTIS Study Team

7.8 Economic Evaluation

7.8.1 Expected Benefits

In general, project benefits, varying from direct transport benefits to indirect environmental, social and economic ones, would be widely distributed among beneficiaries – passengers, other transport users and the local economy and society. The expected benefits can be summarized as follows:

1) Project facility users: Shorter travel time will allow users to have more time and energy for other more productive pursuits, besides having a comfortable, punctual and safe travel.

2) Other transport users: More route diversion by project will normally contribute to the reduction in road traffic congestion for other transport users.

3) Nontransport sector: The expected benefit could be more extensive for the nontransport sector. This would include appreciation of land values to reflect urban reform and more effective development, provision of various job opportunities during construction and operating phases, improvement of the urban environment, and enhancement of traffic safety. It should be noted, however, that environmental degradation, such as air, water and noise pollution, might occur in some areas during the construction period.

Table 7.28
Expected Benefits from the Projects

Benefit Type	Project Facility Users	Other Transport Users	Nontransport Activity/Society
Less travel time	vv	vv	-
Reduced vehicle operating cost	-	vv	-
Improved reliability	vv	-	-
Enhanced traffic safety	v	v	
Reduced air pollution and noise	v	v	vv
Increased land value	-	-	vv
Job opportunities	-	-	vv

Note: vv- significant positive effect
v- expected positive effect

7.8.2 Methodology

Economic evaluation is done by comparing project benefits and costs, both expressed in terms of economic prices over project life. However, it is difficult to translate benefits and costs into economic prices.

In this study, the estimate of the benefits is limited only to time saving and reduction of operating costs. The first benefit can be estimated by comparing the change in passenger-hr with and without the project. On the other hand, the second benefit can be measured in terms of the change in vehicle-km and vehicle-hr with and without the project. The procedure taken in making the economic evaluation is outlined in Figure 7.13.

The general types of economic indicators are as follows:

Economic Internal Rate of Return (EIRR): The EIRR shows the discount rate which gives the breakeven point between the present value of benefits and cost as given by the following formula:

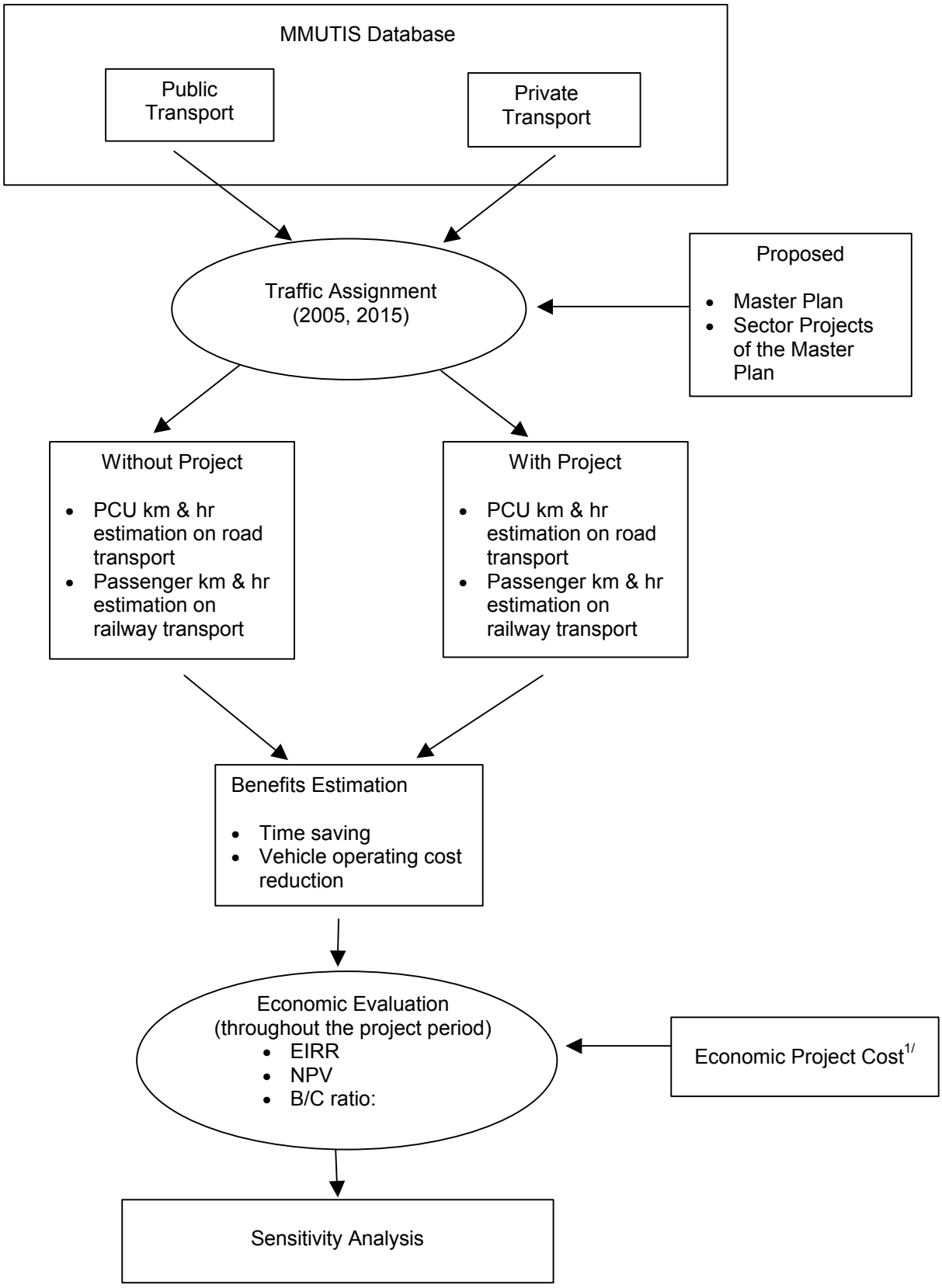
$$B(R) - C(R) = 0$$

$$B(R) = \sum_{i=1}^{n} \frac{b_i}{(1+R)^i}$$

$$C(R) = \sum_{i=1}^{n} \frac{c_i}{(1+R)^i}$$

Where, R : Internal Rate of Return
c_i : Cost in the year (i)

Figure 7.13
Procedure for Economic Evaluation



1/ A conversion factor from financial to economic cost was assumed. It is 0.83 for infrastructure and civil works, 0.78 for machinery and equipment, and 1.00 for land acquisition and compensation.

b_i : Benefits in the year (i)
N : Project life in years

For the project to be economically feasible, the EIRR should be more than the opportunity cost of capital in the Philippines, which is generally pegged at 15% by the National Economic Development Authority.

