4 EVALUATION OF REGIONAL TRANSPORT NETWORK ALTERNATIVES

4.1 Result of Traffic Assignment on Future Network Alternatives

Based on the estimated future traffic demand, the traffic assignment for each road network alternative was conducted to examine the performance of the alternatives.

Figure 4.1.1 shows the result of traffic assignment by network alternative for 2020 and the summary of the result is shown in Table 4.1.1. If there is no development (zero-option), the average volume/capacity ratio of the study area exceeds 2.0 and average travel speed will decrease to 13 km/h. According to this result, alternative 2 and 3 show higher performance.

Figure 4.1.1 Future Traffic Demand (2020)

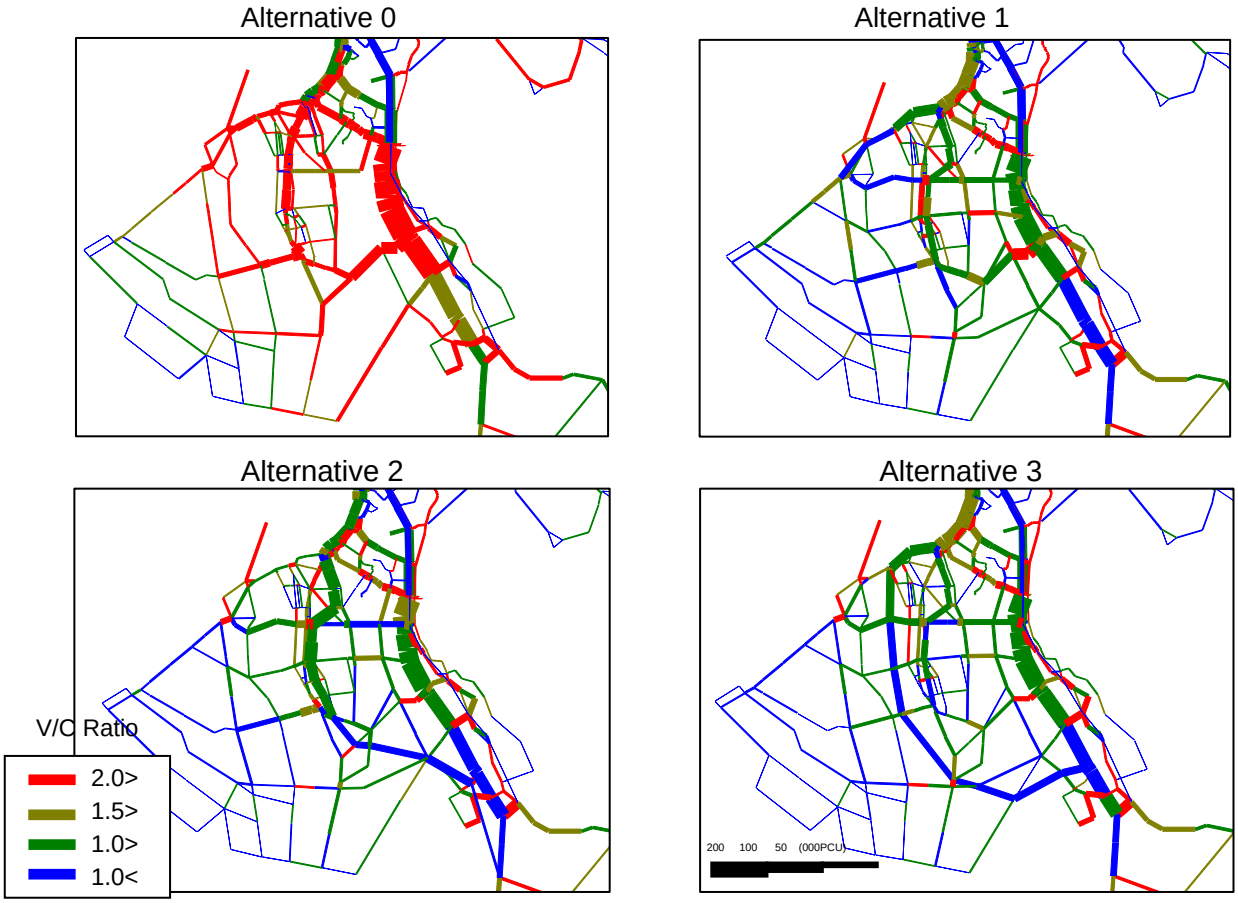


Table 4.1.1 Result of Traffic Assignment (2020)

Alternative	PCU-km (000km)	PCU-Hour (000h)	Capacity - km (000km)	Ave. Speed (km/h)	Ave. V/C Ratio	PCU-km by V/C (%)			
						>1.0	1.0-1.5	1.5-2.0	2.0<
0	43,051	3,280	2588	13.1	2.09	4.9	12.4	16.2	66.4
1	43,582	1,855	38,913	23.5	1.12	21.4	47.2	13.8	17.5
2	44,568	1,824	42,154	24.4	1.06	28.6	42.7	12.0	16.7
3	44,562	1,765	42,266	25.2	1.05	30.3	44.7	10.5	14.6

4.2 Environmental and Social Concerns

Air Pollution

The total discharge volumes of main air pollutants caused by vehicle transportation under the present condition and transport network alternatives are estimated below (Table 4.2.1). As compared with the present condition, future situation of air quality is basically expected to become worse on the whole due to increase of traffic volume. However, the estimated volumes of air pollutants under the Alternatives 1, 2, and 3 are lower than that of the Alternative 0, especially for the Suspended Particulate Matter (SPM) due to improvement of traffic, while marked differences among the Alternatives 1, 2, and 3 are not seen on the discharge volumes of the air pollutants.

Table 4.2.1 Results of Estimate on Total Discharge Volume of the Air Pollutant by Alternative

(Unit: ton/day)

Pollutant	Present	Alternative 0	Alternative 1	Alternative 2	Alternative 3
CO	220	713	624	638	638
NOx	50	136	133	135	136
SOx	0.4	1.2	1.0	1.0	1.0
SPM	2.8	9.8	6.8	6.9	6.8

Note: CO - carbon monoxide, NOx - nitrogen oxide, SOx - sulfur oxide, SPM - suspended particulate matter
Source: Estimated by the JICA study team

Noise

The total road lengths required as mitigating measure to alleviate traffic noise in each transport network alternatives are estimated below. The estimate was made for distance passing through existing built-up area by newly developed road under implementation of the alternatives. As a result of the estimate, marked differences among the Alternatives 1, 2, and 3 are not seen on the total road length required.

Table 4.2.2 Total Road Length Required for Mitigation Measure for Traffic Noise by Scenario

(Unit: km)

Alternative 0	Alternative 1	Alternative 2	Alternative 3
-*	133	126	130

* Note: There is no new road development for the Alternative 0.

Social Concerns

As social indices for evaluation of the proposed transport network alternatives, four indices are examined for the proposed alternatives by using GIS data. Among the indices, marked differences are seen because the road classes differ among the alternatives for new construction and widening sections which pass though existing built-up areas located in the east side of the Cavite-Batangas Road and along the Governor's Drive.

Table 4.2.3 Social Impacts by Alternative

Item	Unit	Alternative 0	Alternative 1	Alternative 2	Alternative 3
i) Area to be newly acquired in the existing built-up area	km^2	-*	3.84	3.18	2.92
ii) Number of building/ structure to be relocated	house	-*	4.026	2.956	2.762
iii) Area where new road passes through the SAFs	km^2	-*	1.07	1.12	0.90
iv) Area where new road passes through informal settlements and resettlement areas from past projects	km^2	-*	0.36	0.31	0.32

Note: *There is no new road development for the Alternative 0.

4.3 Economic Evaluation of Network Alternatives

Economic evaluation is done by comparing project benefits and costs, both expressed in terms of economic prices over project life. The estimate of the benefits is limited only to time saving and reduction of operating costs. The first benefit was estimated by comparing the change in passenger-hour with and without the project. On the other hand, the second benefit was measured in terms of the change in vehicle-kilometer and vehicle-hour with and without the project.

As shown in Table 4.3.1, the three alternatives shows comparable results but alternative 3 shows the highest economical performance (EIRR and NPV).

Table 4.3.1 Project Cost and Economic Evaluation

	Cost (Billion Pesos)			Benefit (Billion Pesos/ year) (2020)	Evaluation		
	Const.	ROW	Total		EIRR (%)	NPV (Billion Pesos)	B/C
Alternative 1	25.8	18.6	44.7	106.3	26.7	72.5	3.0
Alternative 2	30.9	15.3	46.2	106.3	26.9	72.2	3.0
Alternative 3	31.2	15.9	47.1	110.4	27.1	75.6	3.0

4.4 Integrated Evaluation of Regional Transport Network Alternatives

For the three (3) alternatives, a series of quantitative and qualitative analyses were conducted including the aspects described above.

The result of the analysis indicates that Alternative 3 is the best option, as shown in Table 4.4.1.

Table 4.4.1 Assessment on Road Network Alternatives

	Alternative 0	Alternative 1	Alternative 2	Alternative 3
Traffic situation	1	4	4	4
Economic condition	1	4	4	4
Industrialization	1	3	5	5
Easiness for operation (Finance)	5	3	2	2
Easiness for operation (ROW)	5	2	3	3
Regional Development	1	3	3	5
Natural environment	1	3	2	3
Social environment	5	2	3	4
Total Score	19	24	26	30

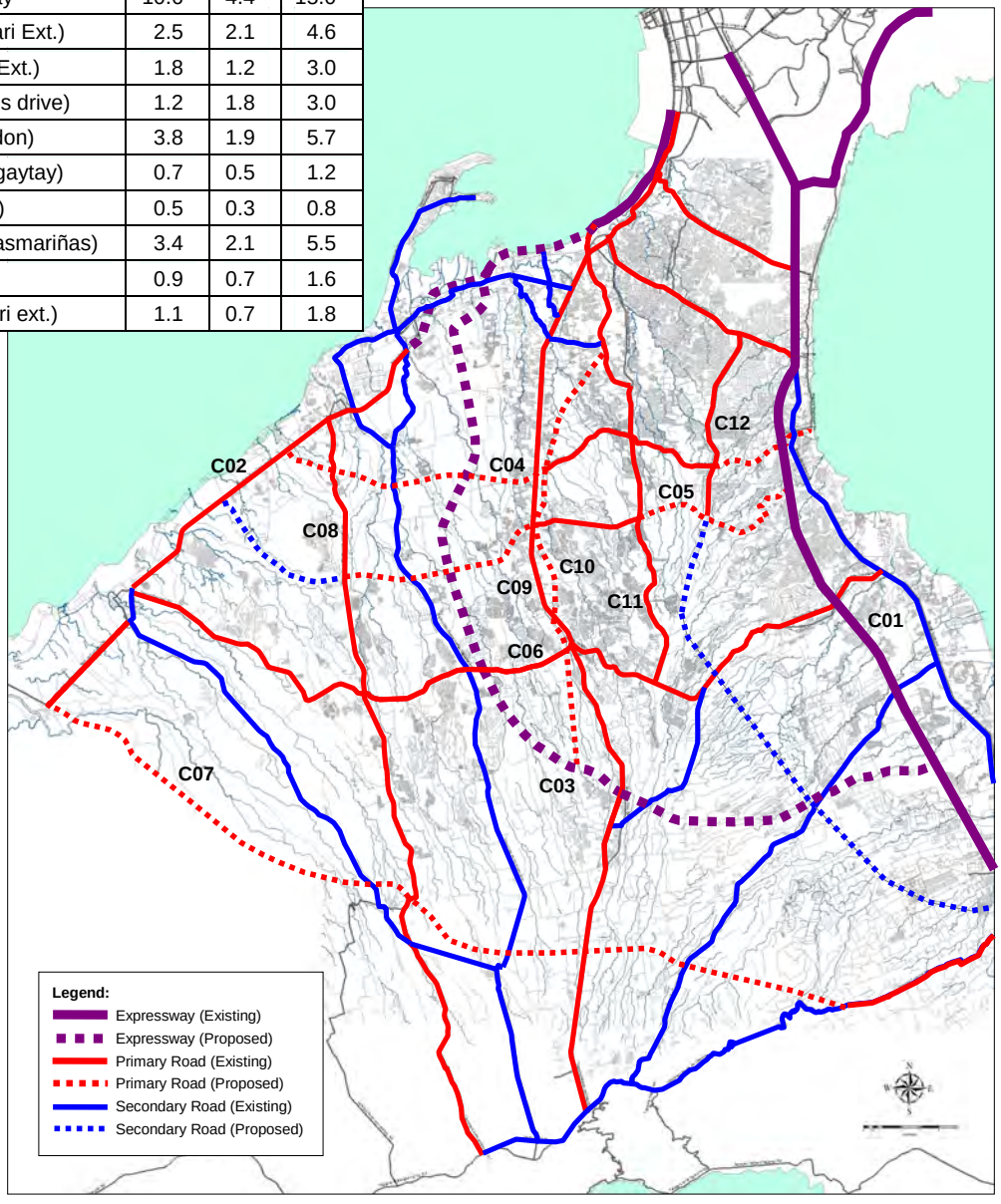
5 SELECTION OF PRIORITY PROJECTS FOR FS

5.1 Project Components of Selected Road Network

Figure 5.1.1 shows the selected road network alternative, which is Alternative 3, and its 12 project components. From these project components, the priority projects were chosen.

