14.1.9 SLEx Extension (to Lucena City)

(1) Objectives of the Project

- To form South Luzon Development Transport Axis.
- To contribute to economic development of Region IV-A and Region V.
- To decongest of traffic on Pan Philippine Highway.

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.9-1**.

(3) Outline of the Projects

- Expressway Length : 47.8 km.
- Beginning : SLEx at Santo Tomas
- End : Pan Philippine Highway at Lucena City
- Type of Structure : Cut/Fill
- No. of lanes : 2 x 2 = 4-lane

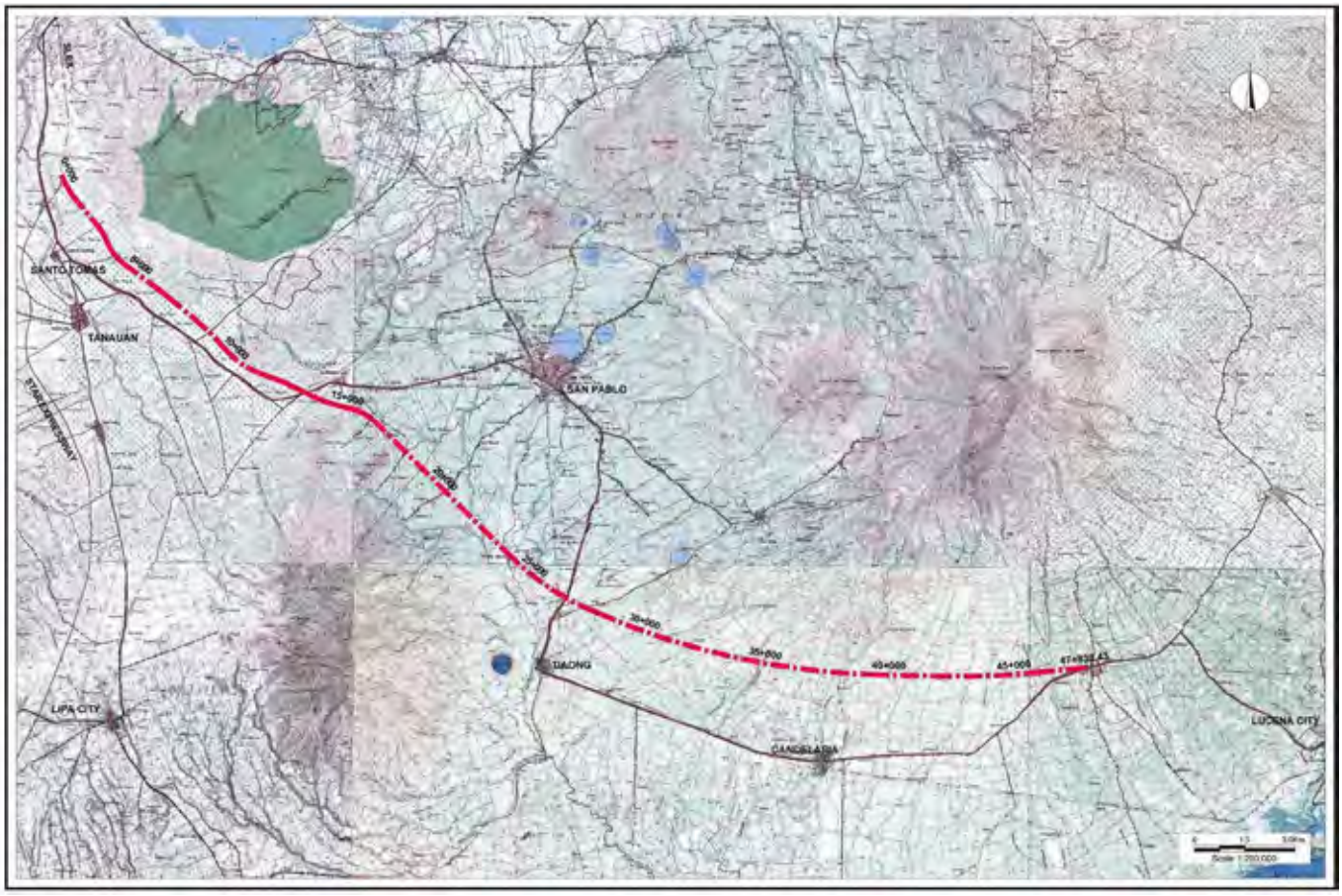


FIGURE 14.1.9-1 PROPOSED ALIGNMENT OF SLEx EXTENSION

14.1.10 NLEx East

(1) Objectives of the Project

- To form North-East Luzon Development axis.
- To decongest traffic of Pan Philippine Highway
- To contribute to economic development of Regions II and III.

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.10-1**.

(3) Outline of the Project

- Expressway Length : 92.1 km.
- Beginning : North end of La Mesa Parkway
- End : North of Cabanatuan City and connected with CLEx
- Type of Structure : Cut/Fill
- No. of lane : 2 x 2 = 4-lane

FIGURE 14.1.10-1 PROPOSED NORTH LUZON EXPRESSWAY EAST (NLEx-EAST) ALIGNMENT

14.1.11 La Mesa Parkway

(1) Objectives of the Project

- To be connected with NLEx-East to form North-East Luzon Development Axis.
- To decongest Quirino Highway traffic

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.11-1**. MWSS ROW is utilized.

(3) Outline of the Project

- Expressway Length : 10.9 km.
- Beginning : Don Mariano Marcos Avenue at Fairview
- End : San Jose Del Monte
- Type of Structure : Cut/Fill
- No. of lane : 2 x 2 = 4-lane

FIGURE 14.1.11-1 PROPOSED LA MESA PARKWAY ALIGNMENT

14.1.12 C-5/FTI/Skyway Connector Road

(1) Objectives of the Project

- To provide access to FTI area for redevelopment of FTI area.
- To connect Skyway with C-5.

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.12-1**.

(3) Outline of the Project

- Expressway Length : 3.0 km.
- Beginning : Skyway between Nichols Toll Plaza and Bicutan I/C
- End : C-5
- Type of Structure : Elevated structure
- No. of lane : 2 x 1 = 2-lane

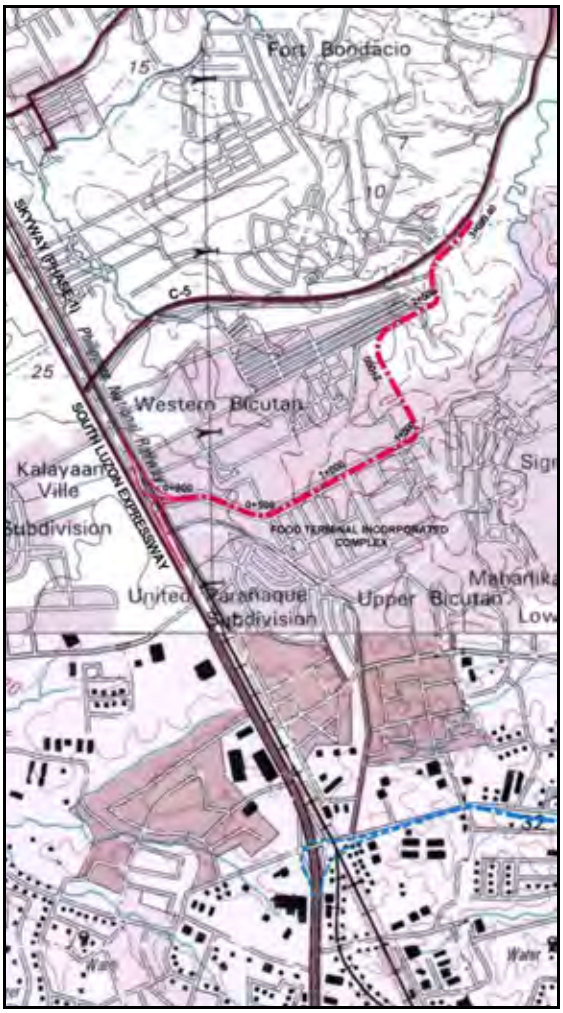


FIGURE 14.1.12-1 PROPOSED C-5/FTI/SKYWAY CONNECTOR ROAD ALIGNMENT

14.1.13 Pasig-Marikina Expressway

(1) Objectives of the Project

- To decongest Metro Manila traffic, especially C-4 and C-5 traffic.
- To provide alternative access to Makati CBD.

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.13-1**.

(3) Outline of the Project

- Expressway Length : 15.7 km.
- Beginning : Ayala Avenue
- End : Marcos Highway
- Type of Structure : Elevated structure
- No. of lane : 2 x 2 = 4-lane

FIGURE 14.1.13-1 PROPOSED PASIG-MARIKINA EXPRESSWAY ALIGNMENT

14.1.14 Global City Link Expressway

(1) Objectives of the Project

- To provide access to Global City from C-6 Expressway

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.14-1**.

(3) Outline of the Project

- Expressway Length : 1.7 km
- Type of Structure : Cut/Fill
- No. of lane : 2 x 2 = 4-lane
- To be implemented together with C-6 Expressway

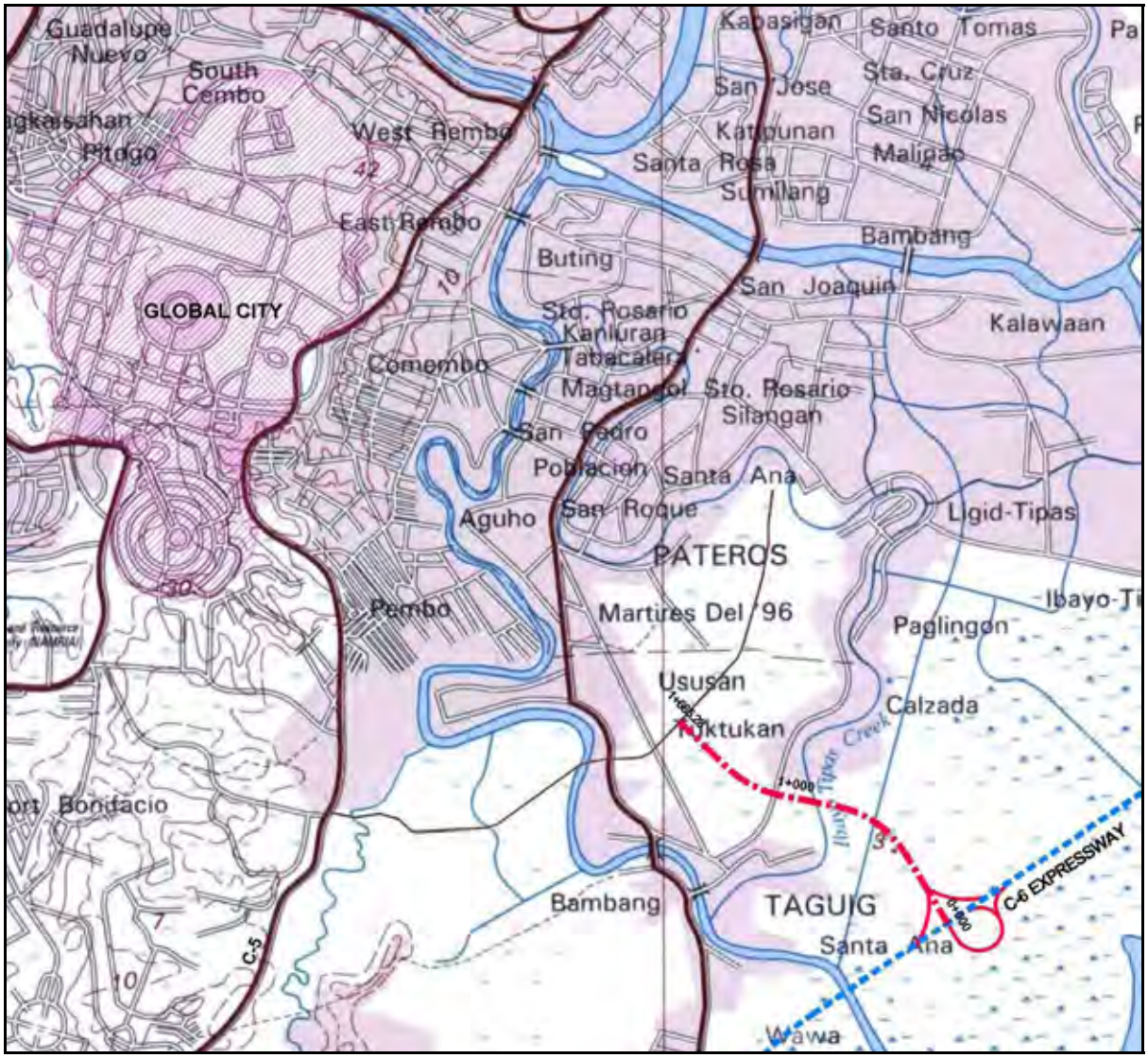


FIGURE 14.1.14-1 PROPOSED GLOBAL CITY LINK EXPRESSWAY ALIGNMENT

14.1.15 R-7 Expressway

(1) Objectives of the Project

- To decongest Metro Manila traffic, particularly Quezon Avenue and Don Mariano Marcos Avenue.

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.15-1**. Along Don Mariano Marcos Avenue, MRT-7 is also proposed. ROW of Don Mariano Marcos Avenue is quite wide at 90 m, thus MRT-7 and R-7 Expressway can be accommodated with the existing ROW.

(3) Outline of the Project

- Expressway Length : 16.1 km.
- Beginning : North side of Welcome Rotonda along Quezon Avenue
- End : At Fairview along Don Mariano Marcos Avenue
- Type of Structure : Mostly elevated, underpass at Quezon Circle
- No. of lane : 2 x 2 = 4-lane

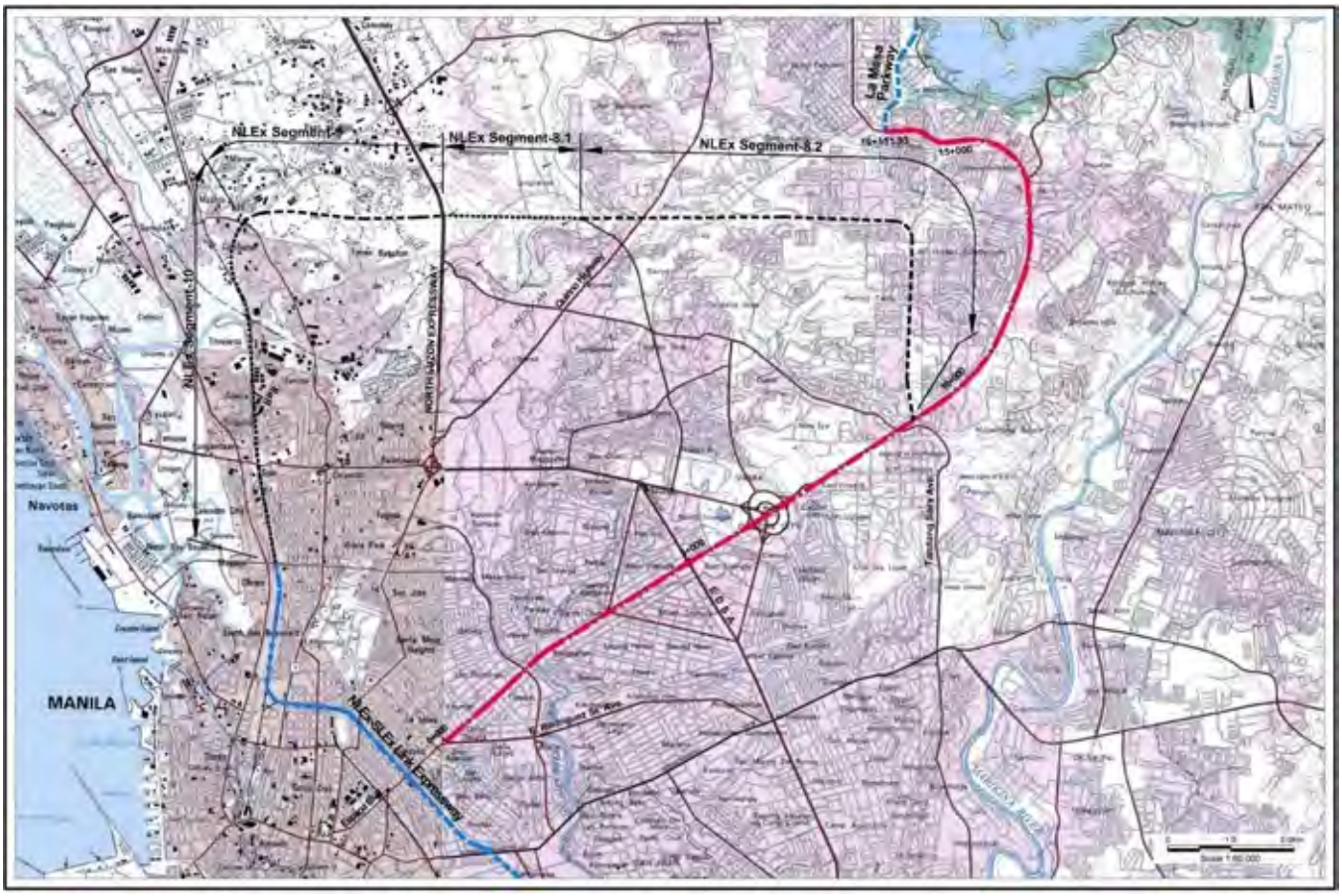


FIGURE 14.1.15-1 PROPOSED R-7 EXPRESSWAY ALIGNMENT

14.1.16 Manila-Bataan Coastal Road

(1) Objectives of the Project

- To provide alternative access to Metro Manila from Central/North Luzon.
- To develop Manila Bay Coastal area.

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.16-1**.

(3) Outline of the Project

- Expressway Length : 70.3 km.
- Beginning : End of R-10 (Phase I), from NLEx Phase III (Phase II)
- End : NLEx Phase III (Phase I), at Balanga, Bataan Province (Phase II)
- Type of Structure : Cut/Fill and long bridges
- No. of lane : 2 x 2 = 4-lane

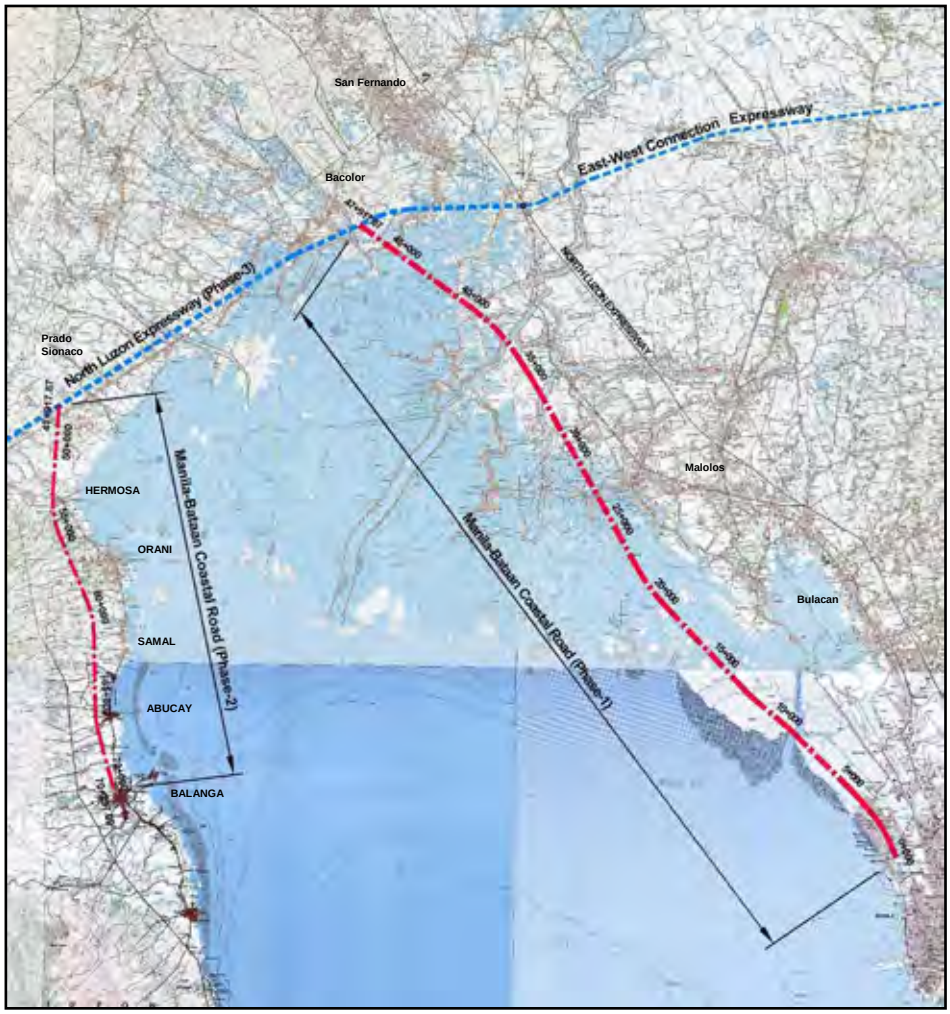


FIGURE 14.1.16-1 PROPOSED MANILA-BATAAN COASTAL ROAD ALIGNMENT

14.1.17 North Luzon Expressway (Phase 3)

(1) Objectives of the Project

- To provide direct connection between Metro Manila and Subic.

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.17-1**.

(3) Outline of the Project

- Expressway Length : 36.2 km.
- Beginning : SCTEx
- End : NLEx
- Type of Structure : Cut/Fill and long bridges
- No. of lane : 2 x 2 = 4-lane

FIGURE 14.1.17-1 PROPOSED NORTH LUZON EXPRESSWAY (PHASE-3) ALIGNMENT

14.1.18 East-West Connection Expressway

(1) Objectives of the Project

- To connect NLEX and NLEx-East to improve expressway network flexibility.

(2) Proposed Alignment

Proposed alignment is shown in **Figure 14.1.18-1**.

(3) Outline of the Project

- Expressway Length : 26.6 km.
- Beginning : NLEx
- End : NLEx-East
- Type of Structure : Cut/Fill
- No. of lane : 2 x 2 = 4-lane

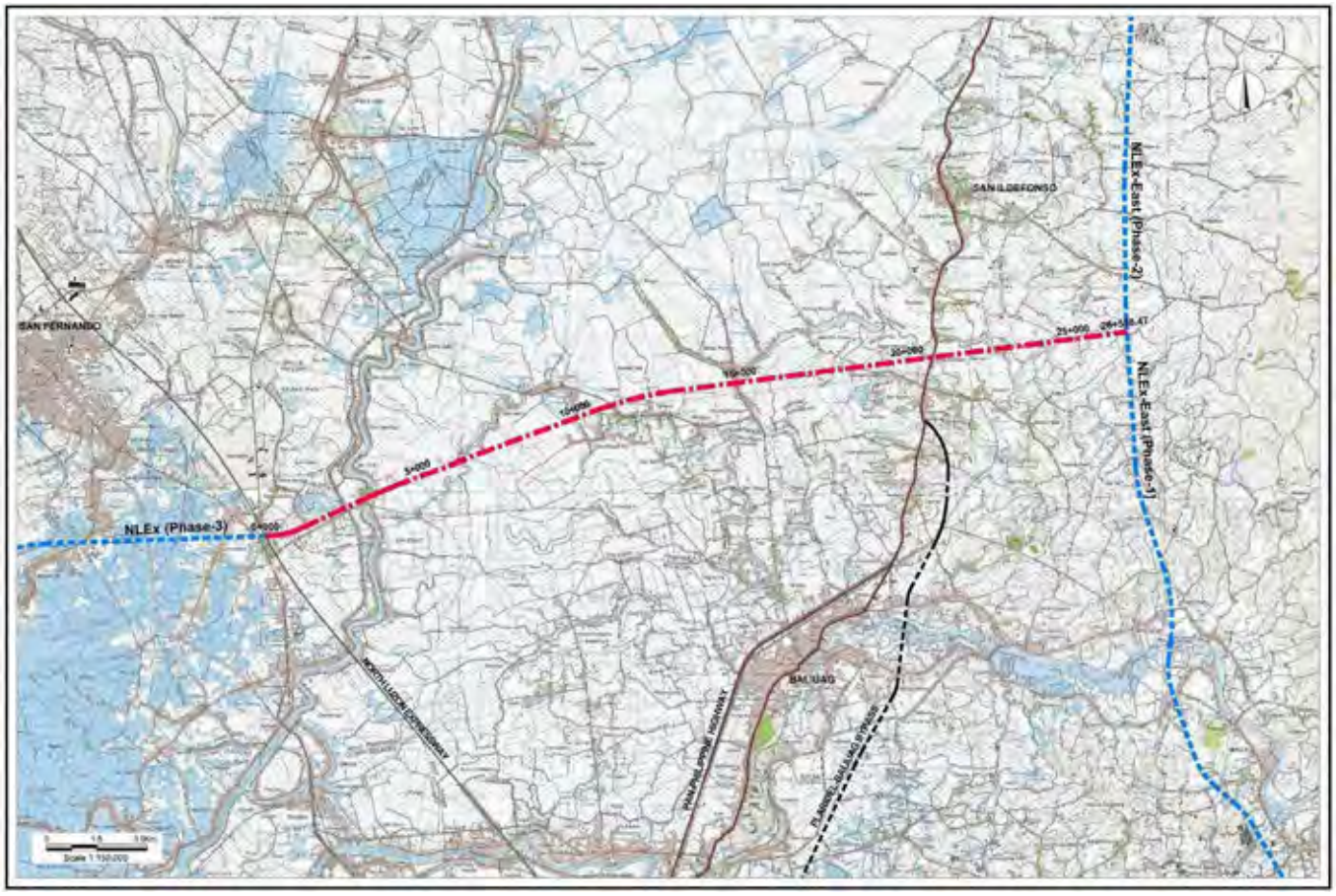


FIGURE 14.1.18-1 PROPOSED EAST-WEST CONNECTION EXPRESSWAY ALIGNMENT

14.2 PRELIMINARY DESIGN

Following previous studies were referenced with regards to alignment selection, design standards, quantities and cost estimate;

- C-6 Expressway: The project cost was referred from "Study on Economic Partnership Projects in Developing Countries in FY2007 Study on Metro Manila C-6 Expressway, in the Republic of the Philippines, March 2008".

- CALA Expressway: "Feasibility Study and Implementation Support on the CALA East West National Road Project, JICA, November 2006".

- Central Luzon Expressway: "Feasibility Study for the Proposed Sectral Luzon Expressway (CLEx) under the Consultancy Services for the Pre-Construction and Supervision of Arterial Road Bypass Project (Phase-1) JICA Loan No. PH-P236", January 2010.

14.2.1 Geometric Design Standards and Typical Cross Sections

Geometric design standards and typical cross sections were discussed in Sections 2.1.3 and 2.1.4 of Chapter 2.

14.2.2 Summary of Preliminary Design

Summary of preliminary design is shown in **Table 14.2.2-1**.