Net Present Value (NPV): The NPV indicates the difference between the discounted costs and benefits using the rate of opportunity cost of capital. A positive NPV means the project is economically feasible.

Benefit-Cost (B/C) Ratio: The B/C ratio is obtained by dividing the present value of benefit with that of the cost. The formula is given as follows:

$$\text{Benefit-Cost Ratio} = \frac{B}{C}$$

$$B = \sum_{i=1}^{n} \frac{b_i}{(1+r)^i}$$

$$C = \sum_{i=1}^{n} \frac{c_i}{(1+r)^i}$$

Where, r : Discount rate
c_i : Cost in the year (i)
b_i : Benefit in the year (i)
N : Project life in years

7.8.3 Vehicle-operating Cost and Value of Time

Vehicle-operating Cost (VOC)

Road-based public and private transport surveyed in the MMUTIS were used in estimating the VOC, the major input to estimate project benefit. The results are shown in Table 7.28 which shows almost the same results as the DPWH figures.

The VOC for railway transport was estimated separately at ₱ 0.287/passenger-km based on recent feasibility studies including those on Line 2 and Line 6.

Value of Time (VOT)

The VOT, used to estimate time-saving benefits, in 1996 was ₱ 432.29/vehicle-hr for public transport and ₱ 60.42/vehicle-hr for private transport. It is assumed that the VOT would increase 1.36 times in 2005 and 1.66 times in 2015.

Table 7.29
Vehicle-operating Cost

Km/h	Public		Private	
	₱/km[1/]	₱/hr[2/]	₱/km[1/]	₱/hr[2/]
0	4.757	25.35	3.268	16.88
10	4.197	40.25	2.849	23.68
20	3.197	47.70	2.640	27.08
30	3.730	50.84	2.284	26.96
40	3.632	52.13	2.379	25.93
50	3.670	52.78	2.342	24.70
60	3.842	53.16	2.352	23.90
70	4.103	53.61	2.422	22.39
80	4.558	54.50	2.562	21.43
90	5.339	56.33	2.805	21.66

1/ distance-related VOC (₱/km)
2/ time-related VOC (₱/hr)

7.8.4 Economic Evaluation Results

Economic Evaluation of Master Plan

The economic analysis for the Master Plan is shown in Table 7.29. With an EIRR of 46.7%, the Plan is economically feasible.

Sector Projects of the Master Plan

The economic analysis of the Master Plan was carried out by sector and its results are shown in Table 7.29. All the sector projects have EIRR values of more than 15% and are economically feasible.

Table 7.30
Economic Evaluation Results

	EIRR (%)	B/C	NPV (million ₱)
Master Plan	46.4	4.7	632,361
MRT	40.6	3.5	153,883
Expressway[1/]	50.8	3.8	107,340
Primary Arterial	47.5	6.3	298,165
Secondary Arterial	28.7	2.7	45,127

1/ Assumes a toll rate of ₱ 4/km.

8 IMPLEMENTATION

8.1 Requirements of the Planning Process

A long-range transportation development plan, such as what is contained in this report, encompasses a list of desirable "hard" projects as well as a set of policies or "soft" measures, implementation of which is scheduled over a 20-year period. This is the essence of planning – determining what needs to be done first. A practical method is to break the "hard" projects into a six-year capital investment program and incorporate it into the respective annual budgets of the MMDA, DPWH, DOTC, LRTA, PNR, PNP (Philippine National Police), and the LGUs. These government entities must be fully aware of the Master Plan, understand not only its individual elements but also its relationship with other projects, and accept their share of the responsibility to realize it.

Although there is no necessity to update the Plan every year, it would be advisable to review it every six years. More detailed feasibility studies, however, should be undertaken for each project in the Plan – whether lined up for private sector funding or conventional financing mode. Inevitably, these studies may modify the Plan. It is important, however, to maintain its overall integrity.

The government entity responsible for updating the Plan is the MMDA since it covers the 17 LGUs included in the Study Area. For the LGUs in Bulacan, Rizal, Laguna, and Cavite, the MMUTIS recommends their respective provincial governments to be responsible for updating the Plan. This suggestion should not be construed as a prescription for the 64 LGUs in the MMUTIS Study Area to be complacent, for the ultimate burden (and benefits) of planning rests on them and their cooperation among each other.

However, because of the existing distribution of power, the actual implementation of most of the projects in the Master Plan will eventually fall on the national government and its agencies. While the 64 LGUs are not expected to finance and implement them, they can pave the way for their early and smooth implementation. Conversely, LGU inaction could consign proposed projects into oblivion.

All stakeholders in the Greater Manila Region must participate and share in the planning and budgeting process. To ensure this, necessary information about the Plan must be provided on a continuing basis to the aforementioned public entities as well as to other stakeholders by way of publication of the Master Plan or making it available on the Internet.

8.2 Strengthening Metropolitan Governance

Sometime in the last quarter of 1998, the *Asiaweek* magazine came out with its rankings of well-governed metropolitan cities. Metro Manila was ranked 14th. Its "Checklist" of the things that make a city function included:

Rule of Law – Having legal frameworks that are both fair and fairly enforced.

Responsiveness - Serving the interest of all stakeholders.

Consensus - Mediating different aspirations to each broad agreement in the best interest of the community.

Equity – Providing opportunity to all men and women to improve their well-being.

Effectiveness and efficiency - Meeting needs through the best use of resources.

Accountability - Decision-makers (in government, private sector and citizens groups) are answerable to the public as well as to their own organizations.

Strategic vision - A long-term perspective on what is needed for society to grow.

It is beyond the ambit of the MMUTIS to offer a treatise on metropolitan governance nor to evaluate the MMDA's performance vis-a-vis the above checklist. Suffice it to say, however, that it provides a long-term perspective on the needs of the transport sector to enable the GMR to grow.

