7.7.2 Daang Hari Road (DH)

The Daang Hari Road (DH) will start from the border between Muntinlupa City (National Capital Region) and the municipality of Imus, Cavite, where it will be connected with the existing Daang Hari Road which is at present under construction. The DH Road will end at the Coastal Road in the Municipality of Tanza. Total length of DH-3 and DH-4 is 21.0 km.

Since the proposed alignment is located at lowland between EL.10 m to EL.30 m and crosses over many rivers flowing down from south to north into Manila Bay, due consideration will be required to decide the design flood levels appropriately. The DH Road can be divided mainly into two parts, namely east and west sections of Aguinaldo Highway. Within the eastern part, DH Road will cross seven rivers, which are moderately small creeks with 15 m to 25 m of width. It will cross with the proposed NS Road at Sta.8+230. At Sta.8+800, a new bridge is under construction along the proposed alignment.

The western part which stretches from Aguinaldo Highway to the end point at the Coastal Road, a total of five rivers will be crossed by the alignment. Paddy and pasture land is the predominant land use in this area, contrary to those in the eastern part. It is noted that future urbanization and land use changes shall be taken into account to estimate flood discharge at crossings where the catchments varies between 50 to 100 km^2 approximately.

Typical conditions along the proposed alignment are shown in Figure 7.7.3.

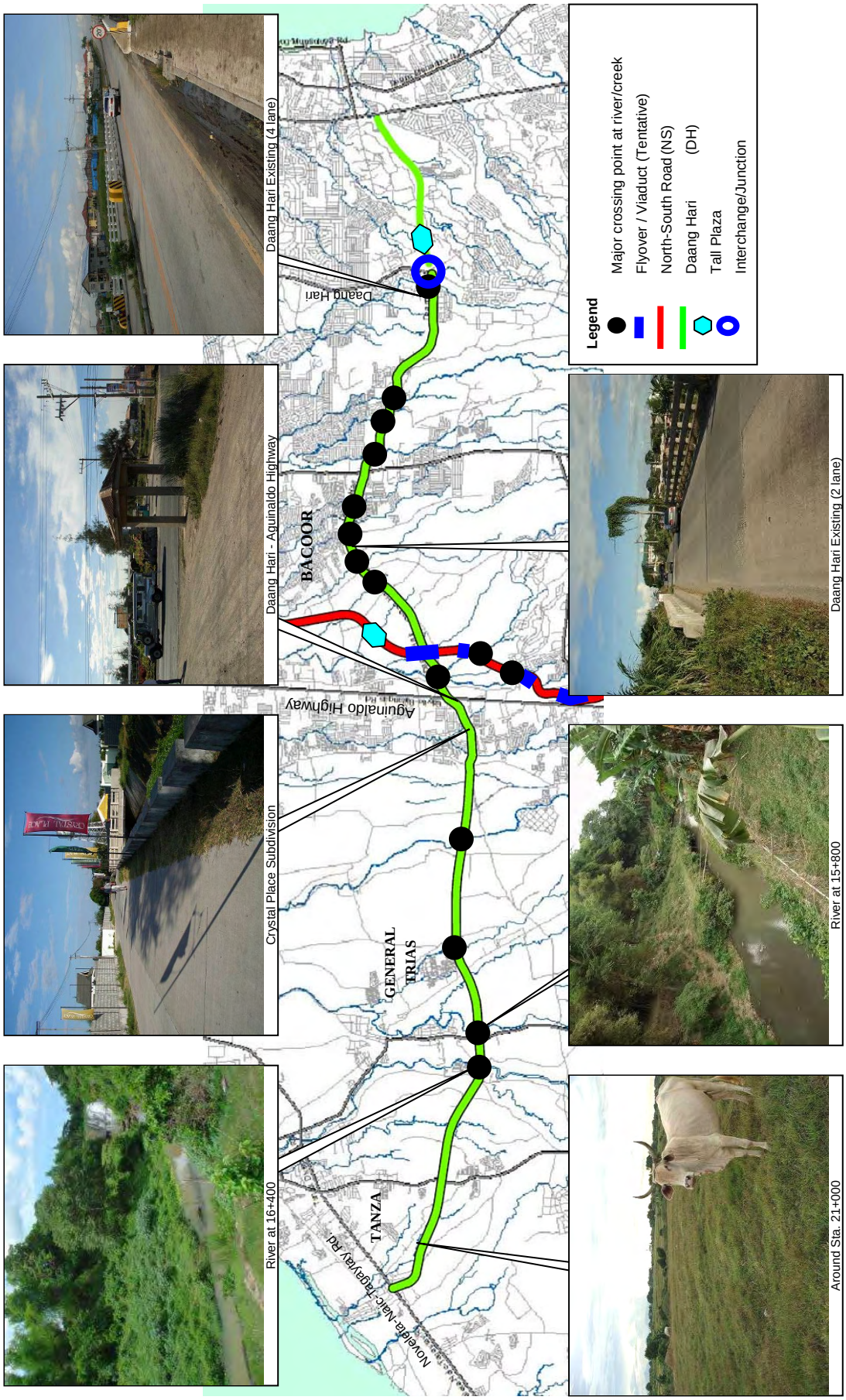


Figure 7.7.3 Photos showing Particular Issues along Daang Hari Road

7.7.3 CALA Expressway (CE)

The proposed CALA Expressway (CE) starts at the Asia Brewery Inc. / Greenfields interchange on South Luzon Expressway (SLEX) in Santa Rosa, Laguna, and will be connected with Governors Drive at the west of First Cavite Industrial Estate (FCIE), Dasmariñas. Total length is 22.7 km. Since the design speed of CE is 100 km/h, horizontal and vertical curve radius shall be larger, as compared to the ones of the other two routes whose design speed is 60 km/h.

From the starting point (Sta.0+000), it runs eastward in parallel with the Cabuyao River for about 6 km. After crossing the existing Sta.Rosa-Tagaytay Road, it will cross a tributary of the Banava River, and then will enter into the Municipality of Silang, Cavite. While going westward, the alignment will cross several rivers and rise altitude up to EL.300 m at around Sta.11+000. These rivers flow down to Laguna de Bay. The channel section is mostly covered by thick vegetation and formed moderately deep valley. The river bed is outcropped at many places and seems relatively stable against turbulence of flow. At Sta.13+500, the alignment runs in the watershed of the Baluctot River, which is one of the major tributaries of the Imus River system flowing to Manila Bay.

Since the topography especially in Silang is undulated and besides, several creeks appeared to be 30m deep running across the route, some bridges on CE will be up to 300 m in length.

After crossing Aguinaldo Highway at Sta.14+300 by flyover, the CE will cross over three rivers. After passing Ylang Ylang River at Sta.18+800, the alignment will run in the narrow strip area between the Rio Grade and the Ylang Ylang Rivers.

The typical conditions of CE are shown in Figure 7.7.4.

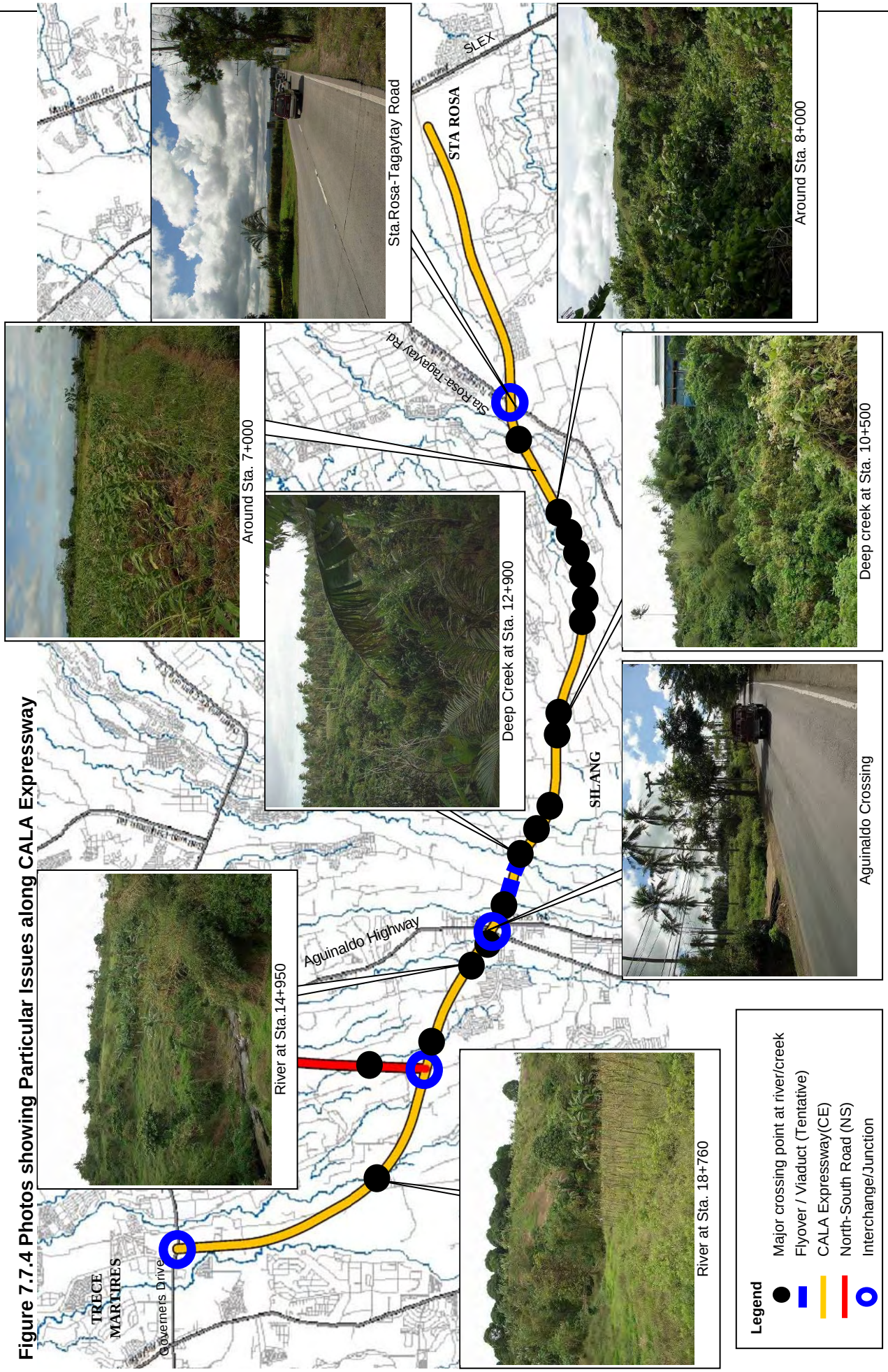


Figure 7.7.4 Photos showing Particular Issues along CALA Expressway

7.8 Preliminary Construction Planning

7.8.1 Major Work Item and Approximate Quantities

Based on the preliminary design, approximate quantities were estimated for the priority project. Major work item and approximate quantities are shown in Table 7.8.1.

Table 7.8.1 Major Work Item and Approximate Quantities

Work Item	Unit	NS-1	NS-2	NS-3	NS-4	NS-5	DH-3	DH-4	CE-1	CE-2	CE-3	CE-4
Excavation (Roadway)	cu.m.	5,681	6,288	33,423	31,636	96.404	12,104	16,479	5,682	1,481,311	266,371	107,323
Embankment (Excavated Material)	cu.m.	5,113	5,659	30,081	28,472	86,764	10,894	14,831	5,114	260,101	188,158	96,591
Embankment (Borrow Material)	cu.m.	62,574	68,916	27,291	67,351	45,976	10,257	142,484	166,376	-	-	98,828
Cement Treated Base Course	cu.m.	6,957	10,214	22,611	23,706	22,355	6,519	30,180	19,800	36,506	10,313	23,925
PCC Pavement (Plain, t=300mm)	sq.m.	44,338	64,535	139,368	144,600	135,613	37,975	175,775	124,280	229,141	64,735	150,172
Bridge Construction	l.m. (nos.)	710 (4)	-	680 (2)	1,400 (7)	1,500 (6)	120 (5)	415 (3)	-	1,439 (11)	580 (3)	190 (2)
Tollgate	nos.	-	1	1	-	-	-	-	-	-	-	-

7.8.2 Procurement Plan

(1) Labor

Philippine has many experiences in highway and bridge construction. Capable labor for construction project is sufficiently available within the country. Therefore, most of labor is procured within the country, and some of skilled labor for special work and construction equipment operator is procured from Manila.

(2) Material and Equipment

Most of material and equipment required for the priority project are manufactured and distributed daily in the country. Therefore, all the material and equipment are planed to be procured within the country except for traffic signal, e-pass machine, and a part of special equipment. Procurement plan of main items is described in the following.

(a) Borrow Material

Borrow pit are scattered at three locations around the site (See Figure 7.8.1). The distance to the site for borrow material is from 5 to 15 km and relatively short. Therefore, borrow material is procured from those three location.

(b) Quarry Material

Reasonable quarry plants are only two around the site: Margondon and Ternate quarry plant shown in Figure 7.8.1. Other plants are located far from the site. The nearest plant is in Angono, Rizal province, and the transport cost from Angono is

significantly high. Therefore, only quarry material, not coarse aggregate for concrete, is procured from Maragondon and Ternate quarry plant.

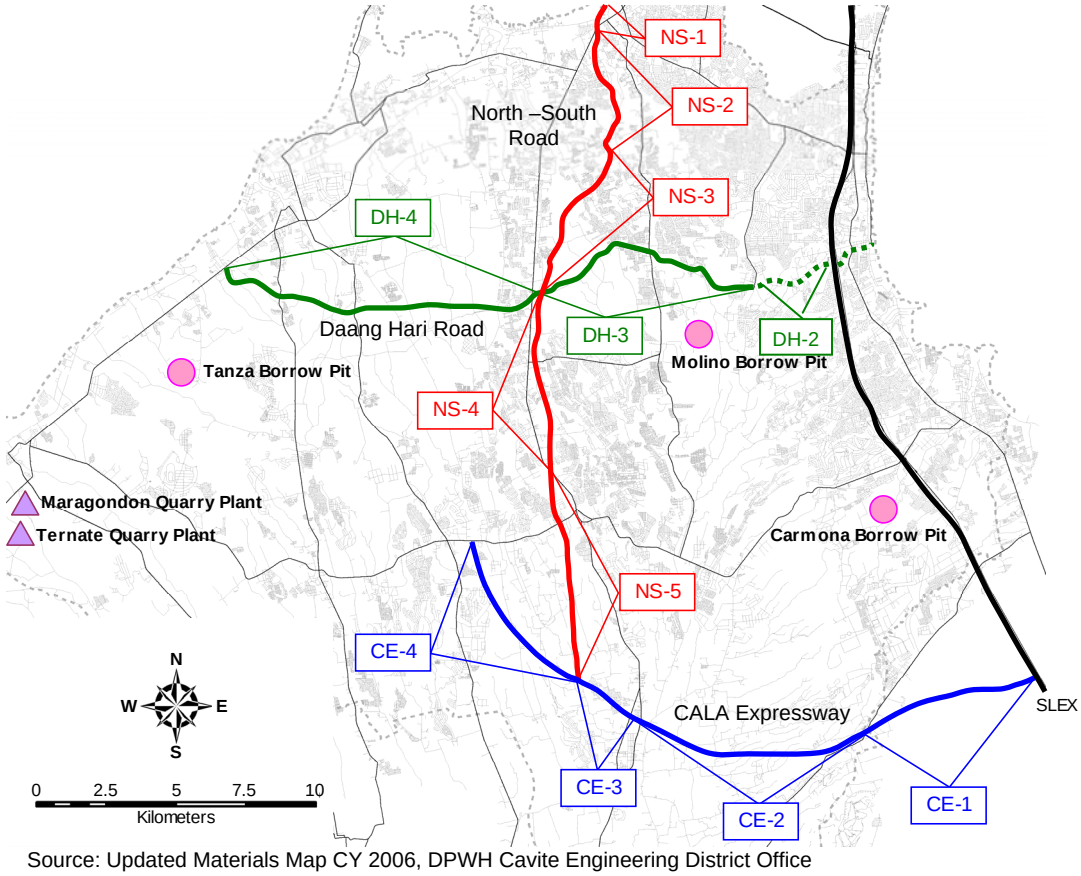
(c) River Sand

River sand is not available around the site. The nearest location is Angono (Rizal province) and Porac (Pampanga province), which transport cost is significantly high. Therefore, only sand material for minor works, not fine aggregate for concrete, is procured from Angono and Porac.