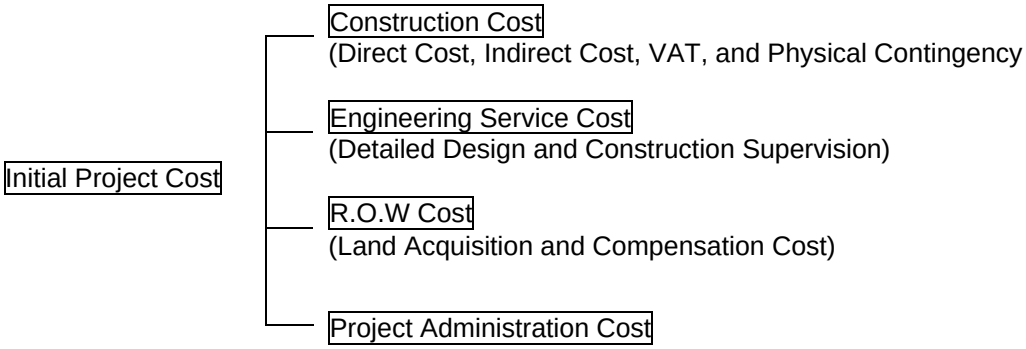
TABLE 14.2.2-1 SUMMARY OF THE PRELIMINARY DESIGN

No.	Name of HSH	Section	Length (km)	PCU in 2030	Lane Width (m)	Lanes Number	Design Speed	Type of Pavement	Type of Structure (km)				Number of I.C.&JCT		Number of Crossing Roads	
									Cut & Embk.	Bridges	Elevated Structure	Tunnel	I.C.& On/Off Ramp	JCT	Over Pass	Under Pass
1	NLEx–SLEx Link Expressway	South Section (SLEX-Espana)	8.55	111,000	3.5	4	80 km/h	AC	0.00	0.00	8.55	0.00	4	0	0	0
		North Section (Espana -Segment 10)	4.80		3.5	4	80 km/h	AC	0.00	0.00	4.80	0.00	3	1	0	0
2	NAIA Expressway-2	Phase 2	4.9	75,000	3.5	4	60 km/h	AC	0.00	0.00	4.90	0.00	4	1	0	0
3	C-6 Expressway (JETRO F/S 2008)	North	16.5	68,000	3.6	4 (6)	80 km/h	AC	16.36	0.14	0.00	0.00	3	1	3	7
		East	25.5	71,000	3.6	4 (6)	80 km/h	AC	23.49	2.01	0.00	0.00	2	0	3	5
		South-East	22.8	78,000	3.6	4 (6)	80 km/h	AC	19.10	0.8	2.90	0.00	3	1	3	9
4	C-6 Extension	Phase-1	29.9	10,200	3.5	4	80 km/h	AC	29.20	0.7	0.00	0.00	2	0	0	0
		Phase-2	13.7	66,000	3.5	4	80 km/h	AC	13.50	0.2(2)	0.00	0.00	1	2	0	0
5	Manila Bay Expressway		8.02	74,000	3.5	4	60 km/h	AC	0.00	0.5	0.00	7.52	2	1	0	0
6	CALA Expressway	SLEX-Aguinald Hwy (JICA F/S 2006)	14.3	95,000	3.5	6	100 km/h	PCC	10.51	2.19	1.60	0.00	1	0	4	7
		Aguinald Hwy. -Manila Cavite Exp.	27.49	106,000	3.5	6	100 km/h	(PCC)	25.21	0.48	1.80	0.00	2	1	1	2
7	Central Luzon Expressway (JICA F/S 2010)	Phase 1: Tarlac-Cabanatuan	28.2	35,000	3.5	4	100(80) km/h	AC	26.79	1.41 (10)	0.00	0.00	2	0	4	7
		Phase 2: Cabanatuan-San Jose	35.7	13,000	3.5	4	100(80) km/h	AC	34.89	0.81 (9)	0.00	0.00	3	0	3	18
8	Calamba-Los Banos Toll Expressway	--	15.5	65,000	3.5	4	80 km/h	PCC	13.99	0.54 (14)	0.97	0.00	3	0	1	11
9	SLEx Extension (to Lucena)	--	47.8	64,000	3.5	4	100 km/h	AC	45.10	2.70 (27)	0.00	0.00	5	0	0	11
10	NLEX-East	Phase-I	30.1	38,000	3.5	4	100 km/h	AC	28.50	1.60 (13)	0.00	0.00	4	0	0	35
		Phase-II	62.0	21,000	3.5	4	100 km/h	AC	58.13	3.88 (39)	0.00	0.00	5	0	0	49
11	La Mesa Parkway		10.9	72,000	3.5	4	80 km/h	AC	10.20	0.70 (7)	0.00	0.00	3	0	0	17
12	C-5/FTI/SKYWAY Connector Rd.		3.0	53,000	3.25	2	60 km/h	AC	0.00	0.0	3.00	0.00	2	0	-	-
13	Pasig Marikina Express Way		15.7	92,000	3.5	4	60 km/h	AC	0.00	0.0	15.70	0.00	2	1	0	0
14	Global City Link		1.7	-	3.5	4	60 km/h	AC	1.40	0..0	0.00	0.00	1	1	0	1
15	R-7 Express Way		16.1	87,000	3.5	4	80 km/h	AC	2.40	0.0	12.95	0.80	10	0	0	0
16	Manila Bataan Coastal Road	Phase I	47.9	74,000	3.5	4	100 km/h	AC	10.40	33.5	4.00	0.00	3	1	0	6
		Phase II	22.4	2,600	3.5	4	100 km/h	AC	21.55	0.85	0.00	0.00	2	1	0	17
17	North Luzon Expressway Phase 3		36.2	46,000	3.5	4	100 km/h	AC	27.40	8.80 (10)	0.00	0.00	4	0	0	32
18	East West Connection Expressway		26.6	29,000	3.5	4	100 km/h	AC	25.35	1.25 (20)	0.00	0.00	3	0	0	24

14.3 PROJECT COST ESTIMATE

14.3.1 Initial Project Cost

Following costs were roughly estimated;



In case that cost estimate for the project of which F/S has been done in past years were available, its results were referred in consideration of price escalation at a rate of 5 % per annum.

(1) Unit Prices of Major Work Items

To estimate each construction cost, unit prices of necessary work items were examined through past or ongoing project. Based on the examination, unit costs for major items were estimated as shown in **Table 14.3.1-1**. Each unit cost is inclusive of in direct cost and VAT. As for physical contingency, 5 % of the above mentioned unit cost were considered separately from unit cost of major items.

TABLE 14.3.1-1 MAJOR WORK ITEMS AND ITS UNIT COST

Item		Unit	Unit Cost (PHP)
Clearing and Grubbing		ha	100,000
Embankment from Borrow Materials		m3	1,000
AASHOTO PC Girder	Type-V	L=30m	1,300,000
AASHOTO PC Girder	Type-III	L=20m	650,000
CIP Pile	Φ3000	m	200,000
CIP Pile	Φ2000	m	133,320
CIP Pile	Φ1500	m	45,000
CIP Pile	Φ1200	m	42,000
CIP Pile	Φ1000	m	35,000
Structural Steel		kg	220
Reign forcing Bar		kg	90
Structural Concrete	f'c=34Mpa	m3	12,000
Structural Concrete	f'c=24Mpa	m3	8,000
Structural Concrete	f'c=21Mpa	m3	6,000
Aggregate Sub-Base Course		m3	1,000
Aggregate Base Course		m3	1,200
Bituminous Concrete Surface Course		ton	2,700
Steel Materials for Temporally Work		Kg	20
Steel Pipe Sheet Pile		Kg	83

(2) Engineering Service Cost

Engineering service cost is consisted of 1) detailed engineering design and 2) construction supervision. The engineering cost was estimated based on certain ration of its construction cost. The ratios were assumed in consideration of the project type as shown in **Table 14.3.1-2**.

TABLE 14.3.1-2 THE RATIO OF ENGINEERING SERVICE COST TO ITS CONSTRUCTION COST

Project Type	Detailed Engineering Design	Construction Supervision	Total of Engineering Service Cost
Shorter Road Length and High Construction Cost/ km	1.2%	1.8%	3%
Longer Road Length and Medium Construction Cost / km	3.0%	5.0%	8%
Longer Road Length and Low Construction Cost /km	4.0%	8.0%	12%

(3) Project Administration Cost

Project Administration Cost was estimated based on the type of its construction as same as the Engineering Service Cost mentioned above. Value of the ratio is shown in **Table 14.3.1-3** based on past experience.

TABLE 14.3.1-3 RATIO OF PROJECT IMPLEMENTATION COST TO ITS CONSTRUCTION COST

Project Type	Project Administration Cost
Shorter Road Length and High Construction Cost/ km	0.5 %
Longer Road Length and Medium Construction Cost / km	3.0 %
Longer Road Length and Low Construction Cost /km	3.5 %

(4) R.O.W. Cost

R.O.W Cost is consisted of land acquisition cost and compensation cost.

- **Land Acquisition Cost;** The land area to be acquired for the each project was estimated by multiplying the width of R.O.W by the road length where to be acquired. The width of R.O.W is basically assumed as below based on typical cross section.

At grad road section: W = 40.0m
Viaduct Section: W = 20.5m

Unit cost of land acquisition was estimated as shown in **Table 14.3.2-4** in consideration of current zonal valuation.

TABLE 14.3.2-4 UNIT COST OF LAND ACQUISITION

No.	Type of Land	Unit Price (Php/m2)
1	Agricultural Area	200
2	Residential Area at out of Metro Manila	300
3	Residential Area in Metro Manila	4,000~8,000
4	Commercial Area	10,000~30,000

- **Compensation Cost;** Compensation cost for the affected buildings was estimated by multiplying floor area (m^2) by unit cost (Php/m^2) for each affected buildings. The unit cost of floor area is shown in **Table 14.3.1-5**.

TABLE 14.3.1-5 UNIT COST OF COMPENSATION FOR BUILDINGS

NO.	STRUCTURE DESCRIPTION	ESTIMATED COST RANGE (PhP / m^2)
1	Light Materials	2,500.00 to 4,000.00
2	Wooden with light materials	3,500.00 to 4,500.00
3	Wooden & light materials with concrete floor slab	4,000.00 to 5,000.00
4	Wooden	7,500.00 to 8,500.00
5	1 storey Semi-concrete with light materials	7,000.00 to 8,500.00
6	2 storey Semi-concrete with light materials	8,500.00 to 9,000.00
7	3 storey Semi-concrete with light materials	9,000.00 to 10,000.00
8	Semi-Concrete	10,500.00 to 12,000.00
9	1 Storey Concrete with light materials	9,500.00 to 10,500.00
10	2 storey Concrete with light materials	10,600.00 to 11,000.00
11	3 storey Concrete with light materials	11,000.00 to 12,000.00
12	1 storey Concrete	11,500.00 to 12,000.00
13	2 storey Concrete	12,500.00 to 14,500.00
14	3 storey Concrete	15,000.00 to 17,500.00
15	4 storeys & up Concrete	18,000.00 to 20,000.00
16	Factories & Warehouses	24,000.00 to 28,000.00
17	Gas Service Stations/Automotive Shops	25,000.00 to 30,000.00
18	Covered Basketball Courts/Garage-type Shops	19,000.00 to 21,000.00

(5) Total Initial Project Cost

Estimated initial project cost based on the above assumption is shown **Table 14.3.1-6**.

TABLE 14.3.1-6 INITIAL PROJECT COST OF THE PROJECT

No.	Name of HSH	Section	Length (km)	Project Cost (B.P) ; Year 2010					Remarks
				Construction Cost	Engineering Cost	Administration Cost	R.O.W. Cost	Total	
1	NLEx–SLEx Link Expressway	South Section (SLEX-Espana)	8.55	17.56 (2.05 B.P/km)	0.53 (3.0%)	0.09 (0.5%)	0.58	18.75	Fiscal Conti.5%
		North Section (Espana - Segment 10)	4.80	11.56 (2.41 B.P/km)	0.35 (3.0%)	0.06 (0.5%)	0.41	12.37	Fiscal Conti.5%
2	NAIA Expressway-2	Phase 2	4.9	11.06 (2.26 B.P/km)	0.33 (3.0%)	0.06 (0.5%)	0.71	12.15	Fiscal Conti.5%
3	C-6 Expressway (JETRO F/S 2008)	North	16.5	7.85 (0.48 P/km)	0.63 (8%)	0.23 (3%)	1.23	9.94	Fiscal Conti.5%
		East	25.5	14.93 (0.59 P/km)	1.19 (8%)	0.41 (3%)	1.49	18.02	Fiscal Conti.5%
		South-East	22.8	20.44 (0.90BP/km)	1.63 (8%)	0.62 (3%)	2.60	25.29	Fiscal Conti.5%
4	C-6 Extension	Phase-1	29.9	10.11 (0.34 B.P/km)	0.81 (8.0%)	0.30 (3.0%)	1.05	12.27	Fiscal Conti.5%
		Phase-2	13.7	5.26 (0.38 B.P/km)	0.42 (8.0%)	0.16 (3.0%)	0.48	6.31	Fiscal Conti.5%
5	Manila Bay Expressway		8.02	44.69 (5.57 B.P/km)	1.34 (3.0%)	0.22 (0.5%)	0.29	46.54	Fiscal Conti.5%
6	CALA Expressway	SLEX-Aguinald Hwy (JICA F/S 2006)	14.3	6.43 (0.45 B.P/km)	0.77 (12.0%)	0.23 (3.5%)	0.45	7.88	Fiscal Conti.10%
		Aguinald Hwy.-Manila Cavite Exp.	27.49	9.38 (0.34 B.P/km)	1.13 (12.0%)	0.33 (3.5%)	0.96	11.79	Fiscal Conti.10%
7	Central Luzon Expressway (JICA F/S 2010)	Phase 1: Tarlac-Cabanatuan	28.2	10.85 (0.39 BP/km)	1.30 (12%)	0.38 (3.5%)	0.65	13.18	Fiscal Conti.10%
		Phase 2: Cabanatuan-San Jose	35.7	13.41 (0.38 BP/km)	1.61 (12%)	0.24 (1.8%)	0.79	16.05	Fiscal Conti.10%
8	Calamba-Los Banos Toll Expressway (2003 JBIC) (2008 DPWH)	--	15.5	5.05 (0.33 B.P/km)	0.40 (8.0%)	0.15 (3.0%)	0.85	6.45	Fiscal Conti.5%
9	SLEx Extension (to Lucena)	--	47.8	13.96 (0.29 B.P/km)	1.68 (12.0%)	0.28 (2.0%)	0.38	16.30	Fiscal Conti.5%
10	NLEX-East	Phase-I	30.1	9.48 (0.31 B.P/km)	1.14 (12.0%)	0.33 (3.5%)	0.36	11.31	Fiscal Conti.5%
		Phase-II	62.0	19.11 (0.31 B.P/km)	2.29 (12.0%)	0.67 (3.5%)	0.74	22.82	Fiscal Conti.5%
11	La Mesa Parkway		10.9	3.94 (0.36 B.P/km)	0.31 (8.0%)	0.12 (3.0%)	0.09	4.46	Fiscal Conti.5%
12	C-5/FTI/SKYWAY Connector Rd.		3.0	5.32 (1.77 B.P/km)	0.16 (3.0%)	0.03 (0.5%)	0.10	5.60	Fiscal Conti.5%
13	Pasig Marikina Express Way		15.7	34.65 (2.21 B.P/km)	2.77 (8.0%)	1.04 (3.0%)	1.00	39.46	Fiscal Conti.5%
14	Global City Link		1.7	0.86 (0.51 B.P/km)	0.10 (12.0%)	0.03 (3.5%)	0.03	1.03	Fiscal Conti.5%
15	R-7 Express Way		16.1	23.98 (1.49 B.P/km)	0.72 (3.0%)	0.12 (0.5%)	1.00	25.81	Fiscal Conti.5%
16	Manila Bataan Coastal Road	Phase I	47.9	76.00 (1.59 B.P/km)	2.28 (3.0%)	0.38 (0.5%)	0.19	78.85	Fiscal Conti.5%
		Phase II	22.4	6.50 (0.29 B.P/km)	0.52 (8.0%)	0.20 (3.0%)	0.18	7.40	Fiscal Conti.5%
17	North Luzon Expressway Phase 3		36.2	24.34 (0.67 B.P/km)	2.92 (12.0%)	0.85 (3.5%)	0.29	28.40	Fiscal Conti.5%
18	East West Connection Expressway		26.6	7.93 (0.30 B.P/km)	0.95 (12.0%)	0.28 (3.5%)	0.21	9.37	Fiscal Conti.5%

14.3.2 Operation and Maintenance Cost

Operation and maintenance costs were estimated based on the available data of some private operators, type of structure, number of lanes, and expressway length. Estimated operation and maintenance costs of each expressway are summarized in **Table 14.3.2-1**.

TABLE 14.3.2-1 OPERATION AND MAINTENANCE COST

No.	Name of HSH	Section	Length (km)	No. of Lanes	Construction Cost (B.Php)	Maintenance Cost (M.Php)						Operation Cost (M.Php)/Year			O & M Cost (M.Php)/Year		
						Routine Maintenance/year			Periodic Maintenance /10y								
						%	Cost /km	Cost in Total	%	Cost /km	Cost in Total	%	Cost /km	Cost in Total	%	Cost /km	Cost in Total
1	NLEx–SLEx Link Expressway	End of SEG-10 - SLEX	13.35	4	**29.12** (2.18 B.P/km)	0.15%	3.27	44	2.0%	43.63	582	0.60%	13.09	175	0.75%	16.36	218
2	NAIA Expressway-2	Phase 2	4.9	4	**11.06** (2.26 B.P/km)	0.15%	3.39	17	2.0%	45.13	221	0.60%	13.54	66	0.75%	16.93	83
3	C-6 Expressway (JETRO F/S 2008)	North	16.5	4	**7.85** (0.48 P/km)	1.00%	4.76	79	10.0%	47.58	785	1.50%	7.14	118	2.50%	11.89	196
		East	25.5	4	**14.93** (0.59 P/km)	0.80%	4.68	119	10.0%	58.55	1,493	1.50%	8.78	224	2.30%	13.47	343
		South-East	22.8	4	**20.44** (0.90BP/km)	0.50%	4.48	102	4.0%	35.86	818	1.50%	13.45	307	2.00%	17.93	409
4	C-6 Extension	Phase-1	29.9	4	**10.11** (0.34 B.P/km)	1.20%	4.06	121	10.0%	33.82	1,011	1.80%	6.09	182	3.00%	10.15	303
		Phase-2	13.7	4	**5.26** (0.38 B.P/km)	1.20%	4.60	63	10.0%	38.37	526	1.80%	6.91	95	3.00%	11.51	158
5	Manila Bay Expressway		8.02	4	**44.69** (5.57 B.P/km)	0.10%	5.57	45	2.0%	111.46	894	0.30%	16.72	134	0.40%	22.29	179
6	CALA Expressway	SLEX-Aguinald Hwy	14.3	6	**6.43** (0.45 B.P/km)	1.00%	4.50	64	10.0%	44.97	643	1.50%	6.74	96	2.50%	11.24	161
		Aguinald Hwy. - Manila Cavite Exp.	27.49	6	**9.38** (0.34 B.P/km)	1.20%	4.09	113	10.0%	34.12	938	1.50%	5.12	141	2.70%	9.21	253
7	Central Luzon Expressway (JICA F/S 2010)	Phase 1:	28.2	4	**10.85** (0.39 BP/km)	1.20%	4.62	130	10.0%	38.48	1,085	1.50%	5.77	163	2.70%	10.39	293
		Phase 2:	35.7	4	**13.41** (0.38 BP/km)	1.20%	4.51	161	10.0%	37.56	1,341	1.50%	5.63	201	2.70%	10.14	362
8	Calamba-Los Banos Toll Expressway	--	15.0	4	**5.05** (0.34 B.P/km)	1.50%	5.05	76	10.0%	33.65	505	1.50%	5.05	76	3.00%	10.09	151
9	SLEx Extension (to Lucena)	--	47.8	4	**13.96** (0.29 B.P/km)	1.50%	4.38	209	10.0%	29.21	1,396	2.00%	5.84	279	3.50%	10.22	489
10	NLEX-East	Phase-I	30.1	4	**9.48** (0.31 B.P/km)	1.80%	5.67	171	10.0%	31.49	948	2.00%	6.30	190	3.80%	11.97	360
		Phase-II	62.0	4	**19.11** (0.31 B.P/km)	1.80%	5.55	344	10.0%	30.82	1,911	2.00%	6.16	382	3.80%	11.71	726
11	La Mesa Parkway		10.9	4	**3.94** (0.36 B.P/km)	1.50%	5.42	59	10.0%	36.11	394	2.00%	7.22	79	3.50%	12.64	138
12	C-5/FTI/SKYWAY Connector Rd.		3.0	2	**5.32** (1.77 B.P/km)	0.20%	3.54	11	2.0%	35.44	106	0.60%	10.63	32	0.80%	14.18	43
13	Pasig Marikina Express Way		15.7	4	**34.65** (2.21 B.P/km)	0.15%	3.31	52	2.0%	44.14	693	0.60%	13.24	208	0.75%	16.55	260
14	Global City Link		1.7	4	**0.86** (0.51 B.P/km)	1.50%	7.59	13	10.0%	50.62	86	6.00%	30.37	52	7.50%	37.96	65
15	R-7 Express Way		16.1	4	**23.98** (1.49 B.P/km)	0.40%	5.96	96	2.0%	29.78	480	0.80%	11.91	192	1.20%	17.87	288
16	Manila Bataan Coastal Road	Phase I	47.9	4	**76.00** (1.59 B.P/km)	0.40%	6.35	304	3.0%	47.60	2,280	0.80%	12.69	608	1.20%	19.04	912
		Phase II	22.4	4	**6.50** (0.29 B.P/km)	1.50%	4.35	98	10.0%	29.02	650	3.00%	8.71	195	4.50%	13.06	293
17	NLEX Phase 3		36.2	4	**24.34** (0.67 B.P/km)	0.70%	4.71	170	10.0%	67.22	2,434	1.50%	10.08	365	2.20%	14.79	535
18	East West Connection Expressway		26.6	4	**7.93** (0.30 B.P/km)	1.50%	4.47	119	10.0%	29.81	793	3.00%	8.94	238	4.50%	13.41	357

CHAPTER 15

ECONOMIC AND FINANCIAL EVALUATION

CHAPTER 15
ECONOMIC AND FINANCIAL EVALUATION

15.1 PURPOSE OF ECONOMIC AND FINANCIAL EVALUATION

This economic and financial evaluation was undertaken for the purpose of providing one of information to determine an "**implementation priority**" of each project. Thus, it was assumed that all projects will be opened to traffic and operational in Year 2015, which is not in accordance with proposed implementation schedule.

Traffic assignment was undertaken for each project case as shown below;

Road Network for Traffic Assignment

- Without Case : 2015 network (on-going projects were assumed to be completed by 2015)
- With Case : 2015 network + subject project

Traffic Demand

- 2015 OD
- 2020 OD
- 2030 OD

15.2 BASE CASE

Opening of a new road will affect the traffic pattern in a road network where the project is implemented. Accordingly the economic and financial evaluation of a project will be also influenced by the opening of other new road. However it is difficult to evaluate each project under various other new road implementation schemes, each project is similarly evaluated by adding new project based the present road network.

There are eighteen (18) road projects studied as priority project shown in **Table 15.2-1**. To evaluate these projects, the same schemed is assumed as shown in **Table 15.2-2**. Opening of new road is assumed in Year 2015.

TABLE 15.2-1 PROJECT LIST FOR ECONOMIC AND FINANCIAL EVALUATION

No.	Project Name	Length	Remarks
1	NLEx-SLEx Link Expressway	13.4	Elevated road
2	NAIA Expressway (Phase 2)	4.9	Elevated road
3	C-6 Expressway	64.8	
4	C-6 Extension	43.6	
5	Manila Bay Expressway	8.0	Tunnel 7.5 km
6	CALA Expressway	41.8	
7	Central Luzon Expressway	63.9	
8	Calamba - Los Banos Toll Expressway	15.5	
9	SLEx Extension (to Lucena)	47.8	
10	NLEx - East	92.1	
11	La Mesa Parkway	10.9	Evaluation was included with NLEx East (No. 10)
12	C-5 / FTI / Skyway Connector Road	3.0	Elevated road
13	Pasig-Marikina Expressway	15.7	Elevated road
14	Global City Link	1.7	Evaluation was included with C-6 Expressway (No. 3)
15	R-7 Expressway	16.1	Elevated road
16	Manila Bataan Coastal Road	70.3	Elevated road
17	NLEx (Phase 3)	36.2	
18	East-West Connection Expressway	26.6	

TABLE 15.2-2 ASSUMED ROAD IMPLEMENTATION SCHEDULE FOR PROJECT EVALUATION

	Y2011	Y2012	Y2013	Y2014	Y2015
Detailed Design	←	→			
Land/ROW Acquisition		←	→		
Civil Work			←	→	
Opening of Road					←

15.3 TOLL SETTING

15.3.1 Present Toll Rate

Table 15.3.1-1 shows the present toll rate as of March 2010. Skyway is the first expressway developed by the BOT schemes with participation of the private sector. The toll rate is much higher than other expressways, about 2 times at grade section and about 4 times at elevated section. The toll rate of inter-regional expressway such as NLEx, SLEx are low about 1 to 2 pesos/km for class 1(Car, Jeepney, and Pickup).

TABLE 15.3.1-1 PRESENT TOLL RATE

(Peso/km)

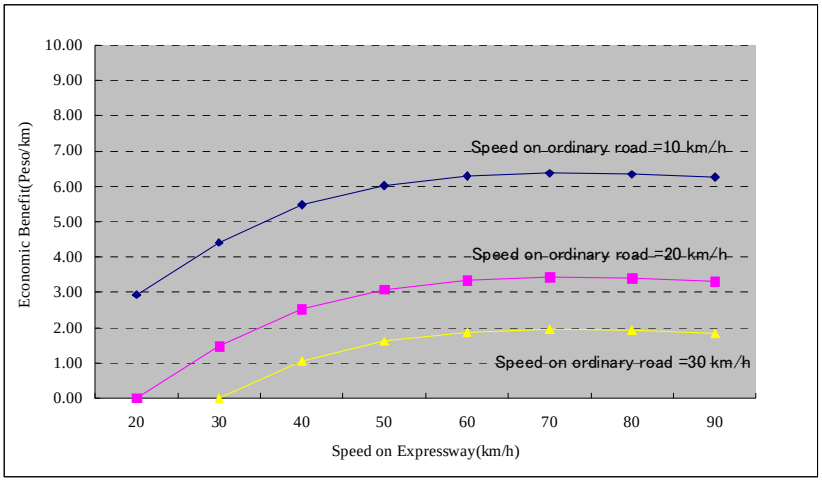
Toll Road		Class 1 Car, Jeepney, Pickup	Class 2 Light Truck	Class 3 Heavy Truck, Trailer
Metro Manila Skyway	Elevated	9.06	18.12	27.20
	At grade	4.81	9.62	14.43
North Luzon Expressway (NLEx)		2.13	5.33	6.39
South Luzon Expressway (SLEx)		0.76	1.48	2.24
Manila-Cavite Expressway		2.67	5.56	8.34
Southern-Tagalog Arterial Road (STAR)		1.02	2.03	3.05
Subic-Clark-Tarlac Expressway (SCTEx)		2.00	4.00	6.00

Source; TRB, 2010 March

15.3.2 User's Economic Benefit

By assuming a difference of travel speed between an ordinary road and an expressway, the economic benefit of expressway was estimated. It was generally said that a toll rate should be lower than user's benefit.

As shown in **Figure 15.3.2-1**, the economic benefit to a passenger car running on expressway is estimated about 6 pesos/km if the car can be run at 50~60 km/h, while the speed is 10 km/h on the ordinary road. Based on the analysis, the rate of urban expressway seems around 6 peso/km to be in the maximum level.



Source: Vehicle operating cost estimated by DPWH

FIGURE 15.3.2-1 USER'S BENEFIT BY USING EXPRESSWAY

15.3.3 Willingness to pay

A Stated Preference survey (SP survey) was conducted in this Study to obtain the data to estimate the expressway user's willingness to pay for travel time reduction. The question is that "Given the conditions stated in the cases below for Ordinary Road and Toll Expressway, which would prefer to use for "to work" trip purpose?

<Sample of SP survey>

Road Type	Travel time (Min.)	Travel Cost (Peso)	Choice (pls. Check)
Ordinary Road	30	0	☐
Toll Expressway	70	40	☐

Interviewee were questioned some similar cases then chose the ordinary road or expressway. Survey Form is attached in Annex 6.

Figure 15.3.3-1 shows the interview results of passenger car drivers/owners. Number of samples was 1,906. **Figure 15.3.3-2** shows the interview results at trucking companies, 50 samples.

Passenger Car Users

- If a toll fee is 10 to 20 pesos, about half of users select an expressway, but if a toll fee exceeds 10 to 20 pesos, those who select an expressway drastically decrease.

- Regardless of a toll fee, about 10% of users select an expressway.

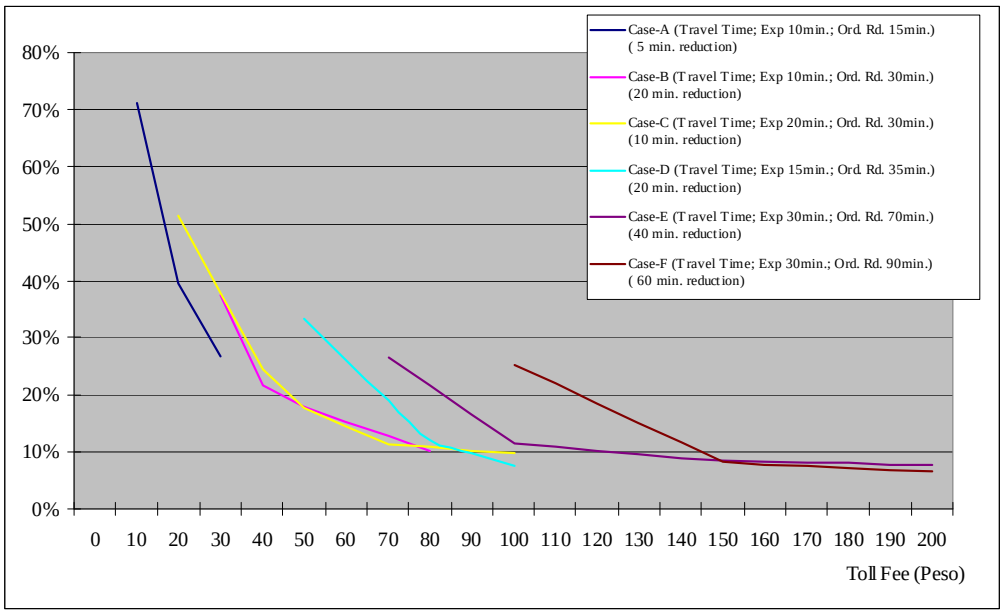


FIGURE 15.3.3-1 WILLINGNESS-TO-PAY SURVEY RESULTS: PASSENGER CAR USERS

Trucking Companies

- Rate of selecting an expressway is quite high. Even a toll fee is 300 pesos, more than 50% of trucking companies select an expressway.