Good governance is the key to the effective implementation of the Master Plan. It requires consensus-building, interagency coordination, rational resource allocation, effective involvement of local governments and stakeholders in the process of development, and transparency. For the 17 LGUs in the inner urban core of the GMR, **the MMDA is expected to act as the central metropolitan agency.** Transport and development planning process should be established, mega projects coordinated, public transport regulatory process improved, city officials trained, institutional fragmentation rectified. An adequate set of database and planning tools are also needed. An increasingly important approach to infrastructure development is the integration of transport modes and facilities as well as between transport and urban planning and development.

With regard to transportation, the two major responsibilities for which the MMDA has to make its mark in are in implementing and updating the Transport Master Plan and in managing and enforcing traffic. Failure in the first task will make the performance of the second nearly impossible.

At the start, there was no motivation for the different agencies to follow and conform to the Master Plan. However, it was gradually accepted by stakeholders and decision-makers. As for the MMDA, **there are many choices of action that it can and should pursue to gain credence**:

1) Mobilize political and public support for specific road and rail projects that are part of the transport plan, and deny local permits for those that are not;

2) Define the ground alignments of the proposed network and reserve their corresponding rights-of-way in coordination with the respective LGU;

3) Coordinate regularly any changes or modifications, in time or in space, to the Plan and disseminate the same to all the stakeholders;

4) Monitor the progress of implementing strategic projects by the DPWH, DOTC and other line agencies, and relate the same to the Plan's targets;

5) Localize the plan by informing and educating the LGUs about relevant transport projects within their respective jurisdiction and assist them in incorporating alignments/locations of key transport infrastructures into a statutory city plan such as zoning land-use plan or physical framework plan;

6) Undertake key projects where they can make a difference, such as land re-adjustment in an urban block that can serve as a multimodal terminal or that can pave the way for another important project;

7) Demonstrate commitment by taking a position in a high-profile or controversial venture, be it adverse (e.g., high-rise building in a zone where its traffic impact cannot be mitigated) or favorable (e.g., relocation of dwellers affected by a project) to the Plan.

On the second role, the MMDA has introduced ad hoc traffic management measures that produce some relief, but sometimes adverse impacts on congestion. It is in this area of responsibility, aside from garbage, where the MMDA has to prove its value as a governing institution. Conversely, it could strengthen its position by patiently building on 'small islands of traffic successes' rather than aim for dramatic improvements of which there is none, since Metro Manila has nearly used up the less painful or high-impact solutions. Although the MMDA has begun to develop its human resource capacity through recruitment, training and equipping of traffic enforcers, these are necessary but not sufficient measures.

8.3 Financing Strategy

Funding is the final arbiter in deciding which of the “hard” transport projects will be implemented. There is a saying “he who has gold rules”; in the GMR, it is the national government that has it, albeit little. Until and when the LGUs control the supply of funds, their control over metropolitan development will remain limited.

The national government traditionally funds transport infrastructure projects through a combination of taxes, user charges and loans both foreign and local. Among the traditional tax instruments are fuel tax, common carriers tax, motor vehicle tax, and income and value-added taxes. While it can – and should – expand all three funding categories, it is in the area of user charges where it should do more. The absolute inadequacy of public funds to cover Master Plan projects require the government to tap new funding sources and create a dedicated transport fund.

Private sector financing of transport infrastructure is a potential source to supplement the needed funds, but this will be constrained by policies on user charges and change in the government’s regulatory role. To tap private resources, the national government has concentrated in providing “hard” infrastructure projects under the BOT scheme. However, unsolicited proposals dominated the investment pipeline. Sans open tender, the process tended to be drawn out and entailed substantial counterpart public funds or expensive amortization of debts. Formulation of BOT projects and public sector funding needs to be planned and carried out accordingly not as a reaction to private schemes. There are, of course, other modalities for private sector participation. Privatization of transport operation, such as the LRT and the PNR, might be the current official policy, but

there appears to be no urgency in completing the process and the formulation seem doomed to fail.

In the short term, implementation of the Plan will rely principally on national government funding with increasing private sector share. While there is a strong policy to get more private money into transport infrastructure, it is anticipated that the latter would not exceed 50% of the total.

In the medium term, new innovative sources of revenue should be tapped, as well as adjustments in road user charges to raise the overall volume of funds. Among the new sources are betterment levies, land-use conversion taxes, traffic impact tax, congestion tax, and the like, which will all require legislation.

The long-term goal should be the creation of a dedicated Metro Transport Fund (MTF), with specific sources and priority calls, of which road maintenance, traffic enforcement and safety, advance rights-of-way acquisition, and mass transit support should get priority funding over new infrastructure.

8.4 Improving Private Sector Participation

To maximize private sector participation in transport projects, it is essential that the government, through its implementing agencies, do their 'homework'. This means that feasibility studies for PSP projects are undertaken, the business case for PSP determined and the concession framework designed prior to tendering. Open and transparent bidding will establish credibility and invite more serious (and big bucks) investors than heretofore seen in the Study Area. What had slowed down PSP in transport is the absence of properly designed projects or the government's abdication of its rightful obligation to private proponents. It is instructive to note that LRT Line 1 (a purely government endeavor) was completed within five years of securing its 'green' flag, while LRT Line 3 (a PSP) has taken five years to begin construction and would take nine years to complete.

Pricing is another key to improving PSP. Instead of revenue or traffic guarantees, operators of toll roads and railways should be granted as much freedom as possible to determine their own tariff. In exchange, they should shoulder the commercial risks.

In toll roads, there already exists a regulatory framework that grants a reasonable level of confidence to the entry of the private sector. What need to be resolved, however, are the conflicting roles of the Toll Regulatory Board (TRB) and the DPWH, and the monopolistic claims of the Philippine National Construction Corporation (PNCC). To maintain neutrality, the TRB should get out of promotion, negotiation and development of PSP projects; instead, it should focus its resources on economic regulation. It is an unhealthy investment climate when all tollway operators are in joint venture only with the PNCC. In addition, the DPWH should be permitted to acquire or expropriate land continuously for future right-of-way.

PSP in railways would have a tougher sailing than tollways because of two factors: There is as yet no regulatory framework, and nearly all rail operations are not financially profitable. A restructuring of the LRTA and the PNR, which shall entail unbundling of their hitherto monolithic operations, will address both factors.