(d) Ready Mixed Concrete

Development work is active in the area around the site, so many ready mixed concrete plants are available. On the other hand, procurement of quarry material is difficult as mentioned in (c) and (d). Purchase of ready mixed concrete is planed from those plants since it is more economical than procuring concrete aggregate.

Figure 7.8.1 Location of Borrow Pit and Quarry Plant



Source: Updated Materials Map CY 2006, DPWH Cavite Engineering District Office

(3) Construction Equipment

Procurement of construction equipment was examined based on Equipment guidebook, edition 22 (2003) issued by ACEL. Imported small to large construction equipment is available in Philippine. All construction equipment necessary for the Project is procured within the country. Low noise construction equipment is planed to be used as much as possible to reduce environmental impact during construction (See Chapter 9). Availability of low noise construction equipment in some models is confirmed.

7.8.3 Construction Method

(1) Construction Sequence

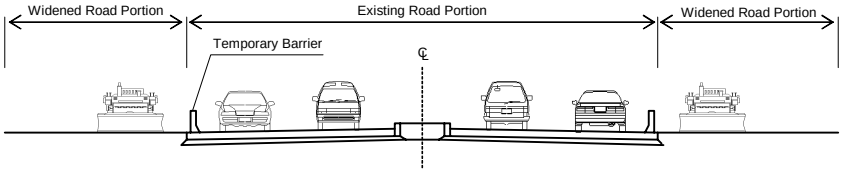
Construction sequence was examined based on the preliminary design of the Project. No complicated and work is involved in the preliminary design. It was carefully designed in terms of economical and easy construction. In addition to heavy traffic, no alternative route is available. Therefore, current traffic must be ensured during the construction. The following is the construction sequence limiting to necessary construction for detour.

(a) Widened Road Section

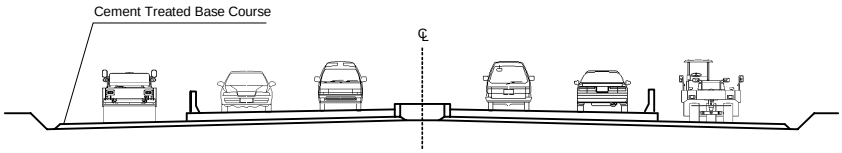
Construction sequence for widened road section is shown in Figure 7.8.2.

Figure 7.8.2 Construction Sequence (Widened Road Section)

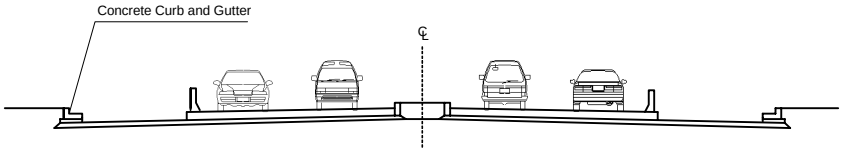
Step 1: Surplus Common Excavation



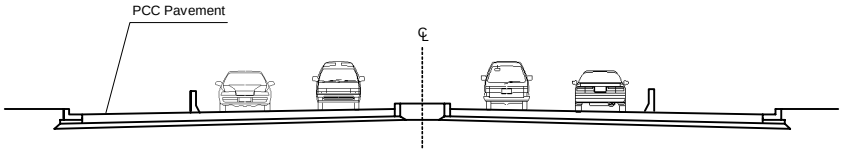
Step 2: Cement Treated Base Course



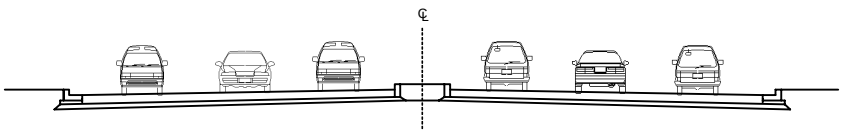
Step 3: Concrete Curb and Gutter



Step 4: PCC Pavement and Markings



Step 5: Completion

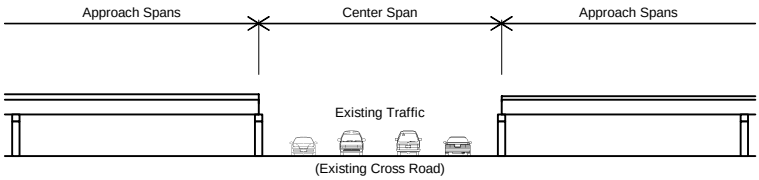


(b) Flyover Section

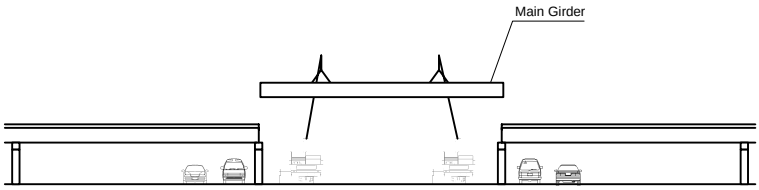
Traffic is heavy at the intersection where flyover is planned. Therefore, erection work for girders of center span requiring a detour is carried out at nighttime when traffic is less. The construction sequence is planned to minimize the effect on current traffic. The construction sequence at the flyover section is shown in Figure 7.8.3.

Figure 7.8.3 Construction Sequence (Flyover Section)

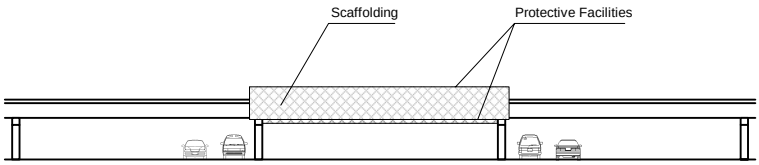
Step 1: Completion of Approach Spans



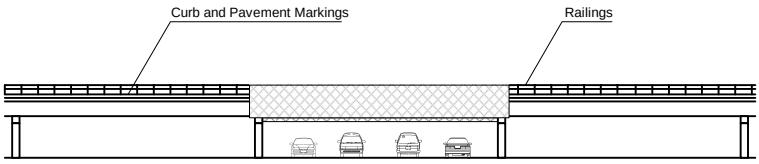
Step 2: Main Girder Erection and Cross Girder Work (Nighttime)



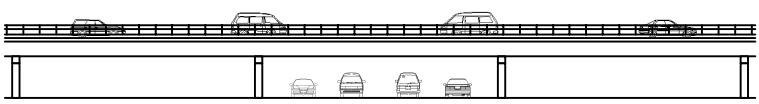
Step 3: Installation of RC Plank, Scaffolding and Protective Facilities (Nighttime)



Step 4: RC Deck Slab and Other Surface Works



Step 5: Completion



(2) Environmental Considerations

Disposal of leftover soil and waste is planned in accordance with measures to reduce environmental impact mentioned in Chapter 9 of this report.

7.8.4 Construction Period

Construction period was examined based on the preliminary design. Normally optimum work period is determined by daily work amount multiplied by the rate of operation day, comparing construction costs with available number of party as a parameter. However, the following issues are found in work period for the Project.

i) In DPWH, each bureau and regional office have own independent standard for cost estimate and daily work amount, and no official values exist.

ii) Although the standard values for cost estimate changes depending on work conditions, the applicable conditions are not clear for those values.

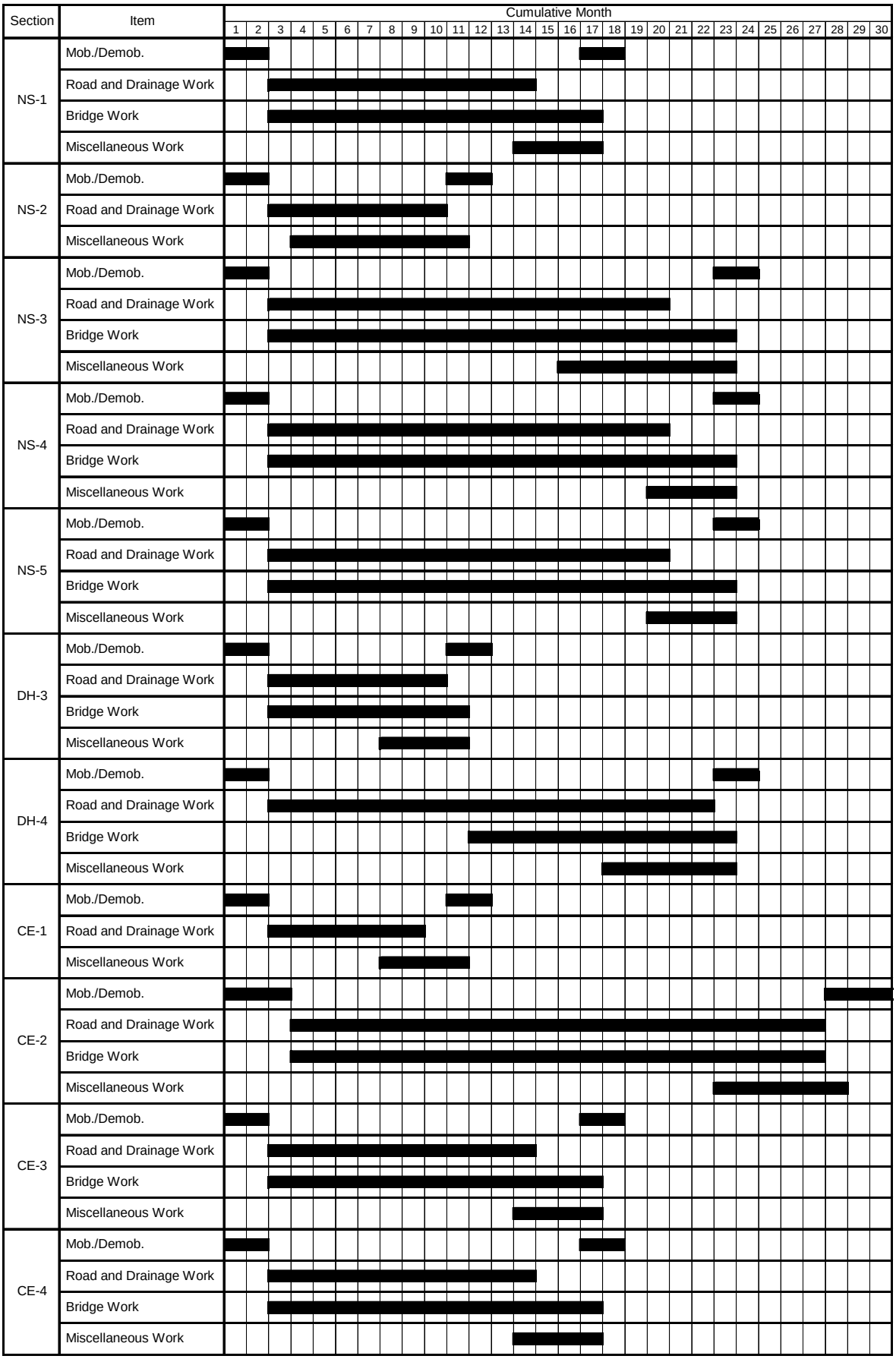
As a reference, comparison table of daily work amount and required construction equipment between PMO-FS and NCR are shown in Table 7.8.2.

Table 7.8.2 Daily Work Amount and Required Construction Equipment

Item		PMO-FS	NCR	PMO-FS/NCR
Surplus Common Excavation	Daily Work Amount	480 cu.m./day	280 cu.m./day	1.7
	Required Construction Equipment	1 x Bulldozer (21 mt.tons) 1 x Wheel Loader (1.34 cu.m.) 2 x Dump Truck (11.46 cu.m.)	1 x Motor Grader (4.0 m) 1 x Wheel Loader (1.53 cu.m.) 3 x Dump Truck (15.0 cu.m.)	
Embankment	Daily Work Amount	800 cu.m./day	400 cu.m/day	2.0
	Required Construction Equipment	2 x Bulldozer (15 mt.tons) 1 x Motor Grader (3.1 m) 1 x Road Roller (10 mt.tons) 1 x Tire Roller (15 mt.tons) 1 x Water Tank Truck (3,000 gals.)	1 x Motor Grader (4.0 m) 1 x Road Roller (10 mt.tons) 1 x Water Tank Truck (1,000 gals.)	
Aggregate Subbase Course	Daily Work Amount	1,200 cu.m./day	400 cu.m./day	3.0
	Required Construction Equipment	1 x Motor Grader (3.1 m) 1 x Road Roller (10 mt.tons) 1 x Tire Roller (25 mt.tons) 1 x Crawler Loader (1.76 cu.m.) 1 x Wheel Loader (1.53 cu.m.) 1 x Water Tank Truck (3,000 gals.)	1 x Motor Grader (4.0m) 1 x Road Roller (10 mt.tons) 1 x Water Tank Truck (1,000 gals.)	
Aggregate Base Course	Daily Work Amount	960 cu.m./day	400 cu.m./day	2.4
	Required Construction Equipment	1 x Motor Grader (3.1 m) 1 x Road Roller (10 mt.tons) 1 x Tire Roller (25 mt.tons) 2 x Bulldozer (15 mt.tons) 1 x Crawler Loader (1.76 cu.m.) 1 x Wheel Loader (1.53 cu.m.) 1 x Water Tank Truck (3,000 gals.)	1 x Motor Grader (4.0m) 1 x Road Roller (10 mt.tons) 1 x Water Tank Truck (1,000 gals.)	
Crushed Aggregate Base Course	Daily Work Amount	360 cu.m./day	18 cu.m./day	20
	Required Construction Equipment	1 x Motor Grader (3.1 m) 1 x Road Roller (10 mt.tons) 1 x Tire Roller (25 mt.tons) 2 x Bulldozer (15 mt.tons) 1 x Crawler Loader (1.76 cu.m.) 1 x Wheel Loader (1.53 cu.m.) 1 x Water Tank Truck (3,000 gals.)	1 x Plate Compactor (700mm) 1 x Water Pump	

Daily work amount and required construction equipment are significantly different for PMO-FS and NCR. Since the applicable conditions are not clear for these standards, it is not possible to estimate appropriate work period. Standard of Ministry of Land, Infrastructure and Transport in Japan was considered, but it was not suitable for other countries due to the different conditions. Therefore, work period for the Project is determined based on similar projects conducted in Philippine in the past. The construction schedule for each section is shown in Figure 7.8.4.

Figure 7.8.4 Construction Schedule

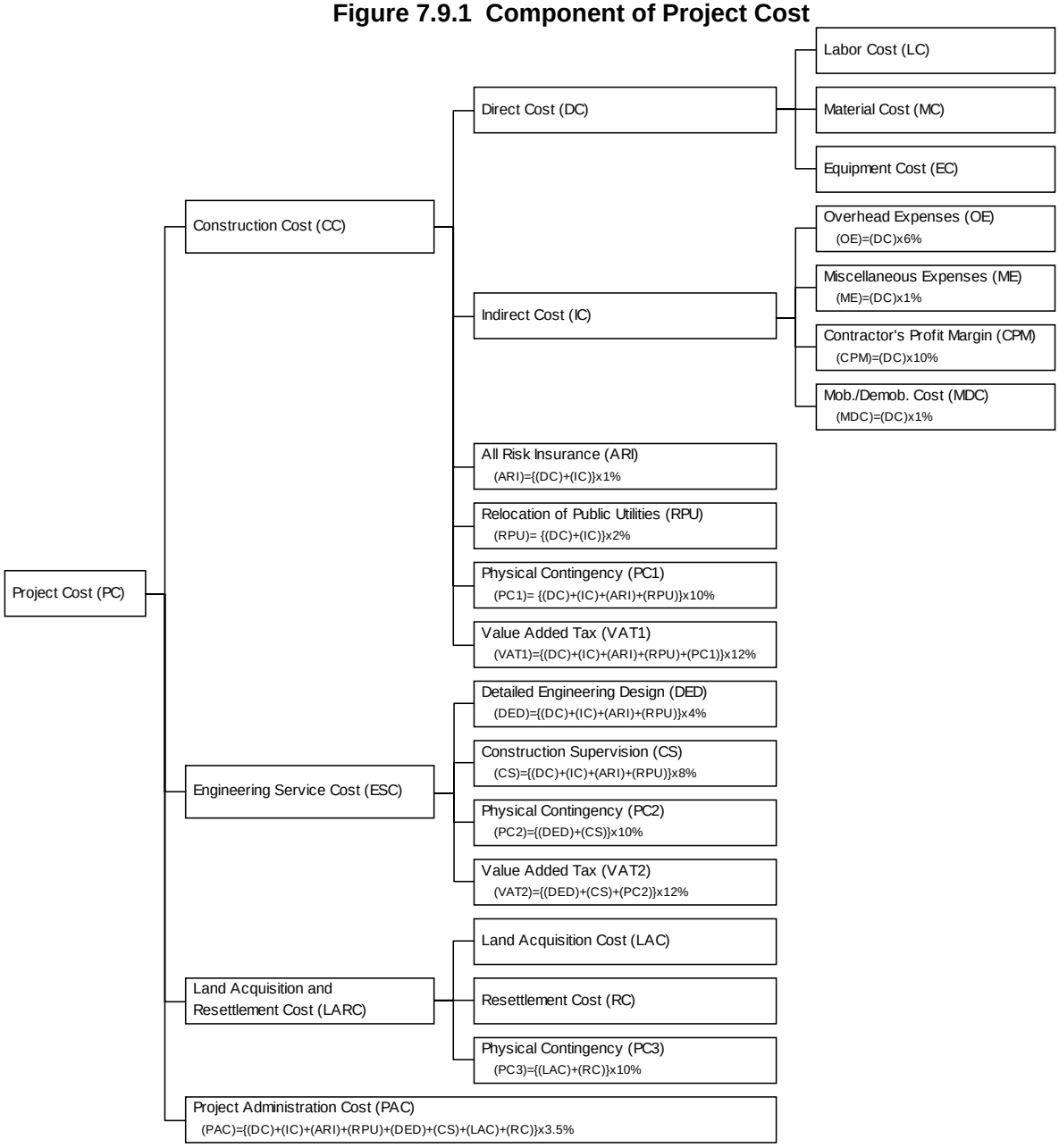


7.9 Preliminary Cost Estimate

7.9.1 Composition of Project Cost

Preliminary cost for the priority project was estimated based on the preliminary design and construction plan. Expense items and fixed rate was based on DO 57 of DPWH. For expense items which fixed rate was not officially specified, the rate of PMO-FS used for feasibility study was applied. The expense items, fixed rate, conditions and method of cost estimation mentioned in this section were agreed with counterpart of DPWH at discussion on July 14, 2006. Figure 7.9.1 shows component of project cost.