Figure 5.1.1 Road Project Components in the Selected Road Network Alternative

		Cost Estimates (Billion Pesos)		
		Const.	ROW	Total
C01	South Luzon Expressway	4.9	0.0	4.9
C02	West Coastal Road	2.2	0.7	2.9
C03	CALA Expressway	10.6	4.4	15.0
C04	E/W 1 (Daang Hari Ext.)	2.5	2.1	4.6
C05	E/W 2 (Calibuyo Ext.)	1.8	1.2	3.0
C06	E/W 3 (Governor's drive)	1.2	1.8	3.0
C07	E/W 4 (Maragondon)	3.8	1.9	5.7
C08	N/S 1 (Tanza-Tagaytay)	0.7	0.5	1.2
C09	N/S 2 (Aguinaldo)	0.5	0.3	0.8
C10	N/S 3 (Bacoor-Dasmariñas)	3.4	2.1	5.5
C11	N/S 4 (Molino)	0.9	0.7	1.6
C12	N/S 5 (Daang Hari ext.)	1.1	0.7	1.8



Note: Estimated preliminarily using unit costs per km.

5.2 Selection of the Target Roads

Methodology

Two steps were taken in the selection of the priority projects from among the list of project components initially identified on the selected alternative network. First (Step 1), the economic evaluation for each project was conducted and all projects are ranked by the result. The demand in 2020 is used for this evaluation and the same methodology of economic evaluation as explained in the previous chapter is applied. At this stage, there was no examination on the road network while each project is to be evaluated, and it is difficult to decide how many projects are to be selected only by the evaluation of individual projects and their rankings. So the next step (Step 2) was the conduct of a hypothetical examination. The better project in terms of economic evaluation is selected one by one, and network performance is checked until the target level of performance is achieved. This time, the target is set to V/C ratio below 1.0 and 1.5 under the traffic demand in 2010 and 2020 respectively. Despite the relatively low service level of the road projects, however, realization of the project is the priority consideration given the present budgetary constraint by the Government.

Result of Economic Evaluation

Table 5.2.1 shows the result of economic evaluation of each project. North-South 3 (C10) shows the highest value and East-West 1 (C04) shows the second highest in terms of EIRR. The third is CALA Expressway but this project shows the highest value on net present value (NPV).

Table 5.2.1 Result of Economic Evaluation of Each Project

		Benefit (Billion Pesos/ year) (2020)	Evaluation			Rank
			EIRR (%)	NPV (Billion Pesos)	B/C	
C01	South Luzon Expressway	5.2	19.7	1.9	1.6	12
C02	West Coastal Road	5.5	25.1	3.4	2.6	8
C03	CALA Expressway	51.6	33.0	41.0	4.5	3
C04	E/W 1 (Daang Hari Ext.)	29.4	41.1	26.2	7.8	2
C05	E/W 2 (Calibuyo Ext.)	10.4	32.1	8.2	4.4	4
C06	E/W 3 (Governor's drive)	8.6	27.9	6.2	3.4	6
C07	E/W 4 (Maragondon)	11.9	25.6	7.7	2.7	7
C08	N/S 1 (Tanza-Tagaytay)	1.7	21.2	0.8	1.9	11
C09	N/S 2 (Aguinaldo)	2.6	22.1	0.7	2.0	10
C10	N/S 3 (Bacoor-Dasmariñas)	28.3	42.7	24.5	8.6	1
C11	N/S 4 (Molino)	3.0	23.6	1.8	2.3	9
C12	N/S 5 (Daang Hari ext.)	5.9	31.4	4.6	4.2	5

Selection of Priority Projects

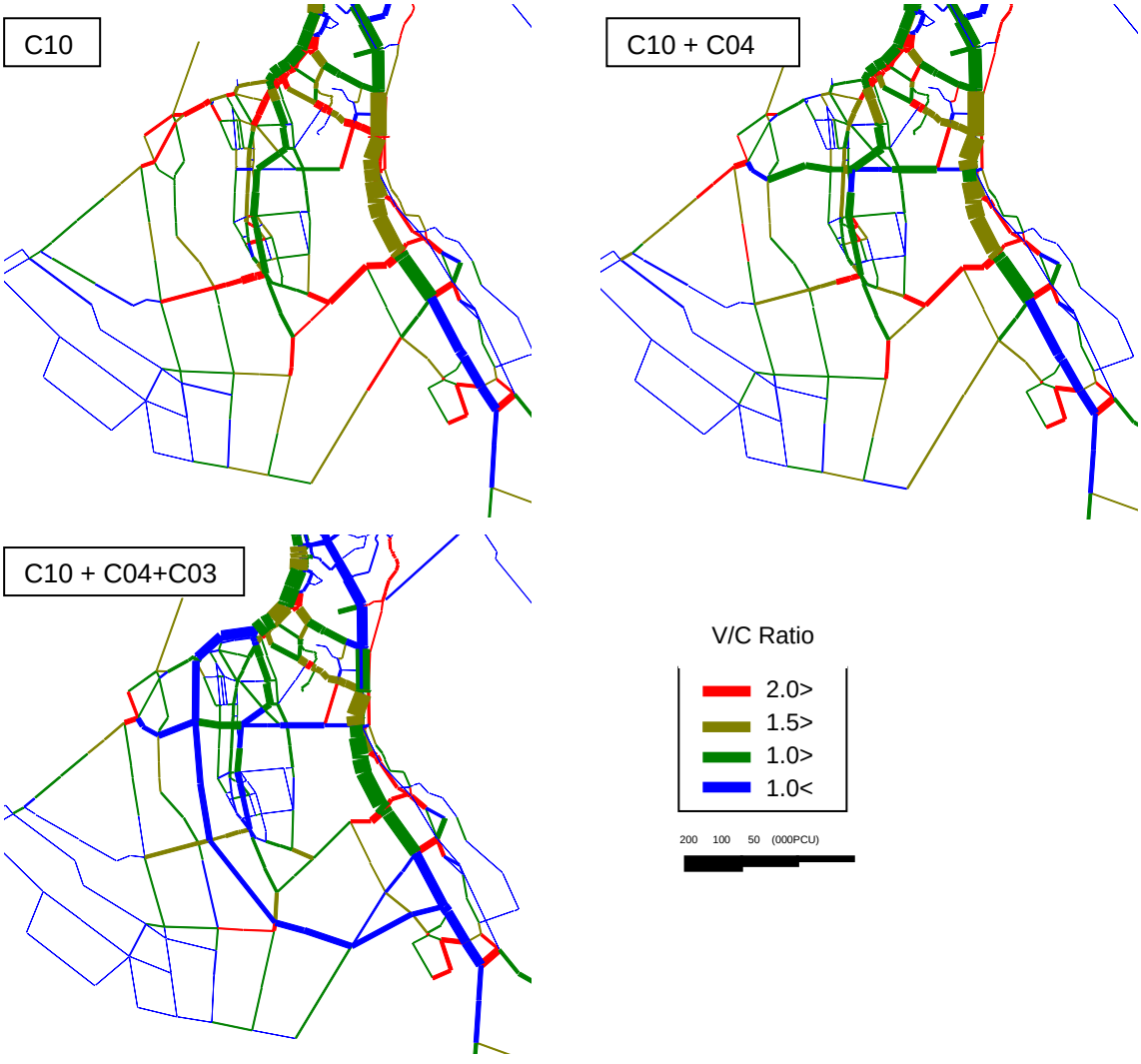
After determining the projects' economic rating, their performance in the network is

evaluated for the future years. Table 5.2.2 shows the result of the procedure for selecting the priority project(s) based on “step 2” evaluation. The results show that the priority projects are C10, C04 and C03 based on the V/C ratio criteria. In addition, results show that there is no significant impact by adding the fourth best project (C05) to the network. Therefore, the three mentioned projects are chosen as the priority projects.

Table 5.2.2 Priority Projects and Network Performance (2010, 2020)

Priority Project		2010		2020	
		V/C Ratio	Ave. Speed	V/C Ratio	Ave. Speed
C10	N/S 3 (Bacoor – Dasmariñas) (C10)	1.30	19.9	1.93	14.5
C04	E/W 1 (Daang Hari Extension) (C10+C04)	1.23	21.6	1.82	16.1
C03	CALA Expressway (C10+C04+C03)	0.91	27.2	1.36	21.4
C05	E/W 2 (Calibuyo Extension) (C10+C04+C03+C05)	0.87	27.4	1.30	21.9

Figure 5.2.1 Network Performance by Stage of Priority Project Selection, 2020



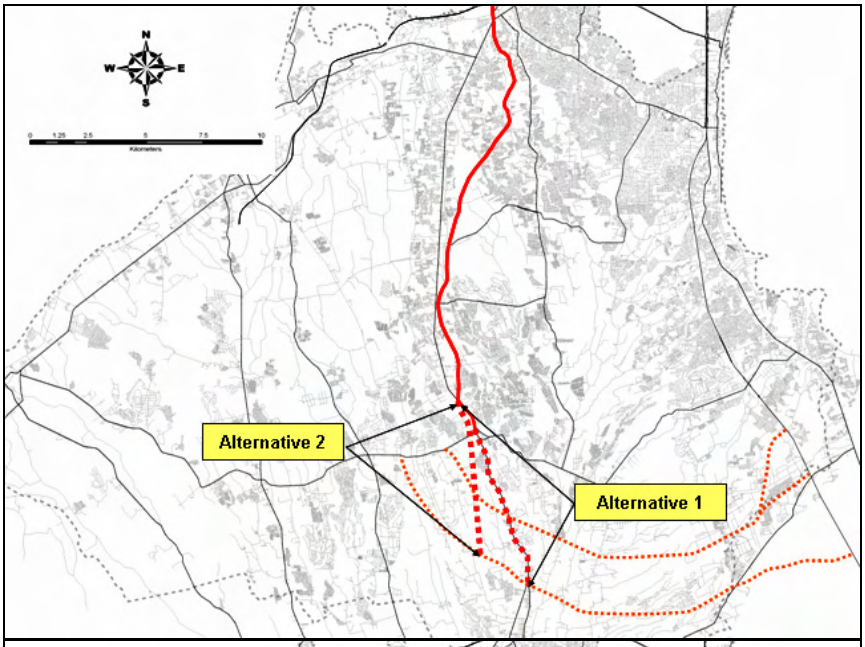
5.3 Alignment Considerations

Alignment Alternatives

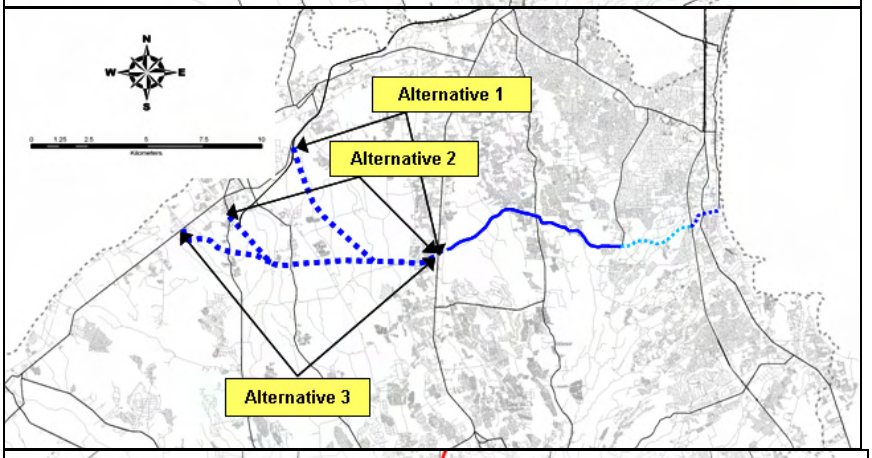
For each of the North-South Road (North-South 3 or C10 in previous sections), Daang Hari Road (East-West 1 or C04) and CALA Expressway (C03), some alternative routes can be considered as shown in Figure 5.3.1.