The DOTC can, under its mandate, exercise the missing 'strategic railway authority' that would regulate private rail operators. Unbundling, on the other hand, means the separation of track infrastructure from rolling stock. Under this framework, the government will retain ownership of the former and invite build-transfer (BT) and build-transfer-operate (BTO) proposals for new lines. The private sector shall own and be granted the concession to operate and maintain rolling stock. To avoid a privatized monopoly, each rail line should be awarded to a different concessionaire. The proposed rail network is sufficiently large to allow five to six operators.

In the long term, PSP should be extended to encompass management or service contracts for traffic signaling, road maintenance and common ticketing among transport service providers.

Writing in “Megacity Management in the Asian and Pacific Region”, Remy Prud’homme, a professor of local governance in France, warns that raffling off services is no cure for poor administration, because it demands “skills, competence and honesty” – which are unfortunately still in short supply in the GMR.

9 DEVELOPMENT OF THE PLAN

9.1 Approach and Policies

The Medium-term Transport Development Plan (MTDP) was formulated by increasing the essential components of the Master Plan. The primary directions of the MTDP include the following:

Integration: While a number of mega projects both in the transport and urban sectors are already underway, they are not coordinated, with insufficient basic transport facilities and services in many locations. The MTDP focuses on integrating new and existing facilities and services to maximize the benefits of the huge investments being made.

New Strategies: It is almost sure that the future transport situation would never improve if society seeks for traditional solutions. Rapid growth of population and urban areas has been a constant pressure on transport sector development. Increasing car ownership and a shift to private transport are the most serious threats. Conventional infrastructure development alone, even if funds were available, would not provide effective solutions. Hence, the MTDP focuses on introducing possible new strategies to prepare for further demand management, integration of urban and public transport development, and improved public-private partnership.

Reality: Public funding capability for the MTDP is severely constrained due to the lack of sources and standing commitment to a number of mega projects. Institutional capacity is also limited and has yet to improve. The MTDP focuses on this reality.

9.2 Available Funds

Public funds available for the MTDP (1999-2004) under low and high estimates have been pegged between ₱ 24 billion (or US$ 0.6 billion) and ₱ 64 billion (US$1.6 billion), respectively. These funds, however, are not only for new projects but mainly allotted for committed projects.

9.3 Broad Priorities

Under severe financial constraints, investment priorities have been broadly set forth as follows:

- Management and low-cost measures, such as traffic management, minor widening, rehabilitation, public transport priorities, terminals, intersection improvements, etc.

- At-grade roads, particularly primary (missing links and those promoting north-south urban expansion) and secondary arteries (to strengthen road network hierarchy). Such roads in the Study Area are extremely important for an effective urban expansion and to accommodate the elevated expressway and MRT.

- The MRT and urban expressway, which will increasingly become more important to sustain large urban areas. These projects assume the private sector's effective participation.

9.4 Candidate Projects

Selected candidate projects totaling ₱ 236 billion are shown in Table 9.1. They are composed of committed projects worth ₱ 99 billion and the MMUTIS-proposed projects worth ₱ 137 billion. After the costs are spread over the MTDP period (1999-2004), the actual costs to government would reach ₱ 68.6 billion and ₱ 53.6 billion for committed/carried-over projects and MMUTIS proposal, respectively. Of the available funds of ₱ 64 billion (high estimate) only 23% or ₱ 14.6 billion is available for new projects.

9.5 Selected Projects

Table 9.1 indicates serious fund constraints for implementing new projects. A review of the actual cash flow of committed projects may provide wider opportunities to accommodate new projects.

Table 9.1
Candidate Projects for MTDP (1999–2004)

Category		Project/Project Package	Estimate Cost (₱ bil)	Cost Govt.		Agency Responsibility	
				Total (₱ bil)	MTDP (₱ bil)	Primary	Support
1. Committed	1)	LRT 3	26.2	Rental	18.0	DOTC	DPWH
1.1 BOT	2)	Skyway (Stage I)	20.0	4.0	2.0	DPWH	LGU
	3)	C-5 South Section	5.6	1.1	0.5	DPWH	LGU
1.2 IFI Loans (committed)	4)	LRT 1 Capacity Expansion, OECF (revenue surplus)	6.3	6.3	-10.8	DOTC	-
	5)	LRT 2, OECF	39.5	27.4	21.0	DOTC	DPWH
	6)	Interchanges (3 nos.), OECF	1.5	1.5	1.5	DPWH	-
	7)	TEAM 4, AusAid	1.6	1.6	0.9	MMDA	DPWH
(almost committed)	8)	ADB Air Quality Improvement	18.6	18.6	18.6	MMDA	DPWH, DENR
	9)	WB-LIL	5.0	5.0	5.0	MMDA	LGU
	10)	WB-MMURTRIP (Priorities 1 & 2)	7.9	7.9	7.9	MMDA	DPWH
	11)	OECF Interchanges (4 nos.)	1.2	1.2	1.2	DPWH	-
	12)	PNR Commuter Improvement: North Rail I	30.3	14.0	(8.4)	DOTC	-
	13)	Line 3 Extension (Monumento/Caloocan)	12.6	7.6	(3.8)	DOTC	DPWH
1.3 Government-funded	14)	Primary & Secondary Roads/Flyovers	2.8	2.8	2.8	DPWH	LGU
		Sub Total	179.1	99.0	68.6		
2. MMUTIS Strategy	1)	MMURTRIP 2	5.0	5.0	5.0	MMDA	DPWH/LGU
	2)	TEAM 5	2.0	2.0	2.0	MMDA	DPWH/LGU
2.1 Management/ Low-cost Mgmt.	3)	Provincial Team (South, North, East)	2.0	2.0	1.2	LGU	DPWH
2.2 Primary Roads and Secondary Arteries	4)	Northern Package [1/]	10.6	10.6	7.1	DPWH	LGU
	5)	Southern Package [2/]	13.7	13.7	10.6	DPWH	LGU
	6)	Central Package [3/]	10.8	10.8	8.3	DPWH	LGU
	7)	Eastern Package [4/]	3.6	3.6	3.4	DPWH	LGU
	8)	Road Environmental Facilities	2.0	2.0	2.0	DPWH	LGU
	9)	N-S Link (Skyway Stage 2 & 3)	40.4	8.1	4.8	DPWH	LGU
Expressway	10)	Port Access (R-10/C-3)	12.7	2.5	1.5	DPWH	LGU
	11)	C-5 North Section	14.1	2.8	2.0	DPWH	LGU
2.3 Airport Access	12)	Airport Access (Skyway I.C. Improvement, etc.)	2.1	0.7	0.7	DPWH	
2.4 Public Transport	13)	MRT Integration (Line 1/Line 3)	3.2	2.3	2.3	DOTC	DPWH/LGU
	14)	MRT Mode Interchange Facilities	2.3	2.3	1.1	MMDA	DOTC/LGU
MRT (BT-BOO)	15)	Line 2 Extension (Masinag)	9.1	5.5	1.6	DOTC	DPWH/LGU
	16)	Line 4 (Recto-Batasan)Phase 1	36.2	21.1	(10.6)	DOTC	DPWH/LGU
	17)	Line 6 (Baclaran-Imus) Phase 1	36.0	18.1	(9.0)	DOTC	DPWH/LGU
	18)	PNR Commuter Improvement MCX (Caloocan-Alabang)	64.6	27.0	(27.0)	DOTC	DPWH/LGU
		Sub Total	270.4	137.0	53.6		
		TOTAL	449.5	236.0	122.2		