Figure 7.9.1 Component of Project Cost



(1) Construction Cost (CC)

Direct cost (DC) was calculated by multiplying direct cost of each item by preliminary quantity based on standard specification 2004 of DPWH. Fixed rate of indirect cost (IC) was based on DO 57. DO 57 specified physical contingency (PC1) to be 3 to 5% of direct cost. However, a new standard, R.A.9184 specified physical contingency to be the maximum 10% of the sum of direct cost and indirect cost, so R.A.9184 was used for physical contingency. The rate of PMO-FS used for feasibility study was applied for all other expense items. For value added tax (VAT1), the current fixed rate, 12%, was applied.

(2) Engineering Service Cost (ESC)

Engineering service cost (ESC) was based on fixed rate of PMO-FS for feasibility study. Engineering service cost for detailed engineering design (DED) was 4% of maximum contractor contract amount, which was the amount subtracted physical contingency (PC1) and value added tax (VAT1) from construction cost (CC). Engineering service cost for construction supervision (CS) was 8% of maximum contractor contract amount. For other expense items, the fixed rate same as construction cost (CC) was applied.

(3) Land Acquisition and Resettlement Cost (LARC)

Estimate reasons for land acquisition cost (LAC) and resettlement cost (RC) is explained in Chapter 9. Considering possibility of realignment with change in development situation at the stage of detailed engineering design, 10% of physical contingence (PC3) was added as a reserved fund.

(4) Project Administration Cost (PAC)

Project administration cost (PAC) was calculated by subtracting physical contingency (PC) and value added tax (VAT) from each expense items (1) to (3) mentioned above, which was based on fixed rate of PMO-FS for feasibility study.

7.9.2 Conditions of Cost Estimate

Conditions of cost estimate are the following.

i) Time of cost estimate : End of June 2006
ii) Foreign currency : US dollar
iii) Exchange rate : 1 US dollar = 53.1567 Peso
(Selling rate of the Bangko Sentral ng Pilipinas)
iv) Tax : All tax was considered.
v) Other : Removal cost of building was estimated in land acquisition and resettlement cost (LARC)

7.9.3 Direct Unit Cost

Direct unit cost was estimated by adjusting engineer's estimate in similar project in the past.

(1) Selection of Similar Project

Similar projects were selected from projects around the project area to minimize difference in regional characteristics and construction condition. Also, the similar projects were selected from projects which cost was estimated within the last two years to minimize difference in exchange rate and escalation in prices.

(2) Component of Direct Unit Cost

Direct unit cost of the selected similar projects was applied as follows, based on DO 57.

i) Labor cost: based on DOLE and related regulations
ii) Material cost: market price (on site) except for process material
iii) Construction equipment cost: operating hourly cost issued by ACEL

(3) Selection of Direct Unit Cost

As mentioned in 7.8.4, applicable conditions for standard of cost estimate and daily work amount of DPWH were not clear. Therefore, comparing engineer's estimates and contractor contract unit price, more realistic direct unit cost was applied.

(4) Adjustment of Direct Unit Cost

(a) Exchange Rate

Direct unit cost (DUC) in foreign portion was adjusted by the following equation to get rid of error caused by the difference in exchange rate. The average rate in the month was applied for the past exchange rate of each similar project.

DUC (foreign portion) = DUC (foreign portion in similar project) x
{exchange rate / exchange rate (in similar project)}

(b) Escalation in Price

The price was adjusted considering escalation in price from the time of estimation for similar projects to the time of estimation for this project. Rate of escalation in price used for adjustment is shown in Table 7.9.1.

Table 7.9.1 Rate of Escalation in Price Used for Adjustment

Currency	CY 2004	CY 2005
Foreign Currency (US Dollar)	2.7%	3.4%
Local Currency and Tax (Peso)	6.0%	7.6%

Source: World Economic Outlook Database (IMF)

(c) Transport Cost

For process material, transport cost was adjusted to be proportional to transport distance in procurement plan.

(5) Direct Unit Cost

Direct unit cost was determined by the process from (1) to (4) mentioned above. Direct unit cost of major works is shown in Table 7.9.2.

Table 7.9.2 Direct Unit Cost of Major Works

Item	Description	Unit	Direct Unit Cost (Peso)
EARTH WORK			
CLEARING AND GRUBBING			
Clearing and Grubbing		sq.m.	48.21
REMOVAL OF STRUCTURES AND OBSTRUCTIONS			
Removal of Existing Concrete Curb and Gutter		l.m.	84.65
Removal of Existing Concrete Sidewalk	t=100mm	sq.m.	147.16
Removal of Existing Concrete Manhole and Catch Basin	610mm dia.	each	1,626.09
Removal of Other Existing Concrete Structures		cu.m.	1,476.96
Removal of Existing Asphalt Concrete Pavement	t=50mm	sq.m.	109.10
EXCAVATION			
Unsuitable Excavation		cu.m.	374.28
Surplus Common Excavation		cu.m.	304.99
Surplus Rock Excavation	Soft Rock	cu.m.	514.09
Surplus Rock Excavation	Hard Rock	cu.m.	968.50
STRUCTURE EXCAVATION			
Structure Excavation		cu.m.	306.80
Foundation Fill		cu.m.	581.54
Pipe Culverts and Drain Excavation		cu.m.	300.41
EMBANKMENT			
Embankment	Excavated Material	cu.m.	199.13
Embankment	Borrow Material	cu.m.	510.08
Selected Borrow for Topping		cu.m.	527.29
SUBGRADE PREPARATION			
Subgrade Preparation	Common Material	sq.m.	18.27
SUBBASE AND BASE COURSE			
CRUSHED AGGREGATE BASE COURSE			
Crushed Aggregate Base Course		cu.m.	927.97
SURFACE COURSES			
PORTLAND CEMENT CONCRETE PAVEMENT			
PCC Pavement	Plain, 14days, t=300mm	sq.m.	1,054.66
BRIDGE CONSTRUCTION			
BRIDGE AND BOX CULVERT			
Bridge Structure	PCDG, Bored Piles	sq.m.	Ave. 50,847.46
Bridge Structure	PCBG, Bored Piles	sq.m.	Ave. 63,559.32
Box Culvert Structure	RCBC, Spread Foundation	sq.m.	Ave. 16,949.15
TOLLGATE FACILITIES AND EQUIPMENTS			
TOLLGATE FACILITIES AND EQUIPMENTS			
Tollgate Facilities and Equipments		unit	101,694,915.25

7.9.4 Estimated Project Cost

The project cost for the priority project was estimated through the process mentioned above. The project cost was estimated not only for base case but also estimated independently for the case when One-Asia provided land for free and for the case of planning full access control road mentioned in subsection 7.7. Estimated project cost is shown in Table 7.9.3.

Table 7.9.3 Estimated Project Cost

Unit: Million Peso

Item	NS1	NS2	NS3	Subtotal (NS1-NS3)	NS4	NS5	Total (NS1-NS5)	DH3	DH4	Total (DH)	CE1	CE2	CE3	CE4	Total (CE)	Grand Total
Construction Cost (CC)																
Direct Cost (DC)	1,065	304	1,314	2,683	2,221	2,314	7,218	387	1,172	1,559	301	3,233	1,078	656	5,268	14,045
Indirect Cost (IC)	192	55	237	484	400	416	1,300	70	211	281	54	582	194	118	948	2,529
All Risk Insurance (ARI)	13	4	15	32	26	27	85	5	14	19	3	38	13	8	62	166
Relocation of Public Utilities (RPU)	25	7	31	63	52	55	170	9	28	37	7	76	25	16	124	331
Physical Contingency (PC1)	129	37	160	326	270	281	877	47	142	189	37	393	131	80	641	1,707
Value Added Tax (VAT1)	171	49	211	431	356	371	1,158	62	188	250	48	519	173	105	845	2,253
Total	1,595	456	1,968	4,019	3,325	3,464	10,808	580	1,755	2,335	450	4,841	1,614	983	7,888	21,031
Engineering Service Cost (ESC)																
Detailed Engineering Design (DED)	52	15	64	131	108	112	351	19	57	76	15	157	52	32	256	683
Construction Supervision (CS)	103	30	128	261	216	225	702	38	114	152	29	314	105	64	512	1,366
Physical Contingency (PC2)	16	4	19	39	32	34	105	6	17	23	4	47	16	10	77	205
Value Added Tax (VAT2)	20	6	25	51	43	44	138	7	23	30	6	62	21	13	102	270
Total	191	55	236	482	399	415	1,296	70	211	281	54	580	194	119	947	2,524
Land Acquisition and Resettlement Cost (LARC)																
Land Acquisition Cost (LAC)	80		403	483	372	371	1,226		381	381	77	257	43	314	691	2,298
Resettlement Cost (RC)	17		1	18	1		19					1			1	20
Physical Contingency (PC3)	10		40	50	37	37	124		38	38	8	26	4	32	70	232
Total	107		444	551	410	408	1,369		419	419	85	284	47	346	762	2,550
Project Administration Cost (PAC)																
Project Administration Cost (PAC)	54	15	77	146	119	123	388	18	69	87	17	163	53	42	275	750
Total	54	15	77	146	119	123	388	18	69	87	17	163	53	42	275	750
Grand Total (Base Case)	1,947	526	2,725	5,198	4,253	4,410	13,861	668	2,454	3,122	606	5,868	1,908	1,490	9,872	26,855
Grand Total[1)]	1,947	526	2,461	4,934	4,176	4,410	13,520	668	2,454	3,122	606	5,868	1,908	1,490	9,872	26,514
Grand Total[2)]	1,947	3,008	3,748	8,703	4,253	4,410	17,366	668	2,454	3,122	606	5,868	1,908	1,490	9,872	30,360

1) The case when One-Asia provides the land (a part of NS3 and NS4) for free

2) The case of planning full access control road for the section between NS1 and NS3

7.9.5 Estimated Maintenance Cost

The budget for maintenance of national road is allocated based on EMK (equivalent maintenance kilometer) which is determined every year by road type under the P.D. 17. However, the budget is not the amount necessary for maintenance but the amount that is financially available. For this project, necessary maintenance cost was estimated in accordance with the maintenance plan.

(1) Routine Maintenance Cost

Routine maintenance cost was estimated based on external order rate of PMO-FS for feasibility study. Estimate conditions were the same as the conditions in 7.9.2. This routine maintenance cost did not include operation cost after the opening. Table 7.9.4 shows estimated routine maintenance cost.

Table 7.9.4 Estimated Routine Maintenance Cost

(Unit: Million Peso/Year)

Item	NS-1	NS-2	NS-3	NS-4	NS-5	DH-3	DH-4	CE-1	CE-2	CE-3	CE-4	Total
Routine Maintenance Cost	0.9	3.1	3.8	2.7	2.8	2.2	2.8	1.8	3.5	1.0	2.2	26.8

(2) Periodic Maintenance Cost

Periodic maintenance cost was estimated by applying unit cost of project cost estimate assuming external order. Estimate conditions were the same as the conditions in 7.9.2. This periodic maintenance cost did not include cost related to operation. Table 7.9.5 shows estimated periodic maintenance cost.

Table 7.9.5 Estimated Periodic Maintenance Cost

(Unit: Million Peso)

Item	NS-1	NS-2	NS-3	NS-4	NS-5	DH-3	DH-4	CE-1	CE-2	CE-3	CE-4	Total
Reconstruction of PCC Pavement (every 20 years)	56	110	152	181	188	126	219	155	285	81	187	1,740
Replacement of E-Pass Equipment[1)] (every 10 years)	-	74	74	-	-	-	-	-	-	-	-	128

1) The cost is for replacement of e-pass equipment only (not include other equipment related to administration)

7.10 Implementation Schedule

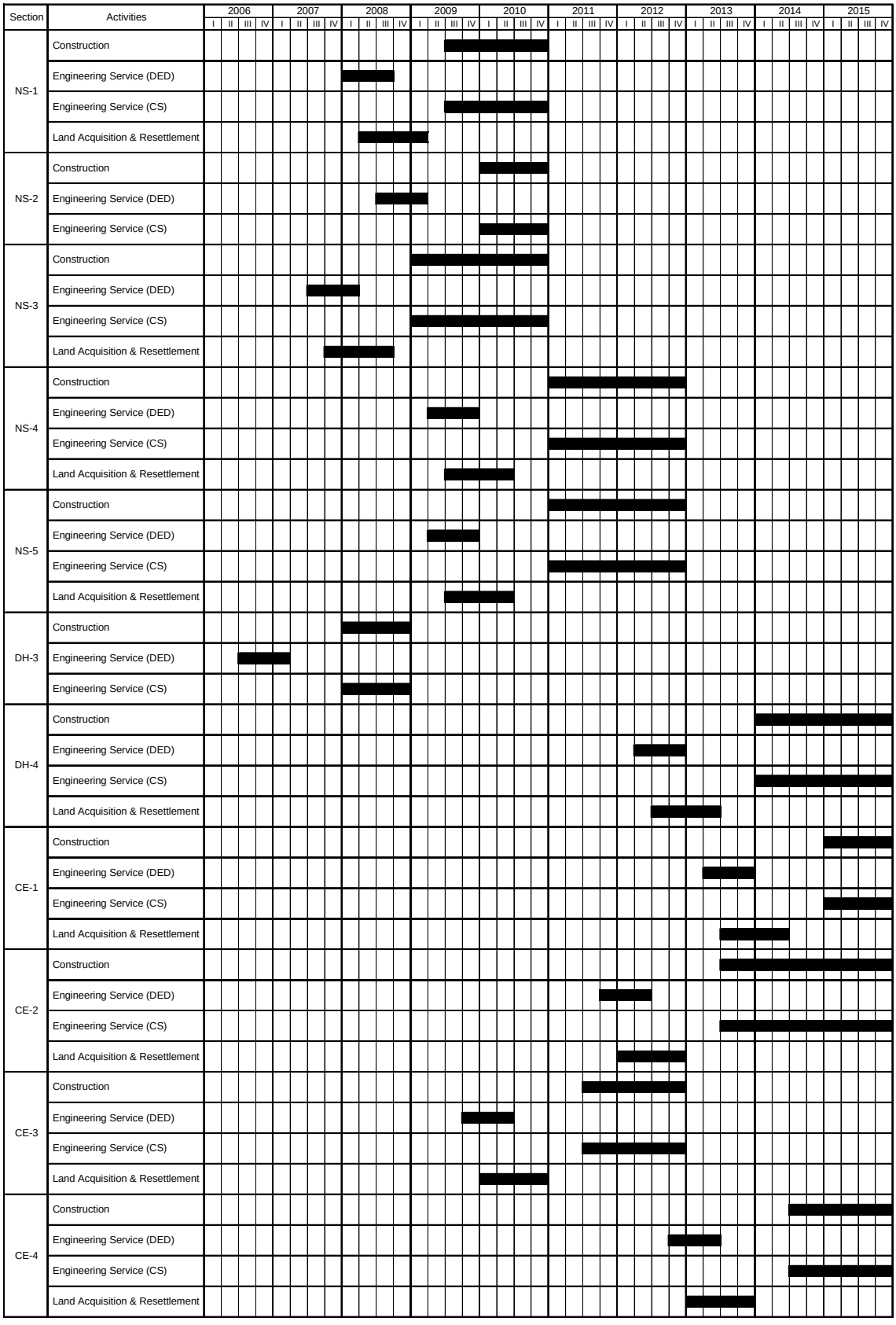
Implementation schedule was prepared in accordance with the following conditions. The schedule was prepared by adjusting to the time of opening for each section and calculating the minimum period backward.

i) Fund procurement and implementation scheme
ii) Detailed Engineering Design: 9 months (including bid documents preparation)
iii) Land acquisition and resettlement plan: based on implementation plan
(work begins after one month from the beginning of DED and ends before the commencement of construction)
iv) Tender period: 9 months for BOT project, 12 months for loan project supported by foreign donors

v) Construction period: based on work period in 7.8.4

The project implementation plan is shown in Figure 7.10.1.