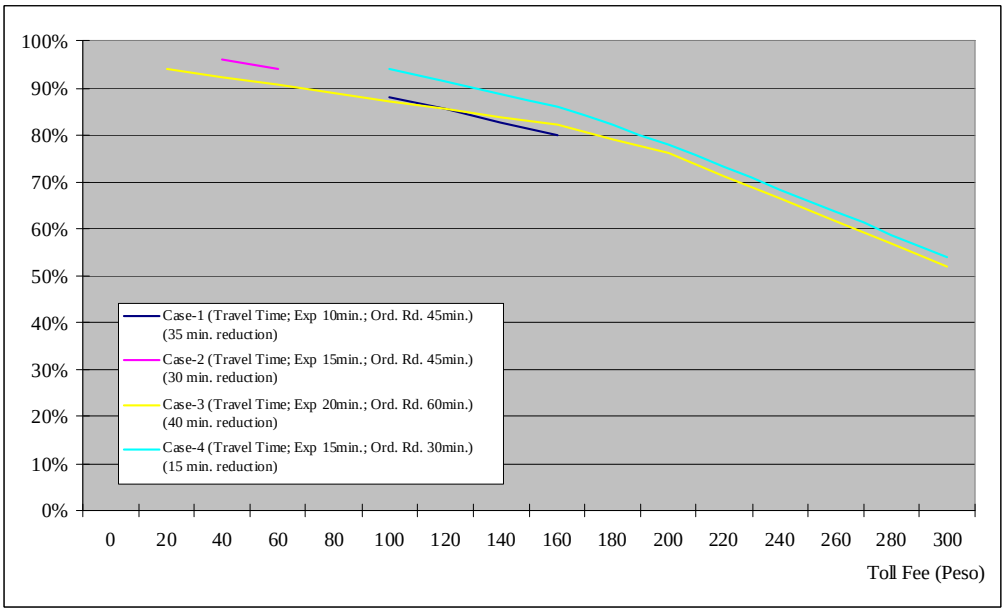


FIGURE 15.3.3-2 WILLINGNESS-TO-PAY SURVEY RESULTS: TRUCKING COMPANIES

Based on above survey result, disaggregate model is developed and time of value is estimated from model parameter.

Disaggregate Model Development

The model form adopted is the Logit model. This model is theoretically sound and is well accepted and widely used. It has the following general form:

$$Prob(a) = \frac{\exp[U_a]}{\sum_A \exp[U_x]}$$

Where,

Prob(a): probability that an individual will choose alternative a among other alternatives form choice set A. For this study a binary choice set – expressway or ordinary road – is used.

U_x: Utility of alternative, with x; as a function of its attributes

The form and parameters of the utility function is determined based on the results of the SP survey. The linear utility function is used for simplicity without necessarily compromising the model fitness; and it has the following form.

$$U = \beta_{xway}XWAY + \beta_{tt}TT + \beta_{tf}TF$$

Where,

TT: Travel time in minutes

TF: Toll Fee Peso

XWAY Express bonus (XWAY = if expressway; otherwise 0)

β_{xway}, β_{tt}, β_{tf} Parameters

To estimate the parameters, the Maximum Likelihood Estimation method is applied. It should be noticed that in other studies, and "expressway bonus"; i.e., a positive constant is added to the utility of the expressway. The parameters of the utility function for each vehicle type are summarized in **Table 15.3.3-1**.

TABLE 15.3.3-1 RESULT OF STATED PREFERENCE ANALYSIS

Vehicle Type		Passenger Car	Truck
β_{tt}	parameter	-1.35748E-002	-7.19493E-002
	t-stat	-5.6627	-10.7536
β_{tf}	parameter	-1.85934E-002	-1.06033E-002
	t-stat	-17.3375	-7.2210
Number of Samples		190	50
Hit Ratio		67%	70%
chi-square		3579	275
P^2		0.27	0.33

Time of Value

The value of time is equal to the ratio of $ß_{tt}/ß_{tf}$. **Table 15.3.3-2** shows the estimation of Time of Value based on Willingness to pay.

TABLE 15.3.3-2 ESTIMATION OF TIME OF VALUE BY SP SURVEY

Unit: Peso/hour

	Time of Value
Car	43.8
Truck	407.1

Time of value of Car estimated Travel Time Cost by willingness to pay, 43.8 Peso/hour is much lower than that (206 Peso/hour) estimated from average income and working hour. (See **Table 15.5.2-6**).

15.3.4 Maximization of Revenue

As a toll rate is raised from zero, total revenue will generally increase. However, if the toll rate becomes too high, traffic volume become less and less the total revenue will decline towards zero. Thus toll revenue will draw a convex to various toll rates with a peak points. Toll rate which brings about the maximum revenue is a main concern for toll road investors.

Toll rate which can maximize revenue is an important factor to consider being able to recover the cost. It should be noted; however that revenue increase would sacrifice the economic benefit.

To set the toll rate, the toll rate vs. attracted traffic was studied. Two case studies were performed which are the NLEx - SLEx Link Expressway and the SLEx extension expressway. The former represents the typical urban expressway and the latter represents the typical inter-regional expressway.

(1) Toll Rate Setting in NLEx – SLEx Link

Using the 2010 time value, the revenue-maximizing toll level on NLEX-SLEX(including Segment 9 and 10) was estimated around Peso 200 (=Peso 8.7/km) for passenger car (See **Figure 15.3.4-1** and **Figure 15.3.4-2**).

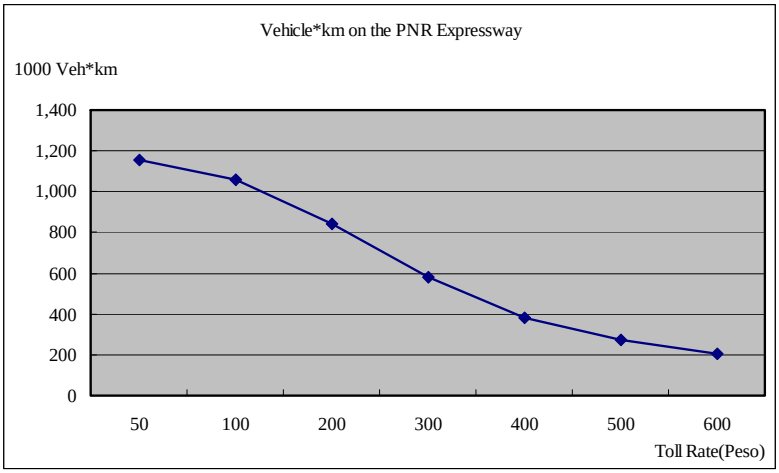


FIGURE 15.3.4-1 NLEx-SLEx LINK (DEMAND VS. TOLL RATE (2010))

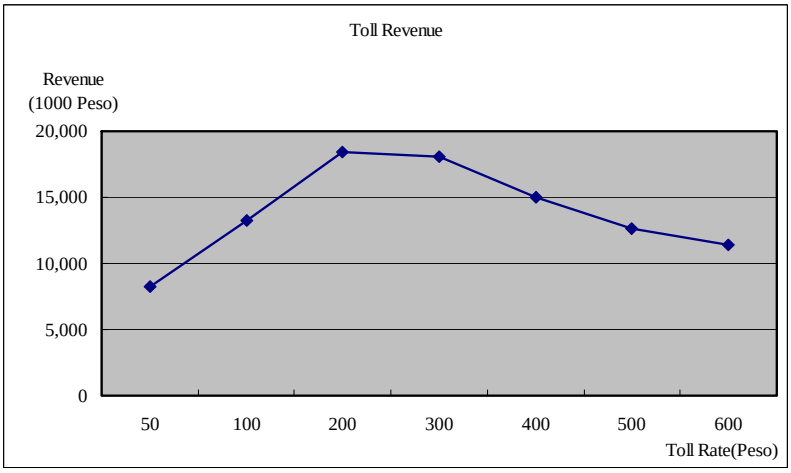


FIGURE 15.3.4-2 NLEx-SLEx LINK (L=23 KM)

DAILY REVENUE VS. TOLL RATE (2010)

(2) Toll Rate Setting in SLEx Extension

Using the 2010 time value, the revenue-maximizing toll level on SLEX extension was estimated more than Peso 8/km for passenger cars. (See **Figure 15.3.4-3** and **Figure 15.3.4-4**).

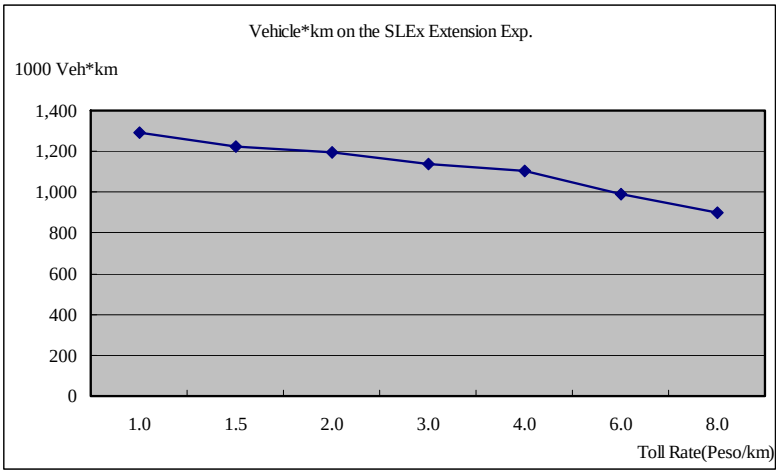


FIGURE 15.3.4-3 SLEx EXTENSION DEMAND VS. TOLL RATE (2010)

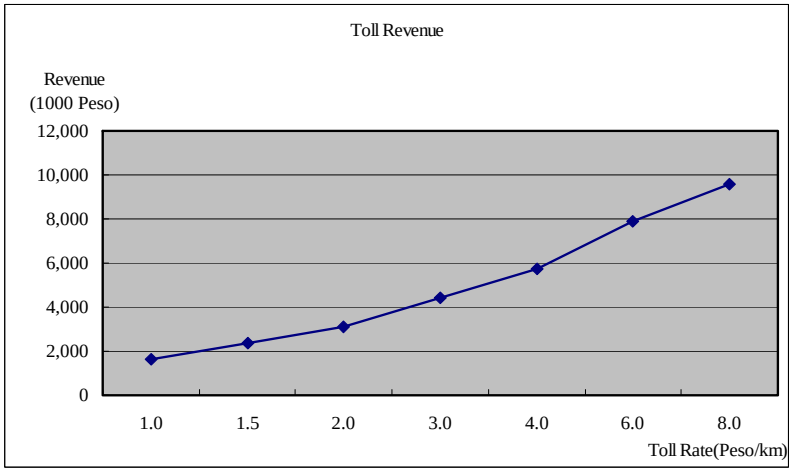


FIGURE 15.3.4-4 SLEx EXTENSION DEMAND VS. TOLL RATE (2010)

15.3.5 Conclusion

Toll rate seems around 6 peso/km based on the result of user's economic benefit and it prefers around 8.7 peso /km in the view of maximization revenue. But toll rate by the result of willingness to pay is much lower than the time value of user's economic benefit and present toll rate is also lower than that.

Based on the analyses above, this study is applied basically the present toll rate. The toll rate for class1(passenger car, jeepney) in year 2010 is around 4.3 peso / km in urban expressway and 2.0 peso / km in inter-regional expressway as shown in **Table 15.3.5-1**.

TABLE 15.3.5-1 TOLL RATES IN THIS STUDY (YEAR 2010)

Expressway Type	Class 1 (Car, Jeepney)	Class 2 Bus, Truck	Toll System
NLEx-SLEx Link (Urban Expressway)	100 Pesos (=4.3 pesos/km)	200 Pesos (=8.6 pesos/km)	Flat Toll System
SLEX Extension Exp. And Inter-regional Expressway	2.0 pesos/km	4.0 pesos/km	Mileage Toll System

15.4 TRAFFIC DEMAND FORCASTING FOR THE PROJECTS

As described in Section 15.2, traffic demand forecast was conducted one by one project with a base road network.

Base road network is assumed that present network add the following on-going road project.

<On-going project>

- SLEx (Batino - Sto. Tomas) 4 lane New Construction
- NLEx(Segment 8, 9 and 10), New Construction
- Skyway Phase 2
- STAR, 4 lane widening
- TPLEx, 2 lane New Construction
- R-1 Extension Expressway

(1) Estimated Traffic Volume of Expressway

Table 15.4-1 shows the average traffic volume of expressway's cross-section. The project of the highest traffic volume in year 2015 is North-South Link Expressway which volume is estimated as 90,900 PCU/day. Other expressways of higher volume are Pasig-Marikina Expressway, R-7 Expressway and CALA Expressway which are located in or near Metro Manila.

TABLE 15.4-1 ESTIMATED TRAFFIC VOLUME OF EXPRESSWAY

Unit: PCU/day

No.	Project	Y2015	Y2020	Y2030
1	North-South Link Expressway	90,900	96,400	111,000
2	NAIA Expressway-2	49,100	62,300	75,100
3-1	C6 Expressway North	53,500	62,900	67,700
3-2	C6 Expressway East	50,500	61,900	71,000
3-3	C6 Expressway South-East	68,500	76,800	78,100
4-1	C-6 Extension(phase1)	34,700	89,600	102,300
4-2	C-6 Extension(phase2)	35,000	61,200	65,800
5	Manila Bay Expressway	64,600	66,300	73,900
6-1	CALA Expressway(SLEx-Governors)	58,400	82,700	95,000
6-2	CALA Expressway(Governors-Cavite)	80,400	97,800	106,200
7-1	Central Luzon Expressway (Phase1)	22,800	29,200	34,600
7-2	Central Luzon Expressway (Phase2)	11,200	12,000	12,800
8	Calamba-Los Banos Toll Expressway	24,000	29,800	42,100
9	SLEx Extension	23,000	25,600	32,300
10-1	North Luzon East (phase1)	12,000	24,900	38,400
10-2	North Luzon East (phase2)	11,200	14,500	20,500
11	La Mesa Parkway	59,600	65,900	71,700
12	C-5/FTI/Skyway Connector Road	52,900	64,100	73,400
13	Pasig Marikina Expressway	79,500	81,900	92,000
15	R-7 Expressway	83,400	83,900	87,200
16-1	Manila Bataan Coastal Road (Phase1)	42,400	62,700	74,400
16-2	Manila Bataan Coastal Road (Phase2)	18,400	19,500	24,400
17	North Luzon East (phase3)	28,800	35,700	46,100
18	East West Connection Expressway	4,100	8,600	13,300

Table 15.4-2 shows the PCU*km of each expressway which is estimated the traffic volume multiply expressway length. This value is in proportion to expressway revenue. The project of the highest PCU*km is CALA Expressway (Governors-Cavite), 2.2million PCU*km.

TABLE 15.4-2 ESTIMATED PCU*KM OF EXPRESSWAY

Unit: PCU*km

No.	Project	Length (km)	Y2015	Y2020	Y2030
1	North-South Link Expressway	13.4	1,218,060	1,291,760	1,487,400
2	NAIA Expressway-2	4.9	240,590	305,270	367,990
3-1	C6 Expressway North	16.5	882,750	1,037,850	1,117,050
3-2	C6 Expressway East	25.5	1,287,750	1,578,450	1,810,500
3-3	C6 Expressway South-East	22.8	1,561,800	1,751,040	1,780,680
4-1	C-6 Extension(phase1)	29.9	1,034,060	2,670,080	3,048,540
4-2	C-6 Extension(phase2)	13.7	479,500	838,440	901,460
5	Manila Bay Expressway	8.0	516,800	530,400	591,200
6-1	CALA Expressway(SLEx-Governors)	14.3	835,120	1,182,610	1,358,500
6-2	CALA Expressway(Governors-Cavite)	27.5	2,211,000	2,689,500	2,920,500
7-1	Central Luzon Expressway (Phase1)	28.2	642,960	823,440	975,720
7-2	Central Luzon Expressway (Phase2)	35.7	399,840	428,400	456,960
8	Calamba-Los Banos Toll Expressway	15.5	356,500	461,900	652,550
9	SLEx Extension	47.8	1,099,400	1,223,680	1,543,940
10-1	North Luzon East (phase1)	30.1	361,200	749,490	1,155,840
10-2	North Luzon East (phase2)	62.0	694,400	899,000	1,271,000
11	La Mesa Parkway	10.9	649,640	718,310	781,530
12	C-5/FTI/Skyway Connector Road	3.0	158,700	192,300	220,200
13	Pasig Marikina Expressway	15.7	1,248,150	1,285,830	1,444,400
15	R-7 Expressway	16.1	1,342,740	1,350,790	1,403,920
16-1	Manila Bataan Coastal Road (Phase1)	47.9	2,030,960	3,003,330	3,563,760
16-2	Manila Bataan Coastal Road (Phase2)	22.4	412,160	436,800	546,560
17	North Luzon East (phase3)	36.2	1,042,560	1,292,340	1,668,820
18	East West Connection Expressway	26.6	109,060	228,760	353,780

(2) Reduction of Total Travel Time and Travel Speed

By the difference of traffic assignment result of with project case and without case, the reduction of travel time in whole road network is estimated. **Figure 15.4-1** illustrated the reduction of travel time by each expressway project.

The project of the highest travel time reduction is C-6 expressway. The other projects of higher travel time reduction are CALA expressway, NLEx East and La Mesa Parkway.

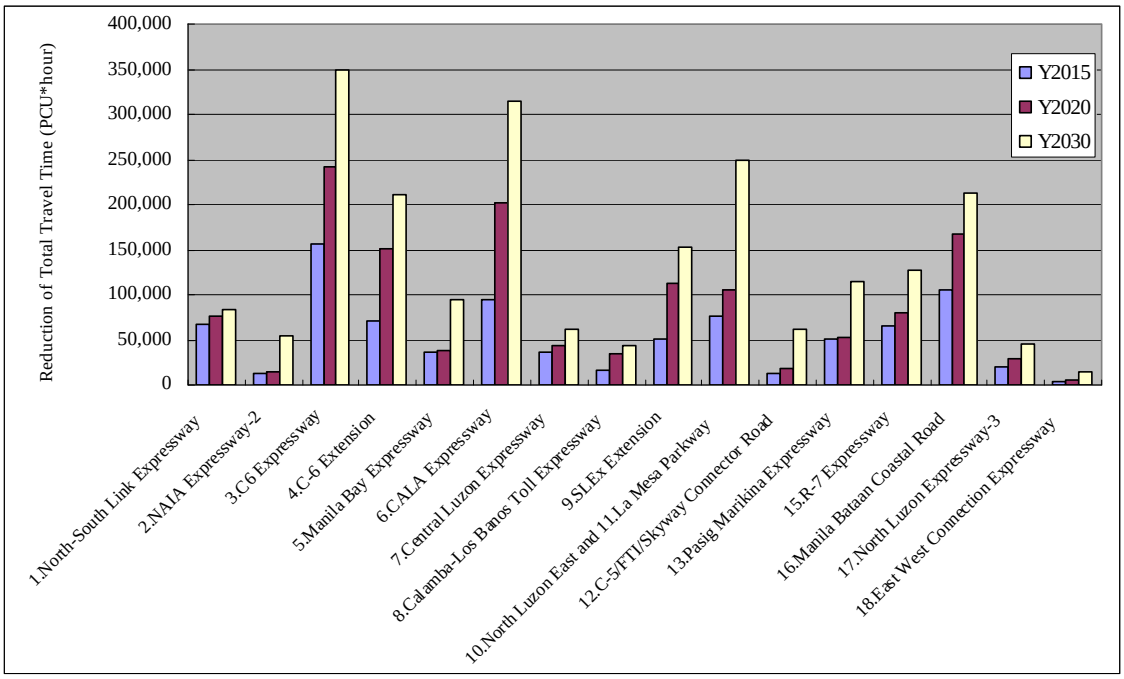


FIGURE 15.4-1 ESTIMATED REDUCTION OF TRAVEL TIME

Generally speaking, as the project of longer length show the higher travel time reduction; total travel time reduction is divided by project length. **Figure 15.4-2** illustrated the travel time reduction per km (= reduction of travel time (PCU*hour) / expressway length (km)) in year 2015.

The projects of higher travel time reduction are N-S link, Manila Bay Expressway, C5/Food Terminal Skyway Connector Road, R-7 Expressway and Pasig Marikina Expressway which are located in Metro Manila Area.

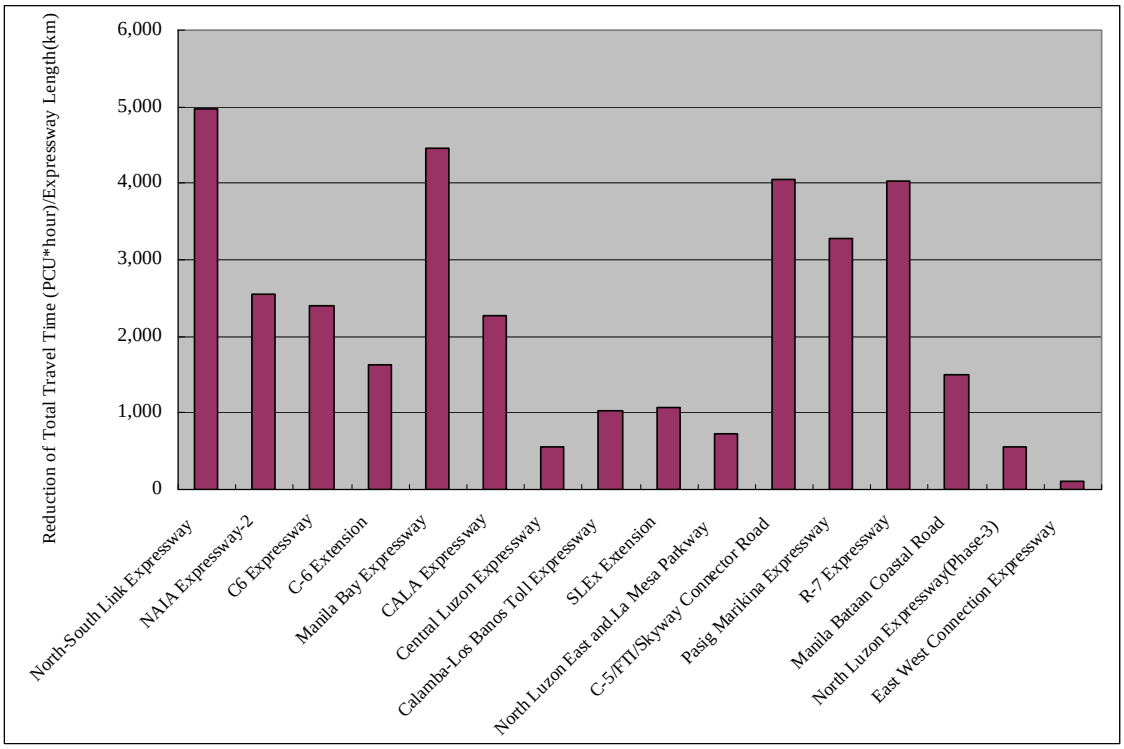


FIGURE 15.4-2 REDUCTION OF TRAVEL TIME PER KM IN YEAR 2015

Table 15.4-3 shows the average travel speed of whole road network and the difference with project case and without case. The project of the most improvement of travel speed is CALA Expressway. The other projects are N-S Link Expressway, C-6 Expressway, C-6 Extension, NLEx, East and La Mesa Parkway, Pasig Marikina Expressway and R-7 Expressway.

TABLE 15.4-3 DIFFERENCE OF AVERAGE TRAVEL SPEED OF WHOLE ROAD NETWORK IN YEAR 2015

No.	Project	Average Speed of Whole Network (km/h)	Difference (W-W/O) (km/h)
0	**Without Case**	**27.8**	
1	North-South Link Expressway	28.3	0.5
2	NAIA Expressway-2	27.9	0.1
3	C6 Expressway	28.3	0.5
4	C-6 Extension	28.3	0.5
5	Manila Bay Expressway	28.1	0.3
6	CALA Expressway	28.5	0.7
7	Central Luzon Expressway	28.1	0.3
8	Calamba-Los Banos Toll Expressway	28.1	0.3
9	SLEx Extension	28.1	0.3
10,11	North Luzon East and La Mesa Parkway	28.3	0.5
12	C-5/FTI/Skyway Connector Road	27.8	0.0
13	Pasig Marikina Expressway	28.3	0.5
15	R-7 Expressway	28.3	0.5
16	Manila Bataan Coastal Road	28.2	0.4
17	North Luzon Expressway(Phase-3)	27.8	0.0

(3) Traffic Demand Conclusion

Based on traffic demand forecast, the volume of new toll expressways in Metro Manila is near capacity in year 2015.

The following new projects are expected the high traffic demand;.

- N-S Link Expressway
- C-6 Expressway
- CALA Expressway
- Pasig-Marikina Expressway
- R-7 Expressway

15.5 ECONOMIC EVALUATION

This chapter aims to evaluate the proposed project, the High Standard Highway Network Development Project, from viewpoints of economic aspect based on the various foreseeable assumptions. The evaluation method applies the economic cash flow analysis based on 'benefit-cost' analysis, that is analyzed comparatively both of so called 'social benefits' derived by the project in the regional economy and 'social costs' necessary for the project's implementation.

15.5.1 General Methodology

(1) General Workflow of Economic Evaluation

The economic evaluation study was carried out by the following workflow as in **Figure 15.5.1-1**.

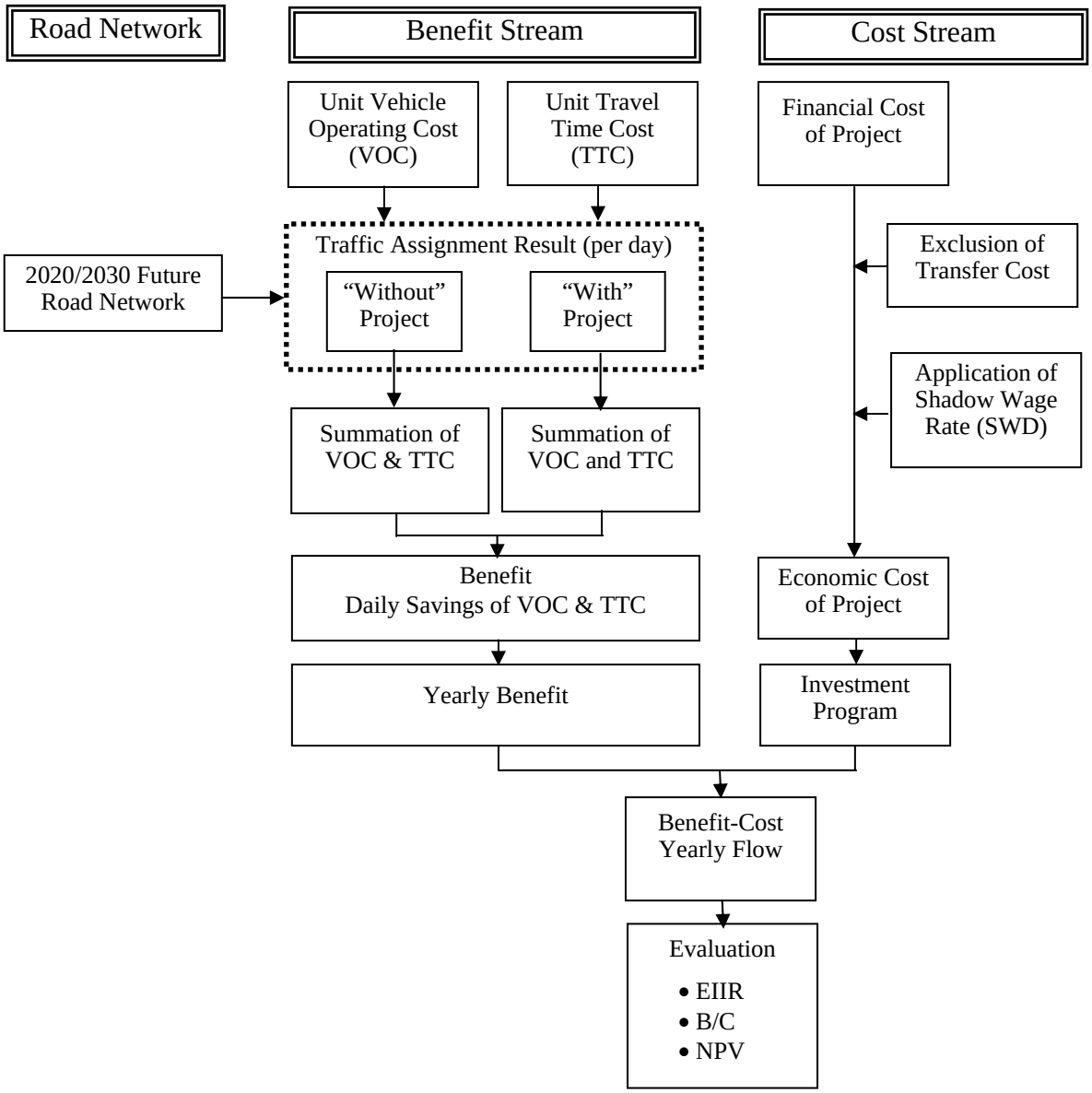


FIGURE 15.5.1-1 WORK FLOW FOR ECONOMIC EVALUATION

(2) Indicators of Economic Evaluation

Economic costs and benefits throughout the project life periods are compared by a discount cash flow analysis. The discount rate (hereinafter referred to as "DR") is at 15%, which is widely used in Philippines as a social discount rate. For economic evaluation, three indicators are calculated: Economic Internal Rate of Return (hereinafter referred to as "EIRR"), Benefit/Cost Ratio (hereinafter referred to as "B/C") and Net Present Value (hereinafter referred to as "NPV"). In addition, the economic life is assumed to be 20 years, taking into account future rapid urban growth and changes of socioeconomic conditions. Therefore, the Pro-forma cash flow of a project evaluation will be prepared for 2011-2030. The residual value of each project in 2031 is calculated and added to the benefit stream. They are defined as **Table 15.5.1-1**.