1/ North Package includes the following: PN3 -- North Central Road (Quirino Hway-SM16); SM13 -- Don M. Marcos Ave. Ext. to N. Central Rd; and SM 14 -- Quirino Hwy. -Novaliches Bypass.

2/ Central Package includes the following: SMI -- Aurora Ave. Ext. to R10; SM2 -- A.M. Maceda & Ext. to Aurora Blvd.; SM3 -- F. Martinez Ext. to Ortigas Ave.; SM4 -- SLE Ext. (Pres. Quirino-J.P Laurel); SM5 -- Gilmore Ave. Ext. to Roosevelt; SM6 -- Victoneta Ave. Ext. to Congressional Ave.; SM17 -- Kalayaan Ave. Ext. to 20th Ave; GS1.5 -- Primary/Primary Grade Separation Projects.

3/ Southern Package includes the following: PS1 -- Talaba-Kawit Rd.; PS3 -- Kawit-Bucandal Rd.; PE1 -- Bucandala-Muntinlupa Rd.; SM21 -- Pasay Road Ext. (Lawton-Gen. Santos); GS6 -- Primary/Primary Grade Separation Projects.

4/ Eastern Package includes the following: SM18 -- New Marikina Rd.; SM20 -- Col. B. Serrano Ave. Ext. to Marcos Hwy; GS7.8 -- Primary/Primary Grade Separation Projects.

10 PROFILE OF THE PLAN COMPONENTS

10.1 Committed Projects

Portions of the investment costs of a number of committed projects under the external ODA loan or government funding will have to be carried over to the next MTDP period of 1999-2004. They include committed and almost-committed projects. BOT projects include the MRT Line 3, C-5 South Section and the Skyway. Included under the committed projects for external ODA loan are the LRT 1 capacity expansion (OECF), LRT 2 (OECF), three highway interchanges (OECF) and TEAM 4 (AusAid), while the almost-committed projects include Air Quality Improvement (ADB), LIL (World Bank), MMURTRIP (World Bank), and four highway interchanges (OECF). Two railway projects are also almost committed under BOT scheme – North Rail Phase I and MRT Line 3 Extension. In addition, some government-funded road projects are committed. The total project cost of the above is ₱ 179.1 billion, ₱ 68.6 billion of which will be carried over to the next MTDP period.

Table 10.1
Committed Projects

Category		Project/Project Package	Estimated Cost (₱ bil)	Cost to the Government	
				Total (₱ bil)	MTDP (₱ bil)
1. BOT	1)	LRT 3	26.2	Rental	18.0
	2)	Skyway (Stage I)	20.0	4.0	2.0
	3)	C-5 South Section	5.6	1.1	0.5
2. IFI Loans (committed)	4)	LRT 1 Capacity Expansion, OECF (revenue surplus)	6.3	6.3	-10.8
	5)	LRT 2, OECF	39.5	27.4	21.0
	6)	Interchanges (three locations), OECF	1.5	1.5	1.5
	7)	TEAM 4, AusAid	1.6	1.6	0.6
(almost committed)	8)	Air Quality Improvement Program, ADB	18.6	18.6	18.6
	9)	LIL, World Bank	5.0	5.0	5.0
	10)	MMURTRIP (Priority 1 & 2), World Bank	7.9	7.9	7.9
	11)	Interchanges (four locations), OECF	1.2	1.2	1.2
	12)	PNR Commuter Improvement: North Rail I	30.3	14.9	(8.4)
	13)	MRT Line 3 Extension (Monumento/Caloocan)	12.6	7.6	(3.8)
3. Government-funded	14)	Primary & Secondary Roads/Flyovers	2.8	2.8	2.8
Total			179.1	99.0	68.6

Source: ADB, WB, OECF, DPWH, MMUTIS Study Team

An outline of the major committed or almost-committed projects is described as follows:

1) Traffic Management Project

MMURTRIP

The Metro Manila Urban Transport Improvement Project (MMURTRIP) Study was completed in July 1998, with funding from a World Bank loan to the Government of the Philippines. The project covers four major corridors (LRT Line 2, EDSA, C-5 and SLE) and the Marikina Valley area. The study recommended various improvement measures like:

- Signal improvement, new signal
- Road improvement (pavement marking, road widening, re-concreting, asphalt overlay, new/improvement drainage facilities, and improvement of alignment)
- Sidewalk improvement (cleaning of sidewalk, provision of sidewalk and removal of sidewalk vendors)
- Pedestrian overpass, pedestrian barrier (on sidewalk, on median, service road), pedestrian walk path, bridge widening, street light, bollard
- Removal of on-street parking, banning of truck parking, removal of sidewalk vendors

MMURTRIP-proposed projects are shown in Table 10.2, while its project components are shown in Appendix I.