Figure 7.10.1 Project Implementation Schedule



8 DEMAND FORECAST AND ECONOMIC/FINANCIAL ANALYSIS OF PROJECT ROAD

8.1 Introduction

8.1.1 Base Case

Opening of a new road will affect the traffic pattern, more or less, in a road network where the project is implemented. Accordingly, the economic and financial evaluation of a project will also be influenced by road projects other than the project subject to evaluation.

There are 14 road projects studied in the CALA master plan and they are scheduled to open as shown in Table 8.1.1. To evaluate these projects, the same schedule was assumed in the base case: NS-1, NS-2 and NS-3 will become operational in 2011; NS-4, NS-5, CE-3, CE-4 in 2013 and DH-4, CE-1, CE-2, CE-5, CE-6 in 2016. As for DH-2 and DH-3, DH-3 was already opened while DH-2 will be opened in 2007; both of them as a single-lane road for one direction and which will immediately be widened into four-lane road by 2009.

Table 8.1.1 Assumed Opening Year for the Base Case

Section	Km	Operational Year														
		06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
NS-1	2.40						■	■	■	■	■	■	■	■	■	■
NS-2	4.35						■	■	■	■	■	■	■	■	■	■
NS-3	6.23						■	■	■	■	■	■	■	■	■	■
NS-4	7.17								■	■	■	■	■	■	■	■
NS-5	7.64								■	■	■	■	■	■	■	■
DH-2	3.20		▒	▒	■	■	■	■	■	■	■	■	■	■	■	■
DH-3	9.21	▒	▒	▒	■	■	■	■	■	■	■	■	■	■	■	■
DH-4	11.84											■	■	■	■	■
CE-1	4.78											■	■	■	■	■
CE-2	9.46											■	■	■	■	■
CE-3	2.59								■	■	■	■	■	■	■	■
CE-4	5.82								■	■	■	■	■	■	■	■
CE-5	(14.50)											■	■	■	■	■
CE-6	(12.00)											■	■	■	■	■

■ Fully Operational ▒ Tentatively Operational with two lanes on both directions

When NS-1 and NS-2 are evaluated, for example, DH-2 and DH-3 are already operational in 2011, their opening year, and other projects will be opened as scheduled, affecting the traffic volume of the subject road. Therefore, the traffic demand of the subject road was forecasted for each benchmark year when another project opens, for both cases of “before” and “after” opening.

In case a strong influence by another project, positive or negative, was observed on the subject road, additional evaluation analysis was made to the base case, assuming the project was delayed or not implemented.

8.1.2 Road Projects for Evaluation

While the demand analysis was done for every road project and every necessary case, the economic and financial analyses were limited to the projects listed in Table 8.1.2, based on the agreement at the Steering Committee Meeting before the start of the Feasibility Study. In the Base Case, NS-4 and NS-5 were treated as non-toll roads and financial analysis was also conducted for those roads by charging a toll.

Table 8.1.2 Road Projects for Evaluation

	NS-1	NS-2	NS-3	NS-4	NS-5	DH-2	CE-1	CE-2	CE-3	CE-4
Economic Evaluation	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
Financial Evaluation	◎	◎	◎	(◎)	(◎)	◎				

8.2 Toll Setting

8.2.1 Current Toll Rate

Table 8.2.1 shows the present toll rate in Manila and adjacent regions as of July 2006. SLEX and NLEX are the inter-regional expressways and adopting the same rate. The Manila-Cavite Coastal Road charges almost same toll rate. These three expressways are running at grade.

Skyway is the first expressway developed by the BOT scheme with participation of the private sector. The rate is much higher than the other three, 1.6 times at grade section and about five times at elevated section. Although the Skyway has a heavy demand, these high rates cannot be regarded as affordable because there is no feasible alternative path.

Table 8.2.1 Current Toll Rate of Expressways in Manila

(Peso/km)

Toll Road		Class 1	Class 2	Class 3
		Car/Jeepney	Truck/Bus	Truck/Trailer
SLEX	at Grade	2.49	6.23	7.47
NLEX	at Grade	2.49	6.23	7.47
Coastal Road	at Grade	2.73	5.45	8.18
Skyway	at Grade	4.29	8.57	12.86
	Elevated	12.14	24.29	36.43

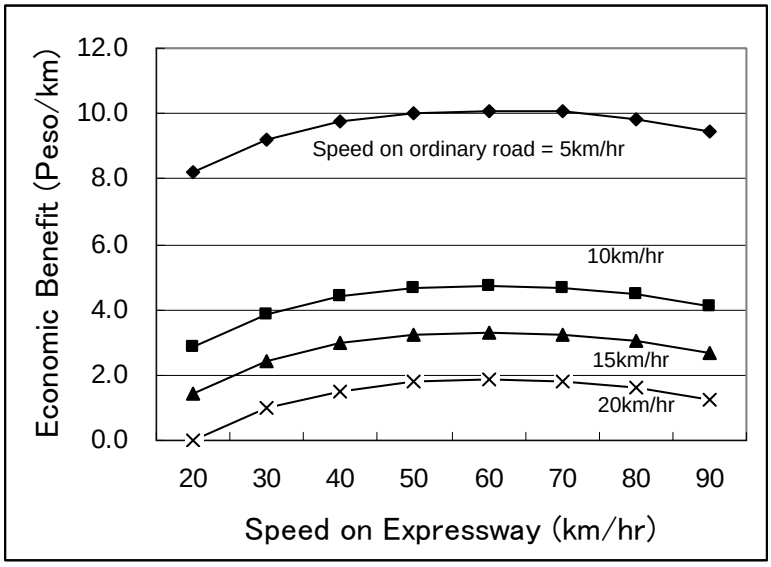
8.2.2 User's Economic Benefit

Assuming a difference of running speed between an ordinary road and an expressway, the economic benefit of using an expressway was estimated because it was a widely supported thesis that a toll rate should be lower than user's benefit.

As shown in Figure 8.2.1, the economic benefit accruing to a passenger car running on an expressway is estimated at about 4.0 pesos/km if the car can be

operated at the speed of 40 to 50 km/hour, while the speed is 10 to 15 km/hour on an ordinary road. Based on this analysis, the rate of Skyway at grade seems to be in the maximum level.

Figure 8.2.1 User's Benefit by Using Expressway



8.2.3 Willingness to Pay

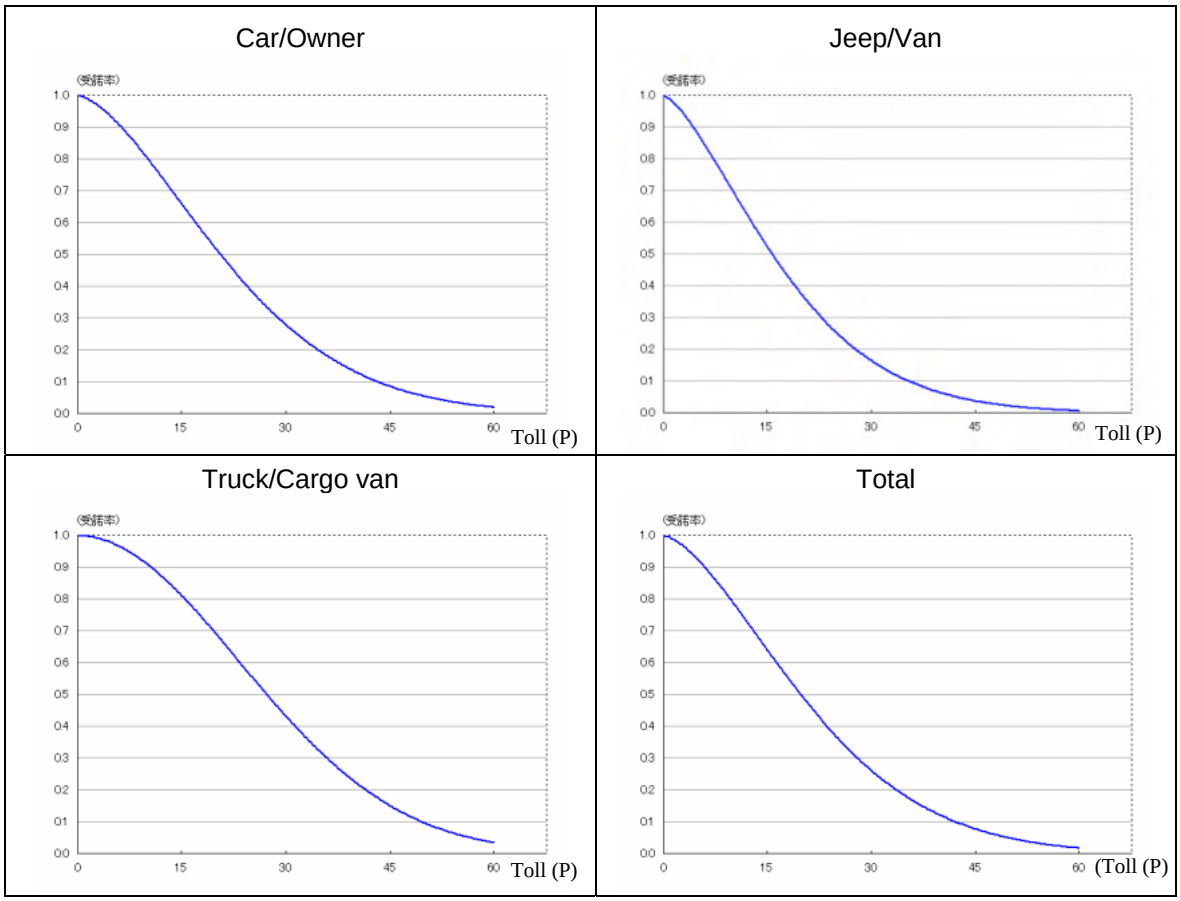
A Stated Preference Survey (SP Survey) was conducted in this Study to obtain a data to estimate the expressway user's willingness-to-pay for travel time reduction. About 1,200 car drivers were interviewed in May 2006, asking a double bound question of "Will you pay 20 (30 or 50) Pesos for 15 to 20 minutes travel time reduction? If yes, how much is the maximum amount you are willing to pay?" The resulting willingness-to-pay was 20 pesos for a car driver, 16 pesos for a jeepney passenger and 27 pesos for truck driver as shown in Table 8.2.2, which seems rather low as compared with the current rate.

Table 8.2.2 Willingness to Pay for Travel Time Reduction

	Ave. (Peso)	Median (Peso)	Time of Value (Peso /Min.)	Sample
Car/Owner	23.01	20.64	**1.31**	766
Jeep/Van	18.21	15.76	**1.04**	336
Truck/Cargo van	28.88	27.35	**1.65**	101
Total	22.28	19.86	**1.27**	1,203

Figure 8.2.2 shows the Weibull distribution for each vehicle type. The median value of the toll rate corresponding to 50% gives the willingness to pay because half of those interviewed agreed to pay the stated amount in exchange for travel time reduction.

Figure 8.2.2 Weibull Distribution of Willingness to Pay



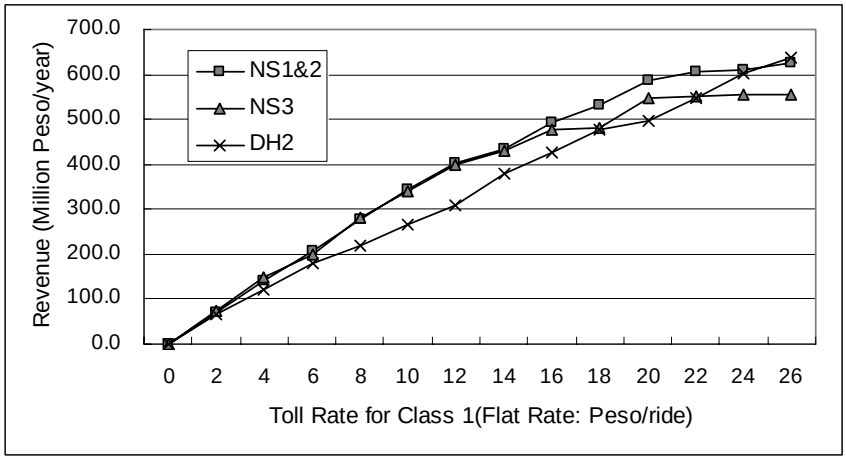
8.2.4 Maximization of Revenue

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

The toll rate which can maximize revenue is an important factor to consider to be able to recover the cost. It should be noted, however, that revenue increase would sacrifice the economic benefit because the higher rate would discourage more potential users from using the road.

Figure 8.2.3 illustrates the revenue curves of NS-1&2, NS-3 and DH-2 over various flat rates. The NS toll roads show a straight-line increase up to 12 pesos, and from then on, the gradient becomes slightly gentle up to 20 pesos and then completely leveled off without increase. On the other hand, DH-2 shows a constant increase with almost a straight line up to 26 pesos. This is because of the DH-2's strong nature of monopoly with no feasible alternative route.

Figure 8.2.3 Relationship of Toll Revenue and Toll Rate



8.2.5 Conclusion

Based on the results of analyses stated above, a flat rate of 18 pesos for Class 1 vehicles, same as the Manila-Cavite Coastal Road, is considered appropriate for all the roads. The lengths of toll roads are in the range of 6.2 to 7.6 km, except DH-2 (NS-1 and NS-2 will be jointly operated with one toll gate) and the toll rate per kilometer is 2.4 to 2.9 pesos.

8.3 Demand Forecast for Project Roads

8.3.1 Do-Nothing Case

The target roads of this study, i.e. NS, DH and CE, are all indispensable for the future of the CALA area. If these roads are not constructed, chronic congestion will be seen everywhere in this area after 2010 as illustrated in Figure 8.3.1. Most likely, all social and economic functions will be paralyzed in the region which will be full with a large number of absorbed people having difficulties to access job opportunities.

8.3.2 Base Case

For the base case explained in section 8.1, a series of traffic assignment was conducted. The result is illustrated in Figure 8.3.2 and Figure 8.3.3.

In 2010 when NS-1, NS-2, NS-3, DH-2, and DH-3 are open for public service, these roads will play a major role in the arterial transport network of the region. However, in the southern part of the study area, traffic congestion will already be serious. In 2015, when all the target roads are expected to be completed, the problem will largely be alleviated. In 2020 and after, however, the situation will be serious again and other roads will become necessary.