Figure 5.3.1 Alternative Alignment

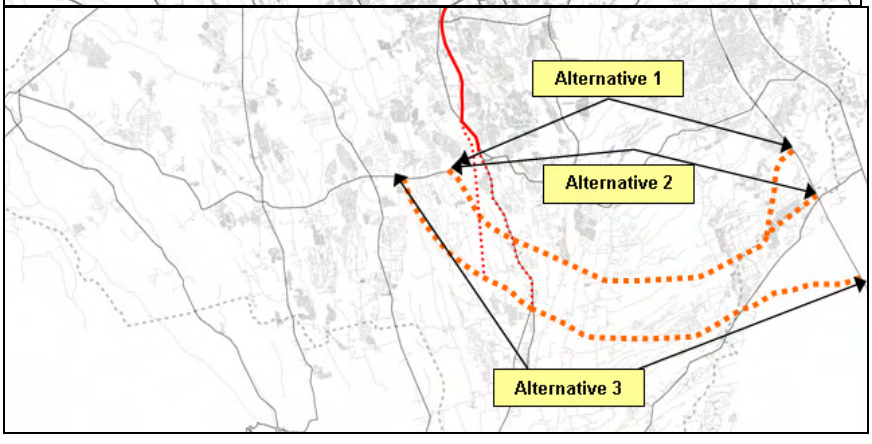
North-South Road



Daang Hari Road



CALA Expressway



Alternative Selection at Stakeholders' Meeting

Based on the discussion in the 4th Technical Working Group meeting held on 26 October 2005, a set of criteria was established to be used in the evaluation of the alternative alignments of the three target roads, as follows: (1) traffic and technical conditions, (2) regional development and (3) environmental and social consideration. In addition, it was decided further by the TWG that, to be consistent with the ongoing consensus building process among the stakeholders, selection of best alternative will be left with the concerned stakeholders.

The alternative alignments for the three target roads were evaluated and optimum alignments were selected during the 4th Stakeholders' Meeting held on 7 December 2005 in Cavite and 9 December 2005 in Laguna. The selected alignments are as follows: Alternative 2 for North–South Road, Alternative 3 for Daang Hari Road and Alternative 3 for CALA Expressway. In the beginning of the stakeholders' meeting, the evaluation criteria and evaluation weights assigned by the TWG were explained to and agreed by the participants of the stakeholders' meeting.

5.4 Selected Project Package for FS

Do-ability of Selected Target Roads

North-South Road. The DPWH, the provincial government of Cavite, the private sector, and potential lenders are of the consensus that the North-South road is of the highest priority – due to its high vehicular traffic and ease of construction. NDC as well as the World Bank are willing to finance this road section as a toll road project.

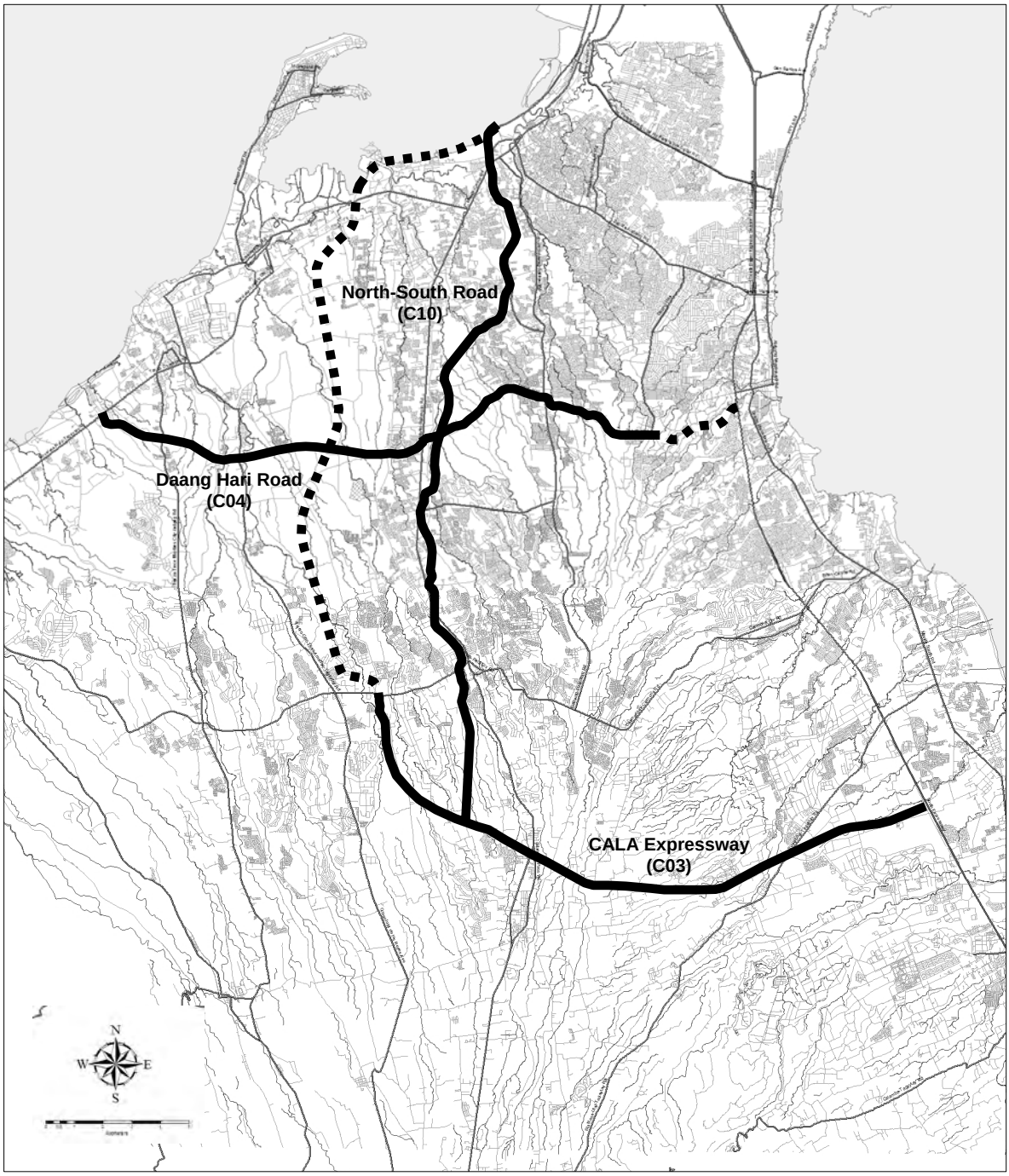
Daang Hari Road. PNCC and NDC have given the linkage of Daang Hari to SLEX its highest priority since it would: i) enhance traffic to SLEX; ii) entail minimal ROW problems during execution (most of the road passes the National Bilibid Prison (NBP) land) and iii) enables future connection to a bay coastal road (C-6 alignment) towards San Pedro, Laguna. The two SOEs have already taken steps (assess feasibility, prepare preliminary designs, conduct of parcellary surveys and initial negotiations with property owners) leading to financing and construction. Obstacles to securing a supplemental toll operating agreement from TRB is not anticipated, since the road falls under the existing franchise of PNCC.

CALA Expressway. The R-1 Extension from Zapote to Noveleta was supposed to start construction in 1998 and should have been operational by now. However, the project got stalled due to a number of factors: i) failure to complete ROW for phase 2 (link of R-1 to SLEX) which led to the latter's abandonment in 2004; ii) corporate squabbles among the project proponent which led to a change in ownership (from UEM-Mara to Coastal Road Corporation) and iii) failure to secure financing after more than three attempts. In October 2003, the IFC was reported to have approved a $70 million loan for the project but was withdrawn in March 2005. In August 2006, the proponent announced again that it has signed a P3.5 billion loan,

this time from 5 local banks. The repeated delays in the realization of the R-1 Extension have undermined the early viability of the southern sections of CALA Expressway and made the North-South tollway even more urgent.

As a result of the technical, economic and environmental analyses, coupled with a series of stakeholder consultations, the target road package for detailed Feasibility Study was arrived at, as illustrated in Figure 5.4.1.

Figure 5.4.1 Target Roads for JICA's Feasibility Study



6 ENGINEERING STUDIES

6.1 Introduction

It is proposed that the three priority project roads should have the basic structures as described in Table 6.1.1.

Table 6.1.1 Proposed Structure of Priority Projects

Road Name	Road Type	Road Length (km/h)	Designed Speed (km/h)	No. of Lanes	ROW (m)
North-South Road	Highway	27.8	60	6	30
Daang Hari Road	Highway	21.0	60	4	30
CALA Expressway	Expressway	22.7	100	6	50

Geotechnical investigation, aerial photography survey, topographic survey, hydrologic and hydraulic studies were conducted along the selected three routes for the preliminary design.

6.2 Proposed Geometric Design Criteria and Typical Cross Section for Project Roads

Table 6.2.1 shows the proposed geometric design criteria for project highways (main line) of North-South Road, Daang Hari Extension and CALA Expressway.

Table 6.2.1 Proposed Geometric Design Criteria for Highways

Design Speed	**60km/hr** NS Road Daang Hari Extension	**100 km/h** CALA Expressway
Horizontal Alignment		
Desirable Minimum Radius (m)	200	700
Minimum Radius (m)	150	460
Exceptional Minimum Radius (m)	120	380
Minimum Curve Length (m)	100	170
Minimum Transition Curve Length (m)	50	85
Minimum Radius allowed to omit a Transition Curve		
Desirable Minimum Radius (m)	1,000	3,000
Minimum Radius (m)	500	1,500
Vertical Alignment		
Maximum Grade (%)	5	3
Exceptional Maximum Grade (%)	8	6
Critical Lengths for Exceptional Grade (m)	6%: 500 7%: 400 8%: 300	4%: 700 5%: 500 6%: 400
Vertical Curve Radius		
Crest: Desirable Minimum (m)	2,000	10,000
Minimum (m)	1,400	6,500
Sag: Desirable Minimum (m)	1,500	4,500
Minimum (m)	1,000	3,000
Minimum Vertical Length (m)	50	85
Minimum Stopping Sight Distance (m)	75	160
Normal Crossfall (Cement Concrete Surfacing) (%)	2.50	2.50
Vertical Clearance (m)	5.10	5.10

Based on the proposed structure of projects, typical cross sections for the North-South Road, Daang Hari Road and CALA Expressway were proposed as shown in Figure 6.2.1, 6.2.2 and 6.2.3, respectively.