TABLE 15.5.1-1 INDICATORS OF ECONOMIC EVALUATION

No.	Indicators	Calculation Formula or Value
1	Discount rate (DR)	15% in Philippines as a social discount rate
2	Economic Internal Rate of Return (EIIR)	r satisfying: *B*: benefit, *C*: Cost $\sum \frac{B_n}{(1+r)^n} = \sum \frac{C_n}{(1+r)^n}$
3	Benefit/Cost Ratio (B/C)	$\sum \frac{B_n}{(1+DR)^n} \div \sum \frac{C_n}{(1+DR)_n}$
4	Net Present Value (NPV)	$\sum \frac{B_n - C_n}{(1+DR)^n}$
5	Pro-forma cash flow of a project evaluation	Period for 2010-2030

Source: JICA Study Team

15.5.2 Economic Cost of the Project

(1) Initial Cost

The project cost must be estimated by shadow price in the cost benefit analysis. This is because market price is distorted by governmental system and policies such as custom duty, import curb and market intervention. The shadow price expresses the real value of the resources.

Project cost for the High Standard Highway construction is estimated in market prices in Chapter 14 as summarized in **Table 14.3.2-5**. They are converted into economic cost and the residual cost after the project life is calculated for economic evaluation, taking the following process.

(a) Out of material and equipment cost, import duty and value added tax (VAT) at 12% are deducted

(b) For the portion of unskilled labor cost, Shadow Wage Rate (SWR) is applied. According to the unemployment rate of Philippine Central Bank data in 2009 is high rate of 7-8%. The recent average unemployment rate is applied to Haveman's formula and 85-90% of SWR is obtained to adjust the labor cost as following.

SWR = (Wage rate in market) x (1.25 – Unemployment rate/0.2)
= (Wage rate in market) x 0.85-0.90

(c) The life year will be considered at 20 years.

(d) The required costs for operation and maintenance were examined in Chapter 14 in market price. These data are converted into economic price and estimated in the form of yearly cost flow.

Accordingly, the economic cost for the Projects of the High Standard Highway is estimated in **Table 15.5.2-1**. The standard conversion factor (SCF) will be estimated at 80.2-81.9 % of its market price. The project implementation period will be assumed to be 4.0 years.

TABLE 15.5.2-1 ECONOMIC COST FOR PROJECTS OF HIGH STANDARD HIGHWAY PROJECT

No.		Project	Financial Cost (A) (Mil PhP)	Economic Cost (B) (Mil PhP)	(B)/ (A)
1		North-South Link Expressway	31,140	25,059	0.805
2		NAIA Expressway-2	12,150	9,810	0.807
3	3-1	C6 Expressway North	9,940	8,115	0.816
	3-2	C6 Expressway East	18,020	14,656	0.813
	3-3	C6 Expressway South-East	26,320	21,438	0.815
	total		54,280	44,209	0.815
4	4-1	C-6 Extension (Phase1)	12,270	9,984	0.814
	4-2	C-6 Extension (Phase2)	6,310	5,138	0.813
	total		18,590	15,122	0.813
5		Manila Bay Expressway	46,540	37,358	0.803
6	6-1	CALA Expressway (SLEx-Govemors)	7,880	6,417	0.814
	6-2	CALA Expressway (Govemors-Manila Cavite)	11,790	9,629	0.816
	total		19,680	16,046	0.815
7	7-1	Central Luzon Expressway (Phase-1)	13,180	10,725	0.814
	7-2	Central Luzon Expressway (Phase-2)	16,050	13,044	0.813
	total		29,230	23,769	0.813
8		Calamba-Los Banos Toll Expressway	6,450	5,269	0.817
9		SLEx Extension	16,300	13,220	0.811
10 + 11	10-1	North Luzon East (Phase-1)	11,310	9,190	0.813
	10-2	North Luzon East (Phase-2)	22,820	18,534	0.813
	11	La Mesa Parkway	4,460	3,608	0.809
	total		38,590	31,332	0.812
12		C-5/FTI/Skyway Connector Road	5,600	4,509	0.804
13		Pasig Marikina Expressway	39,460	31,935	0.809
15		R-7 Expressway	25,810	20,791	0.805
16	16-1	Manila Bataan Coastal Road (Phase-1)	78,850	63,270	0.802
	16-2	Manila Bataan Coastal Road (Phase-2)	7,400	5,989	0.809
	total		86,250	69,270	0.803
17		NLEX Phase-3	28,400	23,033	0.811
18		East West Connection Expressway	9,370	7,607	0.812

Source: JICA Study Team

(2) Maintenance and Operation Costs

The maintenance cost and the operation cost will be estimated. The maintenance cost consists of the routine maintenance and the periodic maintenance. The operation cost is for daily road/traffic management of the road facility. The maintenance and operation costs will be estimated based on the current achievement of the toll highway in Chapter 14 as summarized in **Table 14.4.2-1**.

15.5.3 Economic Benefit of the Project

Economic benefits are calculated according to multiplied the estimated traffic volumes and unit Vehicle Operating Cost (VOC) /Travel Time Cost (TTC) respectively for each case, and the amount of 'without' case minus 'with' case is considered as the benefit provided by the project.

(1) Unit Vehicle Operating Cost (VOC) and Unit Travel Time Cost (TTC)

(a) Unit Vehicle Operating Cost (VOC)

The VOC per unit distance is estimated by type of vehicle being composed of the following components; they are a) fuel cost, b) oil cost, c) tire cost, d) spare parts cost, e) depreciation cost, f) capital opportunity cost and g) crew and overhead cost. The type of vehicles is motor-tricycle, car, van, jeepney, bus and truck.

The Department of Public Works and Highways (DPWH) has been periodically updating VOC data in order to use as input to the HDM Model for the appraisal of highway development and maintenance projects. There are the detailed data of VOC in 2006 (see **Table 15.5.3-1**), therefore, these data are revised and updated in accordance with the recent price indices (in 2009) by type of related goods, exchange rate of local currency. They are summarized in **Table 15.5.3-2**.

TABLE 15.5.3-1 UNIT VOC BY VEHICLE TYPE IN SEPTEMBER 2006

(Pesos per veh-km)

Speed (km/hour)	1. Motor-tricycle	2. Passenger Car	3. Jeepny	4. Good Utility	5. Small Bus	6. Large Bus	7. Rigid Truck 2ax	8. Rigid Truck 3ax	9.Rigid Truck 4ax	10. Rigid Truck 5ax
20	2.98	10.56	8.80	10.09	19.66	30.58	20.94	32.30	35.25	37.27
30	2.48	9.09	7.40	8.34	16.65	25.74	17.96	27.71	30.84	32.83
40	2.15	8.02	6.40	7.07	14.47	22.26	15.92	24.66	28.08	30.08
50	2.03	7.47	5.91	6.44	13.36	20.54	15.01	23.48	27.23	29.25
60	2.03	7.21	5.72	6.15	12.83	19.79	14.67	23.31	27.33	29.31
70	2.10	7.13	5.71	6.07	12.62	19.67	14.63	23.71	27.82	29.72
80	2.20	7.16	5.82	6.15	12.59	19.94	14.75	24.37	28.51	30.37
90	2.29	7.25	6.01	6.31	12.64	20.01	14.94	24.44	29.29	31.14
100	2.36	7.36	6.23	6.50	12.72	20.01	15.07	24.44	29.75	31.59
110	2.40	7.46	6.43	6.69	12.79	20.01	15.07	24.44	29.75	31.59
120	2.42	7.54	6.61	6.84	12.81	20.01	15.07	24.44	29.75	31.59

Source: DPWH

TABLE 15.5.3-2 UNIT VOC BY VEHICLE TYPE IN 2009

(Pesos per veh-km)

Speed (km/hour)	1. Motor-tricycle	2. Passenger Car	3. Jeepny	4. Good Utility	5. Small Bus	6. Large Bus	7. Rigid Truck 2ax	8. Rigid Truck 3ax	9.Rigid Truck 4ax	10. Rigid Truck 5ax
20	4.01	13.12	9.36	12.06	15.80	23.72	29.46	39.41	42.35	44.65
50	2.61	9.28	6.16	7.55	10.40	15.76	19.35	27.26	31.20	33.48
80	2.75	8.77	5.98	7.02	9.88	15.83	18.08	27.30	31.81	33.97
100	2.93	8.94	6.37	7.32	10.08	15.91	18.23	27.36	32.96	35.11
120	3.00	9.11	6.74	7.64	10.19	15.91	18.23	27.36	32.96	35.11

Source: DPWH, JICA Study Team

The VOC saving in whole road network will be calculated according to multiplied the estimated traffic volumes and unit VOC. The unit VOC by type of vehicles will be corresponded to the four (4) vehicle types of estimated traffic volume such as 1) Passenger Car, 2) Jeepney, 3) Large Bus and 4) Truck. The VOC of truck types will be converted by weighted average of vehicle composition. The unit VOC cost by type of vehicles by vehicle speed is shown in **Table 15.4.3-3.**

TABLE 15.5.3-3 UNIT VOC BY FOUR (4) VEHICLE TYPES IN 2009

(Pesos per veh-km)

Speed (km/hour)	1. Passenger Car	2. Jeepny	3. Large Bus	4. Truck
20	13.12	9.36	23.72	34.41
30	11.84	8.29	21.07	30.85
40	10.56	7.23	18.41	27.29
50	9.28	6.16	15.76	23.73
60	9.11	6.10	15.78	23.52
70	8.94	6.04	15.81	23.32
80	8.77	5.98	15.83	23.11
90	8.86	6.17	15.87	23.30
100	8.94	6.37	15.91	23.49
110	9.03	6.55	15.91	23.49
120	9.11	6.74	15.91	23.49

Source: DPWH, JICA Study Team

(b) Unit Travel Time Cost (TTC)

The TTC will be estimated based on the statistics data of average income per employed person per year, economic travel value of passenger during working hours, travel time for business hours and average number of passenger by type of vehicles. The TTC will be estimated based on the following condition (source: the "The Feasibility Study and Implementation Support on the CALA EAST-WEST National Road Project" by Japan International Cooperation Agency in 2006)

i) Travel time of car users and bus passengers is converted to money term using unit value. Travel time values are estimated based on the income level which reflects their productively.

ii) According to the interview survey data, assuming monthly working 175hours, one hour average monthly income for the non-car owner was 29.3 pesos, car owner was 53.2 pesos and truck user was 24.9 pesos.

iii) Travel time for business purpose can be considered fully worth the time value and travel time by going to work and returning from working place to home is assumed to be worth a half of the time value at work.

iv) The average number of passenger by type of vehicles will be assumed based on the result of survey, such as 1) Passenger car: 3.5, 2) Publics: 13.4 and 4) Truck: 2.6.

iv) The value of travel time will be converted at the same annual growth rate of the GRDP per capita for 2005-2008 (3.4%).

Table 15.5.3-4 shows the economic time value of passenger by type of vehicles in 2008. The economic time value was updated by using annual growth rate of the GRDP per capita. The unit TTC by vehicle type in 2009 will be estimated as shown in **Table 15.5.3-5**.

TABLE 15.5.3-4 ECONOMIC TIME VALUE OF PASSENGER IN 2008 BASED ON 2005 DATA

Peso/hour/passenger

Vehicle Type	2005	2008
Public	29.3	32.4
Private	53.2	58.8
Truck	24.9	27.5

Source: JICA Study Team, National Statistics Office 2002-2008, The Feasibility Study and Implementation Support on the CALA EAST-West National Road Project, 2006, JICA Study

TABLE 15.5.3-5 UNIT TRAVEL TIME COST BY PCU IN 2009

Peso/hour/PCU

Vehicle Type	2009
Public	433.6
Private	205.9
All Passenger Car	290.4

Source: JICA Study Team

(2) Estimation of Economic Benefit (VOC and TTC Saving) by Project

Based on the unit VOC by vehicle type by vehicle speed and the total vehicle-km, daily VOC saving by year is estimated. The daily TTC saving by year also is estimated based on the unit TTC by vehicle type and the total vehicle-hour. The economic benefit by project is shown in **Table 15.5.3-6**.

TABLE 15.5.3-6 ECONOMIC BENEFIT (VOC AND TTC SAVING) BY PROJECT

No.		Project	Economic Benefit (VOC+TTC) (x1,000 Pesos/day)		
			2015	2020	2030
1		North-South Link Expressway	14,616	16,861	26,947
2		NAIA Expressway-2	4,496	6.306	7,874
3	3-1	C6 Expressway North	3,352	4,701	6,318
	3-2	C6 Expressway East	8,940	10,016	14,590
	3-3	C6 Expressway South-East	15,025	28,163	31,110
	Total		30,037	51,393	57,785
4	4-1	C-6 Extension (Phase-1)	12,660	27,925	36,139
	4-2	C-6 Extension (Phase-2)	5,873	13,708	16,078
	Total		18,233	41,712	48,034
5		Manila Bay Expressway	8,065	8,589	16,330
6	6-1	CALA Expressway (SLEx-Governor's)	9,196	17,496	19,326
	6-2	CALA Expressway (Governor's-Manila Cavite)	12,976	39,030	48,302
	Total		25,418	55,319	68,497
7	7-1	Central Luzon Expressway (Phase-1)	6,987	10,095	14,923
	7-2	Central Luzon Expressway (Phase-2)	4,518	5,238	7,475
	Total		11,505	15,333	22,398
8		Calamba-Los Banos Toll Expressway	2,310	3,951	6,436
9		SLEx Extension	7,000	11,972	19,502
10 + 11	10-1	North Luzon East (Phase-1)	3,533	4,299	17,430
	10-2	North Luzon East (Phase-2)	4,535	5,750	14,636
	11	La Mesa Parkway	4,880	6,227	14,359
	Total		23,011	28,332	61,776
12		C-5/FTI/Skyway Connector Road	3,909	4,302	5,244
13		Pasig Marikina Expressway	12,707	13,355	18,405
15		R-7 Expressway	14,687	18,565	26,304
16	16-1	Manila Bataan Coastal Road (Phase-1)	25,721	31,795	63,015
	16-2	Manila Bataan Coastal Road (Phase-2)	4,402	5,368	11,313
	Total		29,737	36,779	69,515
17		NLEX Phase-3	10,485	13,830	21,627
18		East West Connection Expressway	921	2,433	9,064

Source: JICA Study Team

15.5.4 Results of Economic Evaluation

The economic cash flow of each project shows in attached Annex. **Table 15.5.4-1** shows the economic evaluation of all projects. The economic internal rate of return (EIIR) is in the range of 5.8%-50.6%. The Benefit/Cost Ratio (B/C) is in the range of 0.5-5.3.

The top ten projects of high EIIR are; project 6-2 (50.6%), project 6-1 (44.6%), project 4-1 (43.6%), project 4-2 (41.5%), project 11 (38.3%), project 3-3 (26.7%), project 12 (26.0%), project 15 (23.4%), project 9 (20.3%) and project 8 (17.1%). The projects which is higher opportunity cost of the capital of 15% are as follows: project 1, project 2, project 3-2, project 3-3, project 4-1, project 4-2, project 6-1, project 6-2, project 7-1, project 8, project 9, project 10-1, project 11, project 12, project 15, project 16-2 and project 17, indicating range of EIIR 15.1%-50.6%. They can be justified economically feasible from the national point of view.

For the B/C, the top ten project of high B/C are; project 6-2 (5.3), project 4-1, (3.8), project 6-1 (3.8), project 4-2 (3.5), project 11 (3.0), project 3-3 (1.9), project 12 (1.8), project 15 (1.6), project 9 (1.4) and project 8 (1.2). It is observed they will be high priority project by comparison.

TABLE 15.5.4-1 ECONOMIC EVALUATION BY PROJECTS

Evaluation Indicators	Unit	Project									
		1	2	3				4			5
				3-1	3-2	3-3	Total	4-1	4-2	Total	
EIRR	%	19.4%	16.7%	13.5%	17.9%	26.7%	24.7%	43.6%	41.5%	42.6%	5.8%
NPV	PhP mil.	5,058	712	(532)	1,941	13,838	22,624	21,651	9,954	30,683	(12,634)
B/C	-	1.3	1.1	0.9	1.2	1.9	1.7	3.8	3.5	3.6	0.5

Evaluation Indicators	Unit	Project									
		6			7			8	9	10	
		6-1	6-2	Total	7-1	7-2	Total			10-1	10-2
EIRR	%	44.6%	50.6%	49.9%	22.1%	8.5%	15.6%	17.4%	20.3%	15.5%	6.7%
NPV	PhP mil.	13,476	31,113	45,544	3,938	(3,255)	683	624	3,667	255	(6,457)
B/C	-	3.8	5.3	4.8	1.5	0.7	1.0	1.2	1.4	1.0	0.6

Evaluation Indicators	Unit	Project									
		11	10+11 Total	12	13	15	16			17	18
							16-1	16-2	Total		
EIRR	%	38.3%	23.3%	26.0%	11.5%	23.4%	14.7%	22.5%	15.0%	15.1%	8.0%
NPV	PhP mil.	5,867	14,386	2,309	(4,423)	8,465	(920)	2,429	152	56	(2,631)
B/C	-	3.0	1.6	1.8	0.8	1.6	1.0	1.5	1.0	1.0	0.6

Source: JICA Study Team

15.6 FINANCIAL EVALUATION

15.6.1 Assumptions for Parameters for Financial Analysis

Assumptions for parameters used for financial analysis is shown in **Table 15.6.1-1**.

TABLE 15.6.1-1 ASSUMPTIONS FOR PARAMETERS

Implementation/ Operation Period	Detailed Design Period		1 year (2011)
	ROW Acquisition Period		1.5 years (2012-mid 2013)
	Construction Period		2.5 years (mid 2012-2014
	Operation Period		30 years (2015-2044)
Cost Estimate	Project Cost	Engineering Cost	As given in Table 14.3.1-6
		ROW Acquisition Cost	
		Construction Cost	
		Administration Cost	
	O & M Cost	Annual Routine Maintenance & Operation Cost	As given in Table 14.3.2-1
		Periodic Maintenance Cost (every 10 years)	
Financing Structure	Equity		30% of Project Cost
	Debt		70% of Project Cost
	Loan Interest Rate		10%
	Loan Tenure	Grace Period	3 years
		Loan Repayment Period	10 years
	Repayment Structure		Even annuity basis
Depreciation	Methodology		Linear
	Period		50 years
Taxation	Corporate Tax		30% of profit
	Property Tax		None
	Tax Exemption Period		None
Inflation Rate			5% per annum
Revenue			As given in Table 15.6.1-2

TABLE 15.6.1-2 ESTIMATED REVENUE

No.	Road name	Revenue (thousand Pesp /day)		
		Year 2015	Year 2020	Year 2030
1	North-South Link Expressway	6,925	8,985	19,759
2	NAIA Expressway-2	2,433	3,672	8,934
3	C-6 Expressway	10,146	15,261	29,076
4	C-6 Extension	5,826	10,123	17,719
5	Manila Bay Expressway	2,607	3,303	6,064
6	CALA Expressway	8,126	13,156	26,123
7	Central Luzon Expressway	3,105	4,601	9,731
8	Calamba-Los Banos Toll Expressway	834	1,380	3,242
9	SLEx Extension	2,391	3,444	7,118
10,11	North Luzon East and La Mesa Parkway	7,564	13,173	28,935
12	C-5/FTI/Skyway Connector Road	810	1,236	2,314
13	Pasig Marikina Expressway	6,805	8,942	16,442
15	R-7 Expressway	6,660	8,499	14,362
16	Manila Bataan Costal Road	4,497	8,388	16,421
17	North Luzon East (phase-3)	2,104	3,320	7,114
18	East West Connection Expressway	336	1,185	3,553

15.6.2 Project FIRR

Project FIRR was analyzed as shown in Annex 15.2 and summarized in **Table 15.6.2-1**.

TABLE 15.6.2-1 PROJECT FIRR OF PROJECTS

Project Name	FIRR (%)
1. NLEx-SLEx Link Expressway	7.7
2. NAIA Expressway-2	8.9
3. C6 Expressway	3.9
4. C6 Extension	9.9
5. Manila Bay Expressway	Negative
6. CALA Expressway	13.6
7. Central Luzon Expressway	Negative
8. Calamba-Los Baños Expressway	Negative
9. SLEx Extension (to Lucena)	Negative
10. NLEx East + La Mesa Parkway	4.0
11. C5/FTI/Skyway Connector Road	4.9
12. Pasig-Marikina Expressway	5.4
13. R-7 Expressway	7.5
14. Manila-Bataan Coastal Road	Negative
15. NLEx Phase 3	Negative
16. East-West Connection Expressway	Negative

Note: All projects assumed to be operational in 2015

Weighted average cost of capital (WACC) is estimated to be about 11.5% (equity 30% and expected return 15%, loan 70% and interest rate 10%). All projects were assessed to be financially unviable, except CALA Expressway which is marginally financially viable. In order to attract a private sector participation, some PPP schemes were tested in the succeeding section.

15.6.3 Some Trial Tests of PPP Schemes

Financial viability of some PPP schemes were tested for the following three (3) projects;

(1) NLEx-SLEx Link Expressway

- PPP modality – Segment Dividing Type
- South section from España Avenue to Skyway Phase I to be constructed by the Government.
- Detailed design cost, ROW acquisition cost, and administration cost are also shouldered by the Government.
- North section from España Avenue to C-3 to be constructed by the private sector.
- Operation and maintenance of both sections by the private sector.

(2) NAIA Expressway (Phase II)

- PPP modality – Upfront Government Subsidy for construction cost (about 45% of construction cost is covered by the Government subsidy)/
- Detailed design, ROW acquisition cost and administrative cost are shouldered by the Government.
- Fifty five (55% of construction cost and O & M costs are shouldered by the private sector.

(3) CALA Expressway

- PPP modality – Segment Dividing Type
- Section 1 (from Aguinaldo Highway to SLEx) is constructed by the Government.
- Segment 2 (from Manila-Cavite Coastal Expressway to Aguinaldo Highway) is constructed by the private sector.
- Detailed design, ROW acquisition and administrative cost are shouldered by the Government.
- O & M of both sections is done by the private sector.

Financial analysis results are shown in **Table 15.6.3-1**. Cash flow diagrams of the three projects are shown in **Figure 15.6.3-1**.

TABLE 15.6.3-1 FIRR UNDER PPP SCHEME

Project Name	PPP Scheme	FIRR (%)	Equity FIRR (%)
NLEx-SLEx Link Expressway	Segment Dividing Type (about 40% of section by the private)	15.4%	16.6%
NAIA Expressway (Phase II)	Upfront subsidy by the Government for construction cost (about 45%)	13.0%	13.3%
CALA Expressway	Segment Dividing Type (about 65% of section by the private)	23.4%	31.4%

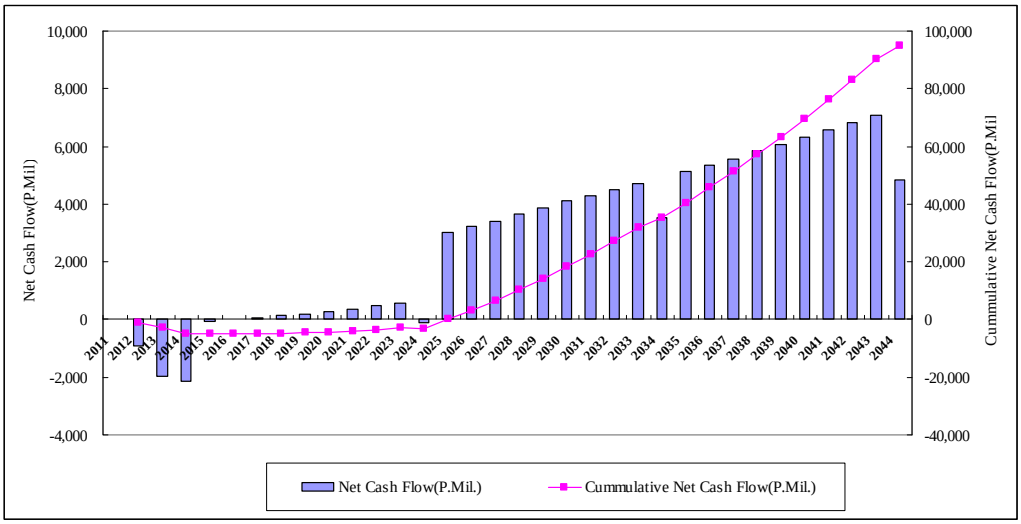
Debt service coverage ratio (DSCR) of three (3) projects is shown in **Table 15.6.3-2**.

TABLE 15.6.3-2 DSCR OF THREE PROJECTS

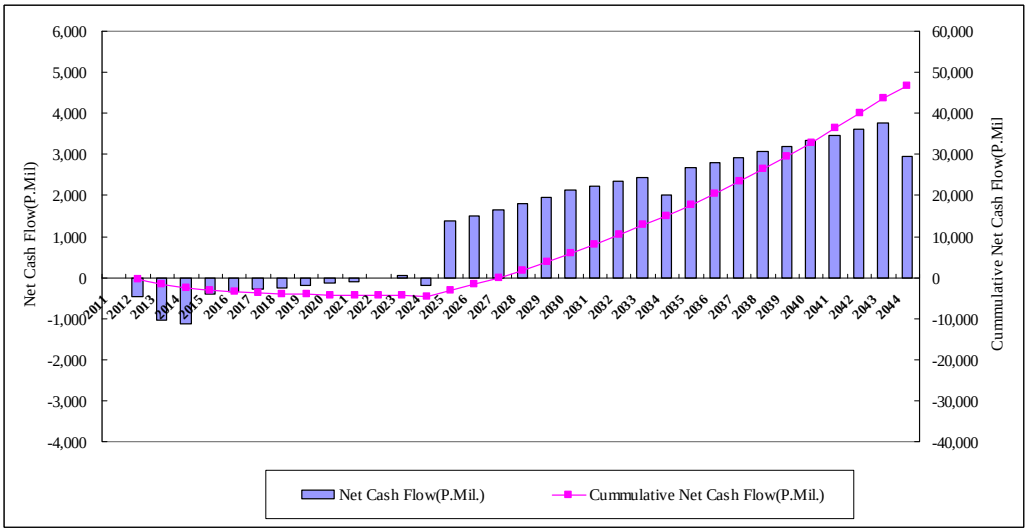
	Min. DSCR	Ave. DSCR
NS-Link	0.96	1.09
NAIA Expressway-2	0.65	0.84
CALA Expressway	1.14	1.87

From **Tables 15.6.3-1** and **15.6.3-2**, NLEx-SLEx Link Expressway under the PPP scheme is marginally feasible financially, NAIA Expressway is still not attractive to the Private Sector due to low DSCR, and CALA Expressway is financially viable.

NS-Link



NAIA Expressway 2



CALA Expressway

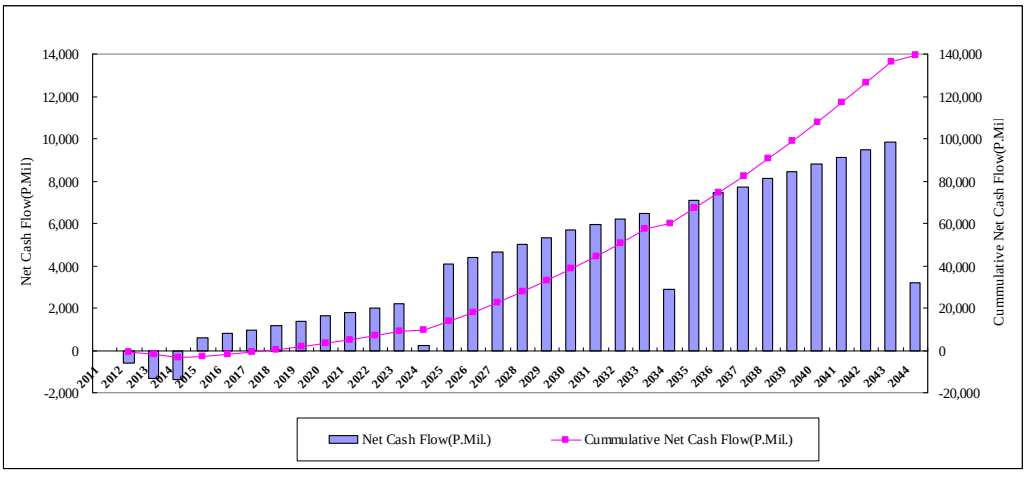


FIGURE 15.6.3-1 CASH FLOW DIAGRAM OF THREE PROJECTS

CHAPTER 16

PROPOSED HSH DEVELOPMENT PLAN

CHAPTER 16
PROPOSED HSH DEVELOPMENT MASTER PLAN

16.1 INTRODUCTION

Master Plan formulation procedure is shown in **Figure 16.1-1.**

Eighteen (18) projects for HSH-1 including beyond 2030 were identified in Chapter 12. Preliminary design for each project was undertaken for each project and construction cost was estimated in Chapter 14. Total construction cost of 18 projects was estimated at 431.78 Billion Pesos at 2010 price, which is about 5.6 times of entire 2010 DPWH budget for road/bridge projects (76.78 Billion Pesos). Projects must be prioritized and implemented in accordance with their priority.

For HSH-2, specific projects were not identified, but measures to be taken for HSH-2 was presented in Chapter 12. DPWH should study recommended measures in each Regional Office and appropriate measures should be implemented in due consideration of HSH-1 development.