Figure 8.3.1 Traffic Distribution (Do-Nothing Case)

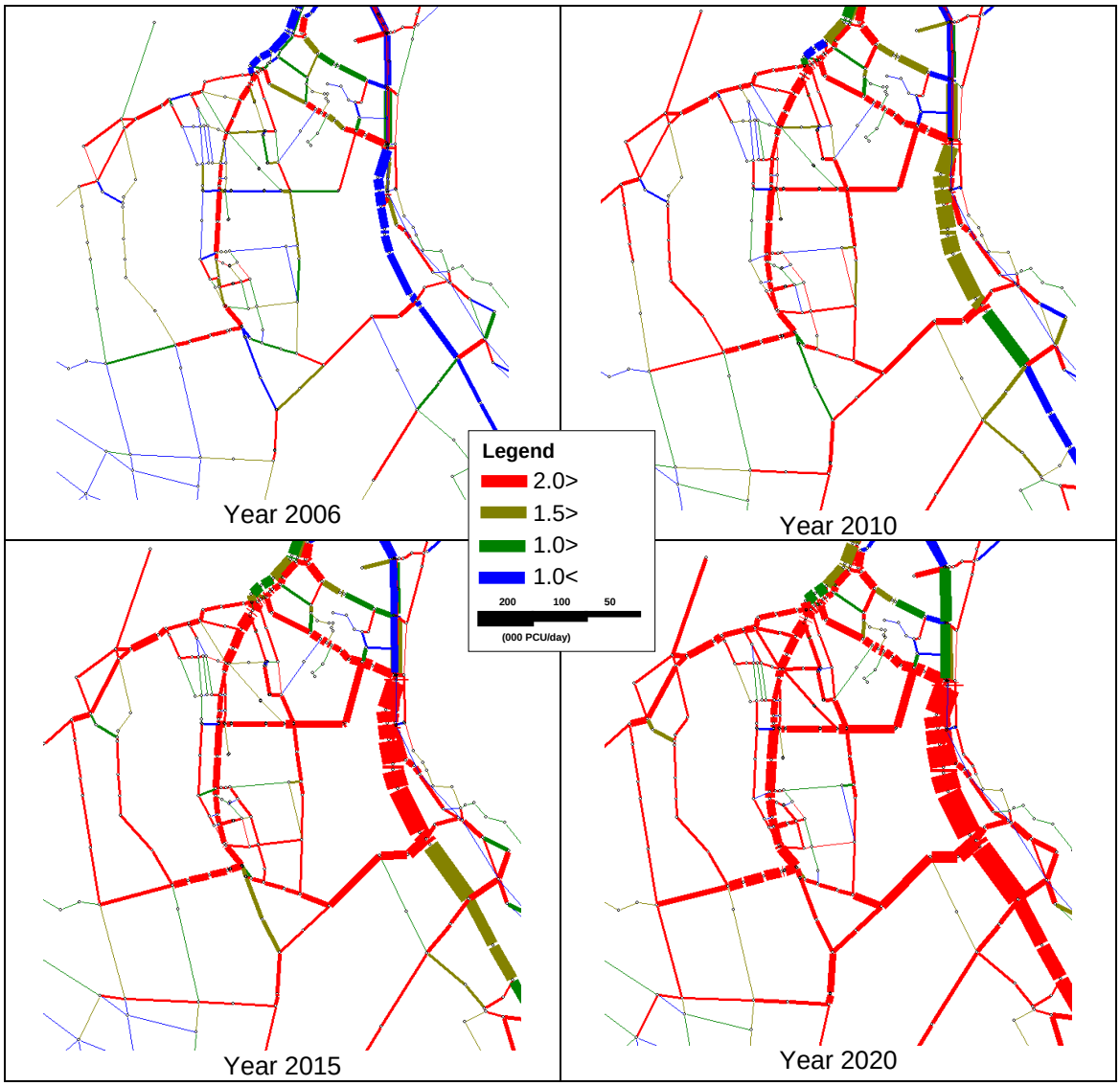


Figure 8.3.2 Traffic Distribution (Base Case)

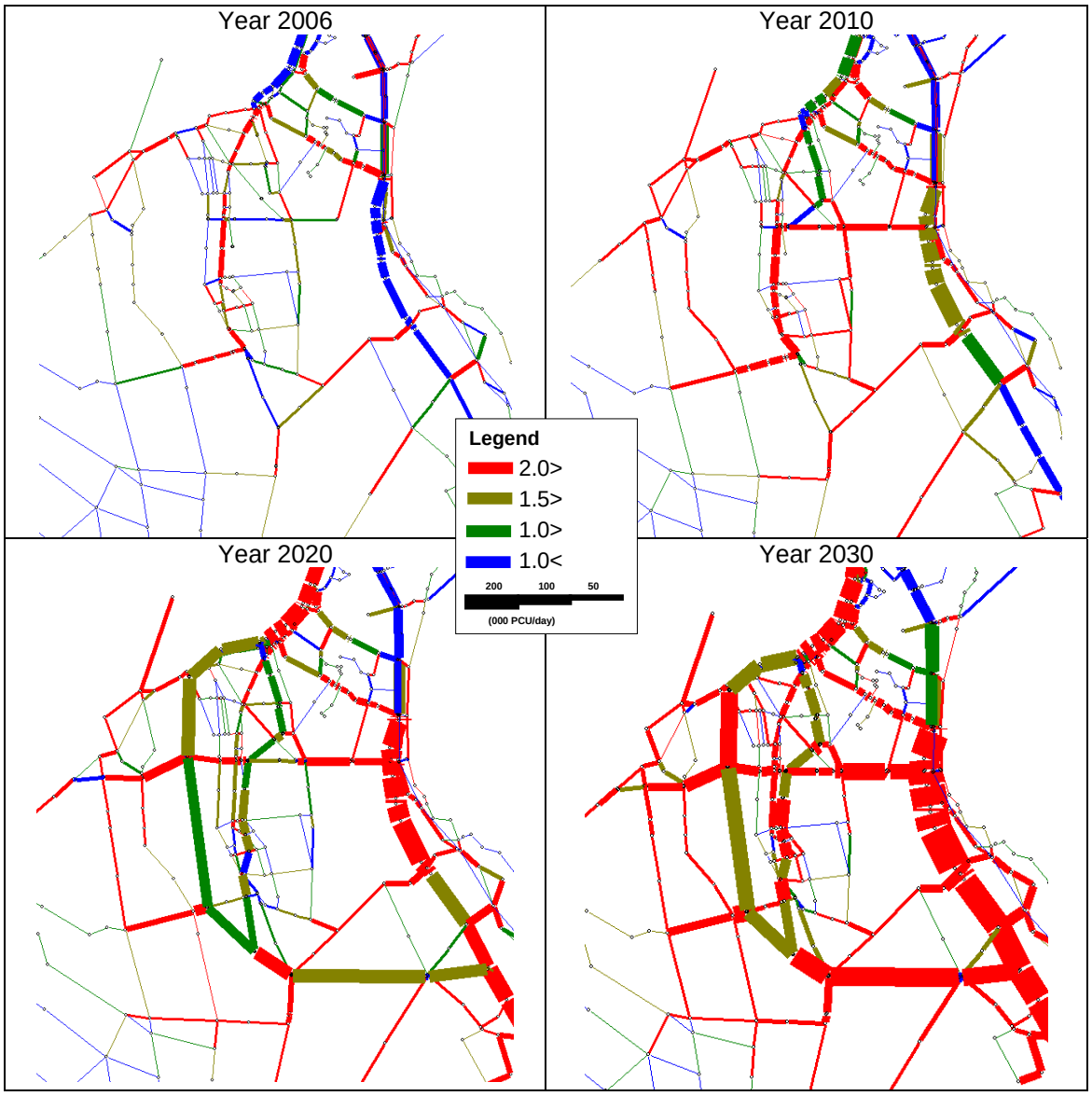
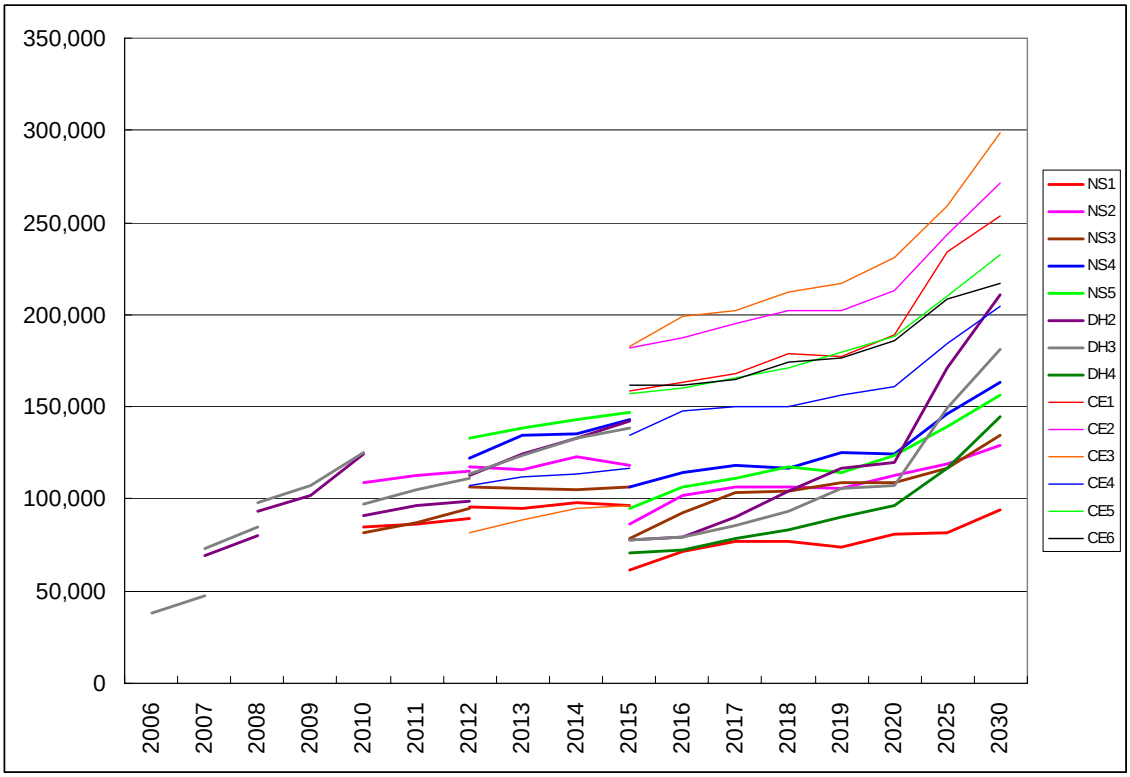


Figure 8.3.3 Estimated Traffic Volume by Section and by Year (Base Case)



8.3.3 Converting NS-4 and NS-5 to Toll Road

The base case explained above assumed that NS-4 and NS-5 were open public roads. Figure 8.3.4 and Figure 8.3.5 show resulting case when these two sections are constructed as a toll road.

The traffic volume on NS-2, NS-3 and NS-4 will not change much while some traffic will be tolled off from NS5. This is due to the fact that traffic capacity is absolutely lacking in the north of Governor's Drive.

Figure 8.3.4 Traffic Distribution (NS4 and NS5 tolled)

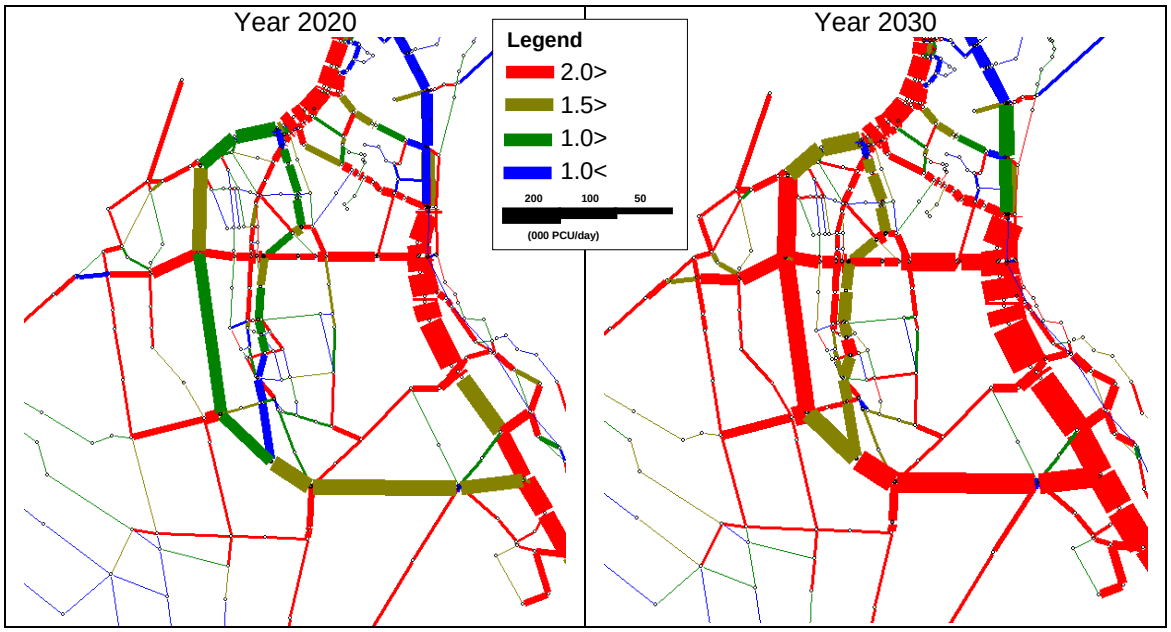
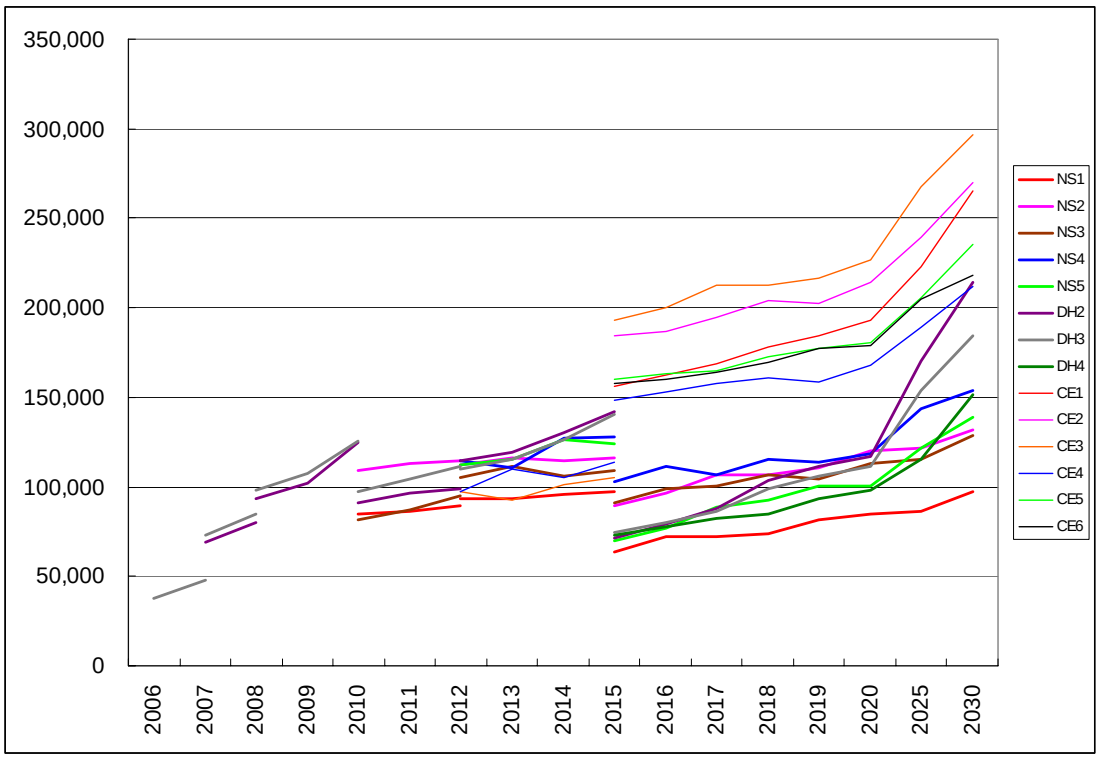


Figure 8.3.5 Estimated Traffic Volume by Section and by Year (NS-4 and NS-5 tolled)



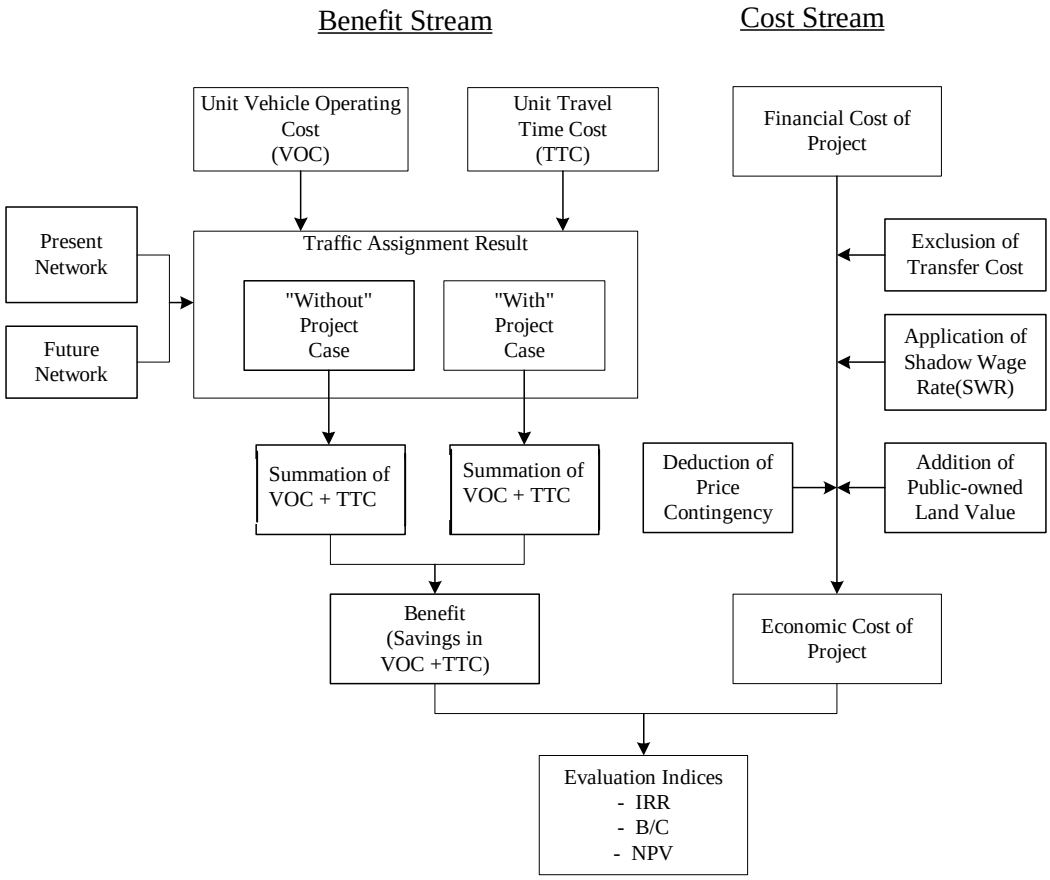
8.4 Economic Evaluation

8.4.1 Methodology and Assumptions

The economic evaluation is to examine the economic viability of a project by comparing economic cost of the projects and economic return (so-called social benefits) to be generated in the regional or national economy by the projects during the project life (30 years after opening), while the financial evaluation is to analyze profitability of a project to the operating agency, by comparing revenue and expenditure. The economic evaluation was done, taking the procedure shown in Figure 8.4.1.