Figure 6.2.1 Typical Cross Section of North-South Road

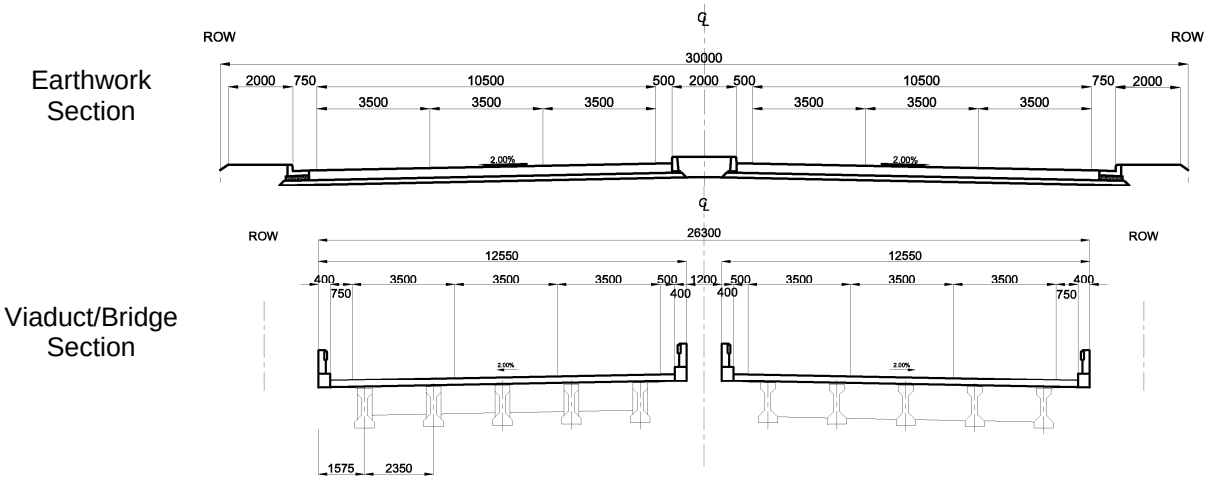


Figure 6.2.2 Proposed Typical Cross Section for Daang Hari Road

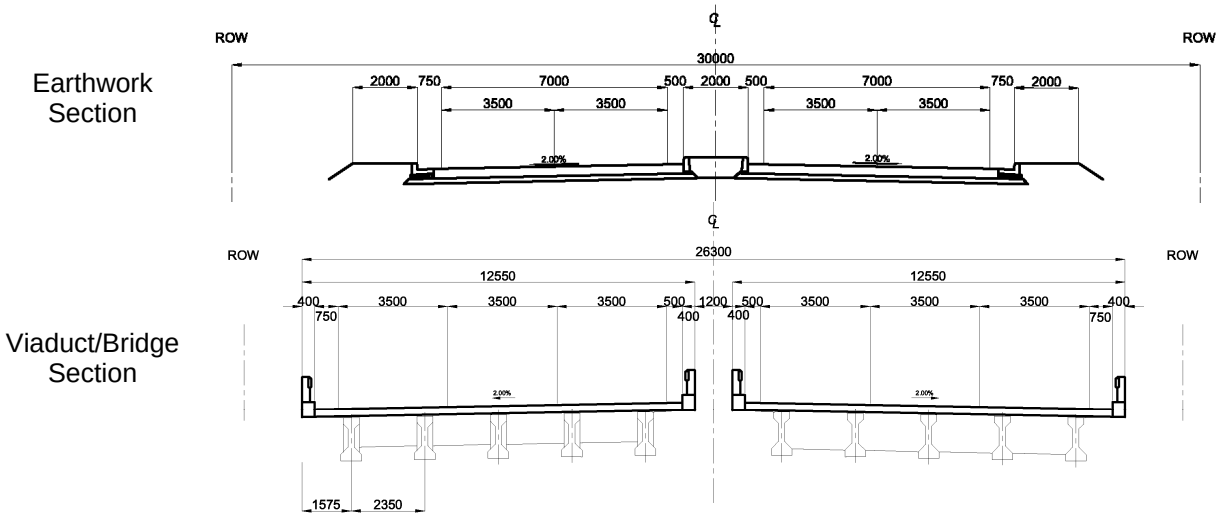
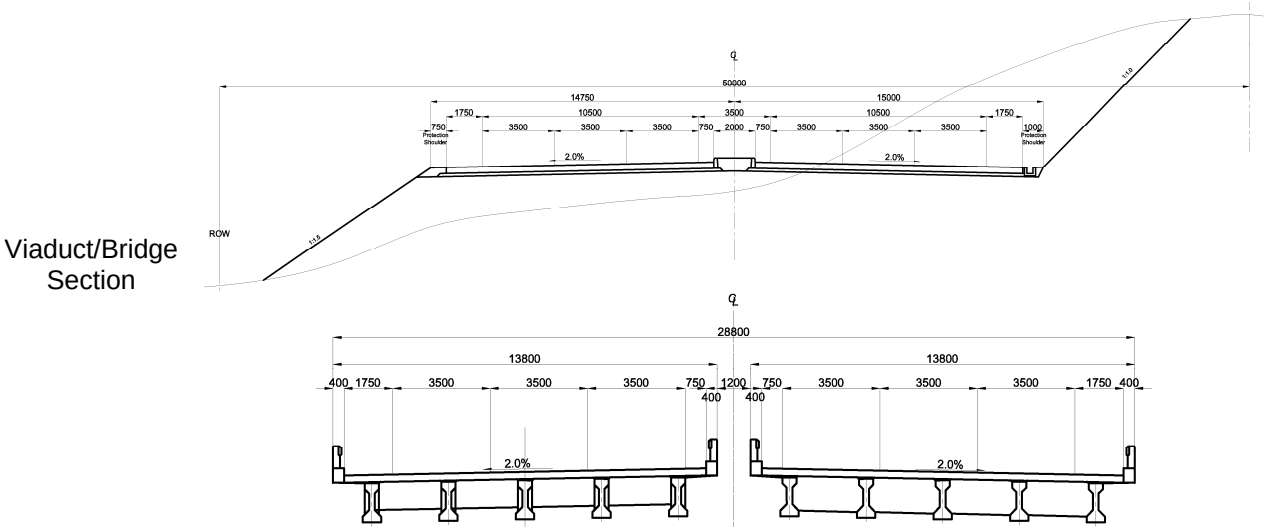


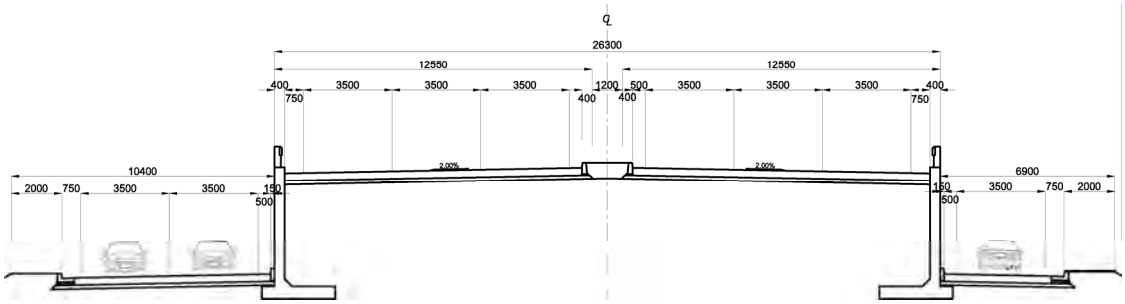
Figure 6.2.3 Typical Cross Section of CALA Expressway



6.3 Issues in Engineering Studies

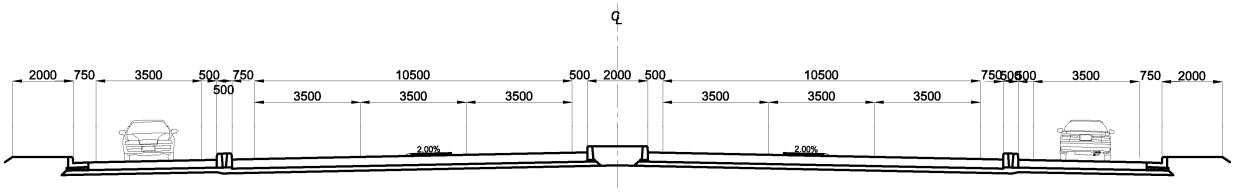
Flyovers and Intersections. The flyovers will be consisting of Pre-Stressed Concrete Deck Girder (PCDG) or Pre-Stressed Concrete Hollow Slab (PCHS) type of superstructure and approach roads on both sides of the flyover on embankment. The maximum gradient for the approach road is set at 4 percent and maximum height of approximately four meters. The vertical clearance of 5.1m is considered in crossing existing major roads. In case grade separation at intersections shall be required to access between the project road and existing major road, the provision of ramps and side roads shall be studied and designed. The configuration of the side roads will be determined by the expected traffic volumes and the availability of the road existing right-of-way.

Figure 6.3.1 Side Road Arrangement at Grade Separation Intersection



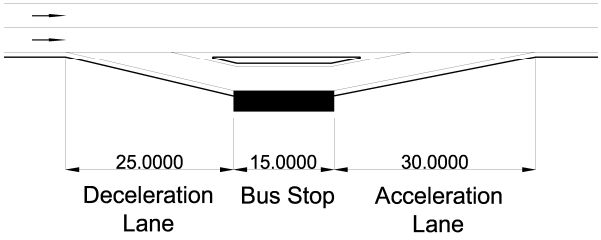
Service Roads. The NS1 and NS3 sections are proposed as a toll road. Hence, it is recommended to design these sections with full access control to ensure non-interrupted traffic flows. Along NS2 wherein it is partially controlled access, it would be essential to provide service roads for neighboring community traffic. For safety, the cross section of NS Road will be separated with service road with a 50 cm wide raised separator as illustrated in Figure 6.3.2.

Figure 6.3.2 Proposed Cross Section of NS Road with Service Road

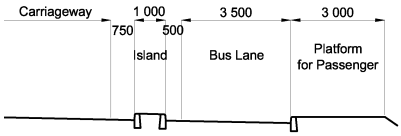


Bus Stops. In view of the high commuter traffic demand along the NS road, it is proposed to provide bus stops outside the main carriage way. For the bus stop on North-South Road, design values for roads in suburban area with 60 km/h design speed were applied. The proposed bus stop design for the project is as shown in Figure 6.3.3. The size of bus stop platform would be 15.00 m long, 3.00 m wide. It is recommended to apply the width of 3.50 m for the bus lane. The length of bus stop section would need approximately 70.00 m, including the 25.00 m deceleration lane and 30.00 m acceleration lane.

Figure 6.3.3 Proposed Bus Stop Arrangement



Layout Arrangement



Cross sectional Arrangement

The Feasibility Study on the Proposed Cavite Busway System by JICA proposed 13 bus stops. As much as possible, the location of bus stops on the North-South Road was adopted based on the identified Cavite Busway bus stop locations in view of easy access to the existing main road and neighboring communities.

Toll System. North South Road is to decongest traffic along the Aguinaldo Highway and to encourage the further regional development in the project area. Based on the traffic demand forecast, the immediate implementation of NS-1, NS-2 and NS-3 sections as a toll road is recommended.

The applicable toll collection system in these sections would be an open toll system having barrier type toll plazas on the main line. The toll plaza on main line could become a traffic bottleneck with long queue, if the toll plaza capacity is smaller than the road section's traffic capacity. Thus, careful consideration is required for the toll collection system and scale design of toll plaza, so as not to create bottleneck on the toll road.

The average toll payment transaction time for different type of toll collection system were obtained from Traffic Management Corporation, the operator of North Luzon Expressway (NLEX), and Citra Metro Manila Toll ways Corporation, the operator of Skyway and South Luzon Expressway (SLEX). Data of NLEX were derived from the measuring of actual transaction time at their toll gate sites, and that of SLEX were obtained during an interview with the person in charge of toll collection system. Table 6.3.1 shows the average transaction time for different type of toll collection system.

Table 6.3.1 Toll Transaction Time for the Study

Gate type	Transaction time (sec)	Transaction capacity (PCU/hour)
Dedicated ETC lane	4.5	800
Manual payment lane	12	300

Source: Study Team

Based on the case studies which aim to maintain the payment waiting queue length within reasonable level, the number of toll booths to be provided at a toll plaza was recommended as shown in Table 6.3.2 . This recommendation assumes that more than 80% of transaction will be made by ETC system.

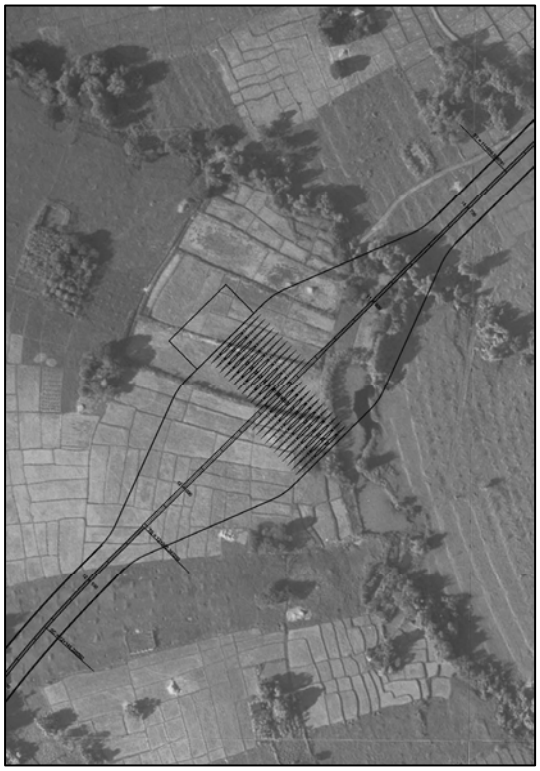
Table 6.3.2 Recommended Number of Toll Booths for North-South Road

Total	Manual Transaction Booth	ETC Booth
12	8	4

Based on the above study result, the toll plaza having 12 toll booths were proposed in NS-2 and NS-3 sections. Figure 6.3.4 shows the proposed layout of the two toll plazas.