16.2 PRIORITIZATION CRITERIA OF HSH-1 PROJECTS

16.2.1 Prioritization Method of DPWH

The DPWH is adopting a Multi-Criteria analysis for evaluation and prioritization of national roads as summarized below and shown in **Table 16.2.1-1.**

DPWH'S MULTI-CRITERIA ANALYSIS

Indicators	Points
1. Project Preparedness	65
1.1 Current Project Status	(10)
1.2 Detailed Design Carried out	(5)
1.3 Economic Viability	(30)
1.4 environmental Assessment	(10)
1.5 Social Impact	(10)
2. Road Network Importance	20
2.1 Road Category	(15)
2.2 Road Strategic Network	(5)
3. Economic and Social Development Policy	15
Total	100

"Economic viability" is given the highest points at 30, followed by "Road Category" and "Economic and Social Development Policy" at 15, then "Current Project Status", "Environmental Assessment" and "Social Impact" at 10.

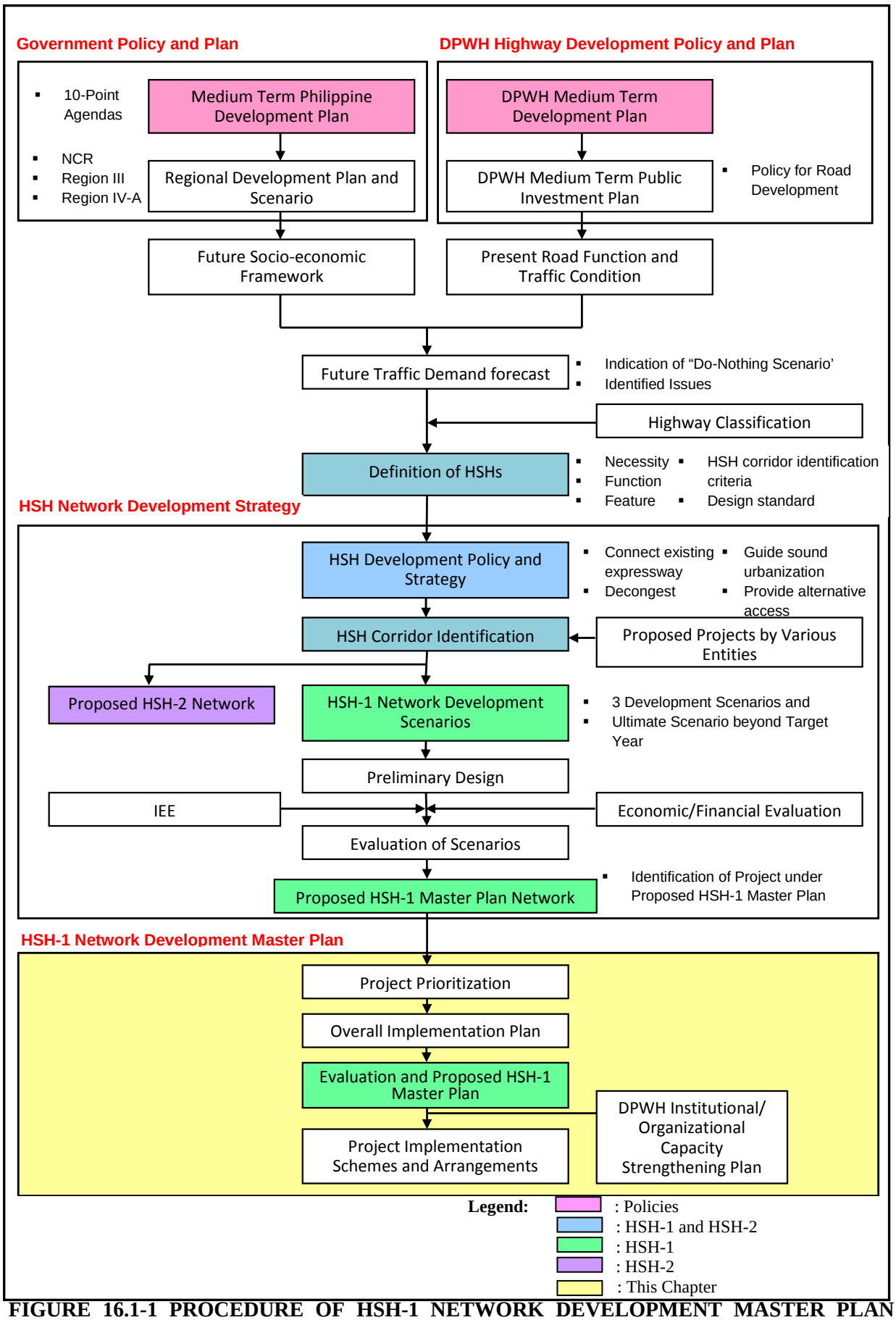


FIGURE 16.1-1 PROCEDURE OF HSH-1 NETWORK DEVELOPMENT MASTER PLAN

TABLE 16.2.1-1 MULTI-CRITERIA ANALYSIS FOR EVALUATION AND PRIORITIZATION OF NATIONAL ROADS

Indicators for New Projects	Score Points	Max. Points
1. Project Preparedness		**65**
1.1 Current Project Status		10
1.1.1 Approved by ICC (within 18 months validity)	10	
1.1.2 Approved by ICC (within 18 months validity) but deferred by lending institution	8	
1.1.3 Approved by ICC (after 18 mos.) but deferred by lending institution	4	
1.1.4 Not approved by ICC. New proposal needs to be submitted to ICC	0	
1.2 Detailed Design Carried Out	5	5
1.3 Economic Viability		30
1.3.1 NPV/C >=2.0	30	
1.3.2 NPV/C < 2.0 but >=1.0	25	
1.3.3 NPV/C < 1.0 but >=0.5	20	
1.3.4 NPV/C < 0.5 but >=0.3	15	
1.3.5 NPV/C < 0.3 but >0	10	
1.4 Environmental Assessment (Project with IEE or EIS or EIA; otherwise 0)*		10
1.4.1 Minor or negligible negative impact and any mitigation accounted for in project costs	10	
1.4.2 Moderate negative impact but mitigation accounted for in project costs	8	
1.4.3 Considerable negative impact but mitigation accounted for in project costs	4	
1.5 Social Impact (Project with LAPRAP, if required; otherwise 0)**		10
1.5.1 No resettlement	10	
1.5.2 Minor resettlement but mitigation accounted for in project costs	8	
1.5.3 Major resettlement but mitigation accounted for in project costs	4	
2. Road Network Importance		**20**
2.1 Road Category		15
2.1.1 North-South Backbone, Arterial National Roads	15	
2.1.2 East-West Laterals, Arterial National Roads	12	
2.1.3 Other Arterial National Roads of Strategic Importance	8	
2.1.4 Secondary National Roads	4	
2.2 Road Strategic Network		5
2.2.1 Identified under major DPWH studies	5	
2.2.2 Not identified under 2.2.1	0	
3. Economic and Social Development Policy		**15**
a) Provide access to basic services which currently are not available		
b) Develop economically and socially underdeveloped/depressed areas (resource base must be available)		
c) Support law and order		
d) Support agricultural modernization		
e) Support traffic decongestion		
f) Support industrial and tourism development		
3.1.1 All points met	15	
3.1.2 Point 3b) met another four out of the six points met	12	
3.1.3 Point 3b) met and another two of the six points met	8	
3.1.4 Only point 3b) met	4	
3.1.5 None of the points met	0	
Total Maximum Score		**100**

Note: All projects in this list must be feasible (NPV/C > 0 at 15% discount rate**)**

*IEE – Initial Environmental Examination; EIS – Environmental Statement; EIA- Environmental Impact Assessment

**LAPRAP – Land Acquisition Plan and Resettlement Action Plan

16.2.2 Prioritization Method Adopted for the study

Multi-criteria analysis method similar to those being used by DPWH was adopted. Through discussion with the TWG members, eight (8) evaluation items were selected as follows;

EVALUATION ITEMS

1. Functional Importance of a Link in HSH Network and Improvement of Inter-modal Linkage
2. Urgency based on Contribution to Traffic Decongestion
3. Project Readiness
4. Contribution to National/Regional Socio-Economic Development
5. Initial Investment Fund Requirement
6. Environmental and Social Impact
7. Impact of a Project on Viability of Existing Toll Expressway
8. Economic and Financial Viability

Each item was further divided into sub-items and weight of each item and sub-item was discussed at TWG Meeting. Major considerations giving priority (or weight) to each sub-item are shown in **Table 16.2.2-1**, and the prioritization criteria adopted for the Study is shown in **Table 16.2.2-2.** Evaluation method of each sub-item is set forth hereunder;

(1) Functional Importance of a Link in HSH Network and Improvement of Inter-modal Linkage

Functionally important link in HSH network or a link belongs to higher hierarchy in HSH network has higher priority.

Functional importance is defined as follows;

- Type-1: A link which forms a backbone transport axis for national integration and decentralization policy or for urban development.
- Type-2: A link which connects 2 or more HSH-1 to improve flexibility for road users in route selection.
- Type-3: A link which branches off from the backbone transport axis.
- Type-4: A link which functions individually.

TABLE 16.2.2-1 MAJOR CONSIDERATIONS IN GIVING WEIGHT TO ITEMS

Item	Weight	Sub-Item	Sub-Weight
1. Functional Importance of a link in HSH Network and Improvement of Inter-modal Linkage	17	1.1 Functional Importance	15.0
		• This is to evaluate conformity with National Policy of Decentralization; therefore, second highest weight was given.	
		1.2 Improvement of Intermodal Linkage	2.0
		• This is to evaluate improvement of logistic system. Additional weight to above.	
2. Urgency based on contribution to traffic decongestion	17	2.1 Number of traffic attracted to a link. (pcu/day)	7.0
		• This is to evaluate contribution to traffic decongestion which is one of the HSH-1 development policy, thus given high weight.	
		2.2 Reduction of travel time (pcu-hour/ day).	10.0
		• This is to evaluate contribution to delivery of people and goods faster and on time which is the major function of HSH-1, thus given high weight.	
3. Project Readiness	15	• This item clearly shows the DPWH's and the Private Sector's implementation priority, thus given second highest weight	15.0
4. Contribution to National/Regional Socio-Economic Development	10	4.1 Contribution to National/Regional Economic Development	5.0
		• This is to evaluate contribution to economic development. Sub-item 8.1 does not quantify this benefit.	
		4.2 Contribution to Social Development: Contribution to Job Creation	5.0
		• This is to evaluate contribution to social development in terms of job creation which is not quantified in Sub-item 8.1.	
5. Initial Investment Fund Requirement	10	5.1 Construction Cost	6.0
		• This is to evaluate Government's or Private Sector's fund preparation difficulty.	
		5.2 ROW Acquisition and Resettlement Cost	4.0
		• This is to evaluate Government's fund preparation difficulty.	
6. Environmental and Social Impact	8	6.1 Natural Impact	3.0
		• During F/S or D/D, this impact can be mitigated by selecting appropriate route, thus given low weight.	
		6.2 Social Impact (No. of Structure Affected)	5.0
		• Relocation of PAPs is one of the bottlenecks in implementation though during F/S and D/D, this impact can be mitigated.	
7. Impact of a project on viability of Existing Toll Expressway	3	7.1 Impact on Traffic Volume of Existing Expressway	3.0
		• This is to evaluate if revenue of existing toll road is affected or not.	
8. Economic and Financial Viability	20	8.1 Economic Viability (Is the Project economically justifiable?)	16.0
		• This is DPWH's top concern, thus given highest weight.	
		8.2 Financial Viability (Is the Chance of Private Sector Participation high?)	4.0
		• This is to evaluate chances of private sector's participation and possibility to reduce Government's financial burden.	
Total	**100**		**100**

TABLE 16.2.2-2 PRIORITIZATION CRITERIA

Item	Weight	Sub-Item	Sub-Weight
1. Functional Importance of a link in HSH Network and Improvement of Inter-modal Linkage	**17**	1.1 Functional Importance	**15.0**
		• A link which forms a Backbone transport axis for national integration or for urban development.	15.0
		• A link which connects 2 or more HSHs to improve flexibility for road users in route selection.	14.0
		• A link which branches off from the backbone transport axis.	10.0
		• A link which functions individually.	8.0
		1.2 Improvement of Intermodal Linkage	**2.0**
		• A link which provides a direct access to an international port or air port or rail terminal.	2.0
		• A link which provides an indirect access to an international port or air port or rail terminal.	1.0
2. Urgency based on contribution to traffic decongestion	**17**	2.1 Number of traffic attracted to a link. (pcu/day)	**7.0**
		• High over 60,000	7.0
		• Medium 20,000 – 60,000	5.0
		• Low Less than 20,000	3.0
		2.2 Reduction of travel time (pcu-hour/ day).	**10.0**
		• High over 4,000	10.0
		• Medium 1,000 – 4,000	7.0
		• Low Less than 1,000	4.0
3. Project Readiness	**15**	3.1 Detailed design on-going or completed.	15.0
		3.2 Detailed Feasibility Study completed / ongoing / committed.	14.0
		3.3 Pre-Feasibility Study completed / ongoing	8.0
		3.4 Conceptual Stage	5.0
4. Contribution to National/Regional Socio-Economic Development	**10**	4.1 Contribution to National/Regional Economic Development	**5.0**
		• High	5.0
		• Medium	4.0
		• Low	3.0
		4.2 Contribution to Social Development: Contribution to Job Creation	**5.0**
		• High over 0.5	5.0
		• Medium 0.2 – 0.5	4.0
		• Low Less than 0.2	3.0
5. Initial Investment Fund Requirement	**10**	5.1 Construction Cost	**6.0**
		• Low Less than 10 B. P.	6.0
		• Medium 10 – 30 B. P.	4.0
		• High Over 30 B. P.	2.0
		5.2 ROW Acquisition and Resettlement Cost	**4.0**
		• Low Less than 0.1 B. P.	4.0
		• Medium 0.1 – 1.0 B. P.	2.5
		• High Over 1.0	1.0
6. Environmental and Social Impact	**8**	6.1 Natural Impact	**3.0**
		• Does not passes through environmentally critical area	3.0
		• Passes through environmentally critical area	1.0
		6.2 Social Impact (No. of Structure Affected)	**5.0**
		• Low Less than 400	5.0
		• Medium 400 – 800	3.0
		• High Over 800	1.0
7. Impact of a project on viability of Existing Toll Expressway	**3**	7.1 Impact on Traffic Volume of Existing Expressway	**3.0**
		• Increase Traffic Volume of Existing Toll Expressway (Positive)	3.0
		• Almost No Impact	2.0
		• Decrease Traffic Volume of Existing Toll Expressway (Negative)	1.0
8. Economic and Financial Viability	**20**	8.1 Economic Viability (Is the Project economically justifiable?)	**16.0**
		• High Over 25%	16.0
		• Medium 15 – 25%	14.0
		• Low Less than 15%	5.0
		8.2 Financial Viability (Is the Chance of Private Sector Participation high?)	**4.0**
		• High Over 10%	4.0
		• Medium 5 – 10%	2.5
		• Low Less than 5%	1.0
Total	**100**		**100**

Transport linkage between HSH-1 and port/airport/rail terminal should be improved, so that goods and people transshipment from one mode to another becomes efficient, and overall transport efficiency is improved.

Weight given is as follows;

	Weight	Sub-weight
Functional Importance of a Link in HSH Network and Improvement of Inter-modal Linkage	17.0	
Sub-Item : Functional Importance of a link in HSH Network		15.0
• Type -1		(15.0)
• Type -2		(14.0)
• Type -3		(10.0)
• Type -4		(8.0)
Sub-Item : Improvement of Inter-modal Linkage	2.0	
• A link which provides a direct access to an international port/airport or rail terminal		(2.0)
• A link which provides an indirect access to an international port/airport or a rail terminal		(1.0)

(2) Urgency based on Contribution to Traffic Decongestion

One of the most important objectives of HSH-1 network development is to reduce traffic congestion, particularly in Metro Manila and its suburbs.

Contribution of a link to traffic decongestion is directly related "urgency". Contribution to traffic decongestion is evaluated by two items.

- Number of traffic attracted to a link (pcu/day):

  When traffic is attracted on to a HSH-1 link, equivalent number of traffic is reduced from other roads, thus contributing to decongestion of traffic on other roads.

- Reduction of travel time (pcu-hour/day)

  Effect of constructing a new link is well expressed by reduction of travel time. When faster travel is assured by a new link, it definitely reduces travel time of a trip.

Weight is given as follows;

		Weight	Sub-weight
Item : Urgency based on contribution to traffic decongestion		17	
Sub-item (1):	Number of traffic attracted to a link (pcu/day)		7.0
	● High : Over 60,000		(7.0)
	(Equivalent to reduction of 6-lane at-grade road)		
	● Medium : 20,000 – 60,000		(5.0)
	(Equivalent to reduction of 4-lane at-grade road)		
	● Low : Less than 20,000		(3.0)
	(Equivalent to reduction of 2-lane at-grade road)		
(Note: traffic attracted ranges from 4,100 to 90,900 pcu/day)			
Sub-item (2):	Reduction of travel time (pcu-hour/day)		10.0
	● High : Over 4,000		(10.0)
	● Medium : 1,000 – 4,000		(7.0)
	● Low : Less than 1,000		(4.0)
(Note: travel time reduction ranges from 106 to 4,969 pcu-hour/day)			

(3) Project Readiness

Project readiness shows the DPWH's and the private sector's implementation priority. A project of which preparation is progressed, it should be implemented ahead of other projects.

Weight is given as follows;

		Weight	Sub-weight
Item : Project Readiness		15.0	
Sub-item:	● Detailed design on-going or completed		15.0
	● Detailed feasibility study completed/on-going/committed		14.0
	● Pre-feasibility study completed/on-going		8.0
	● Conceptual stage		5.0

(4) Contribution to National/Regional Socio-economic Development

HSH-1 surely contributes to both economic and social development. Three sub-items are developed as follows;

- **Contribution to National/Regional economic development**

  This sub-item is difficult to evaluate quantitatively, thus evaluated by land ares traversed as follows;

High Impact

- Contribute to support a secondary industry and provide access to economic zones and international logistics basis.
- Contribute to support a tourism industry and provide access to tourism spots.

Medium Impact

- Contribute to support a primary industry and provide access between agricultural/fishery lands and consumption areas.

- Contribute to support a tertiary industry and provide access to business and commercial areas.

Low Impact

- A link traversing a lake shore.
- A link to provide only a limited small land area

- **Contribution to social development**

  All projects are proposed to be a toll road with participation of private investors, so operation and maintenance period will continue at least for 30 years. During O & M period, jobs are created and contribute to poverty alleviation, which is considered to be medium and long term impact. Under this item, medium and long term impact is evaluated.

Weight is given as follows;

		Weight	Sub-weight
Item :	Contribution to National/Regional Socio-Economic Development	10.0	
Sub-item :			
-	Contribution to National/Regional Economic Development		5.0
	• High		(5.0)
	• Medium		(4.0)
	• Low		(3.0)
-	Contribution to Social Development		5.0
	• High O & M: Over 0.5 Billion Pesos/Year		(5.0)
	• Medium O & M: 0.2-0.5 Billion Pesos/Year		(4.0)
	• Low O & M: Less than 0.2 Billion Pesos/Year		(3.0)

(Note: O & M cost ranges from 0.04 to 1.09 Billion Pesos)

(5) Initial Investment Fund Requirement

When construction cost and ROW/Resettlement cost becomes higher, it become more difficult to prepare fund. Initial investment requirement is evaluated and weight is given as follows;

		Weight	Sub-weight
Item : Initial Investment Fund Requirement		10.0	
Sub-item : Construction Cost			6.0
● Low	: Less than 10 Billion Pesos		(6.0)
● Medium	: 10 – 30 Billion Pesos		(4.0)
● High	: Over 30 Billion Pesos		(2.0)
(Note: Construction cost ranges from 5.32 to 44.69 Billion Pesos)			
ROW Acquisition and Resettlement Cost			4.0
● Low	: Less than 0.1 Billion Pesos		(4.0)
● Medium	: 0.1 – 1.0 Billion Pesos		(2.5)
● High	: Over 1.0 Billion Pesos		(1.0)
(Note: Cost ranges from 0.10 to 5.35Billion Pesos)			

(6) Environmental Impact

Two sub-items are developed and weight is given as follows;

		Weight	Sub-weight
Item : Environmental Impact		8.0	
Sub-item : Natural Impact			3.0
- Those not pass through environmentally critical area			(3.0)
- Passes through environmentally critical area			(1.0)
Social Impact (Number of Structures affected)			5.0
● Low	: Less than 400		(5.0)
● Medium	: 400 – 800		(3.0)
● High	: Over 800		(1.0)
(Note: No. of Structures affected ranges from 10 to 1,200)			

(7) Impact of a Project on Viability of Existing Toll Expressway

When a project is implemented along the same corridor of an existing toll road, traffic volume on an existing road may be reduced, thus revenue is reduced and profitability of an existing toll road is negatively affected. In some other cases, a certain new project may increase traffic of an existing toll road, thus profitability of an existing road is positively affected. Such inter-dependence of a new project and existing toll roads are evaluated. Weight is given as follows;

	Weight	Sub-weight
Item : Impact of a Project on Viability of Existing Toll Expressway	3.0	
Sub-item : ● Increase of traffic volume of existing toll expressway		3.0
● Almost no impact		2.0

(8) Economic and Financial Viability

Economic viability is a key indicator to judge if a project can be implemented or not. When economic viability is judged not feasible, the project should be cancelled or deferred.

If financial viability is high, chances of private sector participation is high, thus the Government's expenditure can be reduced and it will less impact on the Government financial condition.

Weight is given as follows;

			Weight	Sub-weight
Item : Economic and Financial Viability			20.0	
Sub-Item : Economic Viability				16.0
-Economic viability is high	:	EIRR over 25%		(16.0)
-Economic viability is medium	:	15 – 25%		(14.0)
-Economic viability is low	:	Less than 15%		(5.0)

Note:
- 15% is an opportunity cost adopted by the Government, thus a Project with EIRR less than 15% has a very low implementation priority.
- EIRR ranges from 5.8 to 49.9%

			Weight	Sub-weight
Sub-Item : Financial Viability				4.0
-Financial viability is high	:	FIRR over 10%		(4.0)
-Financial viability is medium	:	5 – 10%		(2.5)
-Financial viability is low	:	Less than 5%		(1.0)

(Note: FIRR ranges from Negative to 13.6%)

16.3 PRIORITY OF PROJECTS

16.3.1 Basic Information to Evaluate Priority

Basic information to evaluate priority of projects are summarized hereunder.

(1) Features of HSH-1 Project

Functional category of each project, objectives of the project, objectives of the project, initial investment requirement, O & M cost, land acquisition and resettlement, economic viability, financial viability, etc., are summarized in **Table 16.3.1-1**.

(2) Impact of a New Expressway on Traffic Volume of Existing Expressway

Table 16.3.1-2 shows an impact of 9 new expressways on traffic volume of existing expressways.

TABLE 16.3.1-1 FEATURES OF HSH-1 PROJECT

Project No.	(1) Project Name	(2) Functional Category	(3) Objectives of the Project	(4) Road Length (km)	(5) Type of Road Structures	(6) No. of Lanes	Initial Investment (B. Pesos) (2010 Cost)			(9) O & M Cost B. P. per Year (2010 Cost in 2015)	(10) Land Acquisition		Traffic Impact (in 2015)		(13) Economic Viability (EIRR in %)	(14) Financial Viability (FIRR in %)
							(7) Construction	(8) ROW Acquisition	TOTAL		Land Area to be Acquired (Ha.)	Approx. No. of Structure Affected	(11) No. of Traffic Volume (pcu/day)	(12) Travel Time Reduction (pcu-hr/ km/day)		
1	NLEx-SLEx Link Expressway	Type-1	• To complete North-South Industrial Development Beltway Transport Axis. • To decongest Metro Manila traffic.	13.4	Elevated	4	29.12	1.00	30.12	0.22	1.5	410 (270) (a)	90,900	4,969	19.4	8.1
2	NAIA Expressway (Phase 2)	Type-2	• To provide access to 3 NAIA terminals. • To connect Skyway with Manila-Cavite Coastal Expressway	4.9	Elevated	4	11.06	0.71	11.77	0.08	1.2	200	49,100	2,549	16.7	7.9
3/14	C-6 Expressway and Global City Link	Type-1	• To distribute traffic from expressways from North and South. • To guide sound urbanization of east Metro Manila	66.5	At-grade + Elevated	4~6	44.08	5.35	49.43	0.95	416	1,200	50,500 ~ 68,500	2,407	24.7	3.9
4	C-6 Extension	Type-2	• To decongest traffic on SLEx. • Combined structure for flood control and traffic facility.	43.6	At-grade	4	15.37	1.53	16.90	0.46	41	1,100	34,700 ~ 35,000	1,638	42.6	9.8
5	Manila Bay Expressway	Type-2	• To decongest Metro Manila traffic, particularly Roxas Blvd. and C-2. • To provide access to Manila Ports.	8.0	Under pass and under-sea tunnel	4	44.69	0.29	44.98	0.18	0.9	10	64,600	4,454	5.8	Negative
6	CALA Expressway	Type-2	• To decongest Cavite roads traffic particularly Aguinaldo Highway.	41.8	At-grade	6	15.81	1.41	17.22	0.41	255	240	58,400 ~ 80,400	2,282	49.9	13.6
7	Central Luzon Expressway	Type-2	• To provide access to economic zones. • To connect SCTEx and NLEx-East. • To decongest Pan-Philippine Highway traffic.	63.9	At-grade	4	24.26	1.44	25.70	0.66	365	101	11,200 ~ 22,800	564	15.6	Negative
8	Calamba-Los Banos Expressway	Type-3	• To provide access to tourism destination. • To decongest national roads.	15.5	At-grade	4	5.05	0.85	5.90	0.15	64	130	55,300	2,240	42.7	7.3
9	SLEx Extension (to Lucena City)	Type-1	• To form South Luzon Development Axis. • To decongest Pan Philippine Highway traffic.	47.8	At-grade	4	13.96	0.38	14.35	0.49	240	200	39,000	1,546	35.6	6.9
10	NLEx East	Type-1	• To form North-East Luzon Development Axis. • To decongest Pan-Philippine Highway traffic.	92.1	At-grade	4	28.59	1.10	29.69	1.09	470	910	11,200 ~ 12,000	739	23.3	4.0
11	La Mesa Parkway	Type-1	• To form North-East Luzon Development Axis.	10.9	At-grade	4	3.94	0.09	4.03	0.14	1.3	40	59,600			
12	C-5/FTI/Skyway Connector Road	Type-2	• To develop FTI area. • Skyway and C-5 are connected.	3.0	Elevated	2	5.32	0.10	5.42	0.04	0.5	40	52,900	4,060	26.0	4.9
13	Pasig-Marikina Expressway	Type-4	• To decongest C-4 and C-5 traffic.	15.7	Elevated	4	34.65	1.00	35.65	0.26	19	730	79,500	3,283	11.5	5.4
15	R-7 Expressway	Type-4	• To decongest R-7.	16.1	Elevated/ Under pass	4	23.98	1.00	24.98	0.29	0.8	30	83,400	4,033	23.4	7.5

Note: **(2) Functional Category**

Type-1 : A link which forms a backbone transport axis for national integration or for urban development.

Type-2 : A link which connects 2 or more HSHs to improve flexibility for road users in route selection.

Type-3 : A link which branches off from the backbone transport axis.

Type-4 : A link which functions individually.

(7), (8), (9) : Cost in 2010 prices

(11), (12), (13), (14) : All projects were assumed operational in 2015 for the purpose of prioritization.

(a) : When PNR continue and complete resettlement within its ROW.

TABLE 16.3.1-2 (1/2) TRAFFIC IMPACT OF NEW EXPRESSWAY TO EXISTING EXPRESSWAY: 100 PCU/DAY

Proposed Project	Existing Expressway							Total
	NLEx	Seg 9.10	SCTEx	SLEx	Skyway	STAR	Manila-Caivte	
1. North-South Link Expressway	5	**60**	0	-15	**90**	0	-13	127
2. NAIA Expressway-2	0	0	0	0	**96**	0	**233**	329
3. C6 Expressway	**-101**	**-87**	0	-9	**-190**	0	33	-354
4. C-6 Extension	0	0	0	**-278**	5	-5	0	-278
5. Manila Bay Expressway	0	5	0	-34	**-99**	0	**200**	72
6. CALA Expressway	0	4	0	**-236**	-70	9	**313**	20
7. Central Luzon Expressway	0	0	40	0	0	0	0	40
8. Calamba-Los Banos Toll Expressway	0	0	0	10	0	-10	0	0
9. SLEx Extension	0	0	0	55	0	-64	0	-9
10. North Luzon East and 11. La Mesa Parkway	**-260**	-86	0	0	-10	0	0	-356
12. C-5/FTI/Skyway Connector Road	0	-3	0	24	61	0	1	83
13. Pasig Marikina Expressway	0	-11	0	-14	-14	0	-4	-43
15. R-7 Expressway	5	-23	0	0	0	0	0	-18
16. Manila Bataan Coastal Road	**-392**	**-126**	-36	0	0	0	0	-554
17. North Luzon Expressway (Phase-3)	**-133**	0	**-152**	0	0	0	0	-285
18. East West Connection Expressway	8	0	0	0	0	0	0	8

TABLE 16.3.1-2 (2/2) TRAFFIC IMPACT OF NEW EXPRESSWAY TO EXISTING EXPRESSWAY: IN %

Proposed Project	Existing Expressway							Total
	NLEx	Seg 9.10	SCTEx	SLEx	Skyway	STAR	Manila-Caivte	
1. North-South Link Expressway	0%	**70%**	0%	-1%	6%	0%	-1%	2%
2. NAIA Expressway-2	0%	0%	0%	0%	6%	0%	**22%**	4%
3. C6 Expressway	-6%	-10%	0%	-1%	-13%	0%	3%	-5%
4. C-6 Extension	0%	0%	0%	-17%	0%	-1%	0%	-4%
5. Manila Bay Expressway	0%	1%	0%	-2%	-7%	0%	**19%**	1%
6. CALA Expressway	0%	0%	0%	-14%	-5%	2%	30%	0%
7. Central Luzon Expressway	0%	0%	18%	0%	0%	0%	0%	1%
8. Calamba-Los Banos Toll Expressway	0%	0%	0%	1%	0%	-2%	0%	0%
9. SLEx Extension	0%	0%	0%	3%	0%	**-11%**	0%	0%
10. North Luzon East and 11. La Mesa Parkway	-14%	-10%	0%	0%	-1%	0%	0%	-5%
12. C-5/FTI/Skyway Connector Road	0%	0%	0%	1%	**4%**	0%	0%	1%
13. Pasig Marikina Expressway	0%	-1%	0%	-1%	-1%	0%	0%	-1%
15. R-7 Expressway	0%	-3%	0%	0%	0%	0%	0%	0%
16. Manila Bataan Coastal Road	**-22%**	**-14%**	**-16%**	0%	0%	0%	0%	-7%
17. North Luzon Expressway (Phase-3)	**-7%**	0%	**-68%**	0%	0%	0%	0%	-4%
18. East West Connection Expressway	0%	0%	0%	0%	0%	0%	0%	0%

16.3.2 Evaluation of Project Priority

In accordance with the prioritization criteria, all projects were evaluated their priority. A result of priority evaluation is shown in **Table 16.3.2-1**. Projects were grouped into two (2), first and second priority groups.