Economic cost is a monetary expression of goods and services, really consumed for a project implementation. Then, all the transfer cost (tax and subsidy) will be deducted from the cost measured in market price. In addition, shadow wage rates (SWRs) are applied to unskilled labor costs included in the project cost. The same process is taken to estimate unit cost of vehicle operation which is used for estimation of economic benefits.

Figure 8.4.1 Work Flow for Economic Evaluation

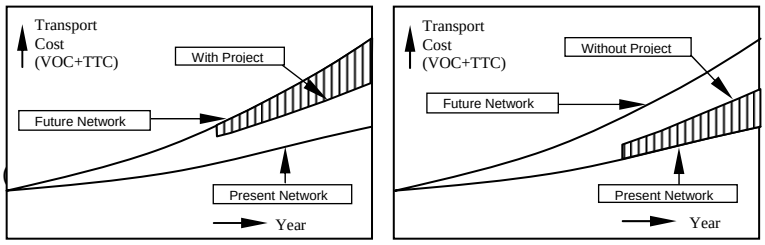


Economic benefit is defined as a amount saved in travel costs by a project. Travel costs consist of two components, vehicle operating cost (VOC) and travel time cost (TTC). These are the benefits most direct and comparatively easy to quantify.

Benefit of a project is measured through so-called “with” and “without” comparison. Using the results of traffic assignment to a network with a project subject to evaluate and also to the same network but without the project, total VOC and TTC of each case are calculated. And then, the benefit is obtained as the difference of them between “with” and “without cases.

If there exists a future network plan for the study area, there are two alternative ways to set the “with and without” cases, concerning how to deal with other projects than the project subject to evaluate. One is to assume that all of other projects will be realized whether the project to evaluate is developed or not. The other is to assume no other projects will be developed. The base network of the former case is the future network and increased VOC and TTC by lack of the project to evaluate are regarded as the benefit. On the other hand, the base network of the latter is the present network and decreased VOC and TTC by adding the project to evaluate are regarded as the benefit. In this study, both cases will be examined and the former is called “minus case” and the latter is called “plus case”. These are schematically illustrated in Figure 8.4.2.

Figure 8.4.2 Definition of Economic Benefit of Project



Economic cost and benefit are compared through a discount cash flow analysis. The cash flow was expressed at the 2006 constant price without applying any inflation in the economic evaluation. Thus, the resultant evaluation indicators are also expressed in real term. The discount rate (DR) is 15% which is widely used in the Philippines as an economic interest rate. The same rate is used in estimation of capital opportunity cost of VOC. As evaluation indicators, internal rate of return (IRR), benefit/cost ratio (B/C) and net present value (NPV) are calculated.

8.4.2 Economic Cost of Road Projects

Project costs stated in the previous chapter are presented in the financial price (at market price) and they were converted into economic cost for the purpose of economic evaluation, taking the following process.

1) Direct construction cost was already broken down into three cost items: material cost, equipment machinery cost and labor cost which was further subdivided into skilled/semi-skilled labor cost and unskilled labor cost.

2) All the taxes such as VAT and import tax included in material and equipment cost were deducted.

3) According to the annual statistics, the average unemployment rate in CALA Provinces was about 11.2% in the past 5 years. Then, the shadow wage rate (SWR) was estimated at 69% according to the Haveman's formula:

SWG = (Wage rate in market) x (1.25 – Unemployment Rate / 0.2)
= (Wage Rate in market) x 0.69

Accordingly, 70% of unskilled labor cost was regarded as the economic cost.

4) A half of the contingency was regarded as the price contingency and deducted from the economic cost. The other half is the physical contingency which was accounted in the economic cost.

Table 8.4.1 shows the resultant economic cost of the projects. Total economic cost of all the road projects is P 20.8 billion, 74% of the financial costs. Economic cost of each project is in the range of 71 – 77% of the financial cost, except 69% of NS-2 which does not need land acquisition.

Table 8.4.1 Economic Cost of Road Project

(Million Peso at 2006 price)

Cost Item	All	NS-1	NS-2	NS-3	NS-4	NS-5	DH-2
Construction	15,727.6	1,145.0	315.0	1,403.6	2,386.8	2,487.1	700.6
Engineering	1,887.3	137.4	37.8	168.4	286.4	298.5	84.1
ROW	2,546.2	102.1	0.0	423.8	391.0	389.9	113.4
Administration	672.0	46.2	11.8	66.5	102.1	105.8	29.9
Total	20,833.1	1,430.7	364.6	2,062.4	3,166.4	3,281.3	928.0
Economic/Financial	0.74	0.73	0.69	0.76	0.74	0.74	0.74
Year	**All**	**NS-1**	**NS-2**	**NS-3**	**NS-4**	**NS-5**	**DH-2**
2006	100.5	0.0	0.0	0.0	0.0	0.0	86.8
2007	408.0	25.3	1.4	222.2	0.0	0.0	148.2
2008	1,800.9	97.5	15.5	202.4	170.2	170.2	693.0
2009	2,022.5	452.8	116.8	818.9	269.2	273.3	0.0
2010	2,194.5	855.0	230.8	818.9	17.7	18.3	0.0
2011	3,618.3	0.0	0.0	0.0	1,354.6	1,409.7	0.0
2012	4,149.6	0.0	0.0	0.0	1,354.6	1,409.7	0.0
2013	800.4	0.0	0.0	0.0	0.0	0.0	0.0
2014	2,809.6	0.0	0.0	0.0	0.0	0.0	0.0
2015	2,928.8	0.0	0.0	0.0	0.0	0.0	0.0
Total	20,833.1	1,430.7	364.6	2,062.4	3,166.4	3,281.3	928.0

Table 8.4.1 Economic Cost of Road Project (Cont'd)

(Million Peso at 2006 price)

Cost Item	DH-3	DH-4	CE-1	CE-2	CE-3	CE-4
Construction	411.7	1,246.4	312.9	3,464.9	1,156.9	696.7
Engineering	49.4	149.6	37.5	415.8	138.8	83.6
ROW	0.0	400.3	81.3	269.6	44.8	330.0
Administration	15.4	59.9	14.4	138.3	44.7	37.0
Total	476.5	1,856.1	446.1	4,288.6	1,385.2	1,147.3
Economic/Financial	0.71	0.76	0.74	0.73	0.73	0.77
Year	DH-3	DH-4	CE-1	CE-2	CE-3	CE-4
2006	13.7	0.0	0.0	0.0	0.0	0.0
2007	10.8	0.0	0.0	0.0	0.0	0.0
2008	452.1	0.0	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	43.6	47.9	0.0
2010	0.0	114.5	0.0	87.1	52.2	0.0
2011	0.0	114.5	33.9	134.3	431.6	139.7
2012	0.0	167.5	47.1	147.1	853.5	170.0
2013	0.0	8.7	2.5	782.6	0.0	6.5
2014	0.0	725.5	121.7	1,546.9	0.0	415.5
2015	0.0	725.5	240.9	1,546.9	0.0	415.5
Total	476.5	1,856.1	446.1	4,288.6	1,385.2	1,147.3

The total land cost is P 2,546 million, inclusive of compensation cost for properties. As the land is not a depreciable asset, the amount was refunded in the last year of the cash flow.

8.4.3 Economic Benefit of Road Projects

Savings in vehicle operating cost (VOC) is one of the main sources of economic benefit. The operating costs per unit distance were estimated by type of vehicle, such as passenger car, taxi, Jeepney, light truck, heavy truck, bus, large bus and they are finally aggregated into public vehicle, private vehicle and truck, as shown in Table 8.4.2. Average occupancy was assumed at 12 persons for public service vehicle, 1.8 persons for private vehicle and 1.5 persons for truck.

Travel time of car users and bus passengers is converted to money term using unit time value. Their time values are estimated based on their income level which reflects their productivity. According to the interview survey data on willingness to pay conducted in 2005 by this Study, average monthly income was 22,358 Pesos for car users, 7,991 Pesos for Jeepney/van users, 10.639 Pesos for truck/cargo van users.

Assuming monthly working hours to be 175 hours, the value of one hour at work is estimated at P 29 for non-car owner (i.e. public transport passenger), P 53 for car owner (i.e. car user) and P 25 for truck user as shown in Table 8.4.2.

Travel time for business purpose can be considered fully worth the time value and travel time for going to work and returning from working place to home is assumed to be worth a half of the time value at work. No value is given to travel time for other purposes. Thus, average value of travel time is obtained by multiplying the share of business trip and "to work" trip for each mode. It is further assumed that

the value of travel time would increase at the same rate of the GRDP per capita growth (2.0 % per annum).

Table 8.4.2 Vehicle Operating Cost and Travel Time Cost in Manila, 2006

(1) Distance-proportional VOC

(Peso /1000 Km/ Vehicle)

Travel Speed (km/h)	Public Vehicle	Private Vehicle	Truck
5	20,694	8,404	31,141
10	14,027	6,151	22,669
20	10,477	4,828	17,724
30	9,406	4,358	15,116
40	8,683	4,084	13,832
50	8,905	3,951	13,097
60	9,700	3,992	12,864
70	10,850	4,117	12,961
80	12,209	4,399	13,941
90	13,427	4,794	15,256

(Peso /1000 Km/ PCU)

Travel Speed (km/h)	Public Vehicle	Private Vehicle	Truck
5	10,347	8,404	12,457
10	7,014	6,151	9,068
20	5,239	4,828	7,090
30	4,703	4,358	6,046
40	4,342	4,084	5,533
50	4,453	3,951	5,239
60	4,850	3,992	5,146
70	5,425	4,117	5,184
80	6,104	4,399	5,577
90	6,714	4,794	6,102

(2) Time-proportional VOC

(Peso / hour / Vehicle)

Peso/ Hour	62	71	153

(Peso/ hour / PCU)

Peso/ Hour	31	71	61

(3) Economic Time Value of Passenger

(Peso/hour/passenger)

Vehicle Type	1997	2005
Public	19.0	29.3
Private	34.5	53.2
Truck	16.1	24.9

(Peso/hour /PCU)

Vehicle Type	1997	2005
Public	114.0	352.1
Private	31.0	95.8
Truck	12.1	37.3

8.4.4 Evaluation Results

1) Entire Projects

As the cost-benefit cash flow of the projects shows in Table 8.4.3, net cash flow is negative only in the first year of 2006. This is because DH-3 is already open in 2006, generating economic benefit and DH-2 will open as a two lane road in 2007 and on the other hand, other project will be gradually developed during 2007-2015. As the result, economic benefit is always larger than economic cost except the first year. In such a case, IRR is not suitable as an evaluation indicator because it will tend to become extraordinary large.

In any case, the economic viability of the entire projects is very high showing 823 % of EIRR and P 77,515 million of NPV. The B/C ratio is 6.6.

Table 8.4.3 Economic Cash Flow of Entire Projects

(Peso million)

Year	Cost	Operation	Benefit	Net CF	E-IRR(%)
2006	100.5			-100.5	-
2007	408.0	10	1266.7	848.5	745%
2008	1,800.9	46	2527.1	680.0	818%
2009	2,022.5	87	2620.6	511.4	824%
2010	2,194.5	131	3737.5	1,412.5	825%
2011	3,618.3	203	4337.7	516.5	826%
2012	4,149.6	286	4633.6	198.1	826%
2013	800.4	302	7502.0	6,399.8	826%
2014	2,809.6	358	8250.7	5,083.0	826%
2015	2,928.8	417	15919.3	12,573.8	826%
2016	156.2	420	17908.0	17,332.0	826%
2017	156.2	420	18535.3	17,959.3	826%
2018	156.2	420	22477.6	21,901.5	826%
2019	156.2	420	25602.9	25,026.9	826%
2020	156.2	420	27530.8	26,954.8	826%

E-IRR	%	-
NPV	P million	77517.5
B/C	-	6.6

2) NS Group

The projects NS 1 to NS-5, from north to south, were evaluated by changing combination. NS-1 and NS-2 are planned to construct at the same time, followed by NS-3. Projects NS-1 to NS-3 are presumably constructed as toll roads by some PPP scheme. NS-4 and NS-5, south of Daang Hari road are still uncertain whether they are tolled or not.

All the NS projects were found economically feasible with an extremely high E-IRR. Especially, NS-1 and NS-2 showed the highest E-IRR. The northern section has a higher E-IRR than the southern section. There is no significant difference between the plus case and the minus case.

Table 8.4.4 Evaluation of NS Group

Evaluation Indicator	Unit	NS-1&2		NS-3		NS-1,2&3		NS-1to 5	
		Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus
E-IRR	%	82.0	80.1	41.5	38.6	35.9	38.0	24.1	22.9
NPV	P million	16032.2	14895.6	4835.6	3573.9	5114.1	10541.8	5523.8	4485.9
B/C	-	11.7	10.9	3.7	3.0	2.5	4.2	1.7	1.6

Note: “Minus” compares the full network and quasi-full network without the project, while “plus” compares with and without the project.

3) DH Group

Among DH-1 to DH-4, from east to west, DH-2 and DH-4 were evaluated according to the agreement at the second Steering Committee Meeting. Table 8.4.5 shows the results. Due to the same reason stated before ((4)-1) in this Chapter), E-IRRs of these projects are almost meaningless. The cash flow of DH-2 has no negative year and then, IRR is infinitive.

In the Study Area of CALA, east-west roads are very limited and there is no feasible detour route for Daang Hari road. Therefore, improvement of DH-2 and DH-4 has a huge demand and shows an excellent evaluation result.

Table 8.4.5 Evaluation of DH Group

Evaluation Indicator	Unit	DH-2		DH-4	
		Minus	Plus	Minus	Plus
E-IRR	%	-	-	66.4	66.7
NPV	P million	17234.4	15928.8	10114.6	9845.6
B/C	-	19.0	17.6	11.6	11.3

4) CE Group

The east-west corridor of CE-1 to CE-4 was evaluated treated as one package. As Table 8.4.6 shows, they are highly evaluated economically. These projects are planned not only to support urban development of the Study Area, but to compose an alternative route for SLEX, together with CE-5 and CE-6 which were regarded as an extension of the Manila-Cavite Coastal Road.

Table 8.4.6 Evaluation of CE Group

Evaluation Indicator	Unit	CE-1to4	
		Minus	Plus
E-IRR	%	33.7	34.7
NPV	P million	9946.8	8970.5
B/C	-	3.6	3.3

8.5 Financial Analysis

8.5.1 Methodology and Assumptions

As the first step, this financial analysis estimates the Project F-IRR of each road projects to know how large/small profitability it implies, without considering interest payment, tax payment and profit sharing. Based on the result of the first step, a realistic implementation scheme is designed to clarify main players' rights and responsibilities. The second step deals with financial statements from the view point of each player, focusing the cash flow of the project company, if it is planned in the scheme.

8.5.2 Evaluation by Project IRR

1) Investment Schedule

The investment amount and disbursement schedule were estimated and planned in Chapter 7.9 as shown in Table 8.5.1.

Table 8.5.1 Investment Schedule by Project Component

(Million Peso at 2006 price)

Year	NS-1	NS-2	NS-3	NS-4	NS-5	DH-2
2006	0.0	0.0	0.0	0.0	0.0	117.3
2007	34.5	2.1	293.6	0.0	0.0	200.3
2008	132.8	22.4	267.4	228.6	228.9	936.5
2009	616.5	168.4	1,081.9	361.6	367.4	0.0
2010	1,164.0	332.6	1,081.9	23.8	24.6	0.0
2011	0.0	0.0	0.0	1,819.5	1,895.3	0.0
2012	0.0	0.0	0.0	1,819.5	1,895.3	0.0
2013	0.0	0.0	0.0	0.0	0.0	0.0
2014	0.0	0.0	0.0	0.0	0.0	0.0
2015	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,947.8	525.4	2,724.9	4,253.0	4,411.6	1,254.1

2) Operation and Maintenance Cost

The routine maintenance cost was annually appropriated at 0.3% of the project cost excluding ROW cost. As for the periodic maintenance cost, 20% of the project cost excluding ROW cost was assumed for every 20 year. This percentage was annualized at 0.44% under 8% of annual interest rate.

The operating cost was annually appropriated at 12% of annual gross revenue which was regarded reasonable in the Philippines based on the past experience. Other minor costs were ignored at this stage.

3) Revenue

Based on the results of demand forecast, annual revenues were estimated as shown in Table 8.5.2. In the year of 2011, 2013 and 2016, some projects are completed and opened, and it will affect the revenue of other projects. Therefore, two revenues are shown in those years of “Before” and “After” the opening. In the year 2016, DH-4, CE-1, CE-2, CE-5 and CE-6 are scheduled to open and it will affect significantly the demand and revenue of NS roads. Especially, NS-5 will lose its revenue by more than 40%, while other NS roads will lose 20 – 27%.

As NS-4 and NS-5 are assumed free of charge in the base case, the revenues of NS-1&2, Ns-3 and DH-2 were estimated assuming no toll on NS-4 and NS-5. In addition to the base case, the Revenues of NS-4 and NS-5 were estimated and shown in the table for the convenience of comparison.

Table 8.5.2 Annual Revenue of Toll Road

(Million Peso at 2006 price)

Year	Case	NS-1&2	NS-3	(NS-4)	(NS-5)	DH-2
2009	-	-	-	-	-	638.5
2010	-	-	-	-	-	781.2
2011	Before	-	-	-	-	828.5
	After	713.4	550.2	-	-	601.5
2013	Before	749.8	744.8	-	-	890.0
	After	731.0	665.0	698.2	731.3	777.8
2016	Before	881.4	791.7	879.7	864.3	906.1
	After	644.6	584.4	704.3	484.2	498.2
2020	-	711.6	685.2	745.8	635.1	754.4
2025	-	751.3	735.8	906.7	765.3	1,075.5
2030	-	816.7	850.2	966.9	876.6	1,328.2

Note: "Before" means the revenue without other projects to be completed in the year, and "After" means with those projects.

4) Project IRR

For the base case, the financial project-IRRs were estimated as shown in Table 8.5.3. All the projects imply a high profitability. If NS-4 and NS-5 are charged, NS-5 shows a marginal F-IRR at 11.9%. (These F-IRRs are calculated without paying tax. Tax payment will be analyzed later in section (3)) Under the condition of 4.5% inflation, nominal F-IRRs of all the projects exceed 15%. DH-2 shows an extraordinary high F-IRR because of its comparatively high toll rate per kilometer and no existence of alternative routes.

Table 8.5.3 Project F-IRR without Tax Payment

Case	Project	F-IRR (%)		NPV	B/C
		Real (2006 price)	Nominal (current price)	US$ million (2006 price)	- (2006 price)
Base Case	NS-1&2	21.9	26.6	1,489.1	1.68
	NS-3	17.9	22.6	1,115.4	1.45
	NS-1,2&3	19.2	23.9	2,495.0	1.54
	DH-2	39.5	44.2	3,180.8	2.72
NS-4&5 tolled	NS-4	13.2	17.9	253.1	1.09
	NS-5	11.9	16.6	-21.2	0.99
	NS-1,2,3,4&5	15.5	20.2	2,765.7	1.26
	NS4&5	12.1	16.8	42.8	1.01

NS-4 and NS-5 are planned as free roads, not charging a toll in the base case. If they are operated as toll roads, traffic volumes on NS-1, 2 an3 will decrease. However, the changes are minimal and F-IRRs are not affected.

Table 8.5.4 Demand Change by charging a Toll on NS-4 and 5

Case	2015	2020	2025	2030
NS-1&2	-4.1%	-6.1%	-2.0%	-1.8%
NS-3	-3.8%	-4.3%	-2.1%	-1.9%

Sensitivity Analysis

The F-IRRs are stable against changes of cost and revenue. The elasticity of F-IRR against the initial cost is in the range of 0.7 and 1.0 and against the revenue is in the range of 0.9 and 1.3.

Table 8.5.5 Sensitivity Analysis by Changing Cost and Revenue

(F-IRR: % in Real Term)

Case	Project	Base Case	Initial Cost		Revenue	
			20% up	40% up	20% down	40% down
Base Case	NS-1&2	21.9	18.2	15.9	17.8	13.4
	NS-3	17.9	15.2	13.2	14.7	11.2
	NS-1,2&3	19.2	16.4	14.3	15.7	11.9
	DH-2	39.5	33.9	29.7	32.3	24.8
NS-4&5 tolled	NS-4	13.2	10.9	9.2	10.5	7.3
	NS-5	11.9	9.8	8.1	9.3	6.4
	NS-1,2,3,4&5	15.5	13.2	11.4	12.6	9.3
	NS-4&5	12.1	9.4	7.7	8.9	5.8

5) Financial Impact by CEs upon NS Road Projects

As stated, CE roads, especially CE-5 and CE-6 will compete with NS roads and if they are not implemented or operated as a toll road, NS roads will be financially improved. However, the changes in F-IRR are not significant.

Table 8.5.6 Influence of CE Roads on F-IRR of NS Roads

Case	Project	Base Case	CE-5&6 delayed		All CEs Tolled at P 2.49 /km
			Open in 2020	Never implemented	
Base Case	NS-1&2	21.9	23.8	24.8	23.8
	NS-3	17.9	19.5	20.4	20.3
	NS-1,2&3	19.2	21.0	21.9	21.4
NS-4&5 tolled	NS-4	13.2	14.3	15.3	13.6
	NS-5	11.9	14.5	17.1	12.8
	NS-1,2,3,4&5	15.5	17.5	18.9	16.8
	NS4&5	12.1	13.3	15.2	12.4

8.5.3 PPP Structure and Profit Sharing of NS-1 to NS-3

1) PPP Structure

A new scheme of PPP is planned for NS-1 to NS-3 although its application is uncertain at this stage. Under the new scheme, the National Development Company (NDC) and the Philippine Infrastructure Company (PIC) will play important roles to set up the Special Purpose Company (SPC) in early stage and SPC will undertake all the necessary pre-operational procedure before starting construction to obtain the project concession inclusive of making agreements between DPWH, TRB, NEDA and ICC. The SPC is also expected to finance for ROW acquisition. After completing these tasks, SPC will be sold out to private sector partially or entirely.

Thus, it will be a key factor for the success of these projects whether the SPC can attain its roles or not and is profitable enough to sell out. For this reason, a preliminary financial evaluation was done focusing the cash flow of the SPC.

2) Equity F-IRR of SPC

In order to analyze the cash flow of the SPC, several conditions were additionally assumed for the base case such as: Inflation Rate 4.5%

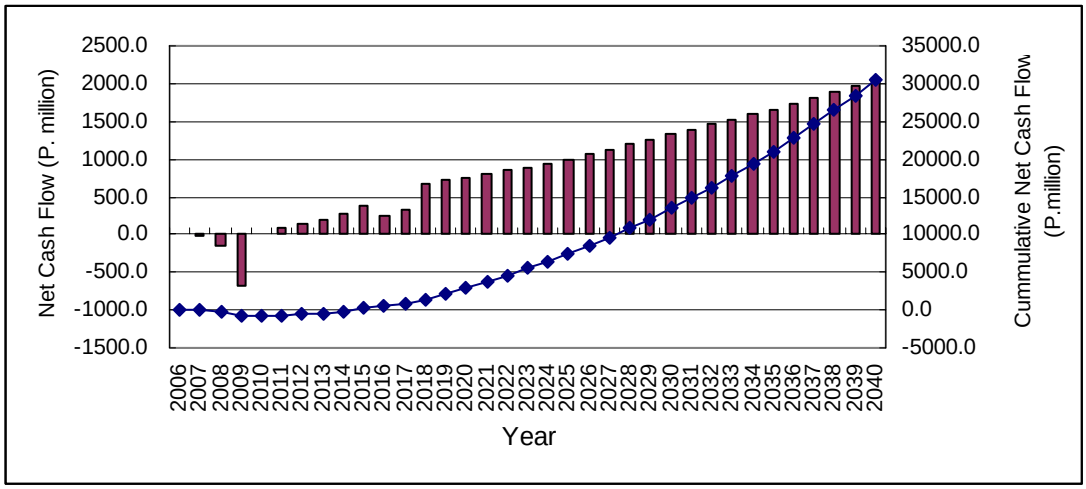
Days in Year is assumed 340 days, assuming a half revenue in the weekend.

- Corporate Income Tax 35%
- The debt to capital equity of the SPC is assumed to be 70:30.
- The capital will be paid-up when necessary, not in advance. The capital will be invested prior to the loan.
- The terms of the loan are 12% of annual interest and seven years of repayment without a grace period and,
- Depreciation period is 30 years for infrastructure and 10 years for toll collection equipment.

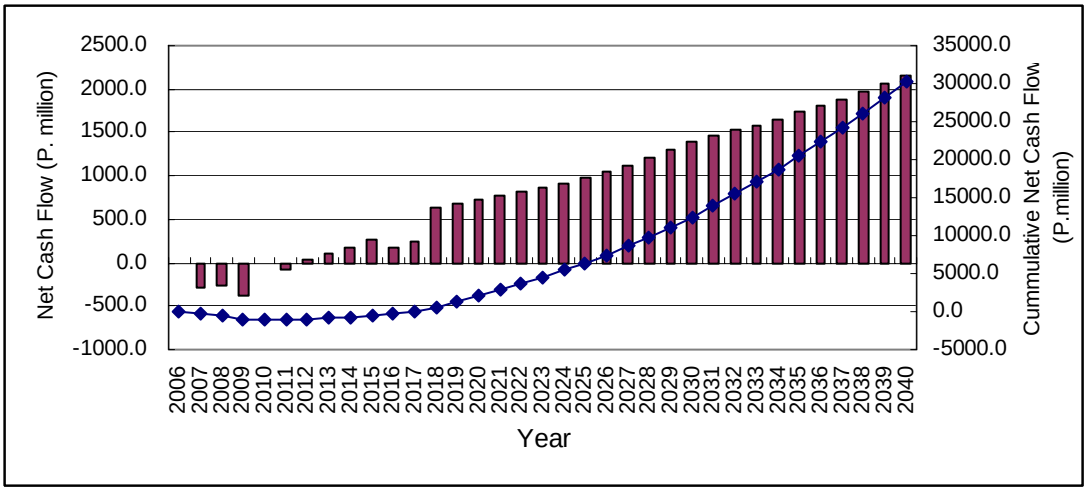
Under such conditions, the cash flow of the SPC was forecasted as shown in Figure 8.5.1. The company will not suffer from a deficit even in the early stage during repayment period, with no need of additional borrowing as a working capital. The both cases of NS-1&2 and NS-3 are quite similar. The cash flows were drawn at current price under 4.5% of inflation.

Figure 8.5.1 Cash Flow of NS Projects

(1) Cash Flow of NS-1&2



(2) Cash Flow of NS-3



Based on the cash flows, the project IRR and the equity IRR were estimated for comparison (Table 8.5.7). As the inflation rate becomes higher, the IRR will also rise higher because the interest rate becomes relatively lower. If the own capital ratio is raised, the equity IRR becomes lower and at 100% own capital without using any loan, the equity IRR becomes equal to the project IRR. Change in the interest rate will not affect much on the equity IRR because interest payment is not included in the cash flow to calculate IRR. In this analysis, it affects the cash flow only through the interest during construction (IDC).

Table 8.5.7 Project IRR and Equity IRR of NS 1, 2 and 3

(1) F-IRR and Inflation

Project	F-IRR	Annual Inflation Rate (%)				
		0.0	2.0	4.0	4.5 (Base Case)	6.0
NS-1&2	Project IRR (%)	17.8	20.0	22.1	22.6	24.3
	Equity IRR (%)	20.6	23.6	26.6	27.4	29.6
NS-3	Project IRR (%)	14.2	16.3	18.4	18.9	20.5
	Equity IRR (%)	15.0	17.8	20.6	21.3	23.3
NS-1,2&3	Project IRR (%)	15.8	17.9	20.0	20.5	22.2
	Equity IRR (%)	17.4	20.3	23.1	23.8	25.9

(2) F-IRR and Own Capital Ratio

Project	F-IRR	Own Capital Ratio (%)				
		10	20	30 (Base)	50	100
NS-1&2	Project IRR (%)	23.0	22.8	22.6	22.3	21.6
	Equity IRR (%)	33.7	29.8	27.4	24.8	21.6
NS-3	Project IRR (%)	19.2	19.0	18.9	18.6	18.0
	Equity IRR (%)	24.0	22.2	21.3	19.9	18.0
NS-1,2&3	Project IRR (%)	20.9	20.7	20.5	20.3	19.6
	Equity IRR (%)	27.6	25.3	23.8	21.9	19.6

(3) F-IRR and Interest Rate

Project	F-IRR	Interest rate of Loan (%)				
		8.0	12.0(Base)	16.0	20.0	24.0
NS-1&2	Project IRR (%)	22.1	22.3	22.6	22.9	23.1
	Equity IRR (%)	25.5	24.8	24.2	23.5	22.9
NS-3	Project IRR (%)	18.4	18.6	18.8	19.0	19.2
	Equity IRR (%)	20.4	19.9	19.3	18.9	18.4
NS-1,2&3	Project IRR (%)	20.0	20.3	20.5	20.7	20.9
	Equity IRR (%)	22.4	21.9	21.4	20.8	20.3

3) Profit Sharing

The direct stakeholders in the project supply-side are the SPC, the Government and the financier (loan provider). The SPC means stock holders of the SPC. They invest to the SPC and enjoy the dividends (Practically, cash in hand of the company was regarded as their financial gain) and the Government gains various taxes during construction period as well as the operational period. Lastly, financiers/bankers will get a profit in the form of interest. The profit shares of there three were estimated in terms of the net present value (NPV) discounted by 12%.

Table 8.5.8 Profit Sharing among Stakeholders on Supply-side

Entity	NS-1&2		NS-3		NS-1,2&3	
	NPV (Million ₽)	%	NPV (Million ₽)	%	NPV (Million ₽)	%
SPC	2,263.8	41.7	1,810.0	35.9	4,073.9	39.0
Government	2,182.4	40.2	2,071.5	41.1	4,253.9	40.7
Financier	976.2	18.0	1,153.7	22.9	2,130.0	20.4
Total	5,422.5	100.0	5,035.3	100.0	10,457.8	100.0

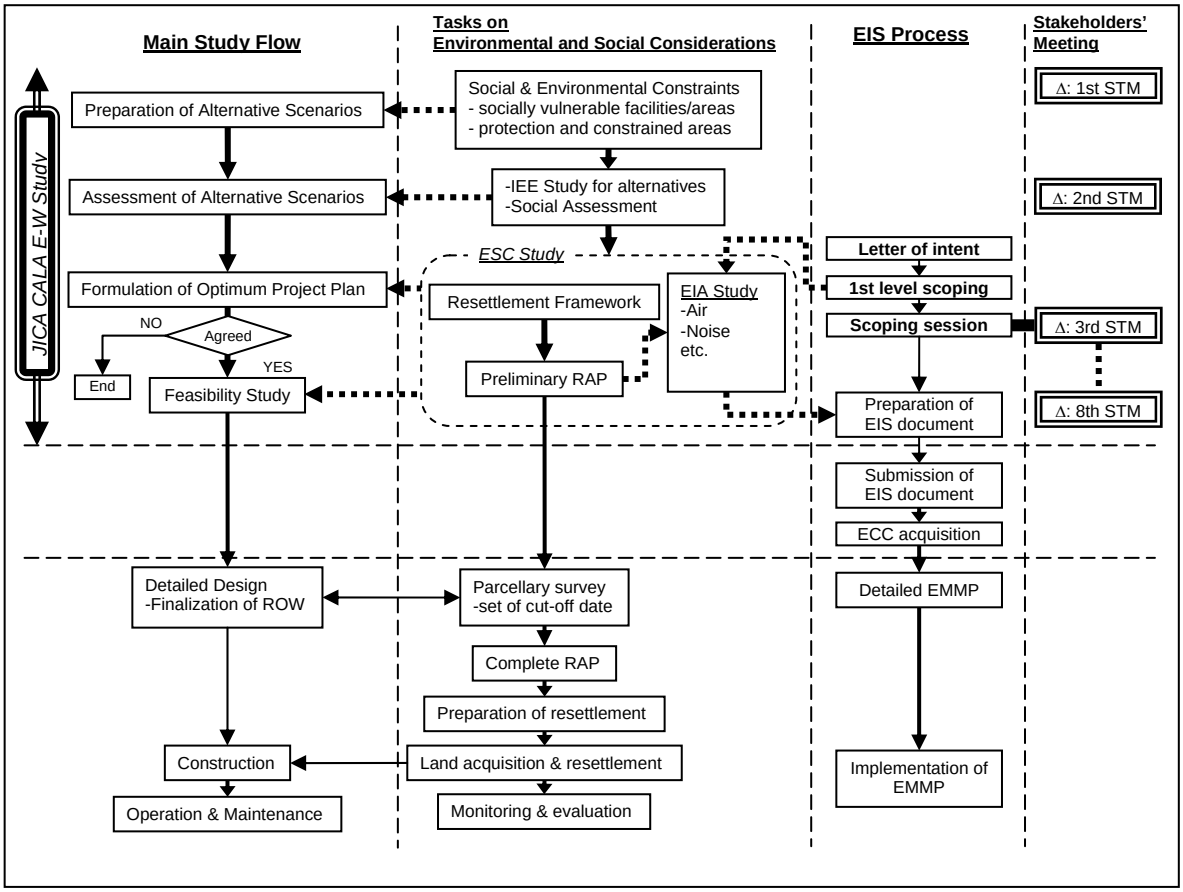
9 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

9.1 Initial Environmental Examination and Scoping for Selected Priority Projects

9.1.1 Overall Framework of Environmental and Social Considerations for the CALA East-West National Road Project

The overall framework of environmental and social considerations for the project is shown below. In the JICA study, legal process of the Philippine Environmental Impact Statement (EIS) system was executed for the project in parallel with the environmental and social considerations study under the JICA Guidelines on Environment and Social Considerations[1] as well as preparation of preliminary Resettlement Action Plan. In the initial stage of the JICA study, the Official Scoping Process under the EIS system commenced with the issuance of a letter of intent by DPWH to the Environment Management Bureau of Department of Environment and Natural Resources (EMB-DENR).

Figure 9.1.1 Overall Framework of Environmental and Social Considerations for the CALA East-West National Road Project



[1] The Study was designated as Category A project under the JICA Guidelines on Environment and Social Considerations, which means the project is likely to have significant adverse impacts on the environment and society, since it was confirmed that the project is subject to acquisition of the Environmental Compliance Certificate (ECC) under the Environmental Impact Statement (EIS) system in the Philippines due to the project type (new road construction at outside critical slope > 20 km). Under the situation, the Study was subject to inquiry to the JICA Environmental and Social Considerations Advisory Committee from the beginning of the study.

9.1.2 Coverage of the ESC Study

The study area basically covers the area along the selected three road routes. Location and area along the road to be studied are varied among the environmental impact items based on features of the natural and social environmental impact items.

The following target roads for the Feasibility Study of the CALA East-West Road Project are selected from necessary new and upgraded roads under favorable future road network as priority projects.

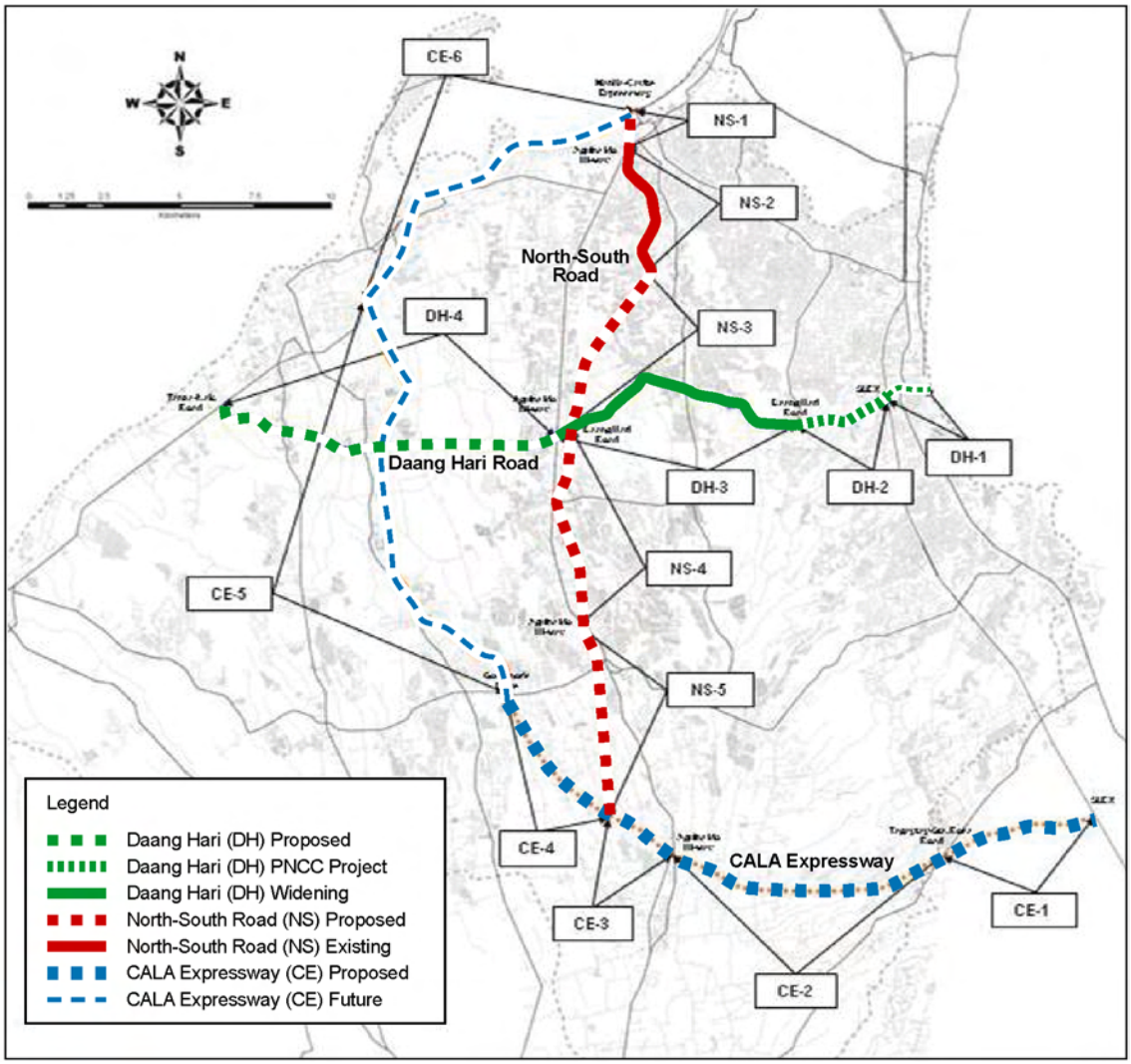
(1) North-South Road
(2) Daang Hari Road
(3) CALA Expressway

Main specifications of the target roads are shown in Table 9.1.1. The routes of the target roads are shown in Figure 9.1.2.

Table 9.1.1 Main Specifications of the Target Roads

Proposed Road	Road Category	Road Length	Design Speed	Traffic Lanes	ROW Width
North-South Road	National highway	27.8 km	60 km/h	6 lanes	30 m
Daang Hari Road	National highway	24.2 km	60 km/h	4 lanes	30 m
CALA Expressway	Expressway	22.7 km	100 km/h	6 lanes	50 m

Figure 9.1.2 Target Roads for the EIA



9.1.3 Environmental Scoping

Main items for the Environmental and Social Considerations Study at EIA Level (EIA Study) are shown in Table 9.1.2. The environmental impact items classified as A to C in the table, based on the result of initial environmental examination (IEE) for the priority projects, were examined under the EIA Study. In principle, the implementation of the whole study was conducted under the initiatives of DPWH as Philippine counterpart under the technical support by the JICA study team. Part of the works was subcontracted by the JICA study team to local environmental consultants who were registered with the EMB-DENR.

Table 9.1.2 (1/2) Environmental Scoping for Priority Projects

Environmental Impact Items		North-South Road	Daang Hari Road	CALA Expressway	Remarks
Social Environment	Involuntary resettlement	A	A	A	The involuntary resettlement would be unavoidable due to land acquisition, especially in the existing built-up area.
	Regional economic activities	B	B	B	While negative social impacts are expected to agricultural, industrial, and commercial activities in some extent due to the land acquisition, industrial and commercial activities will be enhanced as positive impact of the proposed project.
	Land use	B	B	B	Present land use will be changed along the right-of-way newly acquired due to the road development.
	Regional severance	B	B	A	Regional severance may occur due to new road development and/or upgrade of the present road class.
	Existing social infrastructure	C	C	C	Existing social infrastructure may be affected by the project.
	Social vulnerable groups such as the poverty and ethnic minority	A	B	A	Existence of ethnic minority group has not been identified in the study area. The land occupied by squatters may be acquired for the project.
	Inequality between beneficiaries and project-affected peoples	B	B	B	Inequality between beneficiaries and project-affected peoples by the project will occur in some extent.
	Remains and cultural assets	C	C	C	Existence of remains and cultural assets should be confirmed before the construction. In the case that buried remains and cultural assets are found in the construction phase, this matter should be well taken care of.
	Conflict of interests	B	B	B	Conflicts of interests related to the road development may occur among beneficiaries and project-affected peoples.
	Water use right and common land use right	C	C	C	Distribution of existing channels and those use have to be studied.
	Sanitation	B	B	B	Deterioration of the sanitary condition in and around the project area would occur due to newly construction of labor camps for the project.
	Disaster (natural risk) and epidemic such as HIV	B	B	B	Influx of the labors who have epidemic such as HIV may cause the spread of the epidemic in and around the project area.

Table 9.1.2 (2/2) Environmental Scoping for Priority Projects

Environmental Impact Items		North-South Road	Daang Hari Road	CALA Expressway	Remarks
Natural Environment	Topography and geology	B	B	B	The land collapse may occur due to the road development.
	Soil erosion	B	B	B	While soil erosion caused by the road development is basically expected to be very limited, the road development in the erosion-prone area may cause the progress of the soil erosion situation.
	Groundwater	C	C	C	Relationship between excavation depth for the project and groundwater level in the project site has to be confirmed.
	Flow regime of lake and river	B	B	B	Inflow of the drainage water from the road to rivers may change the existing river flow regime.
	Coastal and sea area	D	D	D	There is no development in the coastal and sea area.
	Flora and fauna	C	C	C	There is no protected area in the study area. Although existence of precious species for flora and fauna in the study area are low possibility according to the previous study, it needs to be confirmed. Impact to green area to be conserved for the residents in the urban area will be studied.
	Climate	D	D	D	No impact is expected by the road development itself.
	Landscape	B	B	B	Change of the landscape will be caused by the road development in some extent.
Pollution	Air pollution	A	A	A	Deterioration of ambient air quality would occur caused by construction machineries tentatively during construction period and caused by increase of vehicle traffic in operation.
	Water pollution	C	C	C	Adequate waste water disposal during the construction and adequate drainage in the bridge section have to be planned.
	Soil pollution	D	D	D	No impact is expected by the road development itself.
	Waste	B	B	B	Adequate disposal methods of the construction residue soil and waste have to be planned.
	Noise and vibration	A	A	A	Increase of noise level is expected due to construction machinery tentatively during the construction and increase of vehicle traffic in the operation.
	Land subsidence	C	C	C	Relationship between excavation depth for the project and groundwater level in the project site has to be confirmed.
	Offensive odor	B	B	B	Offensive odor caused by vehicle emission gas may occur.
	Bottom sediment	C	C	C	Adequate waste water disposal during the construction and drainage in the bridge section have to be confirmed.
	Accident	B	B	B	The traffic accident may increase due to increase of traffic volume in operation.

Note: Evaluation categories are as follows;

A: Significant negative environmental impact is expected.

B: Negative environmental impact is expected in some extent.

C: Negative environmental impact is not known in the scoping stage (Further study was required.).

D: Negative environmental impact is not expected. Therefore, the item under this category is not subject to the EIA study.

9.1.4 Study Method for the EIA Study

(1) Study on present environmental conditions

Data on the present environmental conditions in the study area were collected and examined on various environmental aspects based on the result of environmental scoping. The following modes of data collection were conducted: secondary data collection, field reconnaissance, environmental baseline survey for air quality, noise/vibration level, flora and fauna, burial grounds/cemeteries, cultural assets, etc., and social surveys including questionnaire survey on residential perception and demand on the proposed projects.

(2) Environmental impact forecasts and estimates

As results of the environmental scoping mentioned above, environmental impact forecasts and estimates were conducted on the potential environmental and social negative impact items caused by the proposed road development. The impact forecasts and estimates were conducted, as quantitatively as possible, by overlaying maps on project plan and various present natural and social features in the study area, analyzing construction plan, examining similar case studies, and conducting numerical simulation for both construction and operation phases of the project. However, some of the environmental impact items were only able to be examined in qualitative manner.

(3) Evaluation of environmental impacts and selection of optimum route alignments

Optimum route alignments for the three routes were selected from the proposed alternative route alignments by estimating various evaluation indices, setting evaluation criteria, and conducting comprehensive evaluation. Subsequently, alternatives of package program for the selected route alignment were proposed and a most effective and implementable package program was selected as an optimum project.

(4) Examination of environmental mitigation measures and social consideration measures

As the result of the environmental impact forecast and estimate, adequate environmental preventive measures and social consideration measures were examined. Items to be examined for the proposed measures are environmental impact item, mitigation measure, conceivable effect and impact by the proposed measure, implementation timing and period, responsible body, and cost. The places where the environmental mitigation measures are placed and conducted were varied among the environmental impact items.

(5) Preparation of environmental management and monitoring plan (EMMP)

An environmental management and monitoring plan (EMMP) was prepared to grasp the environmental impacts along and around the road, to monitor adequate implementation and effect of the proposed mitigation measures for feedback and follow-up activities if necessary. The EMMP consists of the environmental mitigation measures and social consideration measures, monitoring method, location and frequency, implementation timing and period, responsible body, and cost. The places where the EMMP covers are varied among the environmental impact items.

(6) Preparation of draft Environmental Impact Statement

Based on the above items from (1) to (5), a draft Environmental Impact Statement (EIS) was prepared in compliance with the designated contents and format of the report under the EIS system.

(7) Preparation of Preliminary Resettlement Action Plan (Pre-RAP)

Although avoidance and minimization of the involuntary resettlement caused by land acquisition for the project was carefully examined for selection of optimum route alignment, the involuntary resettlement is not avoided due to present congested built-up area in the study area. Since the involuntary resettlement is not avoided, a Pre-RAP was prepared in parallel with the Feasibility Study (F/S), to make sure of livelihood recovery of the affected peoples and minimize social impacts caused by the resettlement.

In the preparation of the Pre-RAP, the following main items were examined and planned with proposal of adequate measures and recommendations from various viewpoints to be implemented by the responsible bodies on the resettlement. The data collected through the activities mentioned above items from (1) to (4) was utilized for detailed examination.

Table 9.1.3 Main Items of the Pre-RAP

a) Evidence of avoiding and/or minimizing land acquisition and resettlement impact
b) Scale and location of the land acquisition
c) Number of houses/structures to be relocated
d) Socioeconomic profiles of the people affected by land acquisition and resettlement
e) Resettlement policy framework and entitlement matrix
f) Identification and preparation of resettlement sites
g) Consultation and participation of the affected people in resettlement management
h) Institutional arrangements for RAP implementation, including inter-agency coordination
i) Cost estimates and financial plan
j) Monitoring and evaluation arrangements