Figure 6.3.4 Proposed Layout of North-South Road Toll Plaza

NS-2 Toll Plaza at STA. 4+580

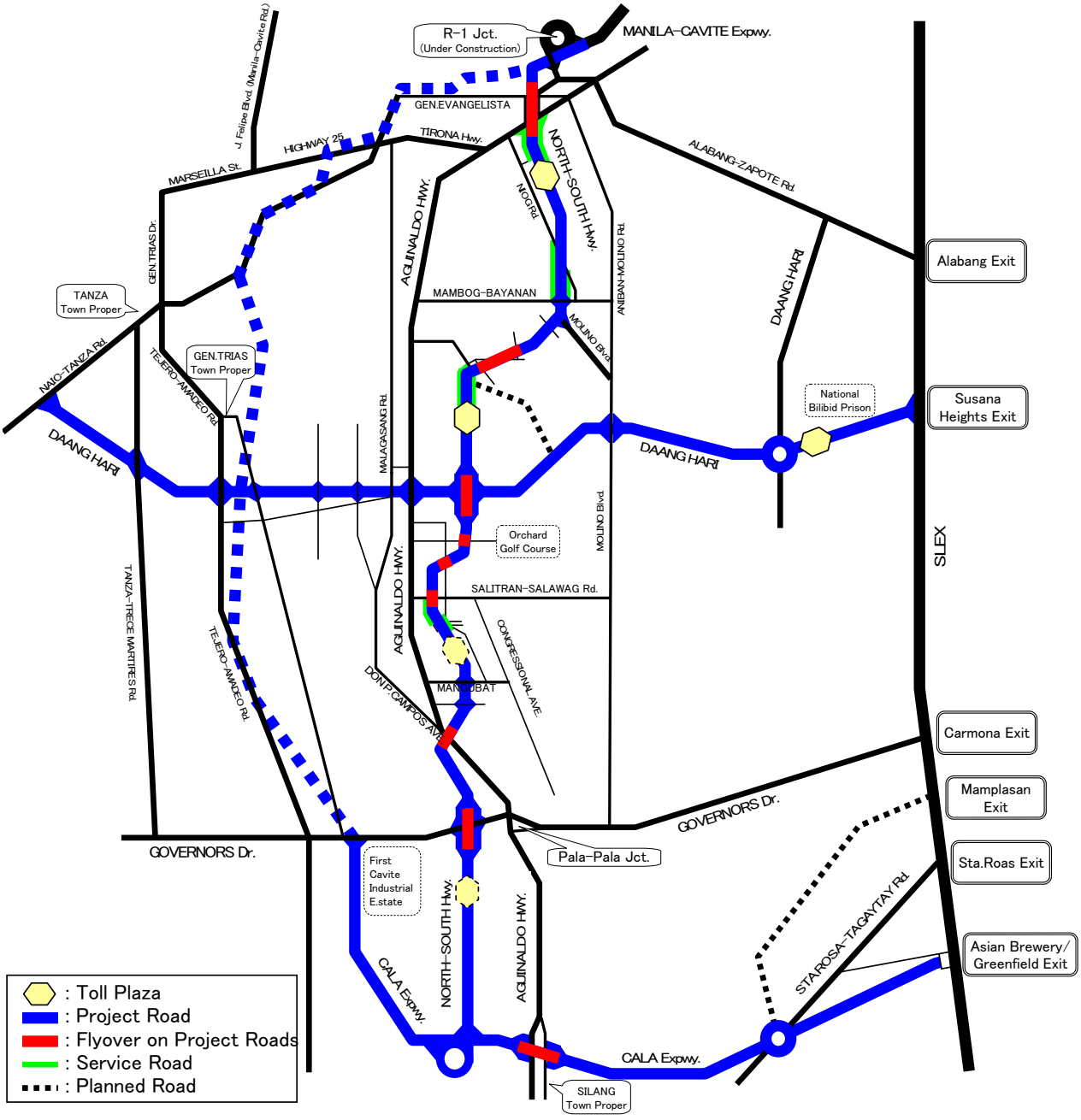


NS-3 Toll Plaza at STA. 11~900

6.4 Description of the Project Roads

Main features of the project roads and network of related existing roads are summarized in Figure 6.4.1.

Figure 6.4.1 Outline of the Project Road and Related Existing Road Network



North-South Road (NS)

The North-South Road (NS Road) will be linked with the existing Manila-Cavite Coastal Road and after running south, it will be connected with the proposed CALA Expressway (CE) at the southern end at Silang. Total length is 27.8 km, which is the longest among the proposed three routes. The design speed is established at 60 km/hr.

It shall cross over the fishpond area developed in Barangay Talaba II. In the next 8.0 km length, the NS Road will run in the most urbanized residential area among the proposed road section in the Study. The proposed alignment is located to pass by the Citta Italia Estate. In addition, several new subdivision housing developments is ongoing in the vicinity. NS Road is also expected to cross over several creeks.

The DPWH, as well as the concerned LGUs, are aware of the inundation problem along the coastal area where the population and industries are concentrated. The improvement of drainage system cannot catch up with the rapid land use changes that will cause acute rising of flood peak discharge and serious inundation. Comprehensive master plan for flood control of three principal rivers of Imus, San Juan and Canas is indispensable.

The NS road crosses the Daang Hari Road (DH Road) then crosses the Aguinaldo Highway where the elevation is approximately EL.100 m. Then, the NS runs almost in parallel with the Dasmariñas River, a tributary of the San Juan River system. It will cross near Bucal Bridge at Dasmariñas town proper. The shape of river is formed by steep slope with a height of 30 to 50 m from riverbed and risk of flood damage will be limited as long as the present land use is enforced.

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. The proposed design speed us 60km/hr, and the total length of DH is 21km.

Since the proposed alignment is located at lowland between EL.10m to EL.30m 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 15m to 25m of width.

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 km2 approximately.

CALA Expressway (CE)

The proposed CALA Expressway (CE) starts at the Asia Brewery Inc. / Greenfield interchange on South Luzon Expressway (SLEX) in Santa Rosa, Laguna, and will be connected with Governor’s 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/hr, horizontal and vertical curve radius shall be larger, as compared to the ones

of the other two routes whose design speed is 60 km/hr.

From the starting point, 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.300m. These rivers flow down to Laguna de Bay. The channel section is mostly covered by thick vegetation and forms moderately deep valley. The river bed is outcropped at many places and seems relatively stable against turbulence of flow. 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 300m in length. After crossing Aguinaldo Highway by flyover, the CE will cross over three rivers. After passing Ylang Ylang River, the alignment will run in the narrow strip between the Rio Grade and the Ylang Ylang Rivers.

6.5 Preliminary Construction Planning and Cost Estimate

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 6.5.1.

Table 6.5.1 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	-	-	-	-	-	-	-	-

Estimated Project Cost

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.

Table 6.5.2 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

Estimated Maintenance Cost

Routine Maintenance Cost. Routine maintenance cost was estimated based on external order rate of PMO-FS for feasibility study.

Table 6.5.3 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

Periodic Maintenance Cost**.** Periodic maintenance cost was estimated by applying unit cost of project cost estimate assuming external order.

Table 6.5.4 Estimated Periodic Maintenance Cost

Unit: Million Peso

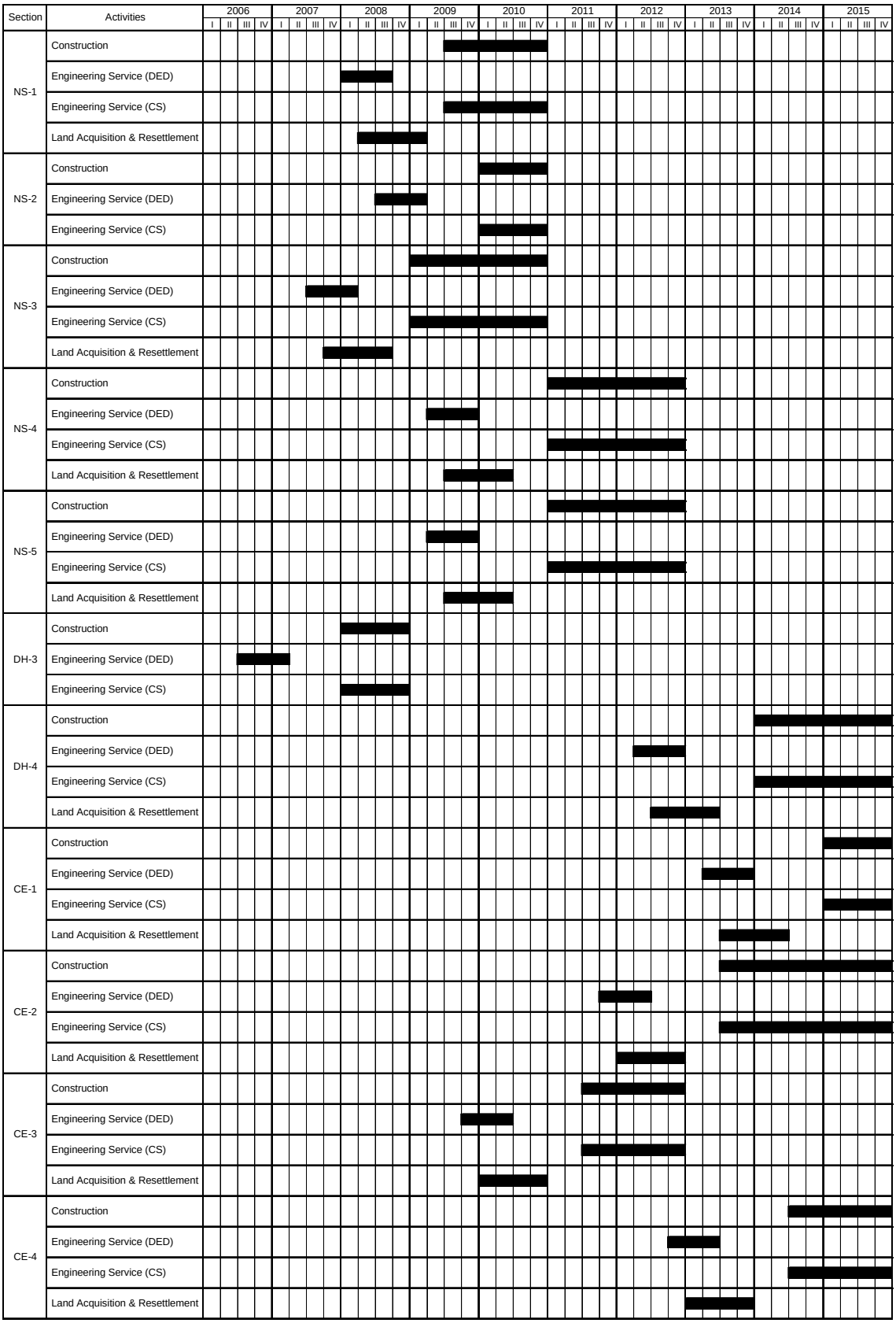
Item	NS-1	NS-2	NS-3	NS-4	NS-5	DH-3	DH-4	CE-1	CE-2	CE-3	CE-4	Total
Reconstruction of PCC Pavement (every 20 years)	56	110	152	181	188	126	219	155	285	81	187	1,740
Replacement of E-Pass Equipment[1)] (every 10 years)		74	74									128

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

Implementation Schedule

Implementation schedule was prepared by adjusting to the time of opening for each section in transport scenario and calculating the minimum period backward.

Figure 6.5.1 Project Implementation Schedule



7 DEMAND FORECAST AND ECONOMIC/FINANCIAL ANALYSIS OF PROJECT ROAD

7.1 Demand Forecast for Project Roads

Toll Setting. Prior to demand forecast, toll rate was determined for the tolled sections.

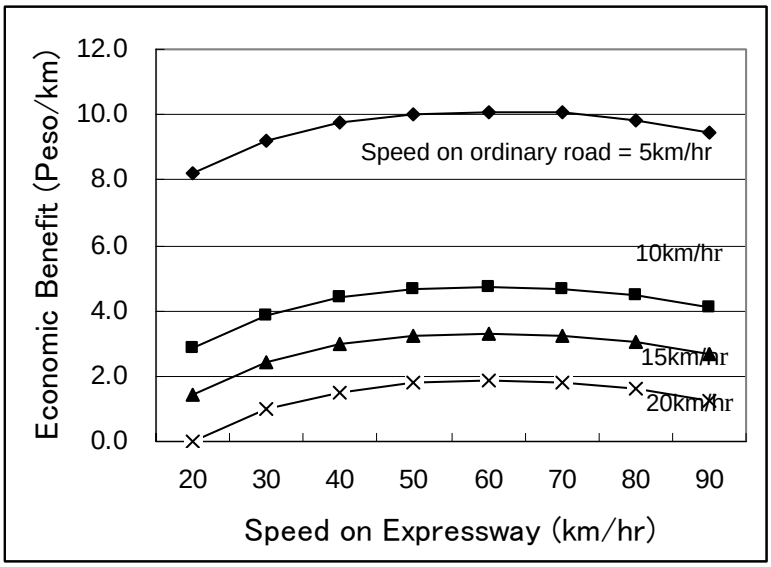
Table 7.1.1 shows the present toll rate in Manila and adjacent regions as of July 2006. SLEX and NLEX are the inter-regional expressways and adopting the same rate. The Manila-Cavite Coastal Road charges almost the same toll rate. These rates are usually comparable to the users' benefit.