First Priority Group: Project of which total score is more than 70 points, except R-7 Expressway. Along R-7 corridor, there is another proposal to introduce BRT system, thus, how to develop this corridor should be more carefully studied.

Second Priority Group: Project of which total score is less than 70 points.

PRIORITY RANKING AND PRIORITY GROUP

Priority Rank	Name of Project	Length (km)	Priority Group
1	NLEx-SLEx Link Expressway	13.4	First Priority Group
2	CALA Expressway	41.8	
3	C-5/FTI/Skyway Connector Road	3.0	
4	NAIA Expressway (Phase II)	4.9	
4	C-6 Expressway (Global City Link)	66.5	
4	CLEx	63.9	
7	SLEx Extension (to Lucena City)	47.8	
8	Calamba-Los Bañ Expressway	15.5	
	Sub-total	256.8	
9	R-7 Expressway	16.1	Second Priority Group
10	NLEx East/La Mesa Parkway	103.0	
11	C-6 Extension	43.6	
12	Manila Bay Expressway	8.0	
13	Pasig-Marikina Expressway	15.7	
	Sub-Total	319.5	
	Manila-Bataan Coastal Road	70.3	Beyond Year 2030
	NLEx (Phase III)	36.2	
	East-West Connection Expressway	26.6	
	Sub-total	133.1	

TABLE 16.3.2-1 PRIORITY OF PROJECT

Item	Weight	Sub-Item	Sub-Weight	Project Number												
				1	2	3/14	4	5	6	7	8	9	10/11	12	13	15
				N-S Link	NAIA	C-6/Global City	C-6 Extension	Manila Bay	CALA	CLEx	Calamba-Los Baños	SLEx Extension	NLEx East/ La Mesa	C-5/FTI/ Skyway	Pasig-Marikina	R-7
1. Functional Importance of a link in HSH Network and Improvement of Inter-modal Linkage	17	1.1 Functional Importance	15.0	15.0	14.0	15.0	14.0	14.0	14.0	14.0	10.0	15.0	15.0	14.0	8.0	8.0
		1.2 Improvement of Intermodal Linkage	2.0	2.0	2.0	2.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2. Urgency based on contribution to traffic decongestion	17	2.1 Number of traffic attracted to a link. (pcu/day)	7.0	7.0	5.0	7.0	5.0	7.0	7.0	5.0	5.0	5.0	5.0	5.0	7.0	7.0
		2.2 Reduction of travel time (pcu-hour/km/day).	10.0	10.0	7.0	7.0	7.0	10.0	7.0	4.0	7.0	7.0	4.0	10.0	7.0	10.0
3. Project Readiness	15	Project Readiness	15.0	14.0	8.0	14.0	4.0	4.0	14.0	14.0	8.0	8.0	8.0	15.0	4.0	4.0
4. Contribution to National/Regional Socio-Economic Development	10	4.1 Contribution to National/Regional Economic Development	5.0	5.0	5.0	5.0	3.0	4.0	5.0	4.0	5.0	5.0	5.0	3.0	4.0	4.0
		4.2 Contribution to Social Development: Contribution to Job Creation	5.0	4.0	3.0	5.0	4.0	3.0	4.0	5.0	3.0	4.0	5.0	3.0	4.0	4.0
5. Initial Investment Fund	10	5.1 Construction Cost	6.0	4.0	4.0	2.0	4.0	2.0	4.0	4.0	6.0	4.0	2.0	6.0	2.0	4.0
		5.2 ROW Acquisition and Resettlement Cost	4.0	2.5	2.5	1.0	1.0	2.5	1.0	1.0	2.5	2.5	1.0	4.0	2.5	2.5
6. Environmental and Social Impact	8	6.1 Natural Impact	3.0	3.0	3.0	3.0	1.0	1.0	3.0	3.0	1.0	3.0	3.0	3.0	3.0	3.0
		6.2 Social Impact (No. of Structures Affected)	5.0	3.0	5.0	1.0	1.0	5.0	5.0	5.0	5.0	5.0	1.0	5.0	3.0	5.0
7. Impact of a project on viability of Existing Toll Expressway	3	7.1 Impact on Traffic Volume of Existing Expressway	3.0	3.0	3.0	1.0	1.0	3.0	3.0	3.0	3.0	2.0	1.0	1.0	2.0	2.0
8. Economic and Financial Viability	20	8.1 Economic Viability (Is the Project economically justifiable?)	16.0	14.0	14.0	14.0	16.0	5.0	16.0	14.0	14.0	14.0	14.0	16.0	5.0	14.0
		8.2 Financial Viability (Is the Chance of Private Sector Participation high?)	4.0	2.5	2.5	1.0	2.5	1.0	4.0	1.0	1.0	1.0	1.0	1.0	2.5	2.5
Total	**100**		**100**	**89.0**	**78.0**	**78.0**	**64.5**	**63.5**	**88.0**	**78.0**	**71.5**	**76.5**	**66.0**	**87.0**	**55.0**	**71.0**
Ranking				***1***	***4***	***4***	***11***	***12***	***2***	***4***	***8***	***7***	***10***	***3***	***13***	***9***

16.4 PROPOSED IMPLEMENTATION SCHEDULE OF HSH-1 PROJECT

16.4.1 Typical Implementation Schedule

Typical implementation schedule for the following cases was studied;

Case-1 : BOT Type with Government Subsidy:

Project is funded by the public (GRP) and the private. Typical example of this case is TPLEx. The Government provided up-front subsidy for construction cost (see **Table 16.4.1-1**).

Case-2 : Segment Dividing Type:

Project is funded by the public (GRP) and utilizing ODA and the private. Similar example of this case is STAR. Total section was divided into two, one segment is constructed by the Government utilizing ODA and other segment by the private sector (see **Table 16.4.1-2**).

Case-3 : Role Sharing Type**:**

Only operation and maintenance (O & M) is funded by the private sector. All others are funded by the Government with/without ODA fund (see **Table 16.4.1-3**).

Case-4 : Conventional Type:

All costs are funded by the Government with/without ODA financing, when business case study concludes that participation of the private sector financing is not financially viable. O & M may be outsourced by the Government (see **Table 16.4.1-4**).

As shown in Tables, the business case/detailed feasibility study stage is quite important to determine direction of funding scheme of the project, ROW limit and other basis of the project. It should be given enough time and fund for successful study.

Time required from the project preparation to the start of construction is summarized below:

APPROXIMATE TIME REQUIRED FROM PROJECT PREPARATION TO START OF CONSTRUCTION

CASE	Approximate Time Required
Case-1 : BOT Type with Government Subsidy	6 years
Case-2 : Segment Dividing Type	6 years
Case-3 : Role Sharing Type	5.5 years
Case-4 : Conventional Type	5.5 – 6 years

Before starting construction, 5.5 – 6 years are required, therefore, project preparation stage should be commenced at the earliest possible time.

TABLE 16.4.1-1 TYPICAL IMPLEMENTATION SCHEDULE
CASE-1: BOT Type with Government Subsidy, (GRP + Private) Fund

Example: GRP provides Up-front Subsidy for Construction Cost.

		Year									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Project Preparation & Approval	Selection of Consultant										
	Business Case/Detailed F/S										
	Project Proposal by DPWH to NEDA										
(**2** years)	NEDA Board Approval										
Detailed Design, ROW Acquisition & Loan Closure	Preparation of Tender Documents for Selection of Project Proponent										
	Selection of Project Proponent										
	Contract Negotiation & Contract Signing including TOA										
	Selection of Consultant (Project Proponent)										
	Selection of IDC & ICE by GRP										
	Detailed Design										
	ROW Acquisition/Resettlement										
	Selection of Contractor by Project Proponent										
(**4** years)	Financial Closure										
Construction											
O & M											

- Detailed F/S determines ROW limit.
- ROW acquisition starts soon after NEDA Board approves the Project.
- Detailed F/S determines PPP scheme and prepares draft tender documents for project proponent selection.

TABLE 16.4.1-2 TYPICAL IMPLEMENTATION SCHEDULE
CASE-2: Segment Dividing Type, (GRP/ODA + Private) Fund

Example: Segment Dividing Scheme

			Year									
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Project Preparation, Approval & ODA Loan		Selection of Consultant										
		Business Case/Detailed F/S										
		Project Proposal by DPWH to NEDA										
		NEDA Board Approval										
(**2.5** years)		Project Appraisal by Lending Institute										
		Pledge/EN/LA										
Detailed Design, ROW Acquisition & Loan Closure	ODA Segment (**2.5** years)	Selection of Consultant										
		Detailed Design										
		ROW Acquisition										
		Selection of Contractor										
	Private Segment (**3.5** years)	Preparation of Tender Documents for Selection of Investor										
		Selection of Investor										
		Contract Negotiation & Contract Signing including TOA										
		Selection of Consultant by Investor										
		Selection of IDC & ICE by GRP										
		Detailed Design										
		ROW Acquisition/Resettlement										
		Selection of Contractor										
		Financial Closure										
Construction	ODA Portion											
	Private Portion											
O & M	ODA Portion + Private Portion											

- Detailed F/S determines ROW limit.
- ROW acquisition starts soon after NEDA Board approves the Project.
- Detailed F/S determines PPP scheme and prepares draft tender documents for project proponent selection.

TABLE 16.4.1-3 TYPICAL IMPLEMENTATION SCHEDULE
CASE- 3: Role Sharing Type, O & M by Private Sector

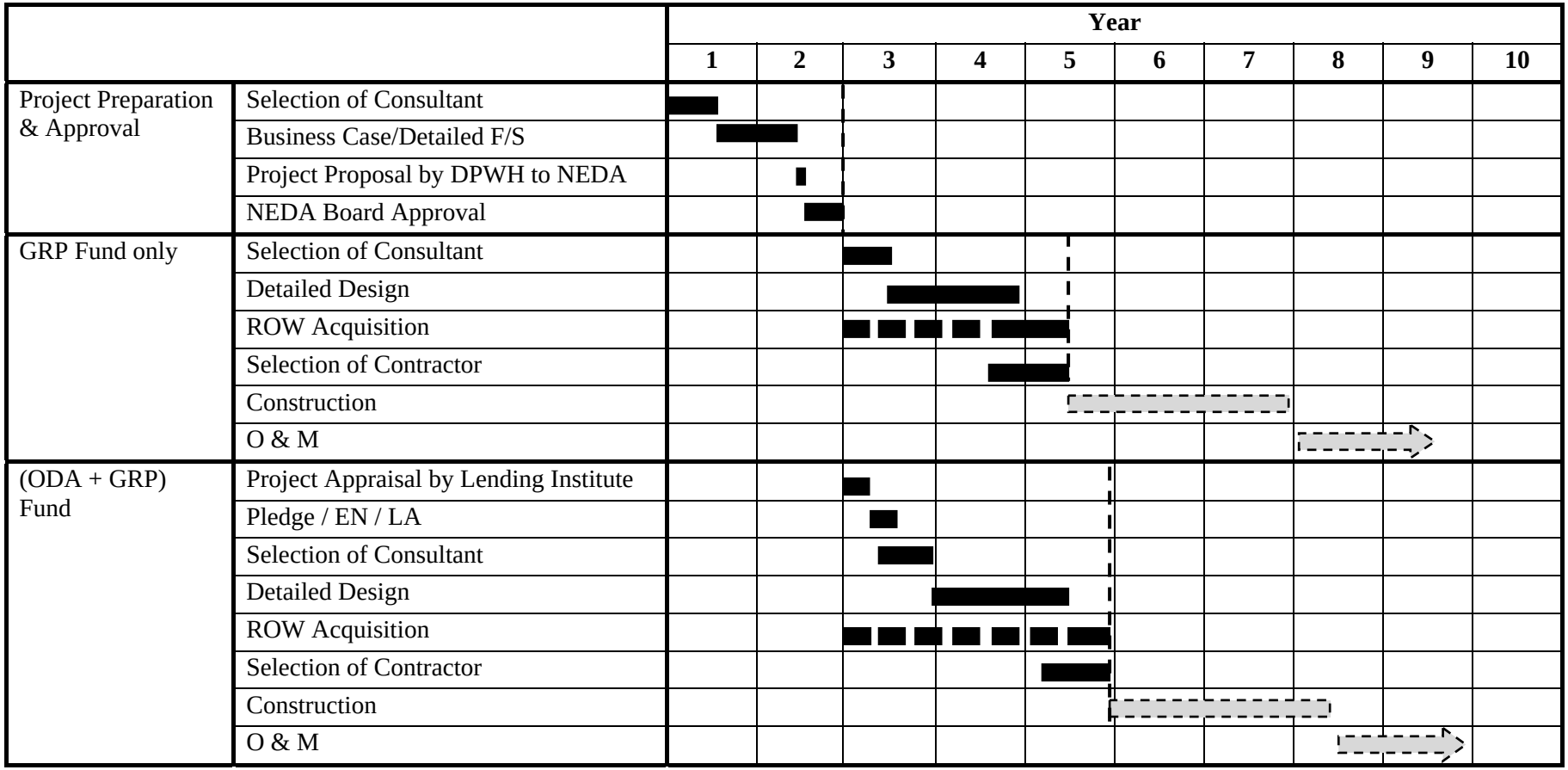
Example: O & M by Private Sector

		Year									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Project Preparation & Approval	Selection of Consultant										
	Business Case Study/Detailed F/S										
	Project Proposal by DPWH to NEDA										
	NEDA Board Approval										
	Project Appraisal by Lending Institute										
(**2.5** years)	Pledge/EN/LA										
Detailed Design, ROW Acquisition & Selection of O & M Company	Selection of Consultant										
	Detailed Design										
	ROW Acquisition										
	Selection of Contractor										
	Preparation of Tender Documents for Selection of O&M Company										
	Selection of O&M Company										
(**3** years) + (**1.5** years)	Contract Negotiation, Contract Signing including TOA										
Construction											
O & M											

- Detailed F/S determines ROW limit.
- ROW acquisition starts soon after NEDA Board approves the Project.
- Detailed F/S determines PPP scheme and prepares draft tender documents for O & M company selection.
- Detailed Design consultant prepares tender documents for O & M company selection.

TABLE 16.4.1-4 TYPICAL IMPLEMENTATION SCHEDULE
CASE- 4 : Conventional Type, All by GRP With/Without ODA

Example: No Private Fund



- Business Case study concludes that Private Sector participation is not financially viable.
- Detailed F/S determines ROW limit.
- ROW acquisition starts soon after NEDA Board approves the Project.
- O & M may not be out-sourced to Private Sector.

16.4.2 Proposed Implementation Schedule of HSH-1 Projects

In due consideration of priority of project and some development status of each project, implementation schedule was proposed as shown in **Table 16.4.2-1**. Special consideration was paid to the following projects;

NLEx-SLEx Link Expressway

- Unsolicited proposal was submitted by a private group on April 30, 2010.
- Pre-feasibility study by METI, Japan and Feasibility Study by a private group was undertaken.

NAIA Expressway (Phase-2)

- Pre-feasibility Study by Economic Research Institute for ASEAN and East ASIA (ERIA), Japan was undertaken.

C-6 Expressway

- North section will be constructed by MRT-7 Consortium.
- KOICA will undertake a Feasibility Study of the remaining sections.

CALA Expressway

- Feasibility Study of Segment-1 was undertaken by JICA in 2006.
- Technical assistance for Segment-2 will be provided by WB.

La Mesa Parkway

- Concession holder submitted the Detailed Design to DPWH.

NLEx-East

- This expressway should be so planned that it can start soon after completion of La Mesa Parkway.

C-5 / FTI / Skyway Connector Road

- Detailed Design is on-going by the DPWH, so this will be ready for implementation soon.

Fund requirement for each decade is estimated as follow:

FUND REQUIREMENT

Unit: Billion Pesos (2010 price)

		2011 - 2020	2021 - 2030
Total		141.41 (14.14 per Year)	203.18 (20.32 per Year)
Case-1	Public 60%	84.85 (4.49 per Year)	121.91(12.19 per Year)
	Private 40%	56.56(5.66 per Year)	81.27 (8.13 per Year)
Case-2	Public 75%	106.06 (10.61 per Year)	152.39 (15.24 per Year)
	Private 25%	35.35 (3.53 per Year)	50.79 (5.08 per Year)

TABLE 16.4.2-1 PROPOSED IMPLEMENTATION SCHEDULE

Project No.	Project Name		Priority Group	Year																				
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	After 2031
1	NLEx-SLEx Link Expressway		First																					
2	NAIA Expressway (Phase 2)		First																					
3/14	C-6 Expressway and Global City Link	North Section	First																					
		East Section	First																					
		South-East Section	First																					
4	C-6 Extension	Phase-1	Second																					
		Phase-2	Second																					
5	Manila Bay Expressway		Second																					
6	CALA Expressway	Segment-1	First																					
		Segment-2	First																					
7	Central Luzon Expressway	Phase-1	First																					
		Phase-2	First																					
8	Calamba-Los Baños Expressway		First																					
9	SLEx Extension (to Lucena City)		First																					
10	NLEx East	Phase-1	Second																					
		Phase-2	Second																					
11	La Mesa Parkway		Second																					
12	C-5/FTI/Skyway Connector Road		First																					
13	Pasig-Marikina Expressway		Second																					
15	R-7 Expressway		Second																					

Fund Requirement (excluding O & M)				
Public	84.85 Billion Pesos	106.06 Billion Pesos	121.91 Billion Pesos	152.39 Billion Pesos
Private	56.56 Billion Pesos	35.35 Billion Pesos	81.27 Billion Pesos	50.79 Billion Pesos
TOTAL	141.41 Billion Pesos	141.41 Billion Pesos	203.18 Billion Pesos	203.18 Billion Pesos
PP Share	Public: 60% Private: 40%	Public: 75% Private: 25%	Public: 50% Private: 50%	Public: 75% Private: 25%

Legend:
- : Project Preparation & Approval (& ODA Loan)
- : Detailed Design, ROW Acquisition & Loan Closure
- : Construction
- : Operation & Maintenance
- : Detailed Design
- : ROW Acquisition
- : Selection of Contractor
- : Fund Raising

16.5 PROPOSED HSH-1 DEVELOPMENT MASTER PLAN

Based on the proposed implementation schedule, HSH network in 2020 and in 2030 was prepared.

Figure 16.5-1 (1/3) to **(3/3)** shows proposed HSH-1 and HSH-2 network in 2020. **Figure 16.5-2 (1/3)** to **(3/3)** shows proposed HSH-1 and HSH-2 network in 2030.

HSH-1 network development progress in the Study Area is shown in **Figure 16.5-3 (1/4)** to **(4/4)**.