Table 10.2
MMURTRIP Projects - Breakdown of Costs
(Million Pesos, 1997 Incl. Physical Contingencies)

Corridor/Area	Component	Total Cost
LRT Line 2	Marcos Bridge - Cubao	82
	Cubao - Recto	174
	Subtotal	255
EDSA	North Avenue - Pasig River	149
	Pasig River - Roxas Boulevard	73
	Subtotal	222
SLE	Nichols I/C	346
	Bicutan I/C	31
	Sucat I/C	273
	Alabang I/C	55
	Subtotal	706
MARIPAS	Marikina Bridge and Access Roads	668
	Marcos Highway (Marcos Bridge Masinag)	264
	Marcos Highway (Masinag - C-6)	419
	Ortigas Avenue Extension	90
	Radial Road III	1,316
	Radial Road II	522
	Subtotal	3,279
Secondary Roads	w/ missing links	561
	w/ major widening	1,807
	w/o major widening	1,116
	Subtotal	3,484
Total		7,946
Priority 1		4,852
Priority 2		3,094

Source: MMUTIS

Learning and Innovation Loan

This World Bank-funded project aims at strengthening metropolitan governance of the transport sector in Metro Manila. More specifically, it is a capability-building program intended for the MMDA.

It was observed that due to inadequate traffic control systems and poor user behavior, a large enforcement force is usually deployed, but its effectiveness is jeopardized by the insufficient skill of enforcers, lack of standard practices for the 17 LGU forces and inadequate coordination among responsible agencies. There is a need therefore for the following:

- Enhance capabilities of MMDA staff and strengthen its organizational structure to suit its responsibilities, and
- Develop the MMDA's enabling capacity to act as a strategic planner and effective facilitator to implement multimodal policies and investments undertaken by various national, local and private agencies.

The MMDA, by virtue of its mandate, serves as the primary mechanism to address transport-related concerns. Thus, its capability-building program has to be comprehensive and linked with the actual implementation of traffic management program to create a significant impact on the organization.

The immediate objectives of the projects are:

- to provide in-house technical expertise and hands-on training in formulating and establishing a cyclical planning process;

- to review the planning responsibilities of involved government agencies and develop a framework for integrating these functions;

- to strengthen the MMDA's capabilities with regard to:

  a) planning and implementation of traffic management schemes;
  b) enforcement of traffic regulations; and
  c) guiding other agencies in adopting good traffic engineering and management practices.

- to establish a command center and provide it with necessary communication systems and other support equipment required for effective traffic regulation and enforcement;

- to test the learning-by-doing scheme and to assess its performance.

The project started in January 1999 and will last until July 2001, with a total project cost of US$ 5.0 million.

Air Quality Improvement Program

This program aims to promote policy reforms to improve air quality in Metro Manila through a combination of the following:

- a policy loan of US$ 200 million to implement the program's policy reforms;
- an investment loan of US$ 25 million to establish an air pollution control facility that will assist industries, commercial establishments and the transport sector monitor and reduce their emissions;
- an investment loan of US$ 71 million to finance part of the necessary public sector projects; and
- a technical assistance (TA) grant of US$ 1,500,000 to develop air emission policies and enhance public support of air pollution reduction.

Two investment projects are included. One will establish an air pollution control facility to provide pollution control and monitoring equipment to industries and commercial establishments, and replace worn engines on public transport vehicles. The second will support public sector investments on traffic engineering and management, traffic enforcement, road rehabilitation, ambient air-quality monitoring facilities, antismoke-belching programs, capability building and institutional development, training for air-quality management, and consulting services.

TEAM 4
(Metro Manila Traffic Engineering and Management Project Phase IV)

The project aims to rehabilitate/upgrade the existing system utilizing state-of-the-art adaptive traffic system – SMART Traffic Signal System. The system is intelligent and can adapt dynamically and respond immediately to traffic by adjusting its signal timing based on the actual traffic situation.

This project, targeting 419 interchanges, consists of two stages over a period of six years (1995-2000) as follows:

Stage 1: Rehabilitation and upgrading of 182 intersections
Rehabilitation and upgrading of central computer system
Stage 2: Rehabilitation and upgrading of 237 intersections
Rehabilitation and upgrading of central computer system
Provision of maintenance

Mainly financed by Australia-based Export Financing Insurance Corporation (EFIC) with support from the Australian Government, the project's total cost is ₱ 1,634 million.

2) Road Projects

Metro Manila Skyway Project (Stage I)

The ongoing Metro Manila Skyway Project is constructing an elevated expressway over the SLE. Stage 1 covers the portion from Sen. Gil Puyat Avenue (formerly Buendia) to Bicutan Interchange (9.3 km) and is under construction. The portion from south EDSA to Bicutan opened in December 1998, while the remaining Sen. Gil Puyat Avenue-south EDSA portion is planned to open in June 1999.

Table 10.3
Metro Manila Skyway Project

	Project Portion	Length	Project Cost (₱ million)
Stage I	Buendia-Bicutan	9.3 km	20,000

C-5 South Section

The C-5 South Section is an ongoing DPWH project. It is planned under a BOT scheme as a tollway from Roxas Boulevard (Manila-Cavite Coastal Road) to SLE. It is part of the Manila-Cavite Expressway Project.

Table 10.4
C-5 South Section Project

Project Name	Length	Project Cost (₱ million)
PC5(2): C-5 South Section	6.4 km	5,600[1/]

1/ Estimated by the MMUTIS.

Interchanges

The Overseas Economic Cooperation Fund (OECF) is funding three ongoing interchange (grade separation) projects in existing intersections, as follows:

Table 10.5
Ongoing Interchange Projects

Project Name	Project Cost (₱ million)
1) EDSA-Quezon Ave. Intersection	600
2) C-5-Ortigas Ave. Intersection, Package II	545
3) C-5-B. Serrano Ave./Katipunan Ave. Intersection	330
Total	1,475

Planned interchange (grade separation) projects for existing intersections are as follows:

Table 10.6
Planned Interchange Projects

Project Name	Project Cost (₱ million)
1) EDSA-Roosevelt Ave. Intersection	280
2) EDSA-North Ave.-West Avenue Intersection	420
3) C-5-Kalayaan Ave. Intersection	340
4) C-5-Lanuza St.-J. Vargas Ave. Intersection	200
Total	1,240

Primary and Secondary Roads and Flyovers

Other road projects funded by the government are as follows:

Table 10.7
Government-funded Road Projects

Project Name	Length	Project Cost (₱ million)
1) Marikina Bridge and Access Road	12.3 km	595
2) Visayas Ave. Extension	4.2 km	390
3) Shaw Blvd. Extension	4.3 km	200
4) Alabang-Zapote Road Widening	10.5 km	835
5) C-3 Missing Link, Northern Segment	0.9 km	532
6) R-10 Widening	5.0 km	218
7) C-5/Lower Bicutan Access Road	1.2 km	35
8) C-5/Commando Link Road	2.7 km	40
Total	---	2,845

3) Public Transport Projects

LRT 3

The EDSA LRT Project Phase 1, or Line 3, is ongoing under a BLT (build-lease-transfer) scheme, which is provisioned in the BOT/BT Law, R.A. 7718, amending certain conditions of R.A. 6957. Line 3 links North Avenue and Taft Avenue with 13 stations along its 16.9 km-long double tracks to transport the estimated number of daily passengers of about 450,000 to 600,000. The maximum capacity of the system is 900,000 pax/day, according to the Metro Rail Transit Corporation, Ltd. (MRTC). The structure types are itemized below:

Viaduct section	9.1 km
At-grade	6.0 km
Underground	1.8 km

The project is contracted to the MRTC at an estimated cost of US$ 655 million or ₱ 26.2 billion.

LRT 1 Capacity Expansion

The existing LRT 1, with a total length of 13.95 km linking the North Terminal in Caloocan and the South Terminal in Baclaran, is elevated at approximately seven meters above street level and started operations in 1984-1985.

Due to passenger increase and its chronic, seriously congested condition, the LRTA decided to implement the following capacity-expansion projects:

Phase 1: Converting the existing 2-unit trains into 3-car trains and requesting new seven 4-car trains to increase the system's overall capacity by 50% at the present 2.5-minute headway operation.

Corresponding adjustments or modification of railway facilities, such as existing LRVs, power supply, catenary, tracks, signaling, and platform extension, are included in the project.

The Japanese Government is funding the project through the OECF's 19th Yen Loan Package at a cost of ¥ 10,439 million, while the local portion is ₱ 2,776 million.

Phase 2: Purchasing additional rolling stock to accommodate a reduced headway of 90 seconds. The Philippine Government is requesting a yen loan of about ¥ 9 billion.

LRT 2

The ongoing LRT Line 2 Project has a total track length of 13.9 km between Recto and Santolan with 11 stations or terminals. Estimated traffic volume along this track is about 570,000 pax/day initially to be increased up to 650,000 pax/day. Funded by the OECF and the Philippine Government, the total project cost is estimated at approximately US$ 988 million.

The project is composed of the following four packages:

Package 1 Construction of depot in Santolan
Package 2 Construction of a 13 km-long superstructure of viaducts
Package 3 Construction of substructure and stations
Package 4 Procurement and installation of signaling, communications systems, tracks, etc.

PNR Commuter Improvement: North Rail I

Originally, the major objective of the Project is planned to link the Clark International Airbase in Angeles City with Metro Manila as a rapid access system to the airport using existing PNR right-of-way. At present, the sole

commuting mode from Meycauayan to Metro Manila is road-based transportation, which is very congested already.

Proposing the North Rail Project is the first priority segment considering its technical, economic and financial feasibility. The proposed route has a junction with LRT 1 in Caloocan and with PNR's Main Line South or Commuter Line South in Sta. Mesa, which is planned to be revitalized under the MCX project, so that the line will compose part of the north-south trunk line.

Train operation of the north commuter line by the PNR is suspended after Caloocan toward the north, and only one or two trains are operated between Tayuman and Caloocan. Squatters occupy the single-track section after Caloocan toward the north where the roadbed is seriously deteriorated and rails are missing. Squatter relocation will be a serious matter in the construction of double tracks in the area especially in the single-track section.

The outline of the railway system is as follows:

Table 10.8
Technical Characteristics of the North Rail

Items		Description
Permanent way	Gage	1435 mm
	Minimum curve radius	630 m meters on the main line, and 250 meters in tunnels/structures
Station		Platform width = 4.5 m
Power supply		25 kV AC
Operation		Central traffic control, ATP, moving block system
Max. speed		60-80 kph urbanized area within Metro Manila, 105 kph outside Metro Manila
Headway		2.0 minutes Minimum
Cost (US$ million) Estimated by MMUTIS	Infrastructure	349
	E&M	409
	Total	758

Source: MMUTIS Study Team

MRT Line 3 Extension (Monumento/Caloocan)

It is recommended to extend MRT Line 3 to Navotas from North Avenue, which is the terminal of the Phase 1 project. The line extension will run along EDSA with an elevated structure about 10 kilometers long. It will connect with LRT 1 and North Rail in the Monumento/Caloocan area. This will provide a strong connection between north-south and east-west passenger flows in the area.

The characteristics of Line 3 extension are listed in Table 10.9.

Table 10.9
Technical Characteristics of Line 3 Extension

Item		Description
Permanent way	Superstructure	Prestressed concrete I-girder
	Substructure	Pile bent type with CCP
	Length	16.9 km
	Gauge	1435 mm
	Minimum curve radius	370 meter in main line 25 meter at depot
	Sleeper	PC sleeper and Concrete Slab type
	Fastening	Pandrol clips
Station	Platform length	130 meter
	Platform width	4.5 meter
Power supply	Voltage	750 V DC
	Feeder system	Over Head Contact
Rolling stock	Body length	31,720 mm
	Total width	2,500 mm
	Floor height	3,250 mm
	Train	3-unit per train
	Capacity	1182 pax/train
	Speed	Max. V=65 kph
	No. of units/train	3 units to be expanded to 4 unit train
Operation	Headway	3.0-3.5 minutes,
	Control system	ATP, CTC
Cost (US$ million)	Infrastructure	190
	E&M	125
(Estimated by MMUTIS)	Total	315