Table 7.1.1 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

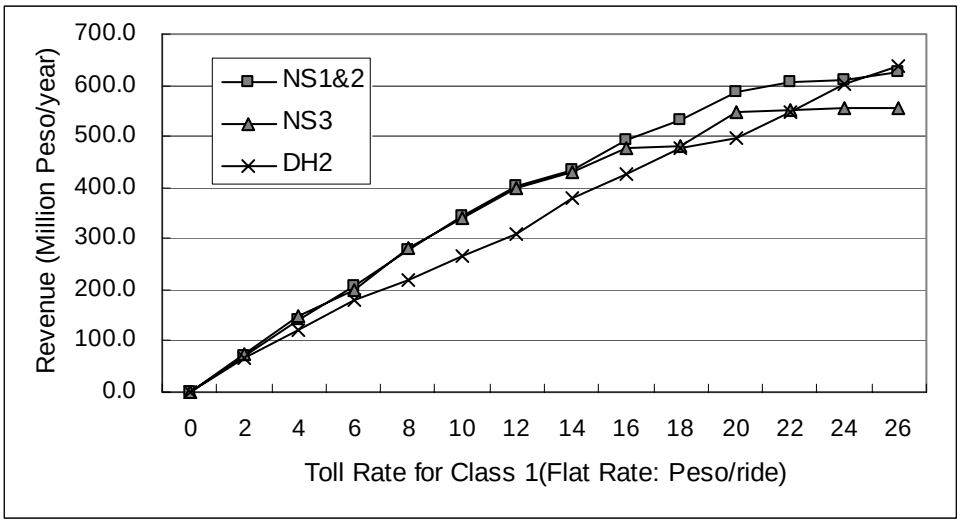
Figure 7.1.1 User's Benefit by Using Expressway



A Stated Preference Survey (SP Survey) was conducted in this Study to obtain data to estimate the expressway users' 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 driver and 27 pesos for a truck driver, as shown in Table 8.2.2, which seems rather low as compared with the current rate.

Figure 7.1.2 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.

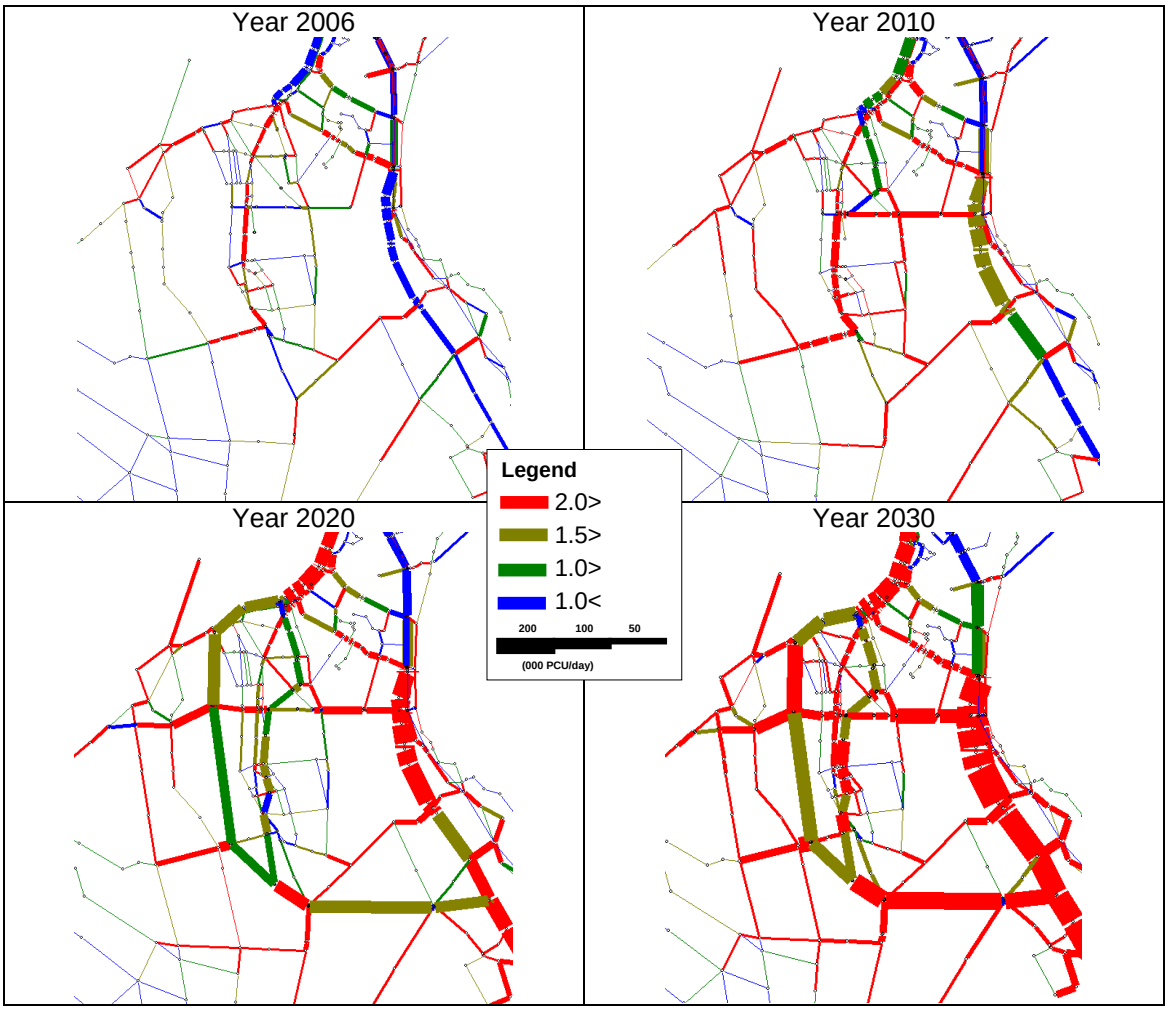
Figure 7.1.2 Relationship of Toll Revenue and Toll Rate



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.

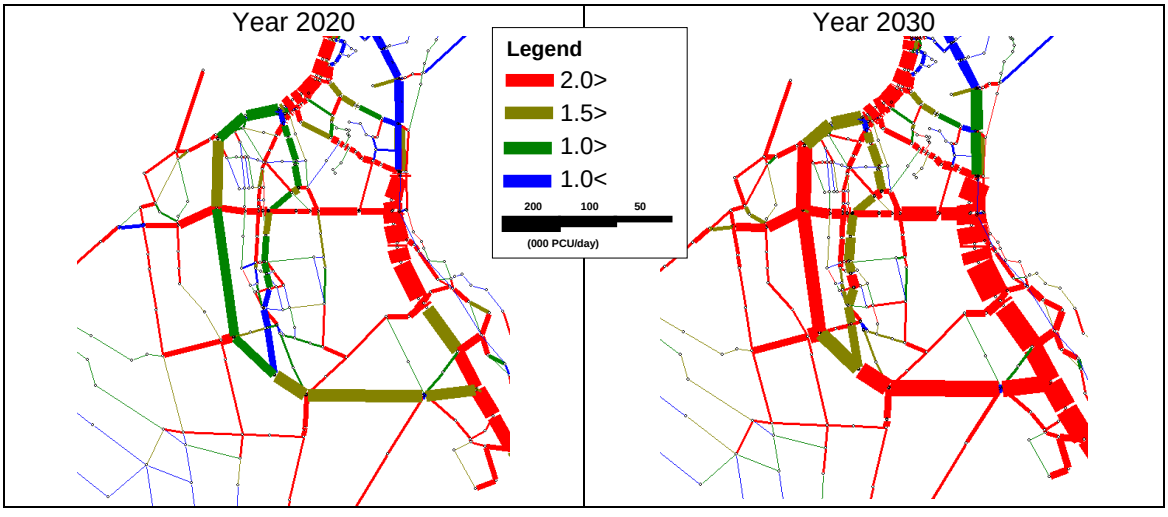
Base Case Forecast. In 2010 when NS-1, NS-2, NS-3, DH-2, and DH-3 are open for public service, these roads will play major roles in the arterial transport network of the region. However, the southern part of the study area will already be experiencing serious traffic congestion by 2010. In 2015, when all the target roads are expected to be completed, the problem will largely be alleviated. By 2020 and beyond, however, the situation will be serious again and other roads will become necessary. (Figure 7.1.3)

Figure 7.1.3 Traffic Distribution (Base Case)



Converting NS-4 and NS-5 to Toll Road (Optional). The base case explained above assumed that NS-4 and NS-5 were open public roads. Figure 7.1.4 shows the results. The traffic volume on NS-2, NS-3 and NS-4 will not change much while some traffic will be tolled off from NS-5. This is due to the fact that traffic capacity is absolutely lacking in the north of Governor's Drive.

Figure 7.1.4 Traffic Distribution (NS4 and NS5 tolled)



7.2 Economic Evaluation

Entire Projects. As shown in the cost-benefit cash flow of the projects (Table 7.2.1), 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 7.2.1 Economic Cash Flow of Entire Projects

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

(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%

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 be constructed at the same time, followed by NS-3. Projects NS-1 to NS-3 are presumably constructed as toll roads by some PPP scheme. As for NS-4 and NS-5, south of Daang Hari road, it is 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 7.2.2 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.

DH Group. Among DH-1 to DH-4, from east to west, DH-2 and DH-4 were evaluated based on the agreement during the 2nd Steering Committee Meeting and the results are shown in Table 7.2.3. Due to the same reason stated before, 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 CALA area, east-west roads are very limited and there is no feasible alternative route for Daang Hari road. Therefore, improvement of DH-2 and DH-4 has a huge demand and shows an excellent evaluation result.

Table 7.2.3 Evaluation of DH Group

Evaluation Indicator	Unit	DH-2		DH-4	
		Minus	Plus	Minus	Plus
E-IRR	%	-	-	66.4	66.7
NPV	P million	17,234.4	15,928.8	10,114.6	9,845.6
B/C	-	19.0	17.6	11.6	11.3

CE Group. The east-west corridor of CE-1 to CE-4 was evaluated as one package. As Table 7.2.4 shows, they are evaluated to be highly economical. 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 7.2.4 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

7.3 Financial Analysis

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.

Evaluation by Project IRR

For the base case, the financial project-IRRs were estimated as shown in Table 7.3.1. 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). 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 the absence of alternative routes.

Table 7.3.1 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

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 7.3.2 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

Equity F-IRR of SPC (Special Purpose Company)

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

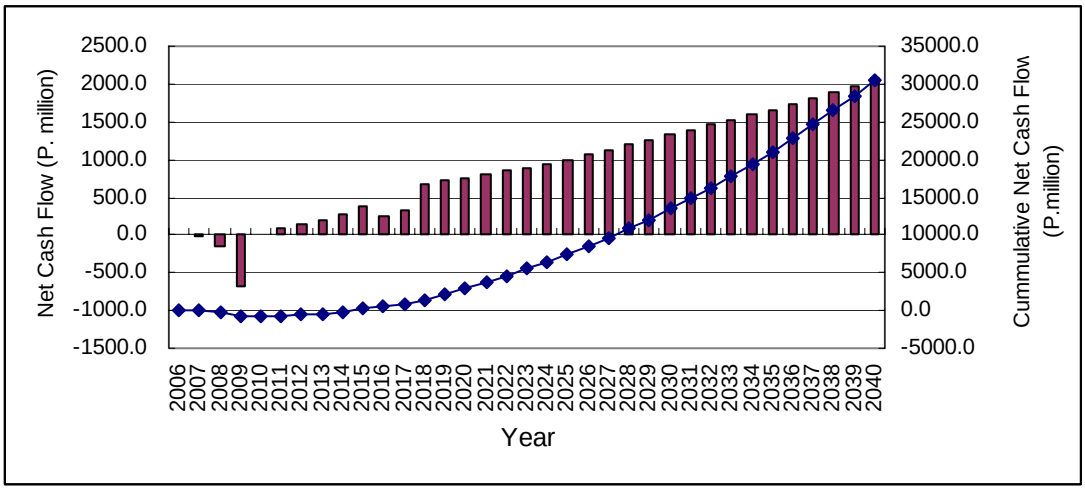
- Inflation Rate is 4.5%.
- Days in a Year is assumed to be 340 days, assuming half revenue on weekends.
- Corporate Income Tax is 35%.
- The debt to capital equity of the SPC is assumed to be 70:30.
- The capital will be paid-up when necessary, not in advance. The capital will be invested prior to the 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 7.3.1. The company will not suffer from a deficit even in the early stage

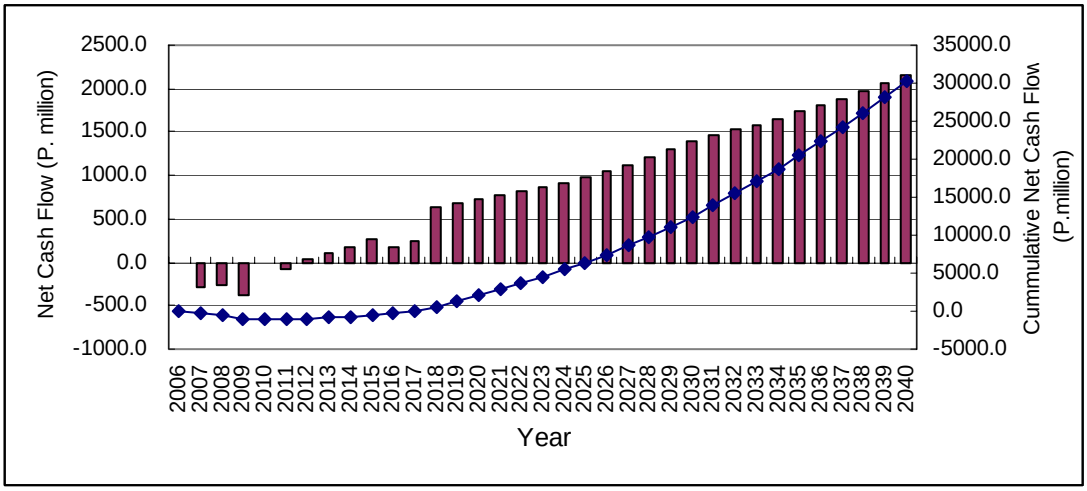
during repayment period, with no need of additional borrowing as a working capital. Both cases of NS-1&2 and NS-3 are quite similar. The cash flows were drawn at current price under 4.5% of inflation.

Figure 7.3.1 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 7.3.3). As the inflation rate becomes higher, the IRR will also increase 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 7.3.3 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

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 7.3.4 Profit Sharing among Stakeholders on Supply-side

Entity	NS-1&2		NS-3		NS-1,2&3	
	NPV (P.million)	%	NPV (P.million)	%	NPV (P.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

8 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

8.1 Initial Environmental Examination and Scoping for Selected Priority Projects

In the Study, legal process of the Philippine Environmental Impact Statement (EIS) system was executed for the project on 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).

The environmental impact items classified as A to C were examined under the EIA study based on the result of initial environmental examination (IEE) for the priority projects. In principle, the implementation of the whole study was conducted under the initiatives of DPWH as Philippine counterpart under technical support of the JICA study team. Part of the works was subcontracted by the JICA study team to local environmental consultants registered with the EMB-DENR.

8.2 Environmental and Social Considerations Study at EIA Level

Based on the results of environmental scoping, the environmental and social considerations study at EIA Level (EIA Study) has been conducted. The Environmental Baseline Survey, Social Survey and Environmental Impact Assessment Study, which were conducted by the local consultant teams respectively, have been completed.

The following steps and methods were taken for the EIA Study;

(1) Study on present environmental conditions
(2) Environmental impact forecasts and estimates
(3) Evaluation of environmental impacts on optimum route alignments
(4) Examination of environmental mitigation measures and social consideration measures
(5) Preparation of environmental management and monitoring plan (EMMP)
(6) Preparation of draft Environmental Impact Statement
(7) Preparation of Preliminary Resettlement Action Plan (Pre-RAP)

[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.

8.2.1 Results of the Environmental Baseline Study and Social Surveys

Information on present environmental conditions along and around the proposed project sites were collected as environmental baseline information to be utilized for examination of the conceivable environmental impacts. For the data collection, field measurement surveys for air quality, noise/vibration level, and surface water quality were conducted as well as field reconnaissance and secondary data collection.

Intentions and opinions related to the proposed projects were inquired from potential project-affected peoples through the social surveys; Perception Survey and Household Inventory Survey for Resettlement. The Perception Survey was conducted in 58 barangays[2] including the alternative alignments. 696 households, who would not be potential affected by the ROW acquisition, were sampled from the above barangays for the Perception Survey. On the other, the Household Inventory Survey for Resettlement was conducted for total 826 households from 23 barangays[3] where were located within the right-of-way (ROW) of the proposed alternative alignments and households directly affected by the ROW acquisition.

8.2.2 Impact Assessment and Mitigation/Enhancement Measures

The three road alignments of the proposed project will affect 58 barangays located in Cavite and Laguna provinces, and Muntinlupa City. The project impacts were classified into three major categories under the physical, biological and socio-economic environment modules. These were further classified according to the two phases of project development: pre-construction/construction, and operation and maintenance phases. The issues and impacts identified during the study were evaluated in terms of their nature, their duration (time-scale), areal extent, reversibility or permanency and cumulative effects. Collectively, these serve to establish the over-all degree or magnitude of the impact: significant, moderately significant, and non-significant.

(1) Impacts during Pre-Construction/Construction Phase

The major impacts during pre-construction and construction period range from moderately significant to significant. The detailed engineering, land clearing and earthmoving activities will modify remove the vegetation cover, alter the terrain, temporarily cause soil displacement and erosion that could result in the deterioration of river water quality and aquatic habitat alteration including the displacement of the already limited aquatic species. Local air/noise quality could also be affected. These impacts are deemed temporary and short-term and can be well minimized or mitigated by proper design based on detailed site investigations and construction management especially the timing of construction during dry

[2] 49 barangays in Cavite Province, 7 barangays in Laguna Province, and 2 barangays in Muntinlupa City of Metro Manila
[3] 23 barangays in Cavite Province, none both in Laguna Province and in Muntinlupa City of Metro Manila

period, close monitoring of unstable slopes and water quality, materials handling program for spoils and solid waste management including restoration and revegetation measures.

The negative socio-economic impacts will be significant and will last well beyond the construction period. Foremost among these impacts is the displacement and relocation of a total of 487 households residing in 28 barangays in six municipalities. Loss of crops properties will also be experienced. These can be mitigated though proper and timely compensation and relocation of affected families. A Resettlement Action Plan (RAP) to be prepared by the DPWH has to be implemented in coordination with the assistance of the respective LGUs, and concerned national government agencies such as the National Housing Authority (NHA), DENR, DAR and the Philippine National Police.

(2) Impacts during the Operation and Maintenance Phase

Road operation and maintenance will bring about increased air pollution and noise levels as more vehicles begin to use the new roadways. These can be mitigated by tree planting to be located at the center of and/or along the proposed roads, noise barriers to be installed at the specific locations with socially sensitive facilities along the proposed roads such as hospital and school, and flyover structure at the specific locations where the roads pass through or aside the lower-storey residential area to disperse air and noise to the sky as well as regular air and noise monitoring and strict implementation of speed limits.

Regional severance or movement interruption to be potentially caused by the proposed projects was examined as a social impact of the proposed projects. Specific sites and areas, where the proposed road may interrupt movement of people/vehicle from one to another sides along the proposed road by the proposed road traversing the sites, were identified by means of aerial photograph with proposed road alignment as well as field reconnaissance. Based on the identified locations of interruption, social impacts at the location were examined and measures to alleviate the impacts were proposed such as multi-level intersection and flyover.

The new roads will bring about improved access to public utilities/services, increase land values and provide increased economic opportunities and revenues for the LGUs. Enhancement of these positive impacts should include an Information, Education and Communication (IEC) campaign to enhance social acceptability and people's cooperation for the proper maintenance of the constructed roads.

8.2.3 Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan (EMMP) represents the key mitigation and enhancement measures for major impacts, which are translated into

concrete action programs/projects and defines the institutional framework and mechanisms for ensuring their appropriate implementation. It likewise provides the estimated investment requirements and commitments/guarantees to carry out the proposed plan. The EMMP is composed of the following components: (a) Design and Construction Management Program, (b) Social Development and Institutional Plans, and (c) Environmental Monitoring Plan.

8.2.4 Recommendations on EIS Implementation

The following shall be conducted to adequately implement the EIS after the JICA Study.

- In the preparation of the Environmental Management and Monitoring Plan (EMMP) in the Detailed Design (D/D) stage, new and/or supplementary baseline study for some environmental and social parameters, subject to the monitoring in both construction and operational stages of the project, would be necessary to conduct at the adequate locations based on detailed monitoring plan.
- The environmental and social impact mitigation/enhancement measures proposed in the EIS shall be confirmed if those are built in the detailed design, construction supervision management plan, and operational plan to secure the implementation of the proposed measures as well as responsible bodies for each measure.

8.3 Preliminary Resettlement Action Plan

8.3.1 Results of Household Inventory Survey for Resettlement

All potential households to be resettled with 826 households were inventoried along the all alternative alignments with 10 m width of buffer from both side edges of the proposed ROW. Direct interview of the households to be potentially relocated were conducted to collect socio-economic and livelihood information of the households including questions on perception of the project. Through the survey, survey control number to the housing units was assigned with marking the interviewed households on community spot map and taking photo record of the housing unit.

8.3.2 Preparation of the Preliminary Resettlement Action Plan

A preliminary Resettlement Action Plan (Pre-RAP) has been prepared by DPWH with technical support by the JICA Study Team in the Study. A comparative study of various alternative routes was undertaken in terms of land acquisition, number of households/structures to be affected, resettlement and other compensatory issues to determine the most viable, cost effective and acceptable option.

The Pre-RAP deals with only the selected routes/sections. While the principles and the resettlement entitlements have been stipulated in this Pre-RAP, the

compensation packages for the affected households/shops and enterprises, including budget, shall be revised based on further detailed planning. Identification of resettlement sites will likely be finalized at detailed design stage. However, the Pre-RAP considers the scope and needs and contain a very preliminary cost estimates for resettlement sites/services, including income/livelihood restoration.

DPWH will be in charge of the implementation of the project and the execution and coordination of land acquisition and resettlement. Environmental and Social Services Office of DPWH (ESSO) will provide technical guidance and support in the implementation of the RAP. The estimated cost for land acquisition and resettlement is P2,320 million.

RAP implementation shall be monitored both internally and externally. The Executive Agency (EA) and ESSO will be responsible for internal monitoring. ESSO will prepare quarterly reports and submit to the funding agencies. The reports will contain progress made in RAP implementation with particular attention to compliance with the principles and matrix set out in the RAP. Independent monitoring expert/agency will be hired by the EA with donor(s) concurrence. The EA shall prepare a post-construction evaluation report on the resettlement process and detail the extent to which the compensation paid and other measures have enabled PAPs to maintain or enhance their pre-project social and economic living conditions.

Due to the preliminary level of project planning and design, there are gaps and outstanding tasks that have to be addressed by DPWH after the feasibility study is complete. These include, among others, updating of the inventory of affected households and assets, inventory of affected businesses, identification of relocation sites and related implementation issues, income and livelihood restoration measures for vulnerable groups.

8.4 Consensus Building Process for Implementation of the Proposed Projects

The project took on several paths for building consensus among the various levels of identified stakeholders. These were in the following forms: (a) stakeholders' meetings; (b) barangay consultations and focus group discussions; (c) household interviews for both directly and indirectly affected households; (d) meetings with local government units' policy making body; (e) meetings with development councils and cluster groups on the municipal and regional levels.

(1) Stakeholders' Meetings

As designed, the project has a total of eight stakeholders' meeting scheduled for disseminating vital project findings and for soliciting timely reactions to project milestones. Among others, the meetings proved to be a valuable source of project inputs for directing study efforts. Participants to the meetings ranged from

governmental officials from local government units and national government agencies concerned as well as representatives from large property owners/developers, project affected parties (both directly and indirectly affected residents), business groups, and non-government organizations.

(2) LGU Consultations and Focus Group Discussions

An integral part of the consensus building activity of the project is the barangay consultations, which were conducted for all potential project-affected barangays along the proposed road alignments. Focus group discussions (FGDs) were held for all 58 affected barangays and these were attended by the barangay captains and councilors, project-affected persons including potential residents to be relocated by the proposed project, peoples organizations (PO), and Non-governmental organizations (NGO). In the barangay consultations, outline of the proposed project was explained by a DPWH officer and a local social expert hired by the JICA Study Team. At the same time, coordination for the social surveys was sought.

(3) Issuance of LGU and Development Councils Resolutions

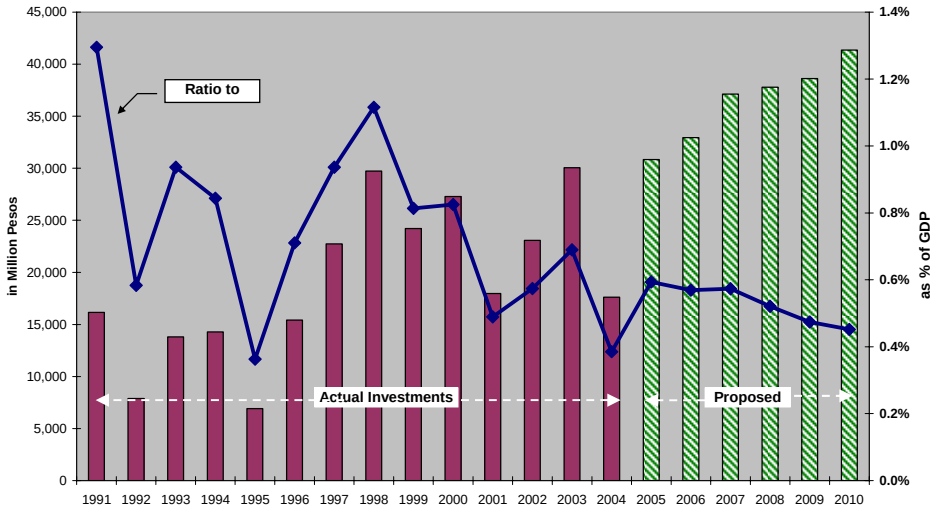
After the barangay consultations, concerned barangay offices were requested to issue resolution or endorsement for the project to indicate their acceptance of the proposed projects. With the endorsements from the barangays, municipal consultations were then held to discuss specific road projects for each municipal. In turn, their support was manifested in their signed resolutions submitted to DPWH. Higher up the institutional ladder are the provincial governments with their resolutions as well. This would complete the circle of consensus for the project from local governments for submission to DPWH as basis for project prioritization and for submission to EMB-DENR as proof of social acceptance of the project under the EIS system.

9 IMPLEMENTATION ARRANGEMENT

9.1 Financial Constraints and Opportunities

The national government, through the DPWH, has funded most public roads in the country. Thus, the fiscal constraints of the former determine what the latter can do. Figure 9.1.1 illustrates the level of investments on roads in the past 14 years and the prospects to year 2010. In terms of road investments as a ratio of GDP, the trend has been on a downward trend – from a peak of 1.3% in 1991 to 0.6% in 2005. This has forced a deferment in the implementation of many vital road projects; with new big-ticket projects (like the CALA target roads) unable to be accommodated earlier than 2008.

Figure 9.1.1 DPWH Historical and Prospective Investments in Roads



The LGUs showed increasing capacities since the passage in 1990 of the local government code, but their share in the funding of roads had remained minuscule. For 2005, the aggregate incomes of the provinces, cities and municipalities in CALA were placed at about ₱10 billion, of which ₱600 million were estimated to have been spent on local roads. Except for a few LGUs, they have no incentive to allocate substantially to the realization of the roads identified in this Study.

ODA sources to finance road projects are still available, but availments had slowed down due to the lack of counterpart peso funds.

Private-financed infrastructure offered promise from 1992 onwards. But after the 1997 Asian financial crisis, the outlook also dimmed – with three concluded toll road projects (Skyway, Star Expressway and R-1 Expressway) unable to get financing for their respective next phases.

To wriggle out of such a bleak prospect and to arrest the country's declining global competitiveness ranking, the government opted to tap the domestic bond market without exceeding the self-imposed limits on the national budget. The strategy called for the National Development Company to float bonds (to the tune of ₱20

billion/year) that would be channeled through the Philippine Infrastructure Corporation (PIC), which in turn, shall invest the proceeds into financially-viable infrastructure projects. A secondary benefit of such a strategy is to regain private sector confidence (which has been badly shaken by the NAIA 3 fiasco) in financing Philippine infrastructure. To be eligible for this new source of financing, as much of the CALA target roads as possible have to be transformed into toll roads. The JICA Study Team determined that NS-1 to NS-3 could be implemented under such a scheme.

This strategy of leveraging public and private resources caught the attention of the World Bank, to the extent of expressing willingness to finance both stages of the proposed North-South Expressway and to deploy a rapid technical assistance team that will jumpstart the project. Table 9.1.1 summarizes the financing mix.

Table 9.1.1 Financing Scheme for CALA Roads

Road Section	Base Scheme	Remarks
Stage 1 of North-South Road (NS-1, NS-2, and NS-3)	PPP Scheme: Existing Molino Blvd to be contributed by DPWH. Funding for ROW of NS-1 to be advanced by PIC. Private concessionaire to design, finance, and build the expressway and recoup its investments from toll fees. DPWH may have to absorb or repay cost of ROW.	DPWH shall tender the concession for Stage 1 of North-South Road in early 2007. While Detailed Engineering by winning bidder is proceeding, ROW acquisition shall start with bridge funding from PIC. Private sector funding for construction of roads and provision of toll equipment.
Stage 2 of North-South Road (NS-4 and NS-5)	PPP+ODA Scheme: IBRD financing for design and construction, under DPWH budget, to complement subsequent private sector financing via a toll concession.	Concession to be tendered, after completion of design and construction of 2-lanes. Funding from ODA+DPWH likely to be ahead of private sector.
Stage 3 of North-South Road (CE-1 and CE-2)	Conventional Scheme: ODA financing for design and construction, from JBIC, under DPWH program.	Private funding not likely, until after 2016. Tolling to start only if concessioned. Additional lanes and toll equipment for the account of private sector.
East-West (DH2)	PPP Scheme: Considered as part of PNCC franchise. NDC, with PIC and PNCC, to execute the project as a toll road - either part of, or separate from, the existing SLEX concession. Funding from local capital market.	No anticipated demands on DPWH budget, other than technical support to NDC/PIC.
East-West (DH3 and DH4)	Conventional Scheme: ODA financing for design and construction, from JBIC, under DPWH program.	DPWH to budget early funding for ROW, or arrange NDC advances.

9.2 Implementation Scenarios

The financing opportunities offered by PIC and IBRD create three implementation possibilities for DPWH and the CALA target roads. Differentiated as to timing, risks and probable outcomes, the three implementation scenarios are:

- Track A – tender the concession for North-South Road following the BOT Law and along the lines, but learning from the mistakes, of Star Expressway. The winning bidder shall then form a special project company (SPC) that will be granted a Toll Concession Agreement (TCA) by TRB, conduct detailed engineering, secure financing, build the roads, operate and maintain the toll roads for a prescribed period before turnover to government. Under this scheme, the participation of PIC is residual; the amount and form of its contribution shall come out of the bidding.
- Track B – same procedure as Track A, but without the participation of PIC. DPWH shall then fund the acquisition of right-of-way from its annual budget, and neither can the SPC expect supplementary funding from PIC.
- Track C – envisages a more aggressive role for PIC, who will immediately form an SPC that shall be granted a TCA and finance ROW acquisition concurrently with the conduct of detailed engineering. It will be followed by a privatization tender for the SPC together with its TCA.

Of the three, Track A and C offers the earliest possibility for completing NS-1 – about the 1st Q2011 - but with higher risk of delay for Track A. The best that could be expected from Track B is 4thQ2011, premised on overcoming two high-risk propositions: DPWH is able to finance and acquire ROW from its own budget in 2008, and concessionaire achieves financial closure on time.

Track C avoids most of the pitfalls that befell previous BOT/PSP projects in the Philippines, but relies for success on an entity bereft of track record in undertaking such a complex enterprise.

A common thread across the three scenarios is NEDA-ICC evaluation and approval. This may take 4 to 6 months - from preparation of documents by DPWH to final imprimatur from NEDA-ICC. However, tendering for North-South Road can be expected to commence only after the May 2007 elections.

9.3 Implementation Support

Regardless of implementation track, DPWH has to designate and constitute a Project Management unit under the PMO for foreign-assisted projects - with personnel drawn from the PMO pool. Some road segments or tasks may be assigned and executed by the District Engineering Office of the DPWH.

DPWH would also need outside technical assistance (possibly, to be provided by IBRD not later than January 2007) to achieve the following timetable for executing Stage 1 of North-South Road:

- 1st semester 2007 – preparation of bid and other supporting documents for NEDA-ICC evaluation;
- 2nd semester 2008 – prequalification, bid and award of concession

Learning from past toll roads, the concession agreement should contain the following features:

- A fixed toll fee, as determined from the feasibility study, but in no case higher than the highest toll rate prevailing in other expressways. This is meant to avoid the bad experience with Star Expressway.
- An endogenous concession period, instead of fixed at 25-years as in existing toll road concessions. In this manner, the concession period is shortened if traffic and revenues are higher than forecasted; or lengthened, if revenues get anemic.
- Rights to the implementation of NS2 and NS3 will have an expiry period, reckoned from the completion of NS1. In this manner, the conundrum that hit R-1, Star, and Skyway will be avoided.
- Costs of ROW, or part of it, shall be incorporated in the project cost to be covered by the toll fee. Start date of construction shall be reckoned from free possession of land, or completion of design, whichever is later.

The selection of the winning private bidder should be on the basis of minimum government exposure (from either NDC-PIC or DPWH) in the toll road venture. Aside from the cost of ROW, PIC may invest in the project company if so required by the winning bid. Financial capability shall be a key qualifying criterion. If no financing is secured within 3 months of completion of DE or after possession of ROW is conveyed, the PIC shall be granted the right to step in, invest, or takeover the project, in addition to cancellation of performance bond and surrender of the DE documents. The bidding consortium must include a design firm as one of its members, and the cost and schedule for DE shall be stipulated in the bid. The output shall become the property of DPWH in the event of failure to proceed to construction, with a waiver for its use by the successor toll concessionaire. Start date of construction will be reckoned from completion/approval of the detailed design by DPWH (rather than TRB).

An interlude is foreseen to occur between completion of this Study (September 2006) and start of implementation – during which time no one is actually accountable. While the BOT PMO of DPWH can be assumed to take charge, the non-toll roads would fall outside its radar screen. Therefore, appointment of a “Project Steward” is advisable. Aside from preserving all records left behind by the JICA Study Team, he should protect the agreed alignment and sign off more property developers.

10 CONCLUSION AND RECOMMENDATIONS

10.1 Conclusion

The road transportation network of Cavite and Laguna has failed to catch up with the region's rapid growth, thus resulting in increasing traffic congestion. Since this growth has been closely intertwined with Metro Manila, the congestion is more severe on roads that link the provinces to the national capital. This north-south pattern is likely to continue over the medium term – with congestion getting worse before it gets better.

Beyond the medium-term horizon, the high growth rate can be sustained (and influenced) by shifting the orientation of commuting trips inward and east-west, i.e., within the CALA region. Two new arterial roads need to be built over the next 10 years: (a) a North-South Road that connects with R-1 Expressway on the north, intersects Daang Hari midway and moves further south of Governor's Drive; (b) an east-west arterial anchored on extending Daang Hari eastward (labeled as DH-2) to connect to SLEX and westward (DH-4). Both arterials have been found to be economically and technically feasible – with EIRR exceeding 80% for stage 1 of the North-South Road, and 60% for DH-4.

In some short sections of the foregoing roads, the level of service had to be scaled down due to right-of-way constraints. These constraints may worsen, if implementation gets delayed further, thus the need to accelerate implementation and to reserve immediately the right-of-way of these future roads.

In order to realize the projects sooner, public sector resources need to be leveraged with private sector investments. The aggregate cost for all the road segments (NS + DH + CE) is ₱26.9 billion. Stage 1 of North-South Road is estimated to require ₱5.2 billion, and stage 2 another ₱8.7 billion. If dependent on DPWH resources only, completion would be delayed by 3 years, at least. The North-South Road can be built on a 'two-in-one' PPP model that combines public and private resources: Stage 1 relying principally on private funds and Stage 2 tapping ODA and public funds. The full cost of DH-2 is already being lined up for a BTO scheme by PIC and PNCC, and need not impinge on DPWH budget.

DH-3 and DH-4 is estimated to need ₱3.1 billion, and has to be put in the DPWH capital program beginning 2008. Right-of-way cost for North-South Road is ₱1.4 billion and ₱419 million for DH-3 and DH-4. The ROW cost can be reduced if private property developers can be persuaded to convey at book or acquisition value, if not donate for one peso.

The CALA Expressway also showed a high economic feasibility. Its E-IRR accounted for 34-35% for the four (4) sections of CE-1 to CE-4. If CE-5 and CE-6 are constructed as the extension of R-1 Expressway, the entire CALA Expressway will function as an alternative of SLEX, and its economic and social value will be enormous.

10.2 Recommendations

The Study Team recommends the following:

- Designation of a Project Steward within DPWH to keep the momentum going for the CALA target roads, and to bridge the gap between study completion and implementation;
- Decide on which of the three implementation tracks to pursue, and accordingly resolve the pending Memorandum of Understanding with NDC-PIC;
- Bid out stage 1 of North-South Road, on or before June 2007, and secure NEDA-ICC clearance before then;
- For the LGUs, to implement small-scale traffic improvement measures on existing corridors, in order to alleviate congestion while new roads are not yet completed;
- Tweak the existing public transport system - consisting of buses, jeepneys, and tricycles – to improve efficiency and slow down modal shift to car use in commuting trips;
- Conduct further study on the 2nd SLEX link of the CALA arterial roads (the eventual alignment of CE-1), since consensus among stakeholders has so far been elusive.