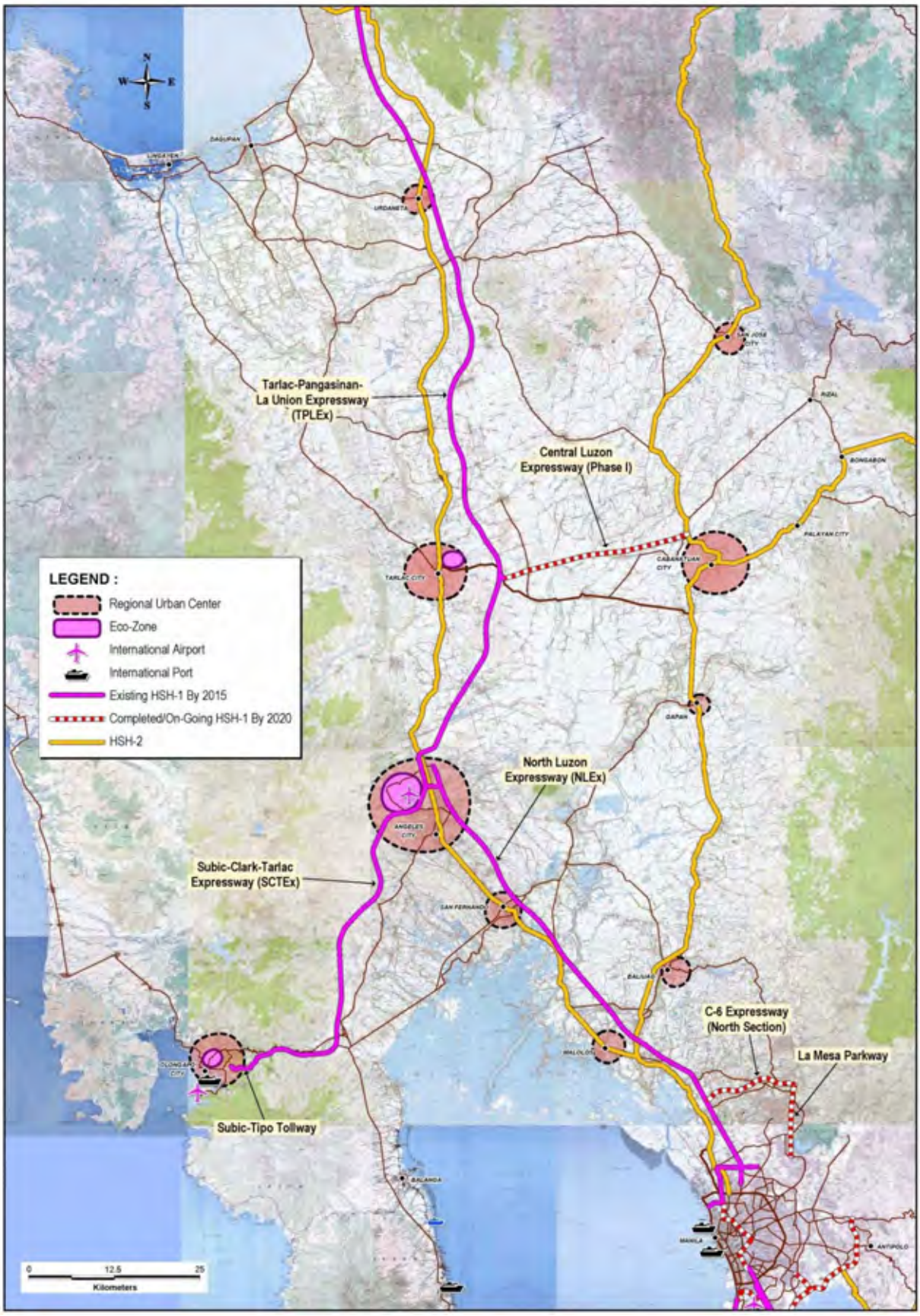


FIGURE 16.5-1 (1/3) PROPOSED HSH-1 AND HSH-2 NETWORK IN 2020: NORTH OF METRO MANILA

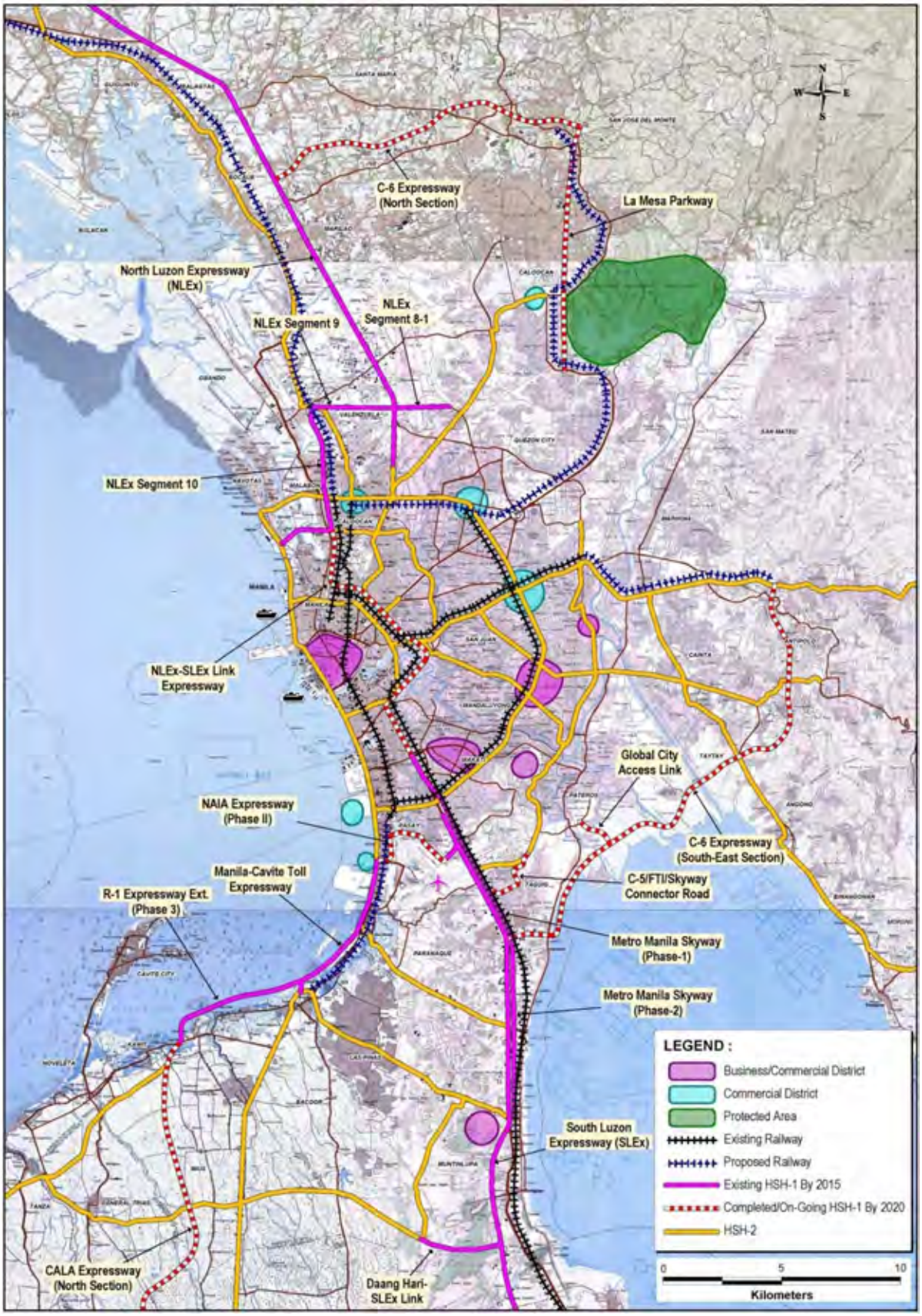


FIGURE 16.5-1 (2/3) PROPOSED HSH-1 AND HSH-2 NETWORK IN 2020: METRO MANILA

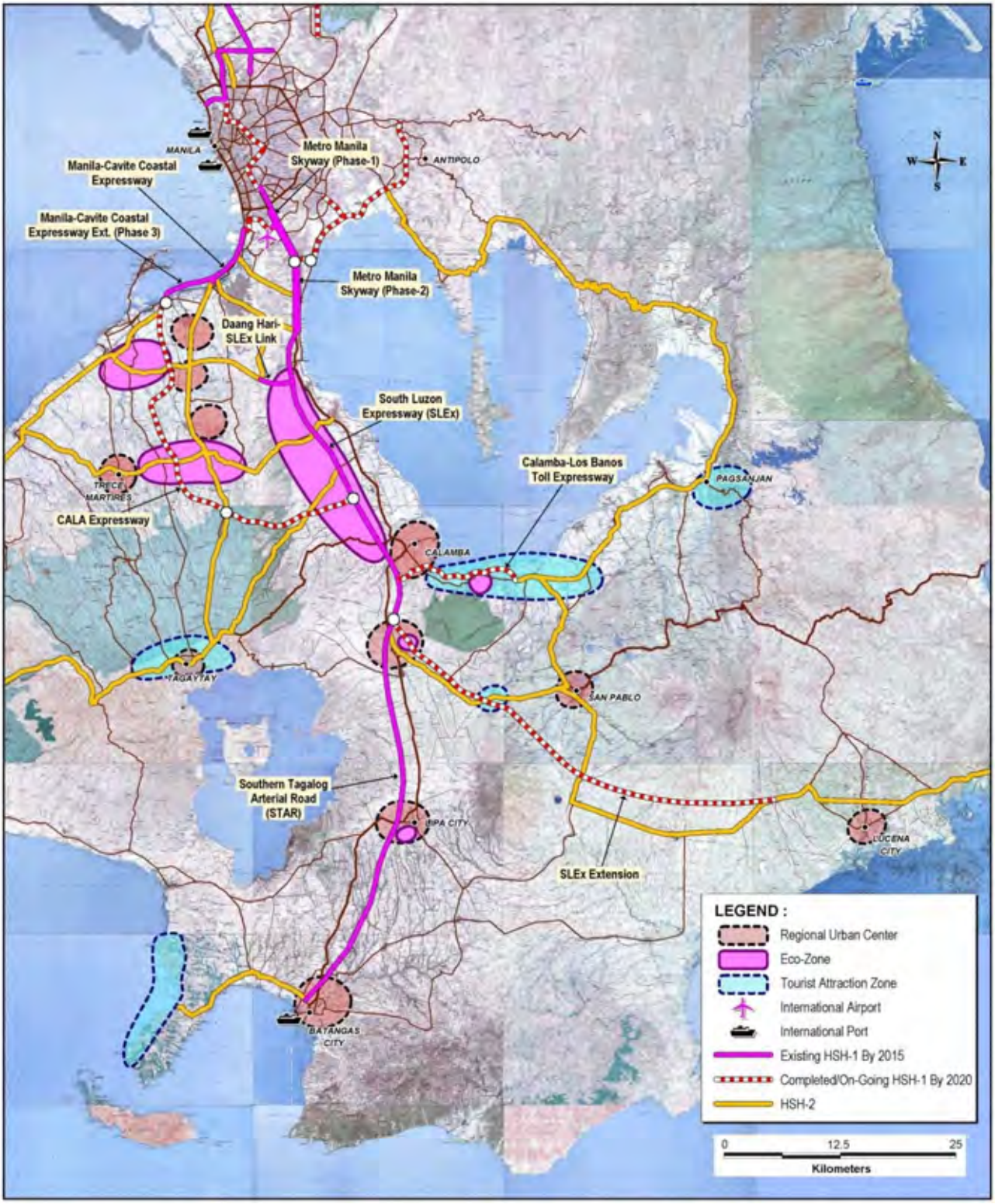


FIGURE 16.5-1 (3/3) PROPOSED HSH-1 AND HSH-2 NETWORK IN 2020: SOUTH OF METRO MANILA

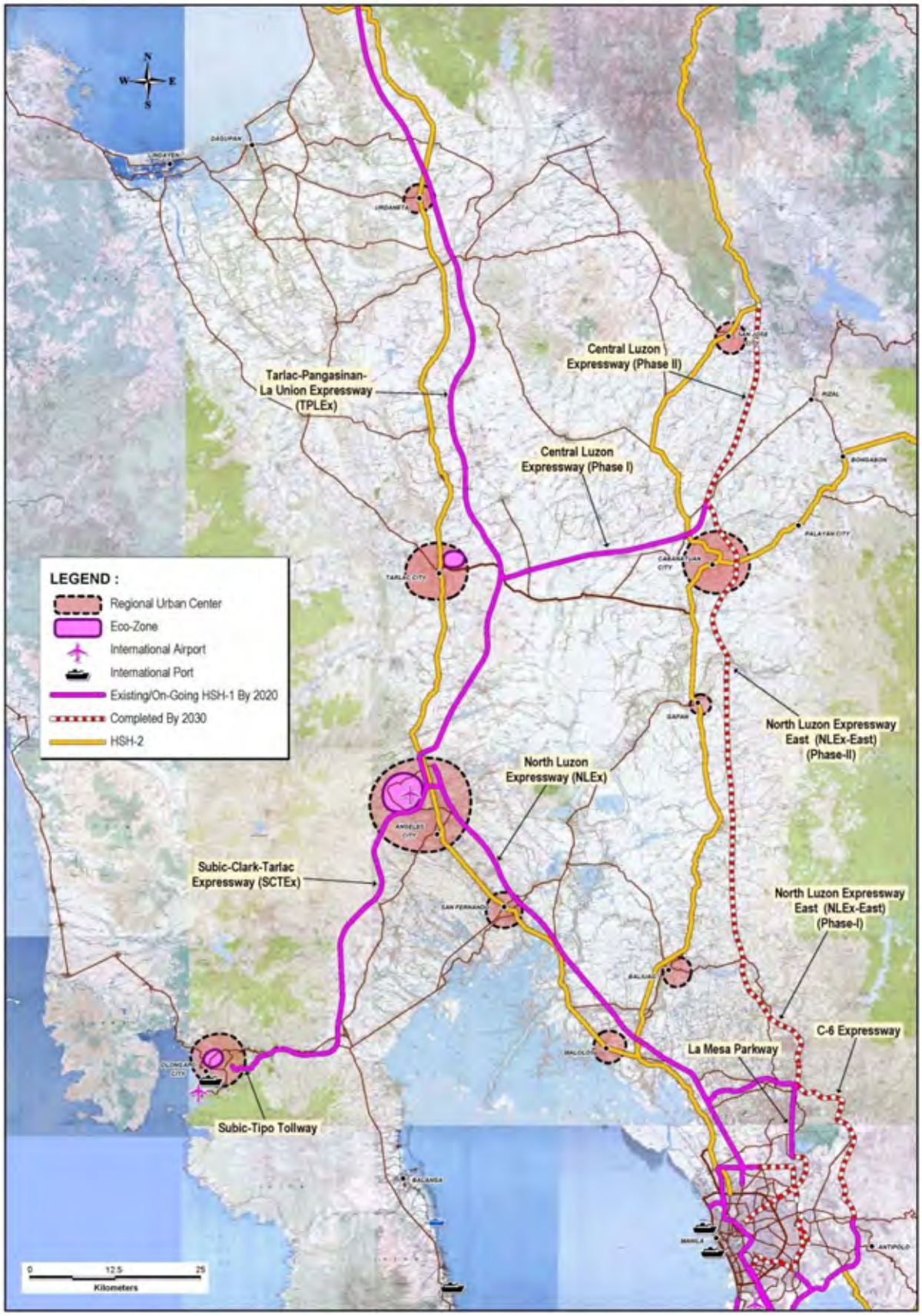


FIGURE 16.5-2 (1/3) PROPOSED HSH-1 AND HSH-2 NETWORK IN 2030: NORTH OF METRO MANILA

FIGURE 16.5-2 (2/3) PROPOSED HSH-1 AND HSH-2 NETWORK IN 2030: METRO MANILA

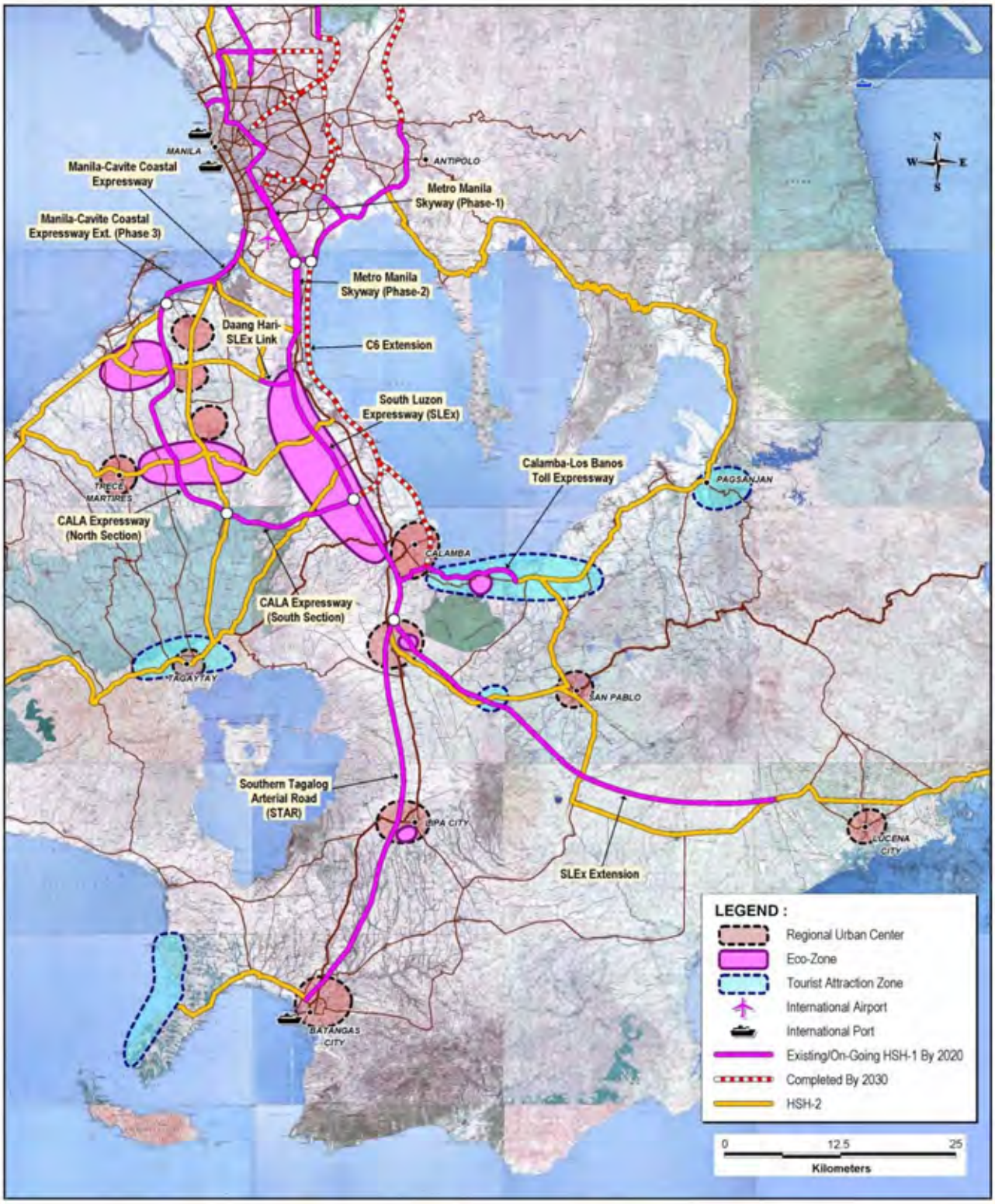


FIGURE 16.5-2 (3/3) PROPOSED HSH-1 AND HSH-2 NETWORK IN 2030: SOUTH OF METRO MANILA

FIGURE 16.5-3 (1/4) EXPRESSWAY NETWORK AT PRESENT
(Including Projects Under Construction/Committed)

FIGURE 16.5-3 (2/4) EXPRESSWAY NETWORK IN 2020
(Including Projects Under Construction)

FIGURE 16.5-3 (3/4) EXPRESSWAY NETWORK IN 2030
(Including Projects Under Construction)

FIGURE 16.5-3 (4/4) EXPRESSWAY NETWORK BEYOND 2030
(Including Projects Under Construction)

16.6 EVALUATION OF MASTER PLAN

Proposed master plan was evaluated from the view point of (1) improvement of transport efficiency, (2) economic viability, and (3) other development impacts.

16.6.1 Improvement of Transport Efficiency

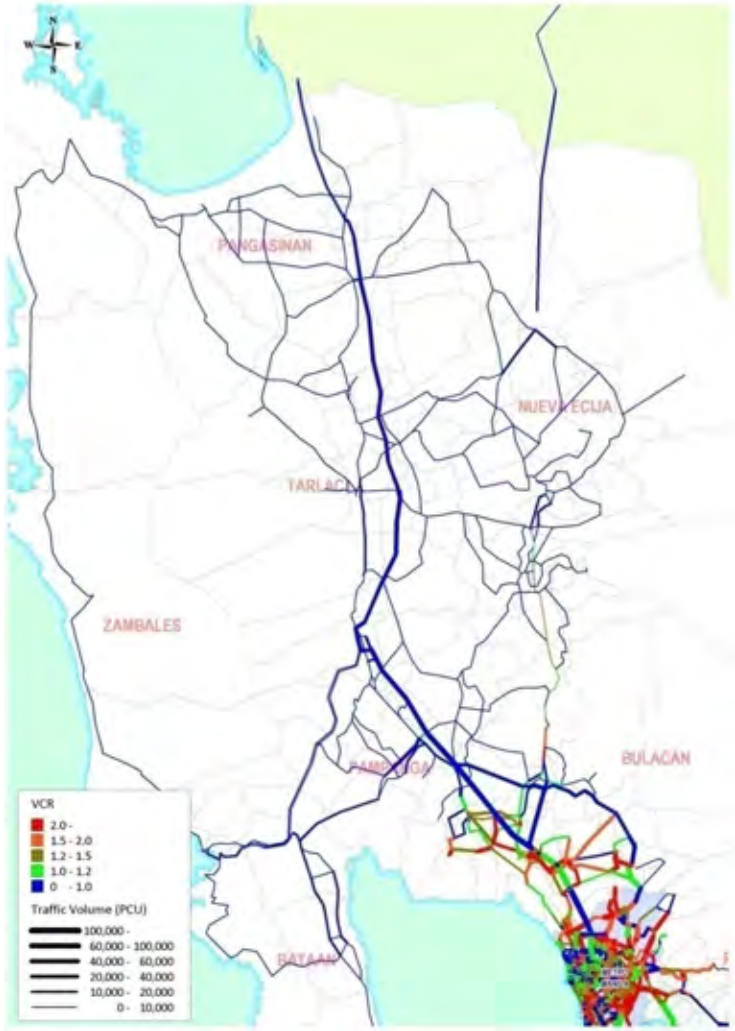
In order to evaluate a proposed master plan, traffic assignment of without case and master plan case was conducted for year of both 2020 and 2030. **Figure 16.6.1-1** shows the result of the without case and master plan case in 2020 and **Figure 16.6.1-2** shows the result of that in 2030.

WITHOUT CASE

MASTER PLAN CASE

FIGURE 16.6.1-1(1) TRAFFIC ASSIGNMENT OF "WITHOUT CASE" AND "MASTER PLAN CASE" IN 2020 (METRO MANILA)

WITHOUT CASE



MASTER PLAN CASE

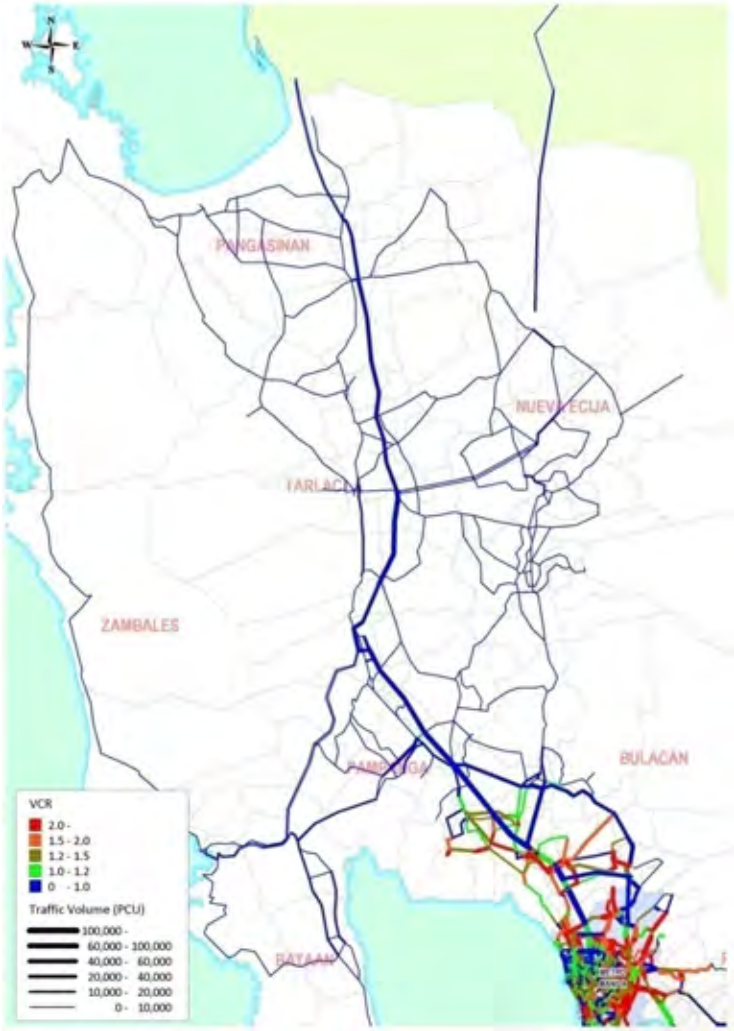
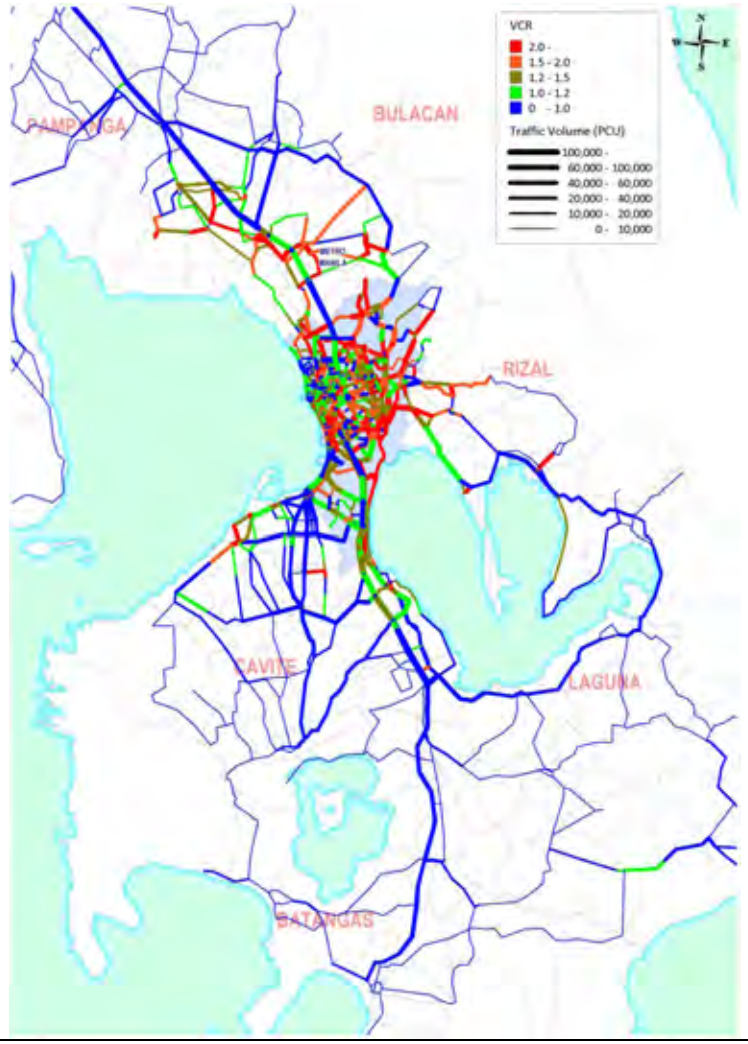


FIGURE 16.6.1-1(2) TRAFFIC ASSIGNMENT OF "WITHOUT CASE" AND "MASTER PLAN CASE" IN 2020 (NORTH OF MANILA)

WITHOUT CASE



MASTER PLAN CASE

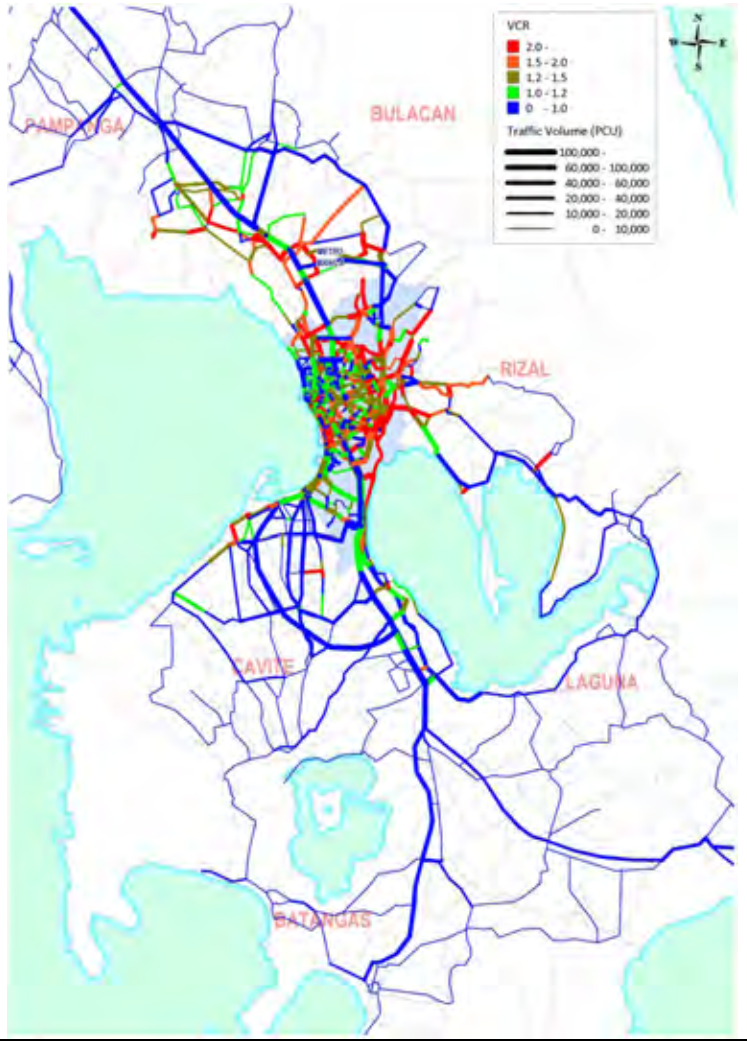


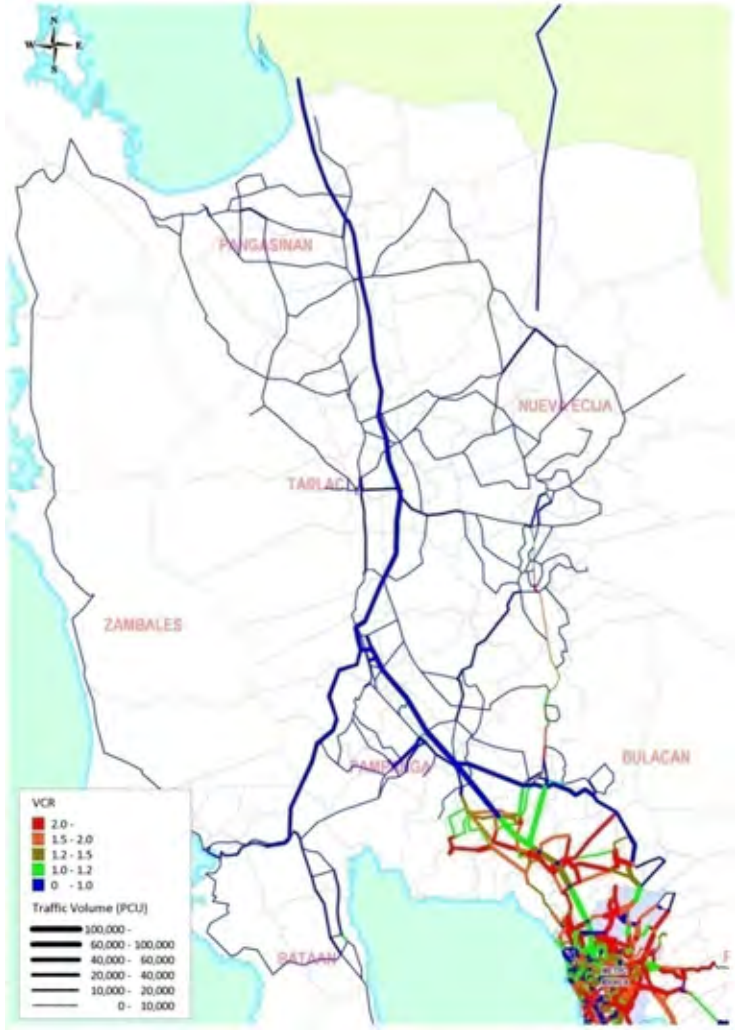
FIGURE 16.6.1-1(3) TRAFFIC ASSIGNMENT OF "WITHOUT CASE" AND "MASTER PLAN CASE" IN 2020 (SOUTH OF MANILA)

WITHOUT CASE

MASTER PLAN CASE

FIGURE 16.6.1-2(1) TRAFFIC ASSIGNMENT OF "WITHOUT CASE" AND "MASTER PLAN CASE" IN 2030 (METRO MANILA)

WITHOUT CASE



MASTER PLAN CASE

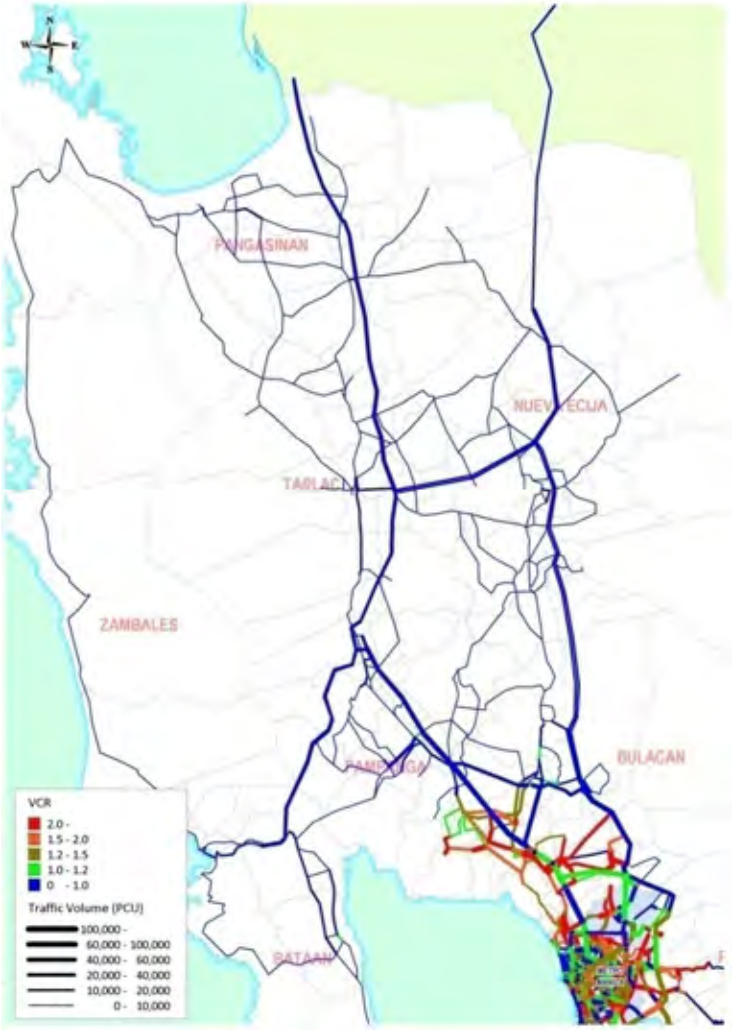
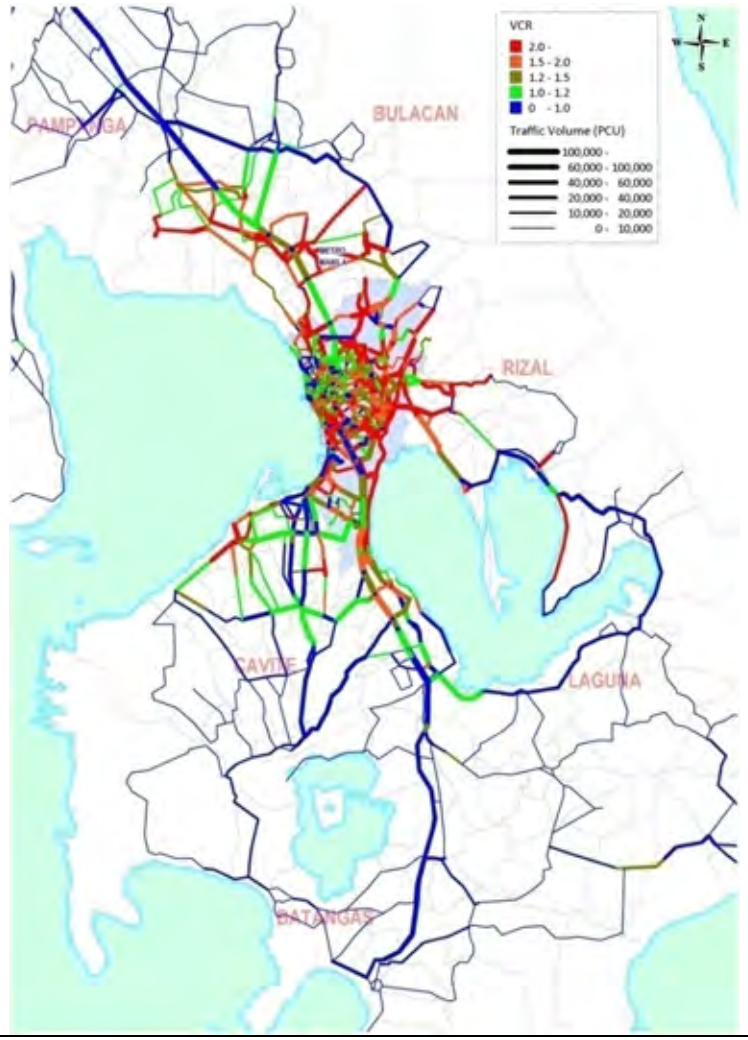


FIGURE 16.6.1-2(2) TRAFFIC ASSIGNMENT OF "WITHOUT CASE" AND "MASTER PLAN CASE" IN 2030 (NORTH OF MANILA)

WITHOUT CASE



MASTER PLAN CASE

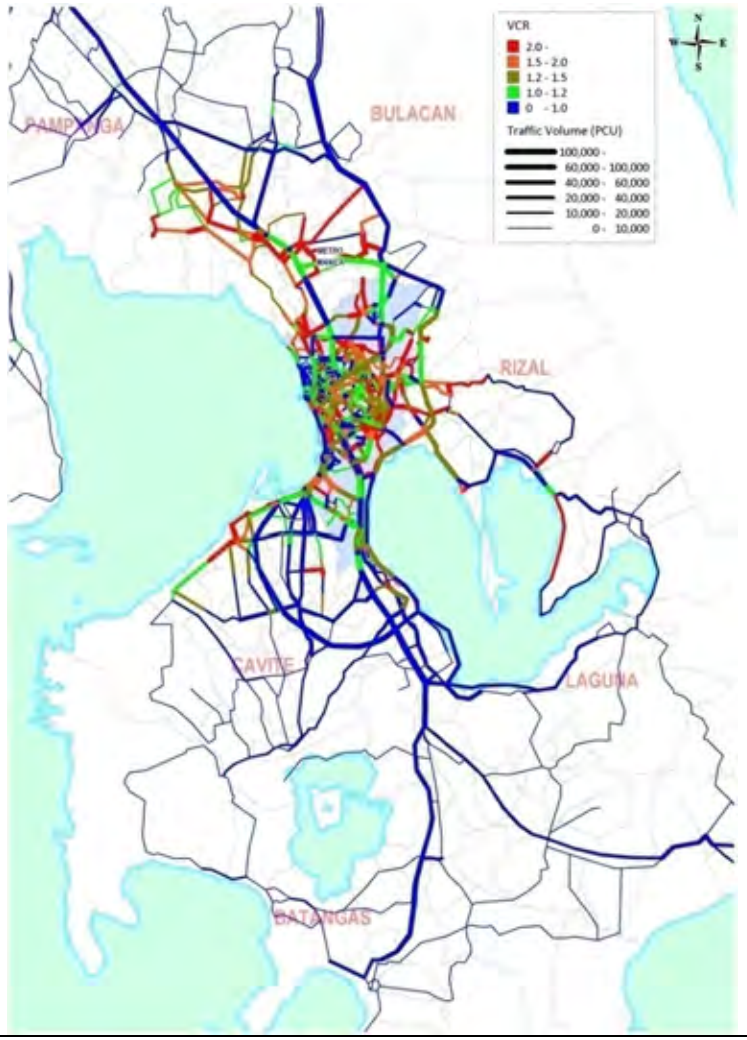


FIGURE 16.6.1-2(3) TRAFFIC ASSIGNMENT OF "WITHOUT CASE" AND "MASTER PLAN CASE" IN 2030 (SOUTH OF MANILA)

(1) Vehicle Travel Distance

Vehicle travel distance (1,000 pcu-km/day) is shown in **Table 16.6.1-1** and **Figure 16.6.1-3**. Vehicle travel distance will increase by about 3% in year 2030. This means road users select less congested road, even though they travel more.

TABLE 16.6.1-1 VEHICLE TRAVEL DISTANCE

Unit: 1,000 pcu-km/day

	2015	2020	2030
(a) Without Case (2015 Network)	91,872	111,731	136,214
(b) With Case (with Master Plan)	91,872	112,263	139,623
Ratio = (b) / (a)	1.00	1.00	1.03

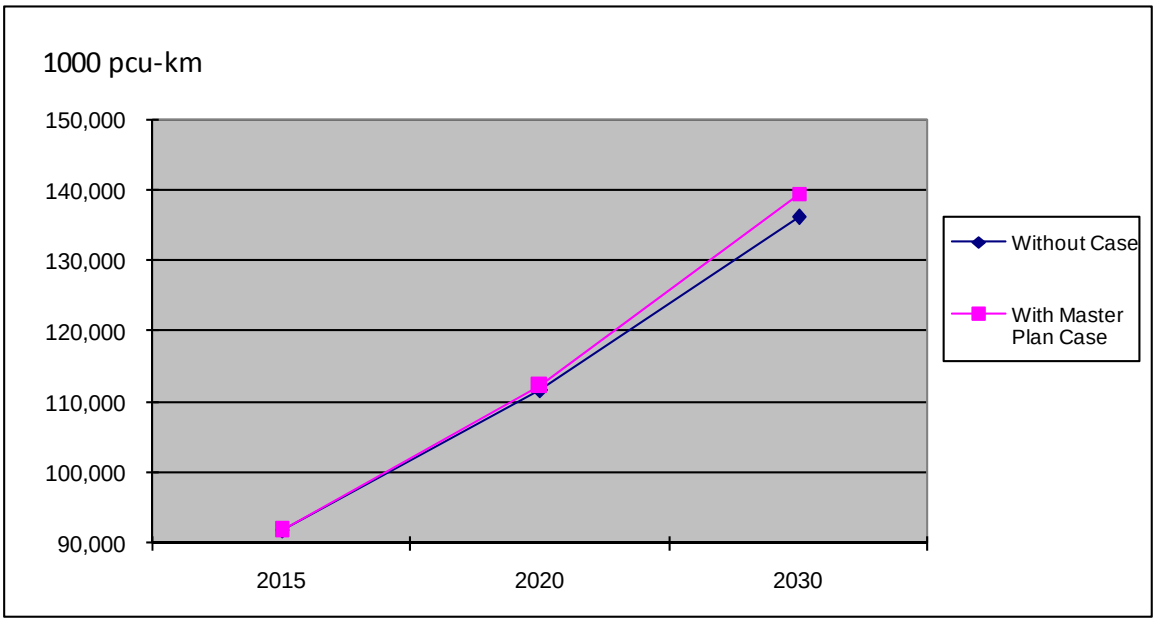


FIGURE 16.6.1-3 VEHICLE TRAVEL DISTANCE

(2) Vehicle Travel Hour

Vehicle travel hour (1,000 pcu-km/day) is shown in **Table 16.6.1-2**, and **Figure 16.6.1-4**. In 2020, 359,000 pcu-hour will be saved daily and 1,233,000 pcu-hour in 2030. Huge vehicle travel hour will be saved when the Master Plan is realized.

TABLE 16.6.1-2 VEHICLE TRAVEL HOUR

Unit: 1,000 pcu-hour/day

	2015	2020	2030
(a) Without Case (2015 Network)	3,331	4,624	6,430
(b) With Case (with Master Plan)	3,331	4,265	5,197
Ratio = (a) – (b)	0	359	1,233

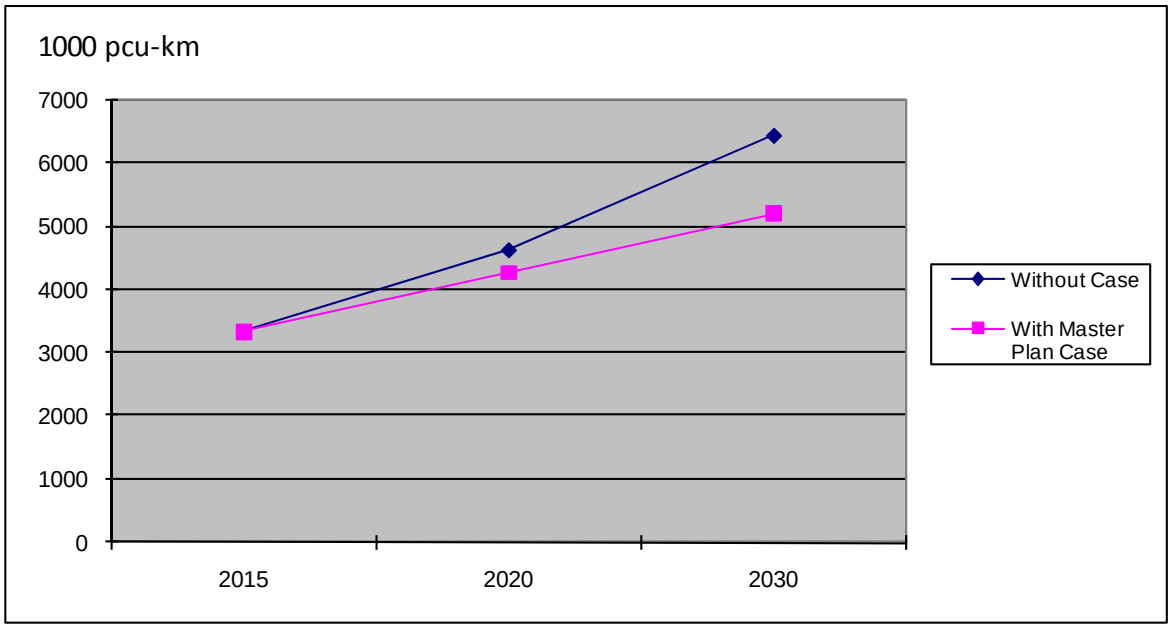


FIGURE 16.6.1-4 VEHICLE TRAVEL HOUR

The sphere of travel time (1-hr, 2-hrs, and over 3 hours) originating from Manila City is shown in Figure 16.6.1-5 for Without Master Plan case and in Figure 15.6.1-6 for Master Plan case. Without the Master Plan, the sphere of 1-hour travel time is almost limited only to Metro Manila. However, if the Master Plan is realized, the 1-hour travel time sphere is substantially extended to parts of Cavite, Laguna, Rizal and Bulacan. With the completion of several expressway projects, cities of Cabanatuan, Tagaytay and Lucena are expected to be within reach for more or less 2-hours.

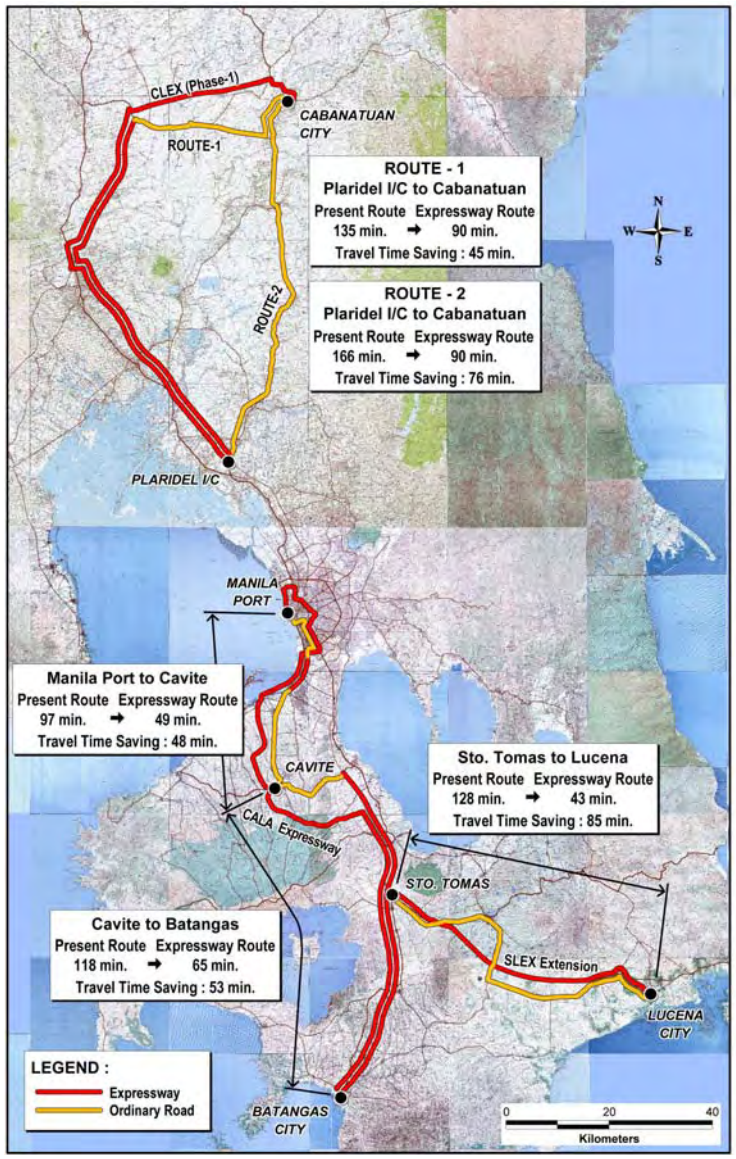
Comparison of travel time by using expressway routes and ordinary routes are shown in Figure 16.6.1-7 and Figure 16.6.1-8. As expected, expressway route in most cases reduced the travel time for more than one-half.

Note: Travel time during off-peak hours
Source: JICA Study Team

FIGURE 16.6.1-5 TRAVEL TIME SPHERE (WITHOUT MASTERPLAN)

Note: Travel time during off-peak hours
Source: JICA Study Team

FIGURE 16.6.1-6 TRAVEL TIME SPHERE (WITH MASTERPLAN)



Note: Travel time during off-peak hours
Source: JICA Study Team

FIGURE 16.6.1-7 COMPARISON OF PRESENT ROUTES AND EXPRESSWAY ROUTES (NORTH AND SOUTH OF METRO MANILA)

Note: Travel time during off-peak hours
Source: JICA Study Team

FIGURE 16.6.1-8COMPARISON OF PRESENT ROUTES AND EXPRESSWAY ROUTES (METRO MANILA)

(3) Volume Capacity Ratio (V/C Ratio)

With new road facility construction, capacity of roads to serve for traffic increases, thus, overall v/c ratio of road network is improved. Under without case, overall traffic volume gets close to traffic capacity of overall roads in 2030, which condition will be improved under "with case" to v/c ratio of 0.70.

TABLE 16.6.1-3 V/C RATIO OF ROAD NETWORK

	2015	2020	2030
(a) Without Case (2015 Network)	0.57	0.69	0.83
(b) With Case (with Master Plan)	0.57	0.65	0.70

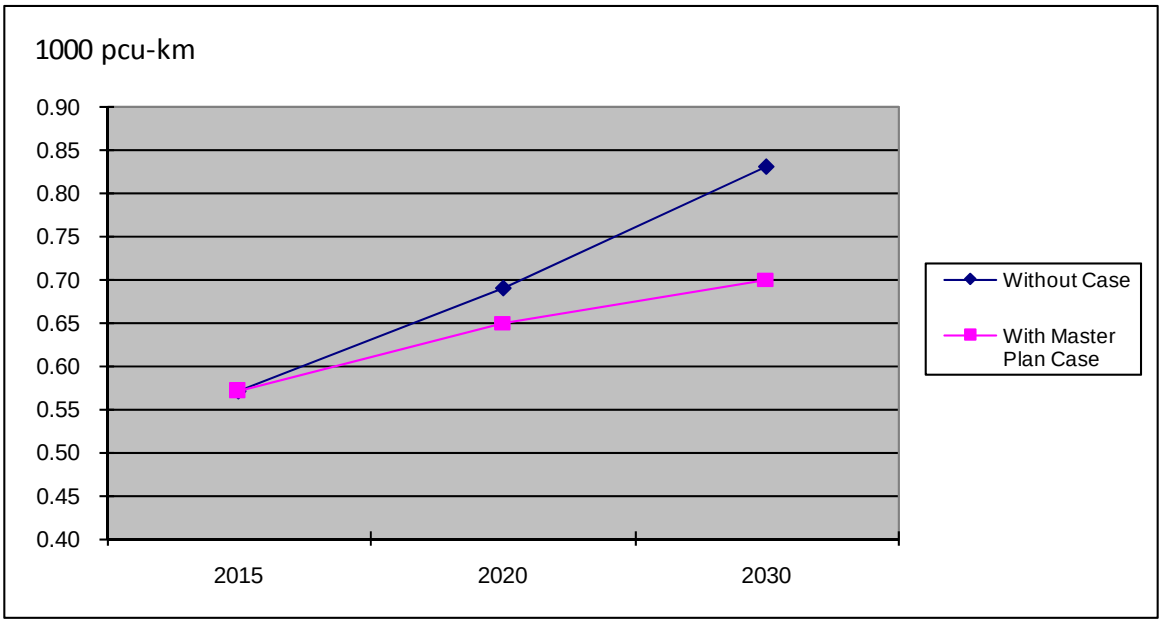


FIGURE 16.6.1-9 V/C RATIO OF ROAD NETWORK

(4) Average Travel Speed

With new road facility construction, average travel speed on the road network will be improved. Under "without case", average travel speed gradually aggravated. In 2030, it will be reduced to 21.2 km/hour from 27.6 km/hour in 2015. Under "Master Plan Case", average travel speed of 2015 level will be maintained and will not be aggravated.

TABLE 16.6.1-4 AVERAGE TRAVEL SPEED (km/hour)

	2015	2020	2030
(a) Without Case (2015 Network)	27.6	24.2	21.2
(b) With Case (with Master Plan)	27.6	26.3	26.9
(b) / (a)	1.00	1.09	1.27

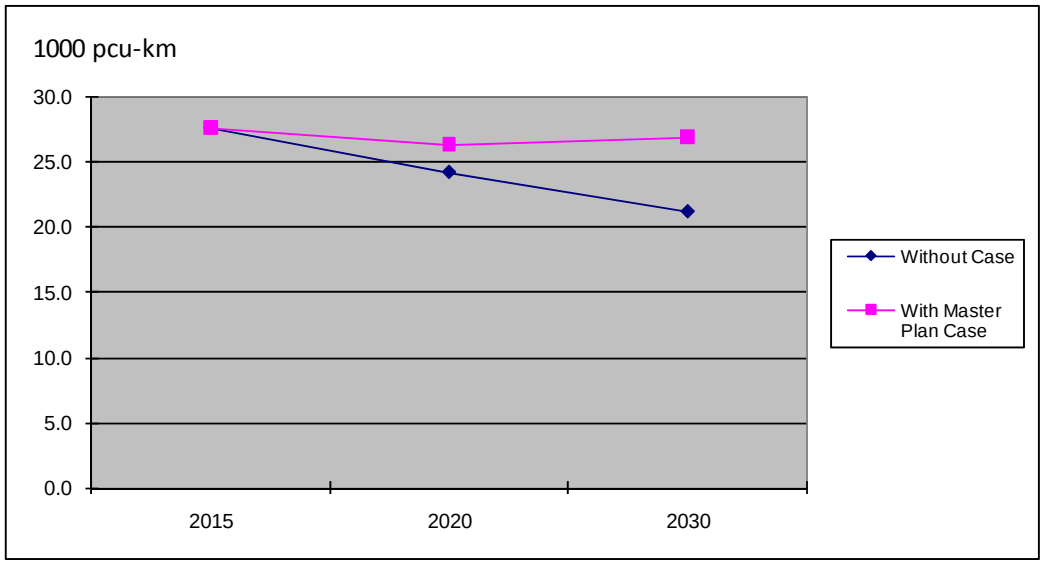


FIGURE 16.6.1-10 AVERAGE TRAVEL SPEED (km/hour)

16.6.2 Economic Viability of Master Plan

Economic viability of Master Plan was examined. Benefit-cost stream is shown in **Table 16.6.2-1**, and economic analysis result is summarized below:

TABLE 16.6.2-1 RESULT OF ECONOMIC ANALYSIS OF MASTER PLAN

EIRR %	29.7
NPV (Million Pesos)	72,296
B/C ratio	1.98

Master Plan was evaluated economically feasible.

Undiscounted Benefit Cost Stream Revenue

Millon Pesos

Sq.	Year	Construction Cost	O & M Cost	Cost Total	Benefit	Benefit - Cost
0	2010					
1	2011	976		976		-976
2	2012	1,483		1,483		-1,483
3	2013	2,541		2,541		-2,541
4	2014	9,476		9,476		-9,476
5	2015	14,648		14,648		-14,648
6	2016	15,080	239	15,319	6,740	-8,579
7	2017	19,405	727	20,133	13,480	-6,653
8	2018	19,563	1,158	20,721	20,219	-502
9	2019	21,109	1,158	22,267	26,959	4,692
10	2020	10,769	1,873	12,642	33,699	21,057
11	2021	13,205	1,873	15,079	40,960	25,881
12	2022	11,423	2,347	13,770	48,221	34,451
13	2023	16,449	2,858	19,307	55,482	36,175
14	2024	13,683	3,201	16,885	62,743	45,858
15	2025	25,467	4,093	29,560	70,004	40,444
16	2026	28,525	4,960	33,485	77,264	43,779
17	2027	22,765	6,072	28,836	84,525	55,689
18	2028	16,230	4,881	21,110	91,786	70,676
19	2029	16,230	7,265	23,495	99,047	75,552
20	2030	0	5,477	5,477	106,308	100,831
21	2031	0	6,381	6,381	106,308	99,927
22	2032	0	6,930	6,930	106,308	99,378
23	2033	0	6,970	6,970	106,308	99,338
24	2034	0	6,262	6,262	106,308	100,046
25	2035	0	6,924	6,924	106,308	99,384
26	2036	0	9,795	9,795	106,308	96,513
27	2037	0	7,435	7,435	106,308	98,873
28	2038	0	5,477	5,477	106,308	100,831
29	2039	0	9,974	9,974	106,308	96,334
30	2040	0	5,477	5,477	106,308	100,831
Residual Value		-110,561			110,561	110,561
Total				398,835	2,011,078	1,612,243

Discounted Benefit Cost Stream Revenue

Millon Pesos

Sq.	Year	Discounte	Construction Cost	O & M Cost	Cost Total	Benefit	Benefit - Cost
0	2010						
1	2011	1.15	848		848		-848
2	2012	1.32	1,121		1,121		-1,121
3	2013	1.52	1,671		1,671		-1,671
4	2014	1.75	5,418		5,418		-5,418
5	2015	2.01	7,283		7,283		-7,283
6	2016	2.31	6,520	103	6,623	2,914	-3,709
7	2017	2.66	7,295	273	7,569	5,067	-2,501
8	2018	3.06	6,395	379	6,774	6,610	-164
9	2019	3.52	6,000	329	6,330	7,663	1,334
10	2020	4.05	2,662	463	3,125	8,330	5,205
11	2021	4.65	2,838	403	3,241	8,804	5,563
12	2022	5.35	2,135	439	2,574	9,013	6,439
13	2023	6.15	2,673	465	3,138	9,017	5,879
14	2024	7.08	1,934	452	2,386	8,867	6,481
15	2025	8.14	3,130	503	3,633	8,603	4,970
16	2026	9.36	3,048	530	3,578	8,257	4,678
17	2027	10.76	2,115	564	2,680	7,855	5,175
18	2028	12.38	1,311	394	1,706	7,417	5,711
19	2029	14.23	1,140	510	1,651	6,960	5,309
20	2030	16.37	0	335	335	6,495	6,161
21	2031	18.82	0	339	339	5,648	5,309
22	2032	21.64	0	320	320	4,911	4,591
23	2033	24.89	0	280	280	4,271	3,991
24	2034	28.63	0	219	219	3,714	3,495
25	2035	32.92	0	210	210	3,229	3,019
26	2036	37.86	0	259	259	2,808	2,549
27	2037	43.54	0	171	171	2,442	2,271
28	2038	50.07	0	109	109	2,123	2,014
29	2039	57.58	0	173	173	1,846	1,673
30	2040	66.21	0	83	83	1,606	1,523
Residual Value			-1,670			1,670	1,670
Total					73,845	146,141	72,296

Net Present Value(Million Peso)	72,296
B/C Ratio	1.98
EIRR	29.7%

16.6.3 Other Effects of the Master Plan

In addition to improvement of transport efficiency and direct economic impacts, following effects will be expected by the Master Plan;

(1) Contribution to Economic Development

The Plan will realize formation of following backbone transport axes which will contribute to national integration, universal development of the Study Area and enhancement of foreign and domestic investment which will stimulate economic development;

- North-South Industrial Development Beltway
- North-East Luzon Development Axis
- South Luzon Development Axis

(2) Contribution to Social Development

Large scale construction work will create a lot of jobs. During the operation and maintenance stage, sustainable job creation will be achieved, thus greatly contribute to lifting up of people's level of life.

(3) Contribution to Construction Industry

Assurance of sustainable construction projects will benefit the construction industry which will invest more for their technology innovation, employment of regular engineers, and capacity development of employees. Constant jobs will improve financial conditions of contractors which will accelerate challenges to new PPP projects utilizing their saving.

(4) Contribution to Tourism Industry

Many tourist spots will enjoy easier accessibility and attract more visitors, thus the tourism industry will be greatly benefitted.

(5) Improvement of Global competitiveness

Faster and more reliable delivery of goods and people will surely improve Global competitiveness and more foreign and domestic investments will be attracted.

(6) Contribution to Retardation of Global Warming

Improvement of transportation efficiency will reduce emission of CO_2 from vehicles which will contribute to retardation of global warming.

(7) Contribution to Sound Urbanization

In many areas of Cavite, Laguna, Rizal and Bulacan Provinces, disorderly urbanization is rapidly progressing. New road network development will guide sound urbanization in those areas.

(8) Improvement of Environment along Existing Roads

A large volume of traffic will be diverted to new expressway from the existing roads, thus traffic load on existing roads will be reduced, resulting in improvement of environment along existing roads.

(9) Formation of Stronger Road Network Against Natural Disaster

Proposed HSH-1 will be built strong against natural disaster. When natural disaster hits the area, HSH-1 network will function as access roads to disaster-hit area and emergency relief operation will be assured and become easier and faster.

(10) Expansion of Business and Social Activities

Improved transport efficiency will assure expanded business and social activities. People will enjoy more business chances and accessibility to social activities such as educational, cultural and medical opportunities.

16.6.4 Government Financing Capability

The Government Financing Capability (GFC) for the Master Plan was examined under the following assumptions;

- DPWH capital outlay budget will increase at 5% per annum in real term.
- Maximum allocation of DPWH capital outlay budget to the Master Plan projects (GFC) will be 10%

Table 16.6.4-1 shows actual DPWH capital outlay budget, estimated future budget and annual fund requirement (AFR) of the Master Plan. Since 2005 to 2010, DPWH capital outlay budget drastically increased at an average rate of about 30% (nominal). For estimation of future budget, it was assumed that 5% annual increase of budget will be made.

TABLE 16.6.4-1 DPWH BUDGET VS. FUND REQUIREMENT OF MASTER PLAN

Year	Actual DPWH Capital Outlay Budget	Estimated Future DPWH Capital Outlay Budget (5% increase per annum (a)	Master Plan Project Annual Investment Requirement		
			100% by Gov. 0% by Private (b)	75% by Gov. 25% by Private (c)	60% by Gov. 40% by Private (d)
2005	26.5				
2006	35.5 (34%)				
2007	38.0 (7%)				
2008	59.0 (55%)				
2009	87.2 (48%)				
2010	102.6 (18%)				
2011	Annual Increase rate	107.1	1.1 (1.0%)	0.8 (0.7%)	0.7 (0.6%)
2012		113.1	1.7 (1.5%)	1.3 (1.1%)	0.8 (0.7%)
2013		118.8	3.1 (2.6%)	2.3 (1.9%)	1.9 (1.6%)
2014		124.7	11.6 (9.3%)	8.7 (7.0%)	7.0 (5.6%)
2015		130.9	17.8 (13.6%)	13.4 (10.2%)	10.7 (8.2%)
2016		137.5	18.5 (13.5%)	13.9 (10.1%)	11.1 (8.1%)
2017		144.4	23.9 (16.6%)	17.9 (12.4%)	14.3 (9.9%)
2018		151.6	24.2 (16.8%)	18.2 (12.0%)	14.5 (9.6%)
2019		159.2	26.2 (16.5%)	19.7 (12.4%)	15.7 (9.9%)
2020		167.1	13.2 (7.9%)	9.9 (5.9%)	7.9 (4.7%)
2021		175.5	16.3 (9.3%)	12.2 (7.0%)	9.8 (5.6%)
2022		184.3	14.0 (7.6%)	10.5 (5.7%)	8.4 (4.6%)
2023		193.5	20.1 (10.4%)	15.1 (7.8%)	12.1 (6.3%)
2024		203.1	16.8 (8.3%)	12.6 (6.2%)	10.1 (5.0%)
2025		213.3	31.6 (14.8%)	23.7 (11.1%)	19.0 (8.9%)
2026		224.0	35.5 (15.8%)	26.6 (11.9%)	21.3 (9.5%)
2027		235.2	28.4 (12.1%)	21.3 (9.1%)	17.0 (7.2%)
2028		246.9	20.2 (8.2%)	15.2 (6.2%)	12.1 (4.9%)
2029		259.3	20.2 (7.8%)	15.2 (5.9%)	12.1 (4.7%)

Note: % in ( ) of (b), (c), and (d) is AFR share to budget

Three cases were examined as follows;

Case-1 : All AFR is financed by the Government.

Case-2 : AFR is shared by the Government and the private sector at the ratio of 75 to 25.

Case-3 : AFR is shared by the Government and the private sector at the ratio of 60 to 40.

Result is shown below:

Fund Sharing of AFR		**No. of Years that AFR exceeds GFC**
Case-1	Government : 100% Private : 0%	9 Years
Case-2	Government : 75% Private : 25%	7 Years
Case-3	Government : 60% Private : 40%	0 Year

From the view point of GFC, the Master Plan projects can be funded under Case-3. It suggests that the Government should seek about 40% funding from the private sector to realize the Master Plan projects.