Source: MMUTIS Study Team

10.2 Proposed Traffic Management Projects/Low-cost Measures

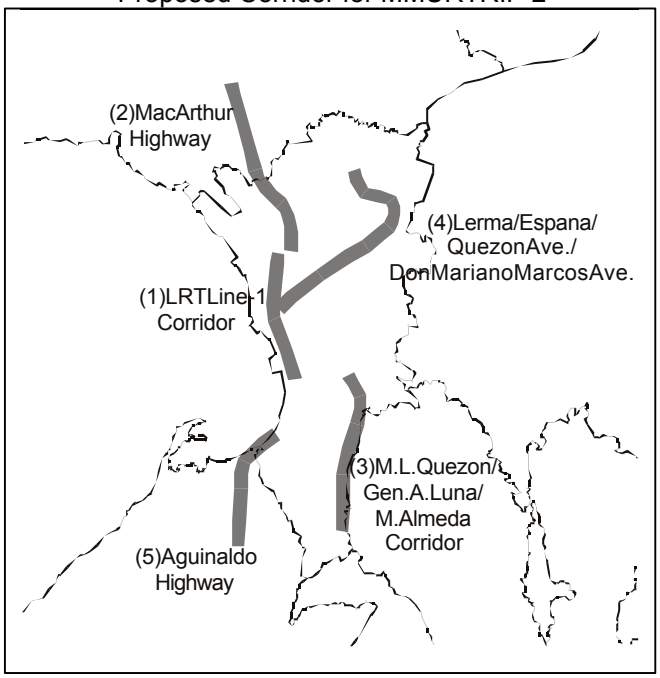
MMURTRIP 2

The MMUTIS Master Plan requires vast investments in rail and road transport network developments to supply enough capacity against future traffic demand. However, due to the lack of public funds, most of the required projects will only be implemented later or in a long term. Therefore, continuous traffic improvement that complement long-term projects is inevitable, and the MMURTRIP (committed project mentioned in the previous section) is expected to play an important role during the MTDP period.

The MMUTIS proposes the continuation of the MMURTRIP's effort on major corridors that the latter has not covered and are facing serious traffic congestion.

After examining the existing and future traffic demand and geometric road conditions, the MMUTIS identified the following corridors for inclusion in the MMURTRIP 2:

Figure 10.1
Proposed Corridor for MMURTRIP 2



1) LRT Line 1 Corridor
2) McArthur Highway
3) M.L. Quezon/Gen. A. Luna/M. Almeda Corridor
4) Lerma/España/Quezon Avenue/Don Mariano Marcos Avenue
5) Aguinaldo Highway

The scope of work can be referred to the MMURTRIP 1, while the initial assessment of the LRT Line 1 Corridor is presented in Appendix II-9. Considering the similarity with the MMURTRIP, the total project cost is estimated to be ₱ 5.0 billion.

TEAM 5

While the ongoing TEAM Project - Phase 4 replaces existing traffic signals only, TEAM 5 intends to further improve the congested traffic situation in Metro Manila with comprehensive traffic management measures. Project components include:

1) Establishment of a Traffic Information Center
2) Rehabilitation of the existing signal system
3) Provision of signal systems to intersections with geometric improvements
4) Traffic safety improvements
5) Introduction of possible TDM measures (an analysis is presented in Appendix II-5.)

The outline of each project component is as follows:

1) Metro Manila Traffic Information Center

Information is becoming increasingly important in managing traffic in a mega city, where a minor accident often leads to a major congestion. If drivers are properly informed of road and traffic conditions, they can have options, like taking another route, deferring starting time, or using another transport mode.

At the same time, countermeasures can be taken and the accident swiftly dealt with, thus restoring road order in a short time.

The proposed Metro Manila Traffic Information Center will have the objectives of securing a fast, comfortable and safe traffic environment by collecting and providing road and traffic information that directly affects economic, social and other activities in the metropolis.

The Center will consist of the following five functional components:

a) Road and traffic information gathering
b) Road and traffic information database
c) Road and traffic information dissemination
d) Incident disposal
e) Coordination among agencies concerned

To support these functions, the Center must be equipped with a suitable information processing and communication infrastructure. A communications network is vital for gathering and disseminating information, as well as coordinating with other agencies. A geographic information system capable of operating on a real-time basis must be introduced to process, update and store the map-based information. Separately, a mobile unit will be set up and dispatched to the accident site for proper immediate action. A draft project description is included in Appendix III-1.

2) Metro Manila Signal System Rehabilitation Project

The existing signal system, installed over a 15-year period since 1980, is not functioning well due to the lack of maintenance. Although a signal renewal project is underway, it will take time to complete. In the meantime, the existing system will still be utilized for several years. The proposed rehabilitation project, on the other hand, is aimed at restoring the original functions of the existing system.

The project consists of three stages. Stage 1 will assess the system's condition to determine the extent of needed rehabilitation, while Stage 3 will carry out rehabilitation work and upgrade of the central computer system. The project covers all subsystems of the existing signal system, which include the following:

a) Signal system
b) Communication cable network
c) Closed circuit television system
d) Driver information system
e) Radio communication system
f) Air pollution monitoring system

A draft project description is included in Appendix III-2.

3) Metro Manila Signalization Project

The project's objective is to install a new, or replace an existing, traffic signal in intersections located in peripheral areas of Metro Manila or far from the existing Traffic Control Center, or where inclusion into the existing ATC system is not technically and economically beneficial to them.

The study also includes:

a) coordination of signals along arterial streets using local master
b) geometric improvement of intersections and other traffic management measures
c) provision of pavement marking near the signalized intersection
d) training of MMDA and LGU staff in charge of traffic management

4) Traffic Safety Improvement Project

This project intends to reduce the number of accidents by carrying out four components, as follows:

a) Traffic Sign and Pavement Marking Improvement
b) Traffic Enforcer Training Program
c) Traffic Safety Education for Drivers
d) Traffic Safety Education for School Children

Providing traffic signs and pavement markings is indispensable to prevent traffic accidents, and all road users are required to respect and obey them. (A draft project description is presented in Appendix III-3). Educational programs, meanwhile, will disseminate information about these signs and markings.

Provincial TEAM Project

Due to the rapid increase in motorization, serious traffic congestion occurs not only in Metro Manila's urban centers, but is also spreading to suburban areas. The Provincial TEAM Project thus aims to improve the traffic situation in provinces adjacent to Metro Manila.

The Proposed Provincial TEAM Project will include:

1) Provision of signals in intersections and replacement of activity signal
2) Coordination of signals along arterial streets using local master
3) Geometric improvement of intersections and other traffic management measures
4) Application of pavement markings near the signalized intersection
5) Training of LGU staff in charge of traffic management

The Study Area will cover Metro Manila's northern, southern and eastern neighboring municipalities, as follows: