Department of Public Works and Highways (DPWH)
Under Technical Assistance from Japan International Cooperation Agency (JICA)

Cavite-Laguna (CALA) East-West National Road Project

ENVIRONMENTAL IMPACT STATEMENT

October 2006

Table of Contents

ACRONYMS

ADB	-	Asian Development Bank
BHS	-	Barangay Health Station
BOD	-	Biological Oxygen Demand
BOT	-	Biold Operate Transfer
BRS	-	Bureau of Research and Standards
BSWM	-	Bureau of Soils and Water Management
CAA	-	Clean Air Act
CALA	-	CAVITE-LAGUNA
CDF	-	Countrywide Development Fund
CE		CALA Expresway
CGC	-	Complaint and Grievance Committee
CL	-	Cavite-Laguna
CLUP	-	Comprehensive Land Use Plans
COD	-	Chemical Oxygen Demand
CPR	-	Concrete Pavement Maintenance, Restoration
DENR	-	Department of Environment and Natural Resources
DH		Daang Hari
DIA	-	Direct Impact Area
DO	-	Dissolved Oxygen
DPWH	-	Department of Public Works and Highways
ECC	-	Environmental Compliance Certificate
EGF	-	Environmental Guarantee Fund
EIA	-	Environmental Impact Assessment
EIS	-	Environmental Impact Statement
EMF	-	Environmental Monitoring Fund
EMMP	-	Environmental Management and Monitoring Plan
ENRCI	-	ENR Consultants, Inc.
ESA	-	Environmental Study Area
EVF	-	East Valley Fault
EW	-	East-West
FGD	-	Focus Group Discussions
FS	-	Feasibility Study
GDP	-	Gross Domestic Product
GOP	-	Government of the Philippines
HHs	-	Households
IEC	-	Information, Education and Communication
IIA	-	Indirect Impact Area
IRR	-	Internal Rate of Return
JICA	-	Japan International Cooperation Agency
LARP	-	Land Acquisition and Resettlement Program
LARR	-	Land Acquisition and Resettlement Rehabilitation
LGUs	-	Local Government Units
lps	-	liters per second
LTI	-	Lichel Technologies Inc.
MAF	-	Mean Annual Flood
mbgs	-	meters below ground surface
MERALCO	-	Manila Electric Company
MGB	-	Mines and Geo-Sciences Bureau
MMUTIS	-	Metro Manila Urban Transportation Integration Study

MRF	-	Material Recovery Facility
MTDP	-	Medium Term Development Plan
MWSS	-	Metropolitan Waterworks and Sewerage System
NAAQG	-	National Ambient Air Quality Guidelines
NAIA	-	Ninoy Aquino International Airport
NCR	-	National Capital Region
NEDA-ICC		Investment Coordination Committee, National Economic and Development Authority
NDC	-	National Development Company
NHA	-	National Housing Authority
NIPAS	-	National Integrated Protected Areas System
NS	-	North-South
NSO	-	National Statistical Office
NTP	-	Notice to Proceed
ODA	-	Official Development Assistance
PAFs	-	Project Affected Families
PAGASA	-	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAPs	-	Project Affected People/Persons
Pb	-	Heavy Metal - Lead
PHIVOLCS	-	Philippine Institute of Volcanology and Seismology
PIC	-	Philippine Infrastructure Corporation
PMO	-	Project Management Office
PNCC	-	Philippine National Construction Corporation
PSP	-	Private Sector Participation
QAL	-	Quaternary Alluvium
QVP	-	Quaternary Volcanic Pyroclastics
RAP	-	Resettlement Action Plan
RFFA	-	Regional Flood Frequency Analysis
RHU	-	Rural Health Unit
RIA	-	Regional Impact Area
ROW	-	Right of Way
SDP	-	Social Development Program
SEP	-	Socio-Economic Profile
SIA	-	Secondary Impact Area
SLEX	-	South Luzon Expressway
SPC	-	Special Purpose Company
SOE	-	State-owned Enterprise
TOR	-	Terms of Reference
TCA	-	Toll Concession Agreement
TRB	-	Toll Regulatory Board
TSP	-	Total Suspended Particulates
TSS	-	Total Suspended Solids
UDHA	-	Urban Development and Housing Act
UNESCO	-	United Nations Educational, Scientific and Cultural Organisation
USDA	-	United States Department of Agriclture
VFS	-	Valley Fault System
WB	-	World Bank
WVF	-	West Valley Fault

EXECUTIVE SUMMARY

1.1 PROJECT BACKGROUND AND RATIONALE

The **CAVITE-LAGUNA (CALA) East-West National Road Project** is a priority project of the Department of Public Works and Highways Region IV-A. It evolved from the recommendation of two earlier conducted studies: Metro Manila Urban Transportation Integration Study (MMUTIS) and CALA Transport Strategy and Short-term Programs and Policies (a component of the Cavite-Laguna Urban Development and Environmental Management Project of the World Bank).

The primary objective of the project is to establish a road network and extend/widen existing roads in the CALA area to help decongest the traffic situation in the metropolitan area (Metro Manila) and further promote development in Cavite and Laguna.

1.2 EIA APPROACH AND METHODOLOGY

The EIA was undertaken to examine the likely impacts of the proposed road project, provide important inputs in the detailed planning and design of the project and to comply with the requirements of the Philippine EIS System. The study covered the following modules:

- Geology
- Soils
- Land Use
- Meteorology and Air/Noise Quality
- Hydrology
- River Water Quality
- Aquatic Ecology
- Terrestrial Ecology
- Socio Economics

This environmental impact assessment represents the work of two companies, namely: Lichel Technologies Inc. (LTI) and ENR Consultants, Inc. (ENRCI), under the technical assistance of the JICA Study Team for the Feasibility Study and Implementation Support on the CALA East-West National Road Project through the Development Study scheme funded by Japan International Cooperation Agency (JICA).

The baseline survey on the physicochemical aspects of the area and the conduct of the socio economic surveys were performed by LTI. The analysis of the data gathered by LTI in relation to the proposed project and the preparation of the environmental impact statement assessment (EIS) was performed by ENRCI.

1.3 THE EIA TEAM

The ENRCI EIA team is composed of the following technical experts/specialists:

- Reynar R. Rollan – Team Leader/Geologist

- Dr. Roger M. Lopez – Socio-Anthropologist
- Marcelo R. Caleda – Terrestrial Ecologist
- Jethro C. Hipe – Air/Noise Quality Specialist

The rest of the technical experts specialist came from the LTI

2.0 PROJECT DESCRIPTION

The **CAVITE-LAGUNA East-West National Road Project** will cover three main road sections namely the East-West Road (Daang Hari Extension); North-South Road (Bacoor-Dasmariñas); and the CALA Expressway and include a corresponding resettlement plan.

As shown in Figure ES-1, the final routes of the CALA East-West project will cover three main road sections. These are the: East-West/Daang Hari Road (Daang Hari Extension); North-South Road (Bacoor-Dasmariñas); and the CALA Expressway.

The East-West Road will include the Daang-Hari Extension, the existing Daang Hari Road and the proposed toll road from the South Luzon Expressway, which will pass through the New Bilibid Prison compound. It will pass through Bacoor, General Trias, Imus, Tanza, and part of Muntinlupa City and will collectively have a length of 24.2 km.

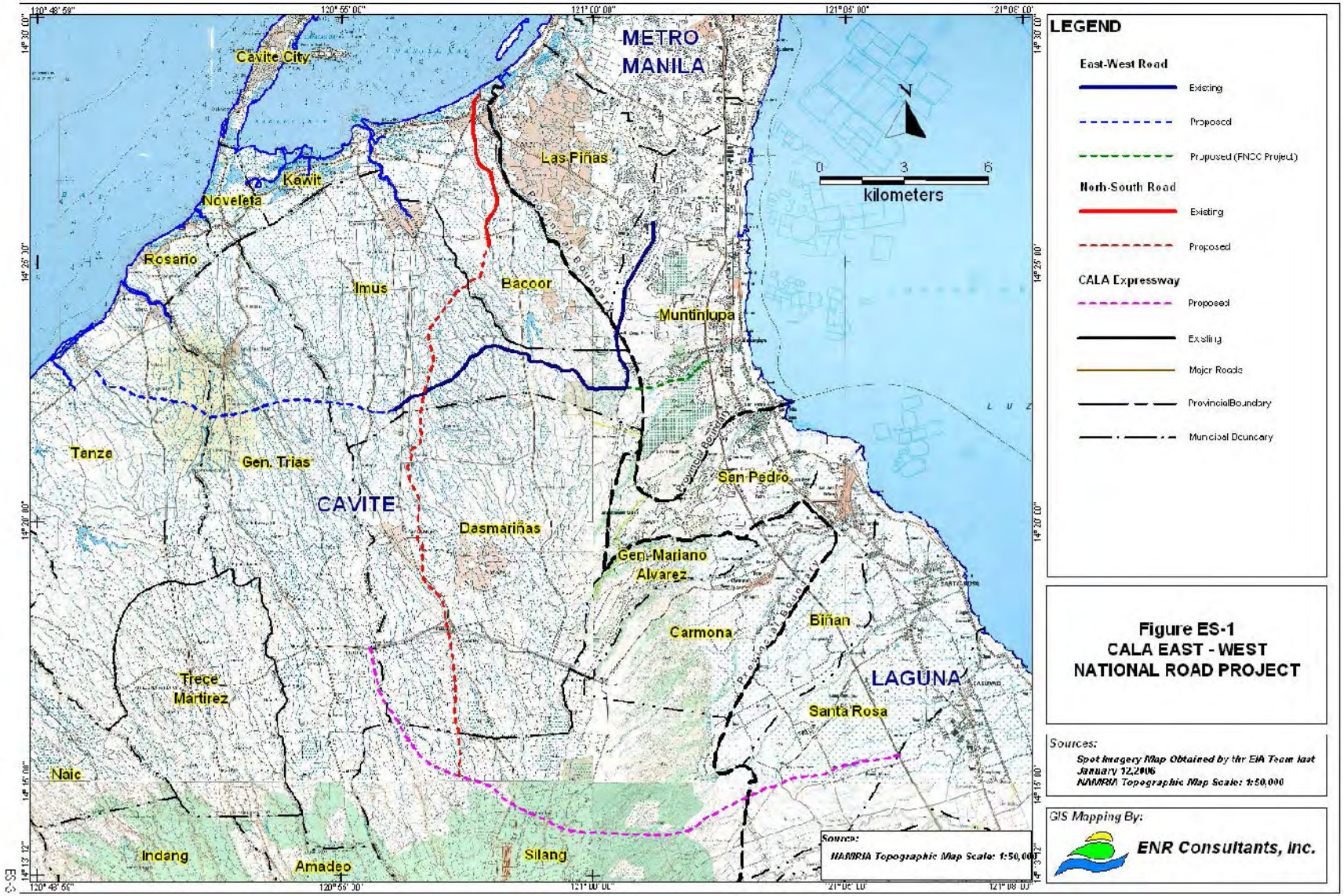
The Daang Hari Extension will connect the Aguinaldo Highway and the Noveleta-Naic-Tagaytay Highway. The final alternative route, ALT-1C, will span 11.4 km, involve 15 major river/creek crossings and will pass through 19 barangays. It will have a right of way (ROW) width of 30 m, which will include a four-lane concrete road with a design speed of 60 km/h.

The existing Daang Hari Road has a length of 9.2 km. Widening along this segment is on going under an existing DPWH project. This segment though is considered part of the East–West Road.

A toll operated road with a length of 3.2 km will also be constructed from through the NBP area in Muntinlupa to the Susana Heights area of the South Luzon Expressway (SLEX).

The North-South road will pass through the municipalities of Bacoor, Dasmariñas, Imus, and Silang. The preferred alternative route, ALT-1B will have a length of about 27.8 km, include 10 major river/creek crossings and four Flyover/Viaducts and will pass through 27 barangays. One of the flyovers/viaducts will be connecting the Manila-Cavite Expressway with the Molino Boulevard. Another flyover/viaduct will be adjacent with the Cavite-Batangas Road (location is after the intersection of the Daang-Hari and Cavite-Batangas Road). A flyover/viaduct will also be put up in the segment where the Cavite-Batangas Road intersects with the North-South Road. The last will be constructed in the intersection of Dasmariñas-Naic Road and the North-South Road.

The North South Road also has a 30-m ROW width, which will have six concreted lanes with a design speed of 60 km/h. Considered part of the project is the widening of the existing Aguinaldo Highway from Dasmariñas to Silang. The widening will involve an expansion at the western side of the said road.


METRO MANILA
Cavite City
Kawit
Noveleta
Rosario
Las Piñas
Imus
Bacoor
Muntinlupa
Tanza
Gen. Trias
CAVITE
San Pedro
Dasmariñas
Gen. Mariano Alvarez
Carmona
Biñan
LAGUNA
Santa Rosa
Trece Martirez
Naic
Indang
Amadeo
Silang
N
0 3 6
kilometers
LEGEND
East-West Road
Existing
Proposed
Proposed (PNCC Project)
North-South Road
Existing
Proposed
CALA Expressway
Proposed
Existing
Major Roads
ProvincialBoundary
Muncipal Boundary
Figure ES-1
CALA EAST - WEST
NATIONAL ROAD PROJECT
Sources:
Spot Imagery Map Obtained by the EIA Team last January 12,2006
NAMRIA Topographic Map Scale: 1:50,000
GIS Mapping By:
ENR Consultants, Inc.
Source:
NAMRIA Topographic Map Scale: 1:50,000

The CALA Expressway will pass though Dasmariñas, General Trias, and Silang in Cavite and at Biñan and Sta. Rosa in Laguna. The final alternative route, ALT-2, is approximately 22.7 km long, will include 13 major river/creek crossings and two flyover/viaducts. One of the flyover/viaduct will be built at the intersection of the CALA expressway and the Silang By-pass Road and the other will be constructed at the intersection of the CALA expressway and Sta. Rosa-Ulat-Tagaytay Road. Twenty-one barangays in Cavite and seven barangays in Laguna will be affected once the construction of the Expressway commences.

The CALA Expressway will have a 50-m ROW width, which will contain six concreted lanes with a design speed of 100 km/h.

2.1 Project Activities

The implementation of the CALA road project will go through the Pre-Construction, Construction, Operation and Maintenance and Abandonment phases.

The Pre-Construction phase shall correspond to the Feasibility Study (FS) and the detailed design phase.

The Construction phase shall be implemented in accordance with the following sequence: East-West, North-South, and the CALA Expressway.

The operation and maintenance of the CALA project will be the responsibility of the DPWH. However, the toll operated road from SLEX to a segment of Daang Hari Road will be handled by PNCC.

DPWH will turn over the project to the LGU's of Cavite and Laguna during the abandonment phase except for the Toll operated road by PNCC.

3.0 BASELINE ENVIRONMENTAL CONDITIONS

Figure ES-2 shows the environmental study area, which includes the direct impact area (DIA) and the indirect impact area (IIA). The DIA covers the area within 500 m from the centerline to both sides of the North South Road, East West Road – Daang Hari Extension, the CALA Expressway and the Toll Road from SLEX to Muntinlupa.

The IIA refers to the barangays and towns where the various segments of the proposed road alignments will pass through. The East-West Road alignment will cover 19 barangays: two in Bacoor; four in Gen. Trias; six in Imus; five in Tanza; and two in Muntinlupa City.

The North-South Road will go through 27 barangays: three in Silang; three in Imus; nine in Dasmariñas; and 12 in Bacoor.

The CALA Expressway on the other hand will cover 21 barangays in Cavite (4 in Dasmariñas, 4 in Gen. Trias, and 13 in Silang) and 7 barangays in Laguna (4 in Biñan and 3 in Sta. Rosa).

The baseline environmental setting was described in terms of the physical, biological, and socio economic aspects.

3.1 Physical Environment

The physical environment of the project area is described in terms of geologic and topographic setting, soils and land use, air and groundwater conditions.

The Cavite Laguna area is located within a volcanic region in Southwest Luzon Uplands, which is bounded by three major offshore and two major onshore structures. The offshore structures include the eastward-dipping Manila trench on the west, the westward-dipping east Luzon trench along the east and the active Lubang Fault to the southwest. On shore structures include the West Marikina Valley Fault System to the east and the 1,300 km long Philippine Fault farther east.

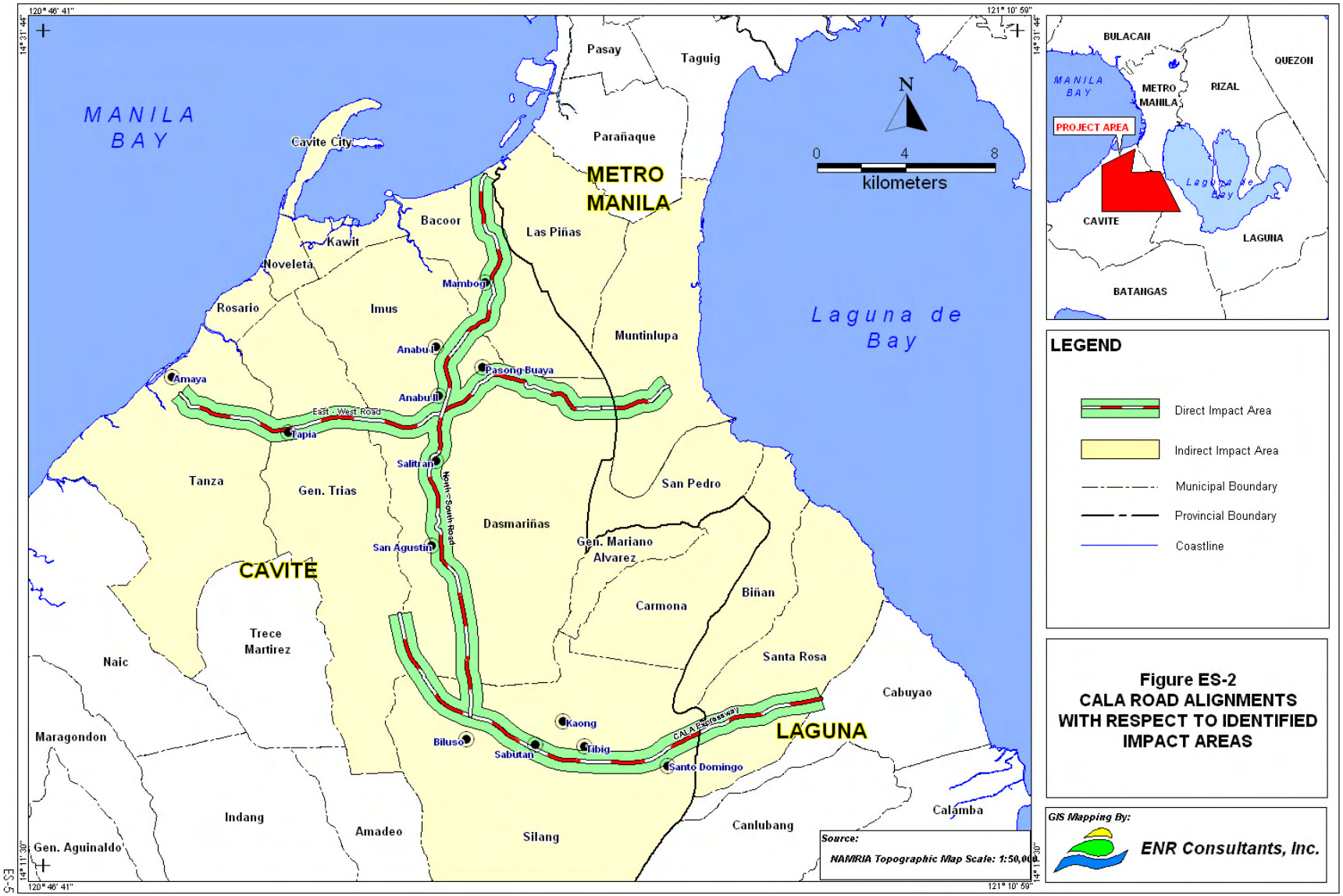
The project area is characterized by a gently sloping terrain, which grades towards Manila Bay and dissected by a sub parallel network of streams emanating from the northern edge of the Tagaytay highlands. It is bounded to the east by the Laguna de Bay and to the south by the Tagaytay escarpment and farther south by Taal Lake. The principal rivers, which will be traversed by the proposed project, include the Ylang-Ylang, Rio Grande, Imus and Cañas.

The underlying geologic materials include weathered pyroclastics, which have adequate capacity to support the proposed road structures. The project area is subjected to the natural processes of erosion, siltation, mass movement, flooding, volcanic and seismic related hazards. With the exception of ground shaking generated by the seismic activities of the major geologic structures in the region, most of these processes are local and do not significantly affect the project area. The only portion of the project area susceptible to tidal flooding is the segment from Kawit to Las Piñas where the North–South Road originates.

Groundwater along the proposed routes of the proposed project occurs within the depth range of 60 m to 80 m and will therefore be unaffected by the activities related to construction and operation.

The overlying soils represent the weathering products of these volcanic materials and serve as the medium upon, which the vegetation and other land use components of the area are set. Traditionally, both Cavite and Laguna are predominantly agricultural provinces. Major crops include rice, corn, vegetable, fruits, root crops, coffee and coconut. Most of the areas originally utilized for agricultural purposes have been converted to or planned to be changed to agro-industrial or residential areas.

Cavite and Laguna Provinces belongs to Type I climate under the modified Coronas Climate Classification. This type is characterized by two pronounced seasons, dry from November to April and wet during the rest of the year. Heavy rainfall occurs between June and September.


MANILA BAY
Cavite City
Pasay
Taguig
Parañaque
METRO MANILA
Las Piñas
Bacoor
Kawit
Noveleta
Rosario
Imus
Mambog
Anabu I
Anabu II
Pasong Buaya
Amaya
East - West Road
Tapia
Salitran
North - South Road
Tanza
Gen. Trias
Dasmariñas
San Pedro
Muntinlupa
Laguna de Bay
San Agustin
Gen. Mariano Alvarez
CAVITE
Carmona
Biñan
Trece Martirez
Naic
Santa Rosa
Cabuyao
Kaong
Biluso
Sabutan
Tibig
Santo Domingo
LAGUNA
Maragondon
Indang
Amadeo
Silang
Canlubang
Calamba
Gen. Aguinaldo
0 4 8
kilometers
N
120° 46' 41"
121° 10' 59"
14° 31' 44"
14° 11' 30"
Source:
NAMRIA Topographic Map Scale: 1:50,000
BULACAN
QUEZON
RIZAL
METRO MANILA
PROJECT AREA
CAVITE
LAGUNA
BATANGAS
LEGEND
Direct Impact Area
Indirect Impact Area
Municipal Boundary
Provincial Boundary
Coastline
Figure ES-2
CALA ROAD ALIGNMENTS
WITH RESPECT TO IDENTIFIED
IMPACT AREAS
GIS Mapping By:
ENR Consultants, Inc.

Ambient air quality and noise conditions as reflected in the nine baseline stations today fall within the DENR standards for residential areas. TSP concentrations exceeded the standards at three out of the nine stations, which are located near the road and are within highly urbanized areas. The high concentrations could also be attributed to the relatively high traffic volume in these areas. Results of the vibration survey indicate that vibration levels in all stations are under Japan's vibration standard with an average reading of 45.0 dB both for day and night periods.

The water quality sampling in 16 selected river stations representing the dry season condition for physico-chemical parameters show that all are still within the Class C standards. With the exception of five stations located in rivers used for irrigation, the results of analysis indicate a typical polluted water body. BOD values in six exceeded the DENR standard. Dissolved Oxygen levels at all stations fall below 5 mg/L. This condition is detrimental to fishes and other aquatic life.

Total coliform counts in all the stations were above the DENR Water Quality Criteria for Class C waters. This is not entirely surprising as the rivers are occasionally used as sewage and waste disposal area by nearby communities and industries.

3.2 Biological Environment

The provinces of Cavite and Laguna form an integral part of the Luzon Biogeographical Zone. Each biogeographic zone is characteristically unique from each other having different ecosystems and habitats, which harbor a high number of species and a diverse composition of flora and fauna.

There are no protected areas established by National Integrated Protected Areas System (NIPAS). The project area does not include designated wetlands under the Ramsar Convention, World Heritage-listed areas and Man and the Biosphere Reserve designated by UN Educational, Scientific and Cultural Organization (UNESCO).

The proposed roadway alignment traversed various land uses. These are the built up areas, agricultural land and the brush land/open land. Ocular observation showed that the density of flora and fauna here were relatively low.

Along the proposed alignment, the species of flora, which were perceived to be directly impacted by the construction phase of the project, are very common in the region and throughout the country as well. Likewise, there are no faunal species considered as threatened or endangered within the project area.

The most common vegetation found within the rivers, which traverse the project area is the common kangkong. Presence of *Colocasia esculanta* (gabi), *Brachiara muftica* (damong tubig) and *Musci sp.* (moss), which commonly grow on rocks and boulders was also noted.

Most of the rivers in the area have a muddy substrate with soft silty materials exuding putrid to very putrid smell. This is an indicator of a polluted water body. Putrefaction is present in some the stations. Actual observation showed that the substrate is composed of organic debris/materials as well as inorganic debris. Organic materials found were small leaf, barks of woods, twigs, kitchen waste and sometimes human waste or human excreta. Inorganic materials include materials and wastes usually found in domestic garbage, but the most common are different kinds of polyethylene materials or plastics.

This condition is detrimental to fishes and other aquatic organisms. As the river waters are polluted, fish species like *Glossogobius spp*. locally known as "bia" or "biya", *Tilapia spp* (tilapia) *Ophicephalus spp* (dalag), *Clarias spp.* (hito), and *Anguilla spp*. (ell) are rare or of limited occurrence.

3.3 Socio Economic Environment

Population and Growth Rate

Census data from NSO in 2000 showed that Cavite is the most populous province in Southern Tagalog with a total population of 2,063,161 and an annual growth rate of 5.5%. Cavite's population accounts for 17.5% of the total population of Region IV. Laguna on the other hand registered a population of 1,965,872 or 16.7% of the total Region IV population. Laguna ranks second to Cavite in terms of population in Region IV.

The eight municipalities and one city of the project area have a total population of 2,021,175 as of the 2000 census. It has an annual growth rate of 4.0% for 1995-2000, which is much higher than the 2.2% national annual grown rate for the same period.

At the municipal/city level, the project area has an average population density of 38 persons/ha, which is much higher than the national average of 3 persons\ha. At the barangay level, the density ranges from two to 112 persons\ha.

Household Profile

The eight municipalities and one city have a combined total number of 416,802 households and an average household size of five persons per household. In the affected 58 barangays, there are a total of 46,829 households with an average size of five persons per household.

Majority (72.2%) of the households in the directly affected areas do not own the land where their house is located, while a larger percentage (91.9%) owns the house that they are residing. A large number of households has houses that are single-detached one-storey type (44.6%) and single-detached two-storey type (19.0%). Likewise, a large majority has permanent (72.7%) and semi-permanent (22.2%) structure of house.

Sources of Income

Until the last two decade or so, the main source of income in the area was agriculture. The situation has changed drastically since the 80's when the rapid progress and expansion of economic activities in Metro Manila brought about a shift to a largely industrial and services-based economy which created new and numerous job opportunities that benefited the local residents. This resulted to the influx of migrants looking for job and residential space causing the drastic increase of population growth rate in the area.

Rapid industrialization and urbanization in the project area has thus resulted to massive conversion of land uses from agriculture and fishing to industrial, commercial and residential uses.

Cavite and Laguna rank second and the third in terms of the highest average family income for areas outside Metro Manila. The annual per capita poverty threshold of Cavite was estimated at P14,965 in 2000. Laguna on the other hand was estimated at P13,226. Family poverty incidence in Cavite reached 10.2% in 2000 while population poverty incidence was at 13%. Laguna's family poverty incidence in 2000 was at 8.6% while population poverty incidence was 11.4%.

Literacy Rate and Educational Attainment

Available data show a relatively high literacy rate in the project area, ranging from 95.1% to 98.5%. Imus registers a high percentage of the population that has reached or finished the tertiary (college or its equivalent, and above) level, followed by Bacoor. Dasmariñas has the largest percentage among those that has only reached the elementary grade level, while Sta. Rosa has the largest in the secondary grade level.

Employment Status

Available data show that generally only a little more than half of the working age population (15 years old and above) has joined the labor force. Out of those who join the labor force, a considerable percentage is still unemployed, the largest of which is found in Bacoor, Imus and Tanza. This is happening despite the various job opportunities created by the rapid industrialization and urbanization in the area.

Leading Causes of Morbidity and Mortality

Among the ten major causes of morbidity or illness in the respective municipalities/city of the project area, the most prevalent are: i) acute respiratory infection, ii) diarrhea, iii) skin disorder, iv) pneumonia, v) hypertension, vi) influenza/fever, vii) wound, viii) urinary tract infection, ix) parasitism, and x) gastro-intestinal disorder.

In the case of mortality or death, the most prevalent are: i) cancer, ii) heart disease, iii) pneumonia, iv) diabetes, v) tuberculosis vi) hypertension, vii) accident, viii) kidney, ix) stillbirth, and x) asthma.

Community and Public Facilities and Services

Basic social services and infrastructures through most of the project area are generally adequate.

Health services are provided by Rural Health Units (RHUs), Rural Health Centers, Barangay Health Centers and major hospitals.

Drinking water comes from one or a combination of the following: Maynilad Water Services, Inc, private deep wells, Water Districts, waterworks and barangay managed Level III water system. Overall, about 63.2% of the households are served with a Level 3 water supply system.

The project area is accessible mainly by land transportation from Metro Manila. The primary mode of transportation is the public utility vehicles such as FX, jeepneys and buses, complemented by privately owned vehicles.

Power supply in the project area is provided by the Manila Electric Company (MERALCO), which has a substation in Silang. An estimated 6.0% of the households are still not served with electricity.

Telecommunication services are provided by a number of companies augmenting the services of the Bureau of Telecommunication (BUTEL), namely: PLDT, Globe Telecom, and Digitel Telephone Co. and Smart. Other telecommunication companies that also provide fast cargo and related services are: LBC Express, RCPI, PT&T, and JRS express.

Public Participation and Social Acceptability

The extent of people's understanding and notions about the project was determined through a perception survey and corroborated by FGDs and primary observations, which also dwelt on significant issues/concerns raised by community stakeholders.

The perception survey generated the following results:

1. The widening of Governor's Drive is the least preferred of the four alignments as far as the directly affected households are concerned. Among the indirectly affected household, the Coastal Road is the least preferred. On the contrary, the Coastal Road got a high rating among the directly affected households.

2. Among the directly affected households, the perceived cause of bad traffic situation is "increase of car traffic" followed by "lack of roads." Among the indirectly affected household, "lack of road" is the foremost cause followed by "increase in car traffic."

3. Both directly and indirectly affected households believe traffic congestion has worsened followed by convenience and then safety.

4. Majority of the directly and indirectly affected households consider the existing road network as either plainly insufficient or totally insufficient. In order to address these problems, the directly affected households prefer the extension of the Manila-Cavite Road followed by improvement of the SLEX and the North-South Busway. Among the indirectly affected households, the top priority is the construction of the East-West Alternative A Road followed by expansion of the Coastal Road and the East-West Alternative B.

5. Households that are directly affected by the Cavite-Laguna Road alignment manifest the highest level of awareness while those indirectly affected by the North-South Road show the highest level of awareness.

6. Majority of the directly affected households got their information about the project from LGU staff. On the other hand, the largest percentage of the indirectly affected households got their information from barangay officials.

7. Majority of both the directly and indirectly affected households assessed the project as a good initiative, which could provide more business and employment opportunities.

8. The most frequently mentioned negative impact is the relocation of affected households.

9. Overall, majority of the directly affected households and the indirectly affected ones have manifested their approval of the project.

10. In general, the survey indicated a conditional acceptance of resettlement for nearly 33.9% and full acceptance for 29.2% of the directly affected households. Those who accepted with conditions were demanding fair compensation and good relocation site complete with basic facilities such as light and water.

11. The survey results show certain similarities in the significance attached by the directly and the indirectly affected households on the issues and concerns raised with respect to the three phases of the project (pre-construction, construction, and operation). “Air pollution/offensive odor” and “noise and vibration” are the topmost concerns. During the construction phase, “economic activities” are the foremost concern of the directly affected households, while “accidents” and “waste generation” are the foremost concerns of the indirectly affected households.

12. Resettlement and influx of workers are foremost concerns among the indirectly affected households, while it is not so among the directly affected ones. “Conflict of interest” involving government personnel that are at the same time beneficiaries of the project, is a common concern to both households.

13. Inequality of perceived benefits that the indirectly affected households will be received from the project against the negative impacts that will be experienced by the directly affected households in terms of resettlement and forced sales of land and crops was raised.

14. Other specific issues raised regarding pre-construction activities include among others alternatives of project affected persons, payment and structure of payment for lands to be affected by the project, compensation for trees and crops, partial effects on structures and lands, relocation, assurance of compensation, final road alignment, compensation of tenants, conversion of agricultural land to road use.

15. Issues raised regarding the construction period include accidents, land collapse, waste disposal, effects on archaeological and historical sites, possible disruption of public utilities and infrastructure and stability of road foundation.

16. Issues and concerns regarding the maintenance/operation phase include noise and vibration, water runoff and contamination, likely change in land use and zoning, improvement of aesthetic and visual effects of the areas where the road alignments will pass, relocation of households and provision of social services, public health and safety, change in culture, lifestyle and values, improved accessibility of women and other vulnerable groups in sourcing their household supplies and better access to basic services.

4.0 FUTURE ENVIRONMENTAL CONDITIONS WITHOUT THE PROJECT

Under a no project scenario, the potential economic development that will be realized with the improved and increased access of Cavite and Laguna may not be totally achieved.

The geodynamic processes such as erosion and siltation will persist even if the project is not implemented. The extent and degree of these processes will depend on the other project developments, which may come about in the area. The foundation characteristics of the rocks will remain the same.

Locally, the soils which mantle most of the project area will likewise be subjected to partial or total removal depending on the developments which will take place. Considering

the continuing boom in real estate development in Cavite and Laguna, a large portion of the idle agricultural lands including portions of the proposed road corridors, could be converted for residential or commercial usage. In the process, the vegetation cover could be removed or modified. This will contribute to the already declining agricultural production of the two provinces.

The terrestrial ecology within the project, which basically corresponds to a degraded agricultural system, will persist but the aerial coverage will decline over time in response to the continuing landuse conversion.

The quality of the surface waters which are intersected by the proposed roadways will continue to decline as local inhabitants continue to utilize them as dumping grounds for both solid and liquid wastes. Accordingly, the already limited fishing activity at the rivers traversing the two provinces will continue to decline.

Groundwater levels will continue to fluctuate with the seasonal changes. The continuing increase in pumpage due to the rise in the population of the water users could bring about the local lowering of the water levels.

The population of the LGUs within the project area will increase as more lands are converted for residential development projects. These will translate to increased waste generation and contribute to congested traffic at and along existing major intersections and thoroughfares. Over time, traffic conditions will worsen as the number of commuters and vehicle owner's increase. This will translate into the worsening of the quality of air along the existing thoroughfares in the project area.

5.0 IMPACT ASSESSMENT AND MITIGATION MEASURES

The three road alignments of the proposed project will affect 58 barangays located in: six municipalities of Cavite, one municipality of Laguna, and Muntinlupa City.

The CALA project impacts were classified into three major categories under the physical, biological and socio-economic environment modules. These were further classified according to the three phases of project development: pre-construction/construction, 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, which is described as follows:

- Significant (S)
- Moderately Significant (MS)
- Non-Significant (NS)

5.2 Impact Assessment and Mitigation/Enhancement Measures

Table ES-1 summarizes the overall project impacts (negative and positive) and their corresponding mitigation and enhancement measures by development phase and by environmental module: physical, biological and socio-economic.

Table ES-1 Summary of Environmental Impacts and their Corresponding Mitigation/Enhancement Measures and Environmental Management Plan

Project Activities	Predicted Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
1. Pre-Construction/ Construction Period						
A. Physical Environment						
Land						
▪ Detailed engineering design; clearing within ROW area; site grading, excavation, backfilling bored piling at bridge areas, hauling/stockpiling of excavated and construction materials	Terrain modification, soil and weathered rock displacement Erosion, siltation of local waterways particularly at bridge crossings	S, P (negative) S, T (negative)	▪ Clearing and excavation works to be planned during dry season where practicable and scheduled so as to allow speedy concreting/backfilling of excavated sections ▪ Use of temporary siltation ponds[1] ▪ Excavated materials be placed on appropriate dumpsites or spoils area at some distance from structure sites and provided with adequate containment; re-use soil spoils for backfilling ▪ Stockpiles of sand and gravel be fenced or so located to reduce transport of sediments during heavy rains including reducing storage time in work areas ▪ Observance of proper materials handling and heavy equipment operations for transport, hauling and moving earth spoils to minimize spills into rivers and nearby waterways[2] ▪ Immediate revegetation of exposed areas which will not be occupied by road structures ▪ Strict observance of proper cut and fill procedures and materials balance to minimize wastage of excavated materials from work areas ▪ Restoration or dredging of silted waterways upon completion of construction activities ▪ Use of temporary sumps for detention of bentonite used in drilling bored piles ▪ Use of tarpaulins or equivalent to cover exposed stockpiles of excavated and construction materials	▪ Part of construction cost	▪ Contractor, DPWH, DENR, MMT	▪ Part of constractor's contract and as input to the feasibility study

[1] *Siltation ponds* correspond to sumps which temporary detain water pumped out of excavations. Detention will facilitate the settlement of sediments from the water prior to eventual release into the nearby waterway.
[2] This refers to the observance of caution in moving loaders and trucks laden with loose materials so as to minimize spillage and likely siltation while crossing waterways.

Table ES-1 Summary of Environmental Impacts and their Corresponding Mitigation/Enhancement Measures and Environmental Management Plan

Project Activities	Predicted Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
			▪ Monitor river quarrying for construction materials within the project area. Sources of construction materials for the project will be identified and approved for quarrying by the Mines and Geosciences Bureau and/or the concerned LGU. ▪ Monitoring of earthmoving activities by a qualified geotechnical engineer or engineering geologist			
	Slope destabilization at new cuts	MS, T (negative)	▪ Undertake slope stability analysis supported by adequate geologic mapping, field tests and laboratory analysis for sections which will involve large cuts. Drilling accompanied by appropriate laboratory test may be undertaken. This is an option to be taken by the contractor should his designer require subsurface data for the proposed slope stabilization measure. ▪ Install as necessary slope protection measures such as shotcreting, rock bolts or soil nails. A soil nail anchors soil like materials which are likely to fail into more stable strata located farther into the slope.	▪ Part of Design Cost ▪ Part of construction cost	▪ Contractor and DPWH ▪ Contractor, DPWH, DENR, MMT	▪ Part of contractor's contract and as input into the design stage ▪ Part of contractor's contract
	Degradation of national and provincial roads used for hauling construction materials and for movement of heavy equipment	MS ,T (negative)	▪ Regular road maintenance, restoration of roads original conditions after construction activities. As practiced, the roads used by the contractors that are degraded by the passage of heavy equipment are restored or repaired at the end of the project or upon completion of construction activities in the particular area.	▪ Part of construction cost	▪ Contractor, DPWH, DENR, MMT	▪ Part of contractor's contract
	Increased generation of solid wastes	NS, T (negative)	▪ Provision of waste bins in various strategic points within the construction area for the workers to dispose their wastes. Wastes from these containers will be collected (dump truck of the contractor) regularly to be disposed at a designated waste disposal site. ▪ Re-use and recycling of scrap materials and containers such as bottles, cans, boxes and plastics as much as practicable or selling them to scrap buyers. ▪ Conduct of a thorough orientation of workers on proper waste disposal practices.	▪ Part of construction cost	▪ Contractor and DPWH	▪ Part of contractor's contract

Table ES-1 Summary of Environmental Impacts and their Corresponding Mitigation/Enhancement Measures and Environmental Management Plan

Project Activities	Predicted Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
			▪ Re-use construction spoils as aggregate or filling materials where practicable. ▪ Regular hauling of construction debris to the designated disposal area to prevent their accumulation on-site resulting to negative effects on the landscape. ▪ Conduct of equipment/vehicle cleanup and maintenance in only one designated area located as far away as possible from waterways. Spent and used oil should be collected and placed in sealed containers and disposed of properly to prevent draining into waterways or sold to used oil recyclers/buyers. ▪ Efficient housekeeping practices including the use of covered receptacles for refuse generated by workers and construction scrap/debris will ensure the proper handling and disposal of solid wastes. ▪ In order to minimize the need to dispose of earth materials, the contractor shall make use of excavated materials as much as possible for filling and as part of construction materials. For non-suitable materials, these are placed in low areas where the possibility of erosion is limited.			
Air						
	Increase in particulates and gaseous emissions and noise levels	MS, T (negative)	▪ Sprinkle water in exposed areas on regular basis especially during dry and windy periods ▪ Speed of vehicles used for construction should be regulated to minimize stirring up of loose materials sinks for dusts/spoils ▪ Proper handling and storage of spoil materials ▪ Proper maintenance of engines for efficient fuel burning to lessen gaseous emissions ▪ Schedule construction activities during daytime ▪ Installation of silencers or mufflers for as many vehicle engines and heavy equipments as possible	▪ Part of construction cost	▪ Contractor, DPWH, DENR, MMT	▪ Part of contractor's contract
	Increased traffic at road intersections leading to	MS, T (negative)	▪ Contractor to assign traffic aides at key road sections	▪ Part of	▪ Contractor,	▪ Part of contractor's

Table ES-1 Summary of Environmental Impacts and their Corresponding Mitigation/Enhancement Measures and Environmental Management Plan

Project Activities	Predicted Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
	construction areas		to assist in traffic management	construction cost	DPWH	contract
Water						
	Changes in river water quality	S, T (negative)	▪ Refer to mitigation measures on soil displacement, erosion and siltation of waterways ▪ Locate gravel crushing, screening areas and concrete batching operations as far away as possible from waterways ▪ Undertake regular monitoring of water quality focusing on DO, BOD, TSS and TDS ▪ Provide adequate temporary sanitary facilities with proper drainage to prevent leaching and wash water from reaching water courses, use of portalets ▪ Contractors to prepare and implement a materials handling program for construction spoils and solid waste management ▪ Contractor to observe proper equipment maintenance and operation to minimize spillage of oil and grease into waterways	▪ Part of construction cost	▪ Contractor, DPWH, DENR, MMT	▪ Part of contractor's contract
B. Biological Environment						
Terrestrial						
▪ Vegetation clearing, excavation and grading and other construction activities	Loss, disturbance and damage to existing vegetation; Habitat degradation of dependent species	MS, T (negative)	▪ For every tree cut, the required replacements must be made[3] ▪ Secure necessary permit from DENR for tree cutting ▪ Implement tree balling where practicable ▪ Immediate revegetation	▪ Part of construction cost	▪ DPWH	▪ Part of ECC requirement
Freshwater						
	Local aquatic habitat	NS, T	▪ Same mitigation for the control of soil erosion and			

[3] Cutting of trees is generally guided by the provisions of PD 705 – Revised Forestry Code of the Philippines (Section 23). In the case of trees located in private lands, guidelines for cutting are embodied in DAO-21 which refers to the Revised Guidelines in the issuance of Private Land Timber Permit/Special Private Land Timber Permit (PLTP/SPLTP). A 100 tree inventory is required and this must be undertaken by a registered forester or by the local DENR office.

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Table ES-1 Summary of Environmental Impacts and their Corresponding Mitigation/Enhancement Measures and Environmental Management Plan

Project Activities	Predicted Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
	alteration and temporary displacement of species	(negative)	sedimentation			
C. Socio-economic Environment						
▪ Detailed engineering design; clearing within ROW area; site grading, excavation, backfilling bored piling at bridge areas, hauling/stockpiling of excavated and construction materials including ROW acquisition	Total or partial loss of land/farm area, properties and crops, dislocation and loss of income due to ROW acquisition	S, P (negative)	▪ Negotiate with PAFs/PAPs for an acceptable compromise on valuation and compensation ▪ Finalize the RAP incorporating therein the agreements reached during public consultations	NA	▪ DPWH	▪ Commitment of DPWH via MOA
	Increase in employment opportunities	MS, T (positive)	▪ Require contractors to source workforce from qualified locals ▪ Contractors to orient workers on desirable working relationship especially if there are non-resident workers	NA	▪ Contractor, DPWH	▪ Part of contractor's contract
	Increase in livelihood and business opportunities	MS, T (positive)	▪ Priority to be given to local subcontractors ▪ Priority to be given to local suppliers of construction materials and equipment ▪ Supply of food and catering to be preferentially awarded to local suppliers	NA	▪ Contractor, DPWH	▪ MOA of LGU with Contractor
	Potential health, sanitation and safety problems	NS, T (negative)	▪ Contractor to provide temporary housing facilities for workers equipped with adequate water and sanitation facilities ▪ Contractors to implement proper solid waste management in the work site, workers will be oriented to observe proper hygiene and sanitation practices and provided with appropriate protection gears while working ▪ Construction areas to be enclosed as necessary and provided with appropriate signage to avoid accidents			
D. Land Use						
Land Use and Zoning						
	Change in land value	S, P	▪ Property appraisal by the local government unit			

Table ES-1 Summary of Environmental Impacts and their Corresponding Mitigation/Enhancement Measures and Environmental Management Plan

Project Activities	Predicted Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
		(positive)	before construction			
2. Operations and Maintenance Period						
A. Physical Environment						
Land						
	Erosion at major discharge points of the road's storm drains	NS, T (negative)	▪ Installation of dissipators at major discharge points of the roads' storm drains	▪ Dissipators: P1,481,000		
Air						
▪ Operation and maintenance of roads	Increase in particulates and gaseous emissions	MS, P (negative)	▪ IEC to road users on the proper maintenance of engines for efficient fuel burning and minimization of gaseous emissions ▪ Tree planting along the roads ▪ Regular road cleaning activity such as regular water sprinkling should be done	▪ Tree Planting: P158,090,000	▪ DPWH, Tollway operator	▪ Part of ECC requirement
	Increase in noise levels	MS, P (negative)	▪ Traffic controls (e.g. speed limits and traffic-volume restrictions) and Vehicle controls along the highway (e.g., truck bans) ▪ Tree planting along the roads ▪ Noise barrier panel should be installed along the roads which pass sensitive areas such as hospital and school.	▪ Tree Planting: P158,090,000 ▪ Sound Barrier: P6,459,000		
B. Socio-economic Environment						
▪ Operation and maintenance of roads	Lessened traffic congestion and improved access to public utilities and services	MS, P (positive)	▪ Enhance the accessibility by providing appropriate signage to guide traveling public to use shortest and most convenient route to reach the interior places from the highway via the existing access roads and vice versa	▪ Part of operations cost	▪ DPWH, Tollway operator	▪ Part of ECC requirement and standard operation procedures
	Increased livelihood and business opportunities, and revenues for LGUs	MS, P (positive)	▪ Encourage LGUs to use part of the increase revenues for promoting conducive for expanding business operation and establishing new livelihood activities, by maintaining peace and order and improving basic services and infrastructure and	NA	▪ Initiative of LGU	▪ Initiative of LGU

Table ES-1 Summary of Environmental Impacts and their Corresponding Mitigation/Enhancement Measures and Environmental Management Plan

Project Activities	Predicted Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
			utilities			
	Increased migration and population	MS, P (negative)	▪ Concerned LGUs (barangay and municipal/city) to regulate encroachment in watershed areas (forest-land) through proper zoning and enforcement ▪ LGUs to adequately plan/provide for social services and infrastructures including health services, waste management and facilities and road network ▪ Encourage the LGUs to regulate or prevent the establishment of squatter colonies by strictly enforcing RA 7279 or the "Urban Development Housing Act (UDHA)"	NA	▪ Initiative of LGU	▪ Initiative of LGU
	Regional severance	S, P (negative)	▪ In order not to disturb human flow between communities, measures for crossing the road should be installed such as flyover, underpass, at grade intersection, and service road.	▪ Part of construction cost	▪ Contractor, DPWH	▪ Part of contractor's contract and as input into the design stage
	Increased accidents	MS, T (negative)	▪ Intersection signal and sign board installation	▪ Part of construction cost	▪ Contractor, DPWH	▪ Part of contractor's contract and as input into the design stage
	Damage of landscape	MS, P (negative)	▪ Revegetation of the exposed areas ▪ Tree planting along the roads	▪ Tree Planting: P158,090,000	▪ Contractor, DPWH	▪ Part of contractor's contract and as input into the design stage
C. Land Use						
Land Use and Zoning						
	Change in land value	S, P (positive)	▪ Regular property appraisal by the local government			

Note: S - Significant impact, MS - Moderately significant impact, NS - Not significant impact
T - Temporary impact, P - Permanent impact
negative - negative impact, positive - positive impact

5.2.1 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 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 824 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 shall 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.

Other negative impacts include the influx of construction workers and their families, decline in heath and sanitation conditions at work areas, potential increase in the incidence of work related accidents, and increased competition for available construction jobs. These can be mitigated through the provision of temporary housing with provisions for adequate water, toilet and waste disposal facilities for construction workers, required use of appropriate safety gears and the installation of necessary enclosures and signage, and prioritization of locally capable labor in hiring as well as proper screening prior to hiring.

The positive project impacts include increased employment, livelihood and business opportunities which could translate to added income of residents and local enterprises. This will redound to increase in revenues to the LGUs, in the form of taxes, and hence additional source of funds to improve the delivery of basic LGU services to the community. These may be enhanced by adopting a policy of local procurement of construction materials and other supply requirements if these are available within the project area.

The areas traversed by or located near the new roadways will change in value. Improved access will increase the value of lots while unfavorable partition will contribute to possible decline in assessment. The rise in value will translate to higher real estate taxes for the concerned LGU. In order to enhance this, the LGUs must undertake a regular assessment of properties within its jurisdiction to provide local residents, establishments and institutions an updated appraisal of the value of the land in the area prior to construction.

5.2.2 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.

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 shall include an IEC campaign to enhance social acceptability and people's cooperation for the proper maintenance of the constructed roads in combination with the installation of proper signages to guide the commuters to the shortest and most convenient route to reach their destinations, regular assessment of real estate properties, and the use of funds generated from taxes to improve the delivery of basic LGU services and utilities.

Increased migration and rapid population growth will be experienced in the project area, which can bring about congestion and the proliferation of informal setters. In order to address this potential development scenario, the development of suburban subdivisions should be promoted; while that of squatter colonies should be prevented or strictly regulated in a manner that does not violate the constitutional rights of abode and other human rights of those involved, otherwise known as "informal settlers."

6.0 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 shall be composed of the following components:

- Design and Construction Management Program
- Social Development and Institutional Plans
- Environmental Monitoring Plan

6.1 Design and Construction Management Program

Careful planning and adequate engineering design as well as observance of proper construction practices are expected to address the impacts predicted to occur during the construction and operation phases of the CALA project.

DPWH or its consultants shall prepare the appropriate engineering studies/plans and implement the construction program. The critical component covered by the program refers to construction management since the key impacts are those generated during this phase of work. It will include among others implementation of a sound materials handling program, proper waste management, provision of adequate utilities as well as health and sanitation facilities, dry season scheduling of earthmoving where practicable, installation of silt traps and siltation ponds where necessary and observance of proper operational

procedures in the use of heavy equipment for transporting, hauling and moving earth spoils from one area to another.

The construction management program shall also include implementation of safety procedures such as the designation of a safety engineer at the construction site, provision of safety equipment for all workers.

In the case of the CALA road project, the risk is essentially limited to vehicular accidents. Mitigation of vehicular accidents shall be part of the implementation of the project traffic rules and regulations as required by DPWH and the Department of Transportation and Communications (DOTC).

6.2 Social Development Program (SDP)

The SDP addresses the key socio-economic issues/concerns raised during the household and perception surveys and FGDs. It consists of the following components:

- Information, Education and Communication (IEC)
- Land Acquisition and Resettlement and
- Employment and Livelihood Development

The IEC shall be undertaken to encourage the participation and cooperation not only of the affected households but a broader sector of stakeholders and facilitate the establishment of support linkages in the implementation of the project. The IEC consists of the following:

- Information dissemination on the results of the EIA;
- Information on the final design of the proposed road alignments based on the detailed engineering study and consultation with the affected households; and
- Information on project implementation and monitoring.

The detailed RAP shall be prepared and finalized to come up with an appropriate and acceptable measure for mitigating the loss of land and other properties as well as income opportunities of project affected families and persons (PAFs/PAPs). It shall include an entitlements and compensation scheme which will cover productive lands and crops, residential land house and other structures, loss of business, voluntary land donations, costs and budget, complaints and grievances.

Information on project implementation and monitoring shall cover implementation arrangements, supervision and monitoring, relocation phases and processes, actual relocation phase and post relocation phase.

6.3 Institutional Plan

An environmental group exists within the DPWH, which is responsible for the compliance of the agency to existing environmental rules and regulations. The same group shall be responsible for the overall implementation of the EMMP, which will include among others:

- Overall planning and management of environmental mitigation, enhancement and monitoring measures;

- Overseeing the finalization and implementation of the various proposed plans such as the LARP and Social Development Program;
- Organization of the MMT and secretariat support to the various committees of the MMT;
- Coordination with DENR, LGUs, IAs/FIA and local communities concerning the implementation of the various management plans; and
- Regular checking of the operation of the construction contractors regarding their compliance with environmental clauses/conditionalities in their contracts.

6.4 Environmental Monitoring Program

Environmental monitoring shall be undertaken to:

- To ensure that the recommended mitigation and enhancement measures as embodied in the EMMP and ECC conditionalities are being implemented;
- To undertake regular monitoring of specific parameters in compliance with existing environmental quality standards; and
- To determine the effectiveness of the EMMP and make recommendations for any corrective or additional mitigating measures.

A monitoring plan shall be developed based on the mitigation/enhancement measures identified for significant environmental impacts and those that are moderately significant, but can have critical effects if not mitigated. The environmental monitoring plan proposed including the key parameters to be monitored is presented in Table ES-2. This covers both the pre-construction/construction and operation stages.

The key parameters to be closely monitored are the following:

- soil erosion and sedimentation of water bodies during construction
- changes in water quality during construction
- air quality and noise impacts during both construction and operation
- tree planting and revegetation of critical areas

Based on the anticipated impacts, the frequency of monitoring by DPWH and the MMT will be more constant and rigid during the construction phase. Monitoring by DPWH during the operation phase will be closely coordinated with the regional office of the DENR. The baseline information generated during the EIA will generally serve as the benchmark data. Additional measurements shall be made at stations near the proposed final alignment on the final road position as determined in the feasibility study.

In compliance with the guidelines of DAO 96-37, a Multi-Partite Monitoring Team (MMT) will be established to take charge of the preparation of the final monitoring program and annual monitoring plan including the conduct of monitoring activities. The MMT is proposed to be composed of the following:

- DPWH Representative
- DENR Representatives (DENR Regional EMB and/or PENRO/CENRO)
- LGU designated representative(s)
- NGO/PO designated representative
- Barangay designated representatives

The constituted/organized MMT shall review and validate, among others, the following:

- coverage of monitoring
- frequency of monitoring
- standard procedures/method of monitoring
- schedule of monitoring
- manpower requirements
- logistics

The MMT shall implement the environmental monitoring action plan. A monitoring evaluation and reporting system shall be established to enable stakeholders to participate in the process. Where necessary, the system shall be reviewed and updated in relation to actual construction and site conditions.

The initial cost of the establishment of the MMT and finalizing the monitoring plan is estimated at P100,000. Monitoring during construction and operation is initially placed at about P500,000 and P700,000 annually, respectively.

Table ES-2 Environmental Monitoring Plan

Project Phase	Method and Scope	Parameter	Location	Frequency	Responsibility	Cost (P)
1. Pre-Construction/ Construction Period						
Physical						
▪ Right of Way Acquisition ▪ Vegetation clearing/tree cutting ▪ Excavation works ▪ Foundation works	▪ Monitoring of Earthmoving activities	▪ Contractor's material handling Program	▪ Construction sites especially at bridge sites	Once a week during construction	DPWH	Part of DPWH supervision cost
	▪ Engineering geological assessment of slopes	▪ Slope profile and signs of instability	▪ Abutments of bridge crossings, steep and high cuts	Once a week during construction or after heavy rains or earth-quake event	Construction Contractor	Part of CC cost
	▪ Water quality tests (DENR Administrative Order No.34 (1990))	▪ River water quality- DO, pH, TSS, BOD, total and fecal coliform	▪ Within 50 m downstream of bridge sites (only at the point where river water is used for some purpose downstream)	Monthly during active construction periods	DPWH/DENR/ MMT	P750, 000/ year ~P 9,000.00 per point
	▪ Geo-hazard assessment	▪ Erosion and siltation	▪ Waterways near construction sites	Weekly	DPWH/DENR/ MMT	P240,000/ year
	▪ Measurement of ambient concentrations (1999 Philippine Clean Air Act)	▪ TSP, SOx, NOx	▪ Construction areas near built up areas (12 points)	Monthly during active construction period	DPWH/DENR/ MMT	P1,400,000/ year ~ P7, 500 per point
	▪ Measurement of ambient level (1978 NPCC Rules and Regulations)	▪ Noise	▪ Construction areas near built up areas (12 points)	Monthly during active construction period	DPWH/DENR/ MMT	P1,400,000/ year
	▪ Monitoring of solid waste disposal	▪ Presence or absence of dumps, waste bins, collection system	▪ Construction sites and temporary quarters of workers	Monthly	Contractor	
Biological						
	▪ Site Inspection	▪ Tree cutting/ balling	▪ Vegetated areas with ROW	Before construction	DPWH/DENR/ MMT	P240,000
Socio-Economical						
	▪ Site inspection	▪ Worker health and safety	▪ Construction areas, worker's camp	Weekly	Contractor	
	▪ Site inspection	▪ Waste management	▪ Project site, worker's camp	Daily	Contractor	

Table ES-2 Environmental Monitoring Plan

Project Phase	Method and Scope	Parameter	Location	Frequency	Responsibility	Cost (P)
2. Operation and Maintenance Period						
Physical						
▪ Operation and Maintenance of roads	▪ Measurement of ambient concentrations (1999 Philippine Clean Air Act)	▪ TSP, SOx, NOx	▪ Selected sections of the completed roads (12 points)	Yearly	DPWH/DENR/ MMT	
	▪ Measurement of ambient level (1978 NPCC Rules and Regulations)	▪ Noise	▪ Selected sections of the completed roads (12 points)	Yearly	DPWH/DENR/ MMT	
Biological						
		▪ Tree Planting, Revegetation	▪ Critical Areas along ROW	Weekly		

6.5 Overall EMMP Implementation and Resource Requirement

The overall EMMP summary including mitigation/enhancement measures, schedule of implementation, estimated investment requirements, institutional responsibilities and guarantees/agreements is shown in Table ES-1. The cost computations are rough estimates and need to be verified/ validated during the plan finalization.

6.6 Environmental Guarantees, Commitments and Agreements

To ensure the protection of the environment with the project, environmental guarantees, commitments and agreements for the implementation of the proposed EMMP are provided by the proponent along with the stakeholders of the project.

A Memorandum of Agreement (MOA) was entered into by DENR and DPWH in 1999 setting down Rights and Obligations of both agencies for the protection of the environment and conservation of the country's natural resources. It is here that the Environmental Guarantee Fund (EGF), which is the usual provision of a fund source by the proponent for any work required to address damages brought about by projects, was replaced. This is stipulated in the MOA as follows:

> "10. As a replacement to EGF, the DPWH shall ensure that Contractor's All Risk Insurance (CARI) is provided to cover expenses for the following: indemnification/compensation of damage to life and property that may be caused by the implementation of the projects and abandonment/decommissioning of the project facilities related to the prevention of possible negative impact."

Likewise, an Environmental Monitoring Fund shall no longer be established by DPWH to support the operation of the MMT and its various monitoring activities since the undertaking of monitoring activites shall be carried out through a "Bayahihan" approach. This is also stipulated in the MOA as follows:

> "12. The Multipartite Monitoring Team (MMT) will be formed through Bayanihan Approach, since there are no funds available for Environmental Monitoring Fund (EMF). The MMT will be formed on a voluntary basis (bayanihan) with members coming from the EIAPO, Planning Service, EIARO (DPWH Regional Offices), CENRO, PENRO, Local Government Units (LGU), Non Government Units (NGO), POs experts and other cause oriented environmental groups. In this regard, expenses of members of MMT in the performance of their official duties will be charged to appropropriate funds of their respective offices."

6.7 Project Commitments, Affirmations and Agreements

The commitment of the stakeholders responsible for the implementation of the environmental management plan is essentially bound by the ECC conditionalities that shall be issued by the DENR. This ECC shall be complemented by the contract of the contractors, which shall contain the appropriate environmental management provisions and the memorandum of agreements, which may be forged among the contractor, LGU and the MMT.

Chapter 1
INTRODUCTION

1.1 PROJECT BACKGROUND AND RATIONALE

The **CAVITE-LAGUNA (CALA) East-West National Road Project** is a priority project of the Department of Public Works and Highways Region IV-A. Its primary objective is to establish a road network and extend/widen existing roads in the CALA area to help decongest the traffic situation in the metropolitan area (Metro Manila). This will also aid in strengthening the link between Cavite and Laguna, which will further promote development in the said area.

The CALA road project evolved from the recommendation of two earlier conducted studies: Metro Manila Urban Transportation Integration Study (MMUTIS) and CALA Transport Strategy and Short-term Programs and Policies (a component of the Cavite-Laguna Urban Development and Environmental Management Project of the World Bank). The former proposed the strengthening of the public transport system in the CALA area while the latter recommended a development strategy for the region adjacent the metropolitan area (Metro Manila). The latter also recommended the construction of the East-West highway and the North-South Bus way.

Based on DPWH's Medium Term Public Investment Program for Region IV (2005-2010), about P1,821.153 million of local funds can be sourced out from the 5-year highway development program for the CALA area. This program covers the improvement and widening of existing national roads and bridges under DPWH's jurisdiction. The CALA East-West Road which amounts to P1.574 billion and the North-South which totals P4.079 billion are under the highway projects proposed for foreign financing starting 2008. The ongoing construction of the Molino Blvd. and the Daang Hari road extensions to Aguinaldo Highway and to San Pedro along the SLEX are funded by the Countrywide Development Fund (CDF) and are not included in the Medium Term Development Plan (MTDP).

1.2 APPROACH AND METHODOLOGY

This environmental impact assessment represents the work of 2 companies commissioned by DPWH under the technical assistance of the JICA Study Team for the Feasibility Study and Implementation Support on the CALA East-West National Road Project through the Development Study scheme funded by Japan International Cooperation Agency (JICA). The baseline survey on the physicochemical aspects of the area and the conduct of the socio economic surveys were performed by Lichel Technologies Inc. (LTI). The analysis of the data gathered by LTI in relation to the proposed project and the preparation of the environmental impact statement assessment (EIS) was performed by ENR Consultants, Inc. (ENRCI).

The baseline survey included the collection of both secondary and primary data. LTI compiled secondary data on geology/hazards, soils, land use, hydrology, meteorology and terrestrial/aquatic ecology. Primary data gathering was made on the aspects of air quality, noise/vibration level and water quality measurement.

LTI also collected primary and secondary on the socio-cultural/economic environment of the affected municipalities. Primary data gathering was done thru Perception Surveys, Focus Group Discussions (FGD), and Household Inventory Survey for Resettlement as inputs to the preparation of the preliminary resettlement action plan (Pre-RAP). Secondary data reviewed by LTI included the Comprehensive Land Use Plans (CLUP) and Comprehensive Municipal and City Development Plans of the affected LGUs to be traversed by the proposed road project.

The preparation of the EIS for the CALA East-West National Road Project commenced with the initial submission of the of the baseline data by LTI in 17 January 2006. The methodologies employed in the preparation of the EIS were the following:

1.2.1 Review of Available Studies and Data Regarding the Project

ENRCI utilized the technical description contained in the Study Report for the on going feasibility study. Technical data provided by DPWH in the course of several coordination meetings and reconnaissance traverses though the various segments of the road were also used. ENRCI also utilized the regional environmental data regarding Cavite and Laguna, which it has previously gathered from its earlier projects in the region. The output of this review is a project description supported by map, sections and drawings, which will provide the DENR an accurate picture of the proposed project.

1.2.2 Baseline Data Review and Assessment

The review and assessment of the socio economic and physicochemical data submitted by LTI was undertaken to ensure the adequacy of the data that will be processed and assessed based on the TOR provided by DPWH and the guidelines set by DENR for road projects. This review has been applied to the initial and final submission of LTI. Where deemed necessary, LTI was advised to submit revised sections of its submissions to make sure that the finalized baseline conditions are adequate to allow impact identification and assessment and the formulation of appropriate mitigating or enhancement measures.

The output is the final environmental baseline description of the project area supported by thematic maps, figures, drawing and photos.

(1) Impact Identification and Assessment

The basic method of impact assessment involves the comparison of the present condition of the project area as established in the baseline survey and the predicted future condition during construction and operation. In order to predict the impacts, the specialists of the various modules examines the technical description and various activities that will be undertaken during the construction an operation stage as provided by DPWH in the feasibility report in relation to the results of the various baseline surveys. Each specialist uses the basic standards for environmental compliance set by DENR for the different aspects of the air, water, land and people sector of the environment. Experience gained from similar or related projects are also used in the assessment.

The identification and assessment of the impacts vary with the level of data for each environmental module and the detail provided in the description of the road project. The following discussions highlight the methods used by the consultants in data gathering and in identifying and assessing impacts (Table 1.1).

Table 1.1 EIS Methodology Matrix

Module	Method of Data Gathering[1]	Method of Assessment
Air/Noise Quality	1. Measurement [2] of ambient concentrations of CO, O_3, TSP, NO_2, SO_2, Lead, SPM and NO in eight selected stations. 2. Measurement of ambient sound levels; Measurements at each station were conducted for 24 hours at 10 minutes continuous measurement per hour. The noise levels at the determined sampling stations were measured using an Extech Digital Sound Level Meter. 3. Evaluation of regional meteorological data obtained from the nearest synoptic station of PAGASA. Climatological parameters include rainfall, relative humidity, temperature, wind speed and direction, cloud cover, typhoon frequency and rainy days. 4. Vibration level measurements.	1. The resulting ambient concentrations taken during the sampling will be compared with the National Ambient Air Quality Guidelines (NAAQG) prescribe in Table 1, Rule VII, Part II of Implementing Rules and Regulations of the Philippine Clean Air Act of 1999. The NAAQG prescribes the ambient concentrations limits of pollutants that will not harm of threaten public health, welfare, and safety. A regression analysis was made to facilitate TSP and noise level predictions during operation phase. 2. For air quality, the pollutant load of the road networks during usage was estimated using available data and the traffic projections. A box model was applied using valid assumptions and available data. Noise levels of common motor vehicles were compared to the standards. 3. For noise, the expected noise levels to be generated by typical construction equipment at specified distances were used.
Geology, Hydrogeology and Hazards	Literature review focused on studies conducted by the Mines and Geosciences Bureau, Philippine Institute of Volcanology and Seismology, Department of Public Works and Highways, NAMRIA and other related government agencies as these relate to the project area; compilation of geologic maps, geohazard maps, groundwater level map and physiographic map which covers the project area	Assessment of available geology related thematic maps vis-à-vis various segments of the road alignment to determine presumptive suitability of foundation, selective walk over traverses of representative segments underlain by various geologic formations, qualitative assessment of hazards if present with respect to the proposed road project; assessment of available groundwater level map with respect to areas to be excavated to establish if the water bearing layers will be intersected or not. To facilitate assessment, GIS methods were used to prepare the different thematic maps. Since the proposed road will essentially traverse single volcanic formation, the impact assessment focused on likely changes in terrain that will be brought about by road cuts, fills or embankments[3] and the likely enhancement of mass movements like slope failure and erosion

[1] As implemented by LTI
[2] Hourly samples were collected for Ozone and 24-hour samples for TSP, SO_2, NO_2, CO, NO, Pb and SPM at each station.
[3] The specific sections where there will be cuts, fills, embankments, slope protection and piling have not been identified in the current level of the feasibility study

Module	Method of Data Gathering[4]	Method of Assessment
Soils and Land Use	Literature review focused on studies conducted by the Bureau of Soils and Water Management, compilation of thematic maps on soil types, slope, land use, and erosion as these relate to the project area; identification of portions of the project area which will be critically affected by the proposed road such as subdivisions, individual or cluster of houses, existing roads sections and properties of government institution.	To facilitate assessment, the maps generated using GIS methods were confirmed through walkover surveys of the project area. The sections of the road that will traverse residential and commercial areas were inspected. As in the geology module, the identification and assessment of the impacts depend on the location of the establishments and various land use units and features with respect to the proposed route of the road. With this information, the assessment of impacts will depend on the more detailed design features such as nature, location of engineering structures such as construction work areas, embankments, fills, cuts, bridge abutments and other road structures.
Terrestrial Ecology	Rapid and descriptive assessment guided by previous studies conducted by the DENR	Selective walkover surveys of the project area.
Aquatic Ecology	Rapid and descriptive assessment guided by previous studies conducted by the DENR	Correlation of results and findings with the existing beneficial uses of the river bodies; Impact assessment was correlated with the predicted impacts on water quality and the extent of erosion and siltation of the waterways.
Hydrology	Data gathering and review of previous studies/reports, relevant literature and secondary data on daily rainfall and other climatological data from PAGASA; stream flow data; selected field traverses; peak flow calculations at selected bridge crossings	Assessment of peak flow calculations, Inspection of several bridge crossings to assess potential for erosion and siltation during construction
Water Quality	Collection of 16 samples at selected section of waterways with the project area and subjected to determinations of the following: pH, salinity, conductivity, turbidity, BOD, COD, DO, color, TSS, Pb and Total Coliform	Analysis of results of water quality tests vis-à-vis the classification of the rivers and standards provided in DAO 34/35 Potential changes in the quality of water are related to the geology and soil impacts such as erosion and siltation and on the operation of the equipment near waterways.
Socio-Economics	Gathering and review of secondary data; field reconnaissance; household survey; in-depth and detailed investigations through focused group discussions; key informant interviews, review of historical documents/records, primary observation and site investigation; informal consultations and validation meetings	Qualitative analysis of secondary data and information gathered from consultations and interviews; process evaluation; analysis of perception survey results

For the CALA project, direct impact and indirect impact areas were defined as follows: direct impact area – covers the area within 500 m from the center line to both sides of the three road alignments and the Toll Road from SLEX to Muntinlupa; indirect impact area – refers to the barangays and towns where the various segments of the proposed road alignments will pass through. Impacts are categorized as short tem or long term; insignificant, moderately significant and significant; positive and negative. These are discussed and evaluated sequentially from preconstruction, construction to, operation.

[4] As implemented by LTI

A separate discussion is allotted for a scenario without the project where the Consultant discusses the likely processes that will take place in the absence of the proposed road project.

(2) Formulation of Environmental Management and Monitoring Plan (EMMP)

The measures needed to mitigate (for negative ones) or enhance (for positive ones) are discussed. Under the EMMP, the key mitigation and enhancement measures for major identified impacts are translated into concrete action programs/projects together with the institutional framework and mechanisms for ensuring their appropriate implementation. It also provides the estimated investment requirements and commitments/guarantees to carry out the proposed plan.

The Environmental Management and Monitoring Plan shall be composed of the following components:

- Design and Construction Management Program
- Social Development and Institutional Plans
- Environmental Monitoring Plan

1.3 THE EIA TEAM

The EIA team is composed of the following technical experts/specialists:

- Reynar R. Rollan – Team Leader/Geologist
- Dr. Roger M. Lopez – Socio-Anthropologist
- Marcelo R. Caleda – Terrestrial Ecologist
- Jethro C. Hipe – Air/Noise Quality Specialist

The key qualifications of the EIA team members are summarized in Table 1.2.

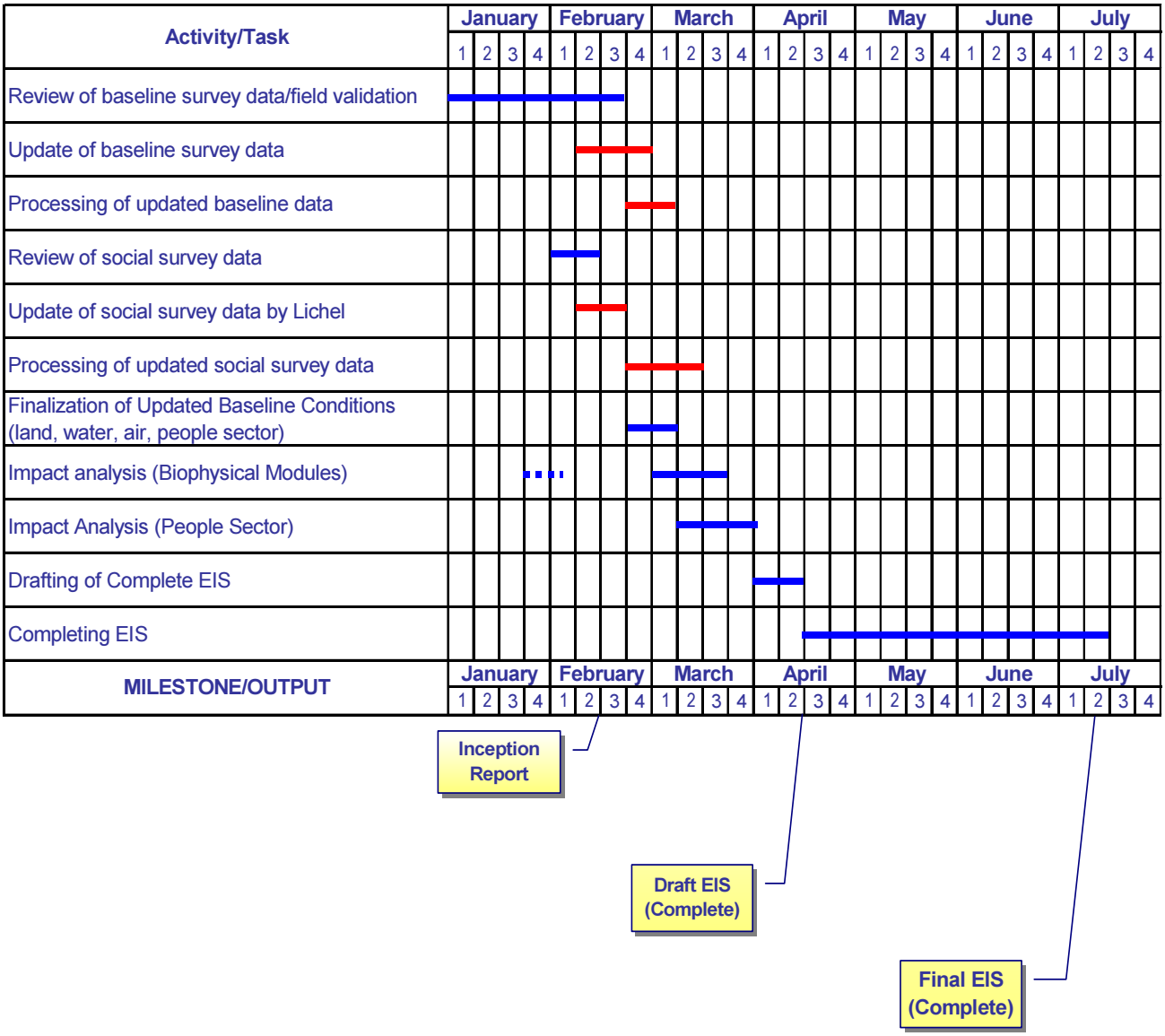
Table 1.2 Summary of Key Qualifications and Experience of the EIA Team

Name	Years of Professional Experience	Educational Background	Relevant Experience
Reynar R. Rollan	29	MS Environmental Studies; Diploma in Applied Engineering, Geological and Geomorphological Surveys; BS Geology	EIA; Water resources studies; well evaluation, design and testing; environmental geological studies for hydroelectric and thermal projects; island resorts; golf courses; subdivisions and industrial estates; permeability testing; georesistivity; engineering geology; solid waste management
Marcelo R. Caleda	23	PhD Forestry (candidate); MS Wildlife Studies; BS Zoology	Biodiversity Studies; plant and wildlife surveys; biological surveys and inventory of flora and fauna; EIA
Dr. Roger M. Lopez	39	PhD Anthropology; MA Anthropology; AB History	Anthropology; sociology; institutional development; community organizing
Jethro C. Hipe	15	PhD Environmental Science (candidate); MS Environmental Engineering; BS Chemical Engineering	EIA; air and water pollution studies; air and water quality assessment

1.4 EIA SCHEDULE

The schedule of the preparation of EIS/EIA is shown in *Figure 1.1*

Figure 1.1 Preparation of EIA/EIS Schedule



Chapter 2
PROJECT DESCRIPTION

2.1 PROJECT LOCATION

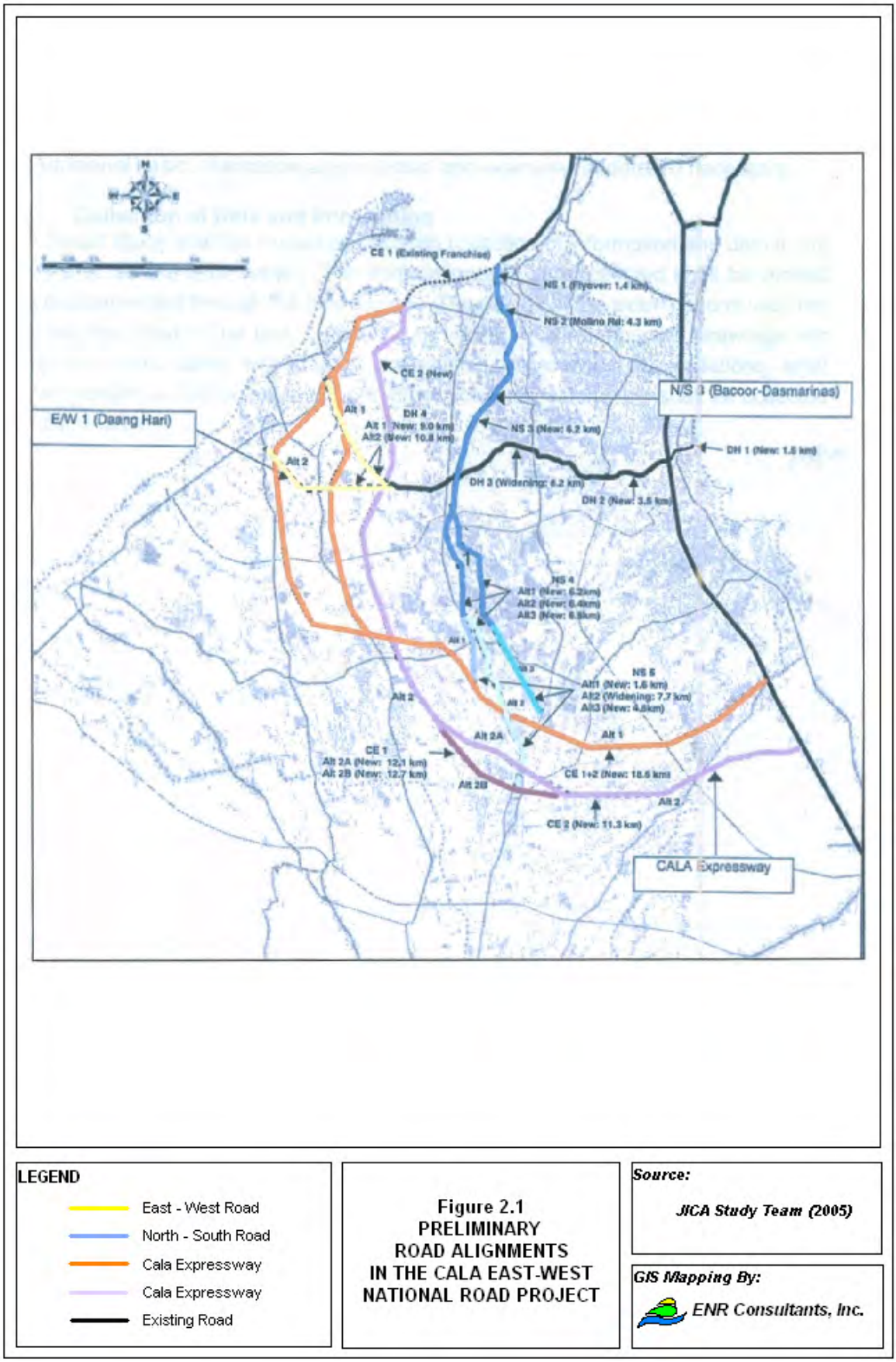
The **CAVITE-LAGUNA East-West National Road Project** will cover pass through the eastern and northern sections of Cavite and the western parts of Laguna and Muntinlupa City. Cavite is located 30 km south of Metro Manila and has a total land area of 142,706 ha. It is bounded on the north by Manila Bay and Metro Manila, on the south by Batangas, on the east by Rizal and Laguna, and on the west by Manila Bay. Laguna on the other hand has a total land area of 175,973 ha. It is bounded on the north by Laguna de Bay and Rizal, on the south by Batangas, on the east by Quezon, on the west by Cavite, and the Sierra Madre Mountain Range on the northeast. Muntinlupa City has a total land area of 4,670 ha. It is bounded on the north by Taguig City, on the west by Las Piñas City, on the east by Laguna de Bay, Parañaque on the northwest and on the southwest by Bacoor and San Pedro.

2.2 PROJECT DESCRIPTION

Project Name	CAVITE-LAGUNA (CALA) East-West National Road Project
Project Type	Road Project
Project Proponent	Department of Public Works and Highways (DPWH)
Responsible Person	Engr. Faustino N. Sta. Maria Jr.
Contact Address	The Feasibility Study and Implementation Support on the CALA East-West National Road Project DPWH Region IV EDSA, Quezon City
Project Cost	P26.8 billion
EIS Preparer	ENR Consultants Inc.
Contact Address	2nd Floor FSS Building 89 Sct. Castor St., Barangay Laging Handa Quezon City, Metro Manila 4137227

Figure 2.1 shows the preliminary road alignments, which were identified by the JICA Study Team. The likely final road alignments based on the SPOT imagery map obtained by the EIA team last January 12, 2006 from DPWH is shown in Figure 2.2.

The final routes of the CALA East-West project will cover three main road sections. These are the: East-West Road (Daang Hari Extension); North-South Road (Bacoor-Dasmariñas); and the CALA Expressway.



LEGEND

- East - West Road
- North - South Road
- Cala Expressway
- Cala Expressway
- Existing Road

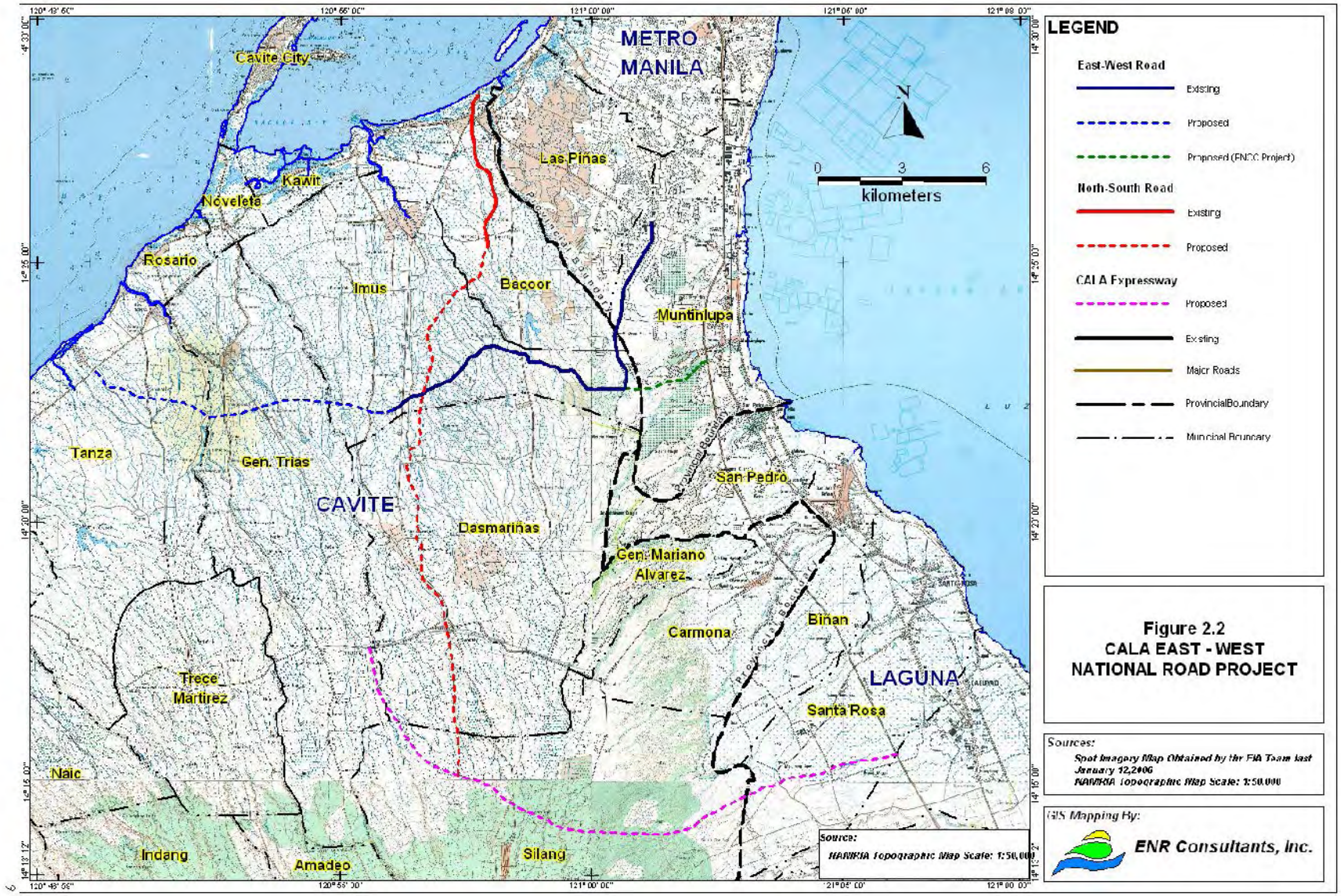
Figure 2.1
PRELIMINARY ROAD ALIGNMENTS IN THE CALA EAST-WEST NATIONAL ROAD PROJECT

Source:

JICA Study Team (2005)

GIS Mapping By:

ENR Consultants, Inc.


METRO MANILA
Cavite City
Las Piñas
Kawit
Noveleta
Rosario
Imus
Bacoor
Muntinlupa
Tanza
Gen. Trias
CAVITE
San Pedro
Dasmariñas
Gen. Mariano Alvarez
Carmona
Biñan
LAGUNA
Santa Rosa
Trece Martirez
Naic
Indang
Amadeo
Silang
N
0 3 6
kilometers
LEGEND
East-West Road
Existing
Proposed
Proposed (ENCC Project)
North-South Road
Existing
Proposed
CALA Expressway
Proposed
Existing
Major Roads
ProvincialBoundary
Municipal Boundary
Figure 2.2
CALA EAST - WEST
NATIONAL ROAD PROJECT
Sources:
Spot Imagery Map Obtained by the EIA Team last January 12,2006
NAMRIA Topographic Map Scale: 1:50,000
GIS Mapping By:
ENR Consultants, Inc.
Source:
NAMRIA Topographic Map Scale: 1:50,000

2.3 PROJECT COMPONENT AND KEY FEATURES

2.3.1 Physical Infrastructure Development

The East-West Road will include the Daang-Hari Extension, the existing Daang Hari Road and the proposed toll road from the South Luzon Expressway, which will pass through the New Bilibid Prison compound. It will pass through Bacoor, General Trias, Imus, Tanza, and part of Muntinlupa City and will collectively have a length of 24.2 km.

The Daang Hari Extension will connect the Aguinaldo Highway and the Noveleta-Naic-Tagaytay Highway. The final road alignment considered is ALT-1C, which will span 11.4 km. This will include 15 major river/creek crossings and will pass through 19 barangays. It will have a right of way (ROW) width of 30 m, which will include a 4-lane concrete road with a design speed of 60 km/h.

The existing Daang Hari Road has a length of 9.2 km. Widening along this segment is on going under an existing DPWH project. This segment though is considered part of the East – West Road. PNCC will construct a toll-operated road with a length of 3.2 km. This will pass through the NBP area in Muntinlupa to the Susana Heights area of the South Luzon Expressway (SLEX).

The North-South Road will pass through the municipalities of Bacoor, Dasmariñas, Imus, and Silang. The final road alignment identified is ALT-1B. This has a length of about 27.8 km, including 10 major river/creek crossings and 4 Flyover/Viaducts and will pass through 27 barangays. One of the flyovers/viaducts will be connecting the Manila-Cavite Expressway with the Molino Boulevard. Another flyover/viaduct will be adjacent with the Cavite-Batangas Road (location is after the intersection of the Daang-Hari and Cavite-Batangas Road). A flyover/viaduct will also be put up in the segment where the Cavite-Batangas Road intersects with the North-South Road. The last will be constructed in the intersection of Dasmariñas-Naic Road and the North-South Road.

The North-South Road also has a 30-m ROW width and will have 6 concreted lanes with a design speed of 60 km/h. Considered part of the project is the widening of the existing Aguinaldo Highway from Dasmariñas to Silang. The widening will involve an expansion at the western side of the said road.

The CALA Expressway will pass though Dasmariñas, General Trias, and Silang in Cavite and at Biñan and Sta. Rosa in Laguna.

The final road alignment considered for the CALA Expressway is ALT-2. The said road alignment is approximately 22.7 km long, will include 13 major river/creek crossings and 2 flyover/viaducts. One of the flyover/viaduct will be built at the intersection of the CALA Expressway and the Silang By-pass Road and the other will be constructed at the intersection of the CALA Expressway and Sta. Rosa-Ulat-Tagaytay Road. Twenty-one barangays in Cavite and 7 barangays in Laguna will be affected once the construction of the Expressway commences.

The CALA Expressway will have a 50-m ROW width, which will contain 6-concreted lanes with a design speed of 100 km/h.

Figure 2.3 shows the project and the structures to be built in the three road sections while Table 2.1 highlights and summarizes the specifications of the three components of the CALA project.

Table 2.1 Specifications of the Proposed CALA Roads

Proposed Road	Category	Final Road Alignment and Length		Design Speed	Traffic Lanes	ROW Width
East-West	National Highway	ALT-1C	24.2 km	60 km/h	4 lanes	30 m
North-South Road	National Highway	ALT-1B	27.8 km	60 km/h	6 lanes	30 m
CALA Expressway	Expressway	ALT-2	22.7 km	100 km/h	6 lanes	50 m

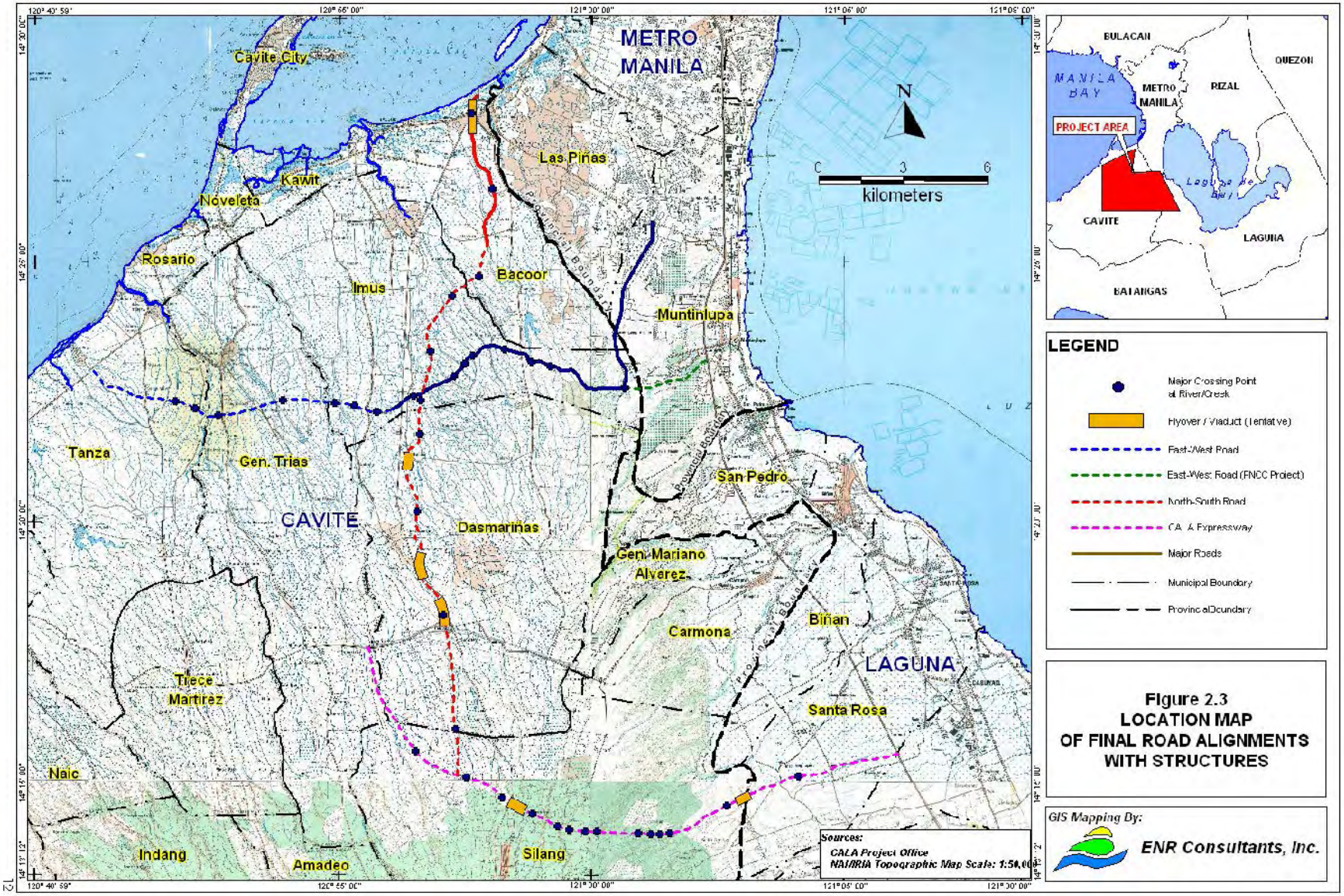
2.3.2 Resettlement Plan

In the course of the project, affected residents/families will have to be resettled. Policies to be considered with respect to the resettlement of project affected families are: Government of the Philippines' (GOP) policies on resettlement particularly DPWH's Land Acquisition and Resettlement Rehabilitation (LARR) Framework; JICA's Guidelines on Environmental and Social Considerations; and Official Development Assistance's (ODA) policy on resettlement such as the World Bank and Asian Development Bank.

Resettlement policy of the GOP is based on the Bill of Rights of the Constitution. These are Articles III Section 1 and Article II Section 9. Article III Section 1 states that no person shall be deprived of life, liberty, or property without due process of law, nor shall any person be denied the equal protection of the laws. Article II Section 9 on the other hand states that private property shall not be taken for public use without just compensation. RA 8974 covers the procedures on land acquisition. This also covers the ROW acquisition.

JICA's policy on resettlement corroborates with World Bank (WB) and Asian Development Bank (ADB) policy on resettlement. The following measures are supported by JICA: avoidance of involuntary resettlement or minimizing resettlement effects; compensation for assets and loss of income at replacement value; participation of stakeholders in the resettlement process; protection of vulnerable groups; and preparation of Resettlement Action Plan.

DPWH's LARR is a framework for compensation plan, operational procedures, and provisions for internal and external monitoring. Regulations identified that are applicable to the project are: adverse social impact of road projects are avoided, minimized, and/or mitigated; PAPs are provided with sufficient compensation and assistance for the lost assets to restore or improve living conditions of PAPs; nobody is to be disadvantaged of the project; project stakeholders including PAPs are consulted in all phases of the project.


METRO MANILA
Cavite City
Las Piñas
Kawit
Noveleta
Rosario
Imus
Bacoor
Muntinlupa
Tanza
Gen. Trias
CAVITE
Dasmariñas
San Pedro
Gen. Mariano Alvarez
Carmona
Biñan
LAGUNA
Santa Rosa
Trece Martirez
Naic
Indang
Amadeo
Silang
N
0 3 6
kilometers
Sources:
CALA Project Office
NAMRIA Topographic Map Scale: 1:50,000
BULACAN
QUEZON
MANILA BAY
METRO MANILA
RIZAL
PROJECT AREA
CAVITE
LAGUNA
BATANGAS
LEGEND
Major Crossing Point at River/Creek
Flyover / Viaduct (Tentative)
East-West Road
East-West Road (PNCC Project)
North-South Road
CALA Expressway
Major Roads
Municipal Boundary
Provincial Boundary
Figure 2.3
LOCATION MAP
OF FINAL ROAD ALIGNMENTS
WITH STRUCTURES
GIS Mapping By:
ENR Consultants, Inc.

2.4 PROJECT ACTIVITIES

The implementation of the CALA road project requires interconnected activities from planning to feasibility phase, detailed design/engineering phase, implementation, construction, and up to operation and maintenance. These activities are specifically divided into 3:

- Pre-Construction
- Construction
- Operation and Maintenance

2.4.1 Pre-Construction

The Feasibility Study (FS) and the detailed design phase. Key activities are:

- Feasibility study phase covers basic surveys, baseline data collection, establishment of the general layout of the road and plan formulation.
- Detailed design phase entails the review and analysis of technical data collected and surveys conducted, preparation/development of detailed management plans (land acquisition and resettlement plan), detailed design of the road and cost estimates.
- Securing of permits and clearances includes acquisition of permits/clearances from concerned national government agencies and local government units prior to construction.
- Selection of contractor includes the selection of a civil works contractor following standard bidding procedures acceptable to the Philippine government and the financing institution. Bidding will be officiated by the project proponent. After the contractor has been selected, the contract will be executed and a Notice to Proceed (NTP) will be issued. The Design Consultant and the Contractor will do a joint pre-construction survey to verify the alignment, elevations/locations and presence of natural and man-made structures along the three road alignments.

2.4.2 Construction

DPWH will oversee the construction of the final road alignments in the East-West Road, North-South Road, and the CALA Expressway. The East-West will be the priority road for construction since this will involve the extension and widening (segment) of the existing Daang Hari Road. The North-South will commence after the East-West and the CALA Expressway is the last proposed road to be constructed. Review, finalization and implementation of the road design will also be carried out in this stage.

2.4.3 Operation and Maintenance

The operation and maintenance of the CALA project will be the responsibility of the DPWH. However, the toll operated road from SLEX to a segment of Daang Hari Road will be handled by PNCC.

Project monitoring and evaluation is part of the operation and maintenance phase. These will include occasional field inspection and feedback, implementation of the Resettlement Action Plan for the project affected families, and Environmental Monitoring Plan.

Road Maintenance will be done to improve/enhance road performance, prolong road life, and ensure the safety of the transport sector (motorists). This includes concrete pavement maintenance, restoration (CPR), and resurfacing.

2.4.4 Abandonment Period

DPWH will turn over the project to the LGUs of Cavite and Laguna except for the Toll operated road by PNCC. The transport sector in the two provinces will be the direct beneficiaries of the project.

2.5 ORGANIZATION AND MANAGEMENT OF THE CALA PROJECT

2.5.1 Implementation Arrangement

This section discusses the evolving consensus on how the CALA roads will be implemented and what ancillary steps are required to support and facilitate their early implementation. Implementation support encompasses all staff work and measures leading to actual construction.

In the past, the planning and feasibility study have concentrated on the engineering and economic analyses of road projects, with the subsequent implementation phase taken for granted as following the usual or conventional ways within and under the DPWH. Resolution of obstacles to construction is then left to the creativity and resourcefulness of project managers. This situation is deemed unacceptable for the target roads.

2.5.2 Implementation Scenarios

(1) Conventional

This scenario assumes implementation of all target roads (NS-1 to NS-7, as well as DH-2 to DH-4) will be handled by DPWH. Funding will also come from the capital budget of the department that gets screened and approved by Congress, and may or may not entail foreign loans from ODA sources. The roads would then end up as national, open access, non-toll roads.

Because of funding constraints, the roads would be built in stages and implementation can only commence by 2008. Detailed engineering and ROW acquisition of any road segment or package can be initiated by that time; thus pushing actual construction further to 2009. The protocol for securing ODA financing would entail appraisal and loan evaluation not earlier than 2007.

Thus, the most likely implementation would have the following timetable:

- JBIC appraisal & loan approval in 2007;
- ROW acquisition for NS-1 commences in 2008;
- Public tender for NS-1 by 2nd Quarter of 2008; followed by construction in 1st Quarter of 2009;
- ROW acquisition for NS-2 and NS-3 in 2009, followed by construction in 2010;
- ROW acquisition for DH-3 and DH-4 in 2011, followed by construction in 2012;
- ROW acquisition for NS-4 – NS-7 begins in 2012 followed by construction in 2013.

In terms of responsibilities, a Project Management unit under the PMO for foreign assisted projects of the DPWH will be designated and constituted 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 (which had implemented the existing DH-1 and Molino Roads with local, Congress-initiated, funds).

(2) With NDC-PIC Participation

The entry of the National Development Company (NDC), a state-owned enterprise (SOE), into infrastructure development is new. It is a novel way to get around the budget limitations, and at the same time raising the level of investments in infrastructure. As envisioned in the Medium Term Development Program to Year 2010, a Philippine Infrastructure Corporation (PIC) was created by NDC to raise as much as P100 billion (mainly from peso bond issuance) from the domestic capital market and funnel the amounts into roads and other infrastructure where user charges can be imposed to pay back the bonds.

For the CALA roads, it would entail converting some of the target road segments into toll roads. Based on the analysis made by the Study Team, the roads suitable for tolling are NS-1, NS-2 and NS-3, initially. DH-2 also appears promising as it will provide linkage of Daang Hari to SLEX. NDC-PIC has placed these roads into its funding pipeline. Accordingly, under this scenario, NS-1, NS-2 and NS-3 will be built as toll road by a special-purpose project company (SPC) to be initially capitalized by NDC. The Toll Regulatory Board (TRB) shall grant a Toll Concession Agreement (or TCA) to the SPC before the latter is privatized via open tender.

A similar scheme is being contemplated for DH-2, except for the involvement of the Philippine National Construction Company (PNCC) as a partner of NDC. PNCC holds the franchise for SLEX. With the participation of NDC-PIC, the DPWH would focus its resources on the other roads, that is, DH-3, DH-4, NS-4 to NS-7, which are now envisaged to be financed from the DPWH capital budget and supplemented by ODA. The implementation timetable would be as follows:

- ROW acquisition for NS-1 commences in 3rd Quarter 2006, followed by bidout for project company sometime in 2007
- Construction of NS-1 starts 4th Quarter 2007
- Construction of DH-2 by PNCC and PIC in 1st Quarter 2007
- ROW acquisition for NS-2 and NS-3 in 2007, followed by construction in 2008
- JBIC appraisal and loan approval in 2007 (for the DPWH-allocated roads)
- ROW acquisition for DH-3 and DH-4 in 2008, with funds advanced by NDC-PIC, followed by construction in 2009;
- ROW acquisition for NS-4 - NS-7 begins in 2010 followed by construction in 2012

(3) Key Differences of the Two Scenarios

The main advantage of the NDC-PIC participation is early realization of the high-priority road projects by as much as 2 to 3 years in the case of NS-1. The acquisition of ROW for some segments of the CALA target roads (i.e., NS-1 - NS-3, DH-2 and DH-4) can be done in advance, thus making them more attractive to ODA and commercial lenders.

The key features that make the second scenario very appealing are: (a) reduced reliance on national budget appropriations, and thus greater leeway for DPWH to execute other

road projects in the medium-term; (b) lower level of foreign financing, and thus better matching of peso revenues with debt servicing and (c) the project beneficiaries (or road users) get to contribute more to the cost of the road construction and maintenance, rather than being shouldered by all taxpayers.

However, this new implementation scenario is more demanding and complex, aside from requiring extra tasks outside the scope of the CALA Study Team. For one, the scheme has never been tried before.

2.5.3 Implementation Support

(1) Doing the Usual

To support the implementation of all the road segments, whether placed on the DPWH or PIC pipelines, the following will be required:

- Completion of ECC documents (which is presently being undertaken within the scope of the present study) and support to DPWH staff in securing formal approvals from the DENR
- Completion of the detailed feasibility studies for all road sections (E-W segments DH-2 - DH-4, and North-South segments NS-1 - NS-7)
- Preparation of project documents for evaluation and appraisal by ODA agencies
- Preparation of documents for classification of Daang Hari and Molino Boulevard as national roads.

(2) Doing the Extra Mile

In addition to the above, and because of the conversion of NS-1 to NS-3 into toll roads, the following pre-implementation efforts will have to be made:

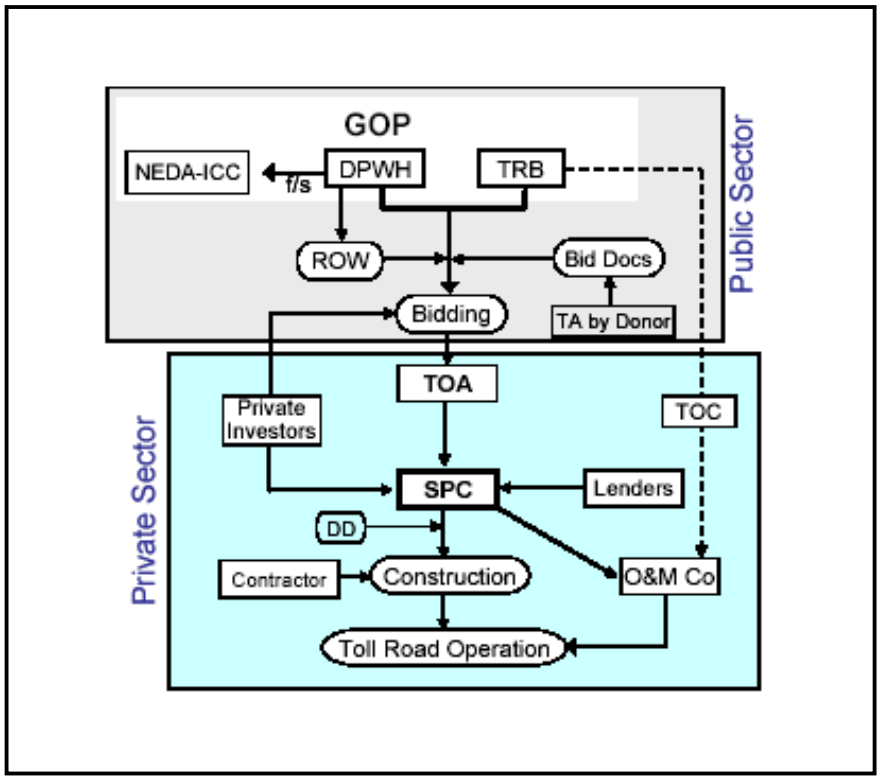
- Detailed engineering of NS-1 has to be done, as soon and as fast as possible
- Parcellary mapping has to be done immediately, or the acquisition of ROW will be deferred
- Detailed resettlement action plan (RAP) has to be formulated
- Financial viability analysis for NS-1, NS-2 and NS-3 have to be conducted
- Practical tolling schemes have to be examined, given that it links to R-1 which is being tolled as an open system
- Cost and viability analyses to support application and negotiation for a Toll Concession Agreement (TCA) from TRB for NS-1, NS-2 and NS-3
- Inclusion of NS-1 - NS-3 in the BOT Program of DPWH and approval of the NEDA-ICC
- Tender documents for private sector entry into the special-purpose project company that will undertake construction and operations of NS-1, NS-2 and NS-3.

2.5.4 Road to a Modified BOT

The involvement of NDC-PIC, however, needs to overcome several obstacles. For one, it has no franchise to develop toll roads, notwithstanding its character as an SOE. Neither would the yet-to-be-formed SPC have. Under the law, a Toll Concession Agreement needs to be issued by TRB in favor of the SPC that NDC-PIC would create. Furthermore, it has no technical expertise in road planning, design or construction. Thirdly, the financial viability of the proposed toll roads will require capital grants from DPWH, and that, in turn, needs to be legitimized.

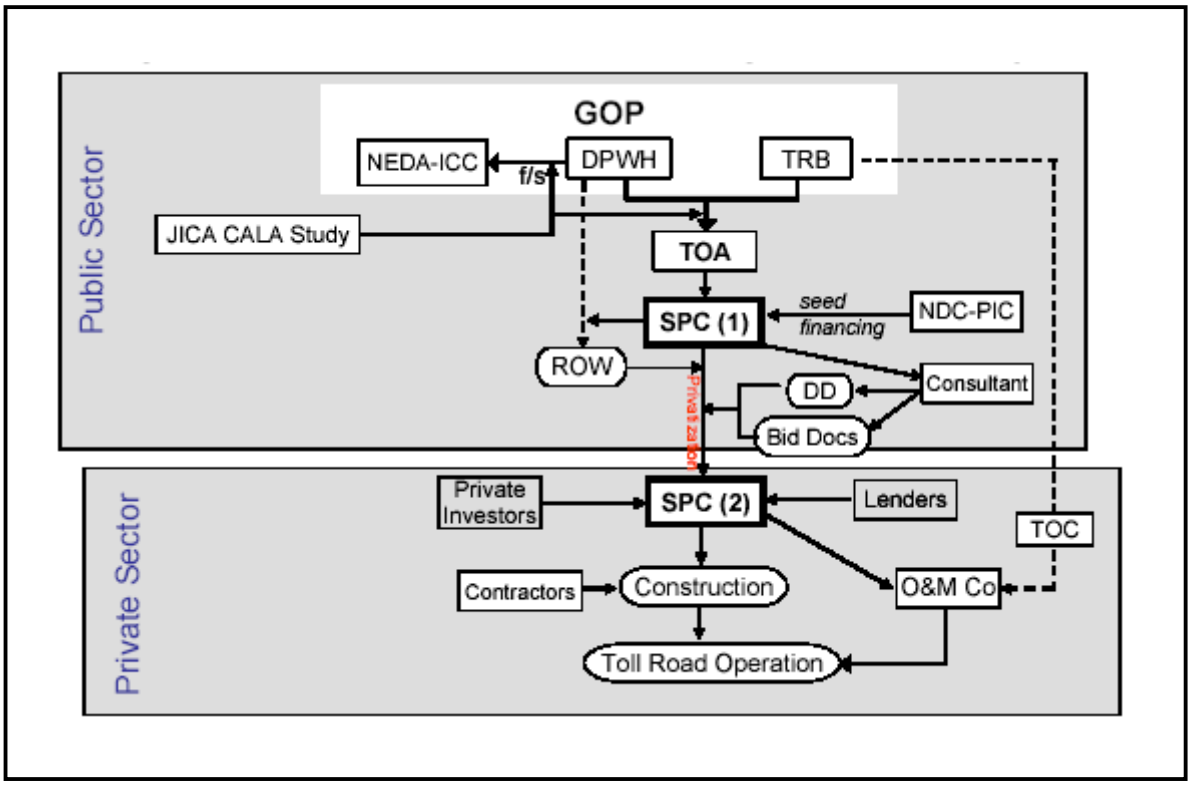
Within the framework of the BOT Law, the DPWH can undertake a solicitation process for Stage 1 of the CALA Expressway. It has been done before by DPWH for the Star Expressway *(Figure 2.4).* The downside of this approach is that the SPC or NDC-PIC will have to compete with other prospective bidders, and the winning bidder would deal with many uncertainties like design and project cost. Hence, it would inherit the same problems experienced by previous BOT projects and lead to implementation delays.

Figure 2.4 Conventional Scheme for BOT



The other approach is to grant the SPC the status of an unsolicited proponent, who will then be subjected to a Swiss challenge under the BOT Law. It does not promise a shorter timetable to project realization. A modified approach preferred by NDC-PIC is for the bidding to occur after the SPC has secured the TCA. Although not provided for in the implementing rules and regulations of the BOT Law, the modified procedure is not illegal and it satisfies the public policy requirement for transparency. It enables NDC-PIC to jumpstart the implementation of NS-1 and to commence detailed engineering works and ROW acquisition without waiting for private sector funds to flow in. A large part of the project uncertainties (i.e. ROW and firm cost) is removed; bidders could price their bids more accurately, and the project becomes more bankable. A lengthy negotiation for the TCA between the government and the private sector is avoided. This procedure is shown on Figure 2.5.

Figure 2.5 Modified BOT Scheme for Stage 1 of Expressway



2.5.5 Terms and Timing of PSP Tender

The premise for NDC-PIC involvement is to pave the way for private sector participation (PSP), not to replace it. Hence, the public tender for the privatization of the SPC as well as its TCA has to be properly structured and timed.

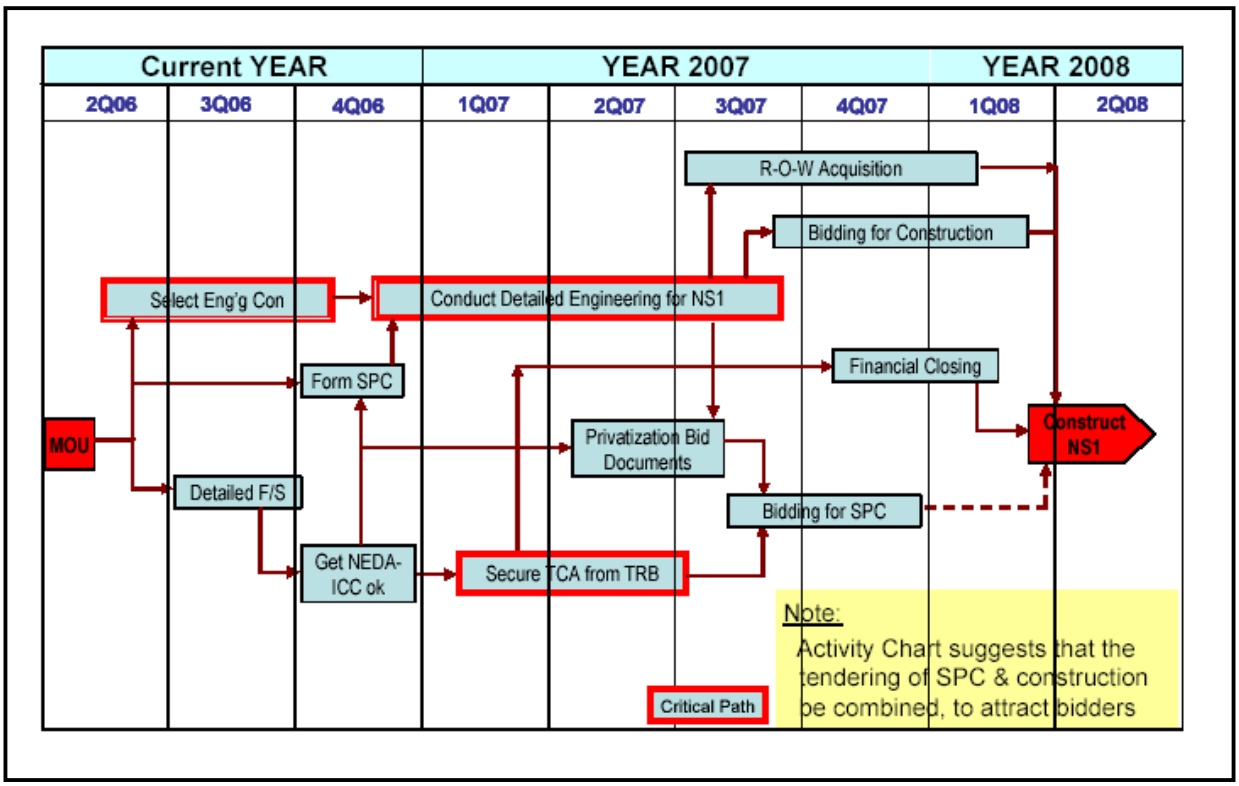
Subject to further study, the distinguishing features of the TCA are as follows:

- The TCA will have a fixed toll fee, as determined from the feasibility study, but in no case higher than the highest toll rate prevailing in other expressways (e.g., rate for NLEX is currently pegged at P2.50/pcu-km).
- To balance public and private interests, the concession period will be endogenous 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 are below expectation. A target revenue, adjusted with inflation on a yearly basis to cover costs and provide for a decent return on investment, shall be the criterion.
- Rights to the implementation of NS-2 and NS-3 will have an expiry period, reckoned from the completion of NS-1. In this manner, the problems experienced during R-1, STAR and Skyway implementation will be avoided.
- Costs of ROW, or part of it, shall be incorporated in the project cost to be covered by the toll fee.
- In terms of selecting the winning private bidder, the recommended rules are as follows:
- The award shall be given to the bidder that minimizes total government exposure (NDC-PIC and DPWH) in the toll road venture. The winner shall become the controlling equity shareholder in the SPC.

- The shareholdings of NDC-PIC in the SPC will be diluted accordingly, with the objective of reducing the same to zero, or at most to a minority bloc. Thus, initial expenses (for incorporating the SPC, acquiring the ROW, detailed engineering, and securing the TCA) incurred by NDC-PIC can be compensated.
- Financial capability shall be a key qualifying criterion. Since project cost (for NS-1) is known and TCA is given, bidders should be able to submit a firm project financing package as part of their bids.

The tendering of the SPC should be done as early as possible to minimize government exposure. However, it cannot be earlier than two predecessor events: (a) the grant of TCA and (b) the completion of the Detailed Engineering works. Figure 2.6 illustrates the sequence of events leading to the construction of NS-1, triggered by the signing of a Memorandum of Agreement between DPWH and NDC-PIC. Since the selection of the Engineering Consultant who shall design the NS-1 structure will occur while the SPC is still a government-owned corporation, the procedure needs to conform to the Procurement Act of 2003 (R.A. No. 9184). The selection (likely duration of 3-4 months) and the DE works (10–12 months) would be on the critical paths to privatization of the SPC or the actual construction of NS-1. In the event that the bidding for the construction of NS1 occurs when SPC is still government-owned or controlled, then the earliest date that NS1 can be constructed is the 2nd quarter of 2008. It is possible to shorten the period by 6 months, if the TCA is secured not later than the completion of DE, and if the bidding for PSP is combined with the bidding for construction. The combined tendering will have the benefit of attracting a wider base of bidders, as construction companies will join consortia that will seek to snare or capture the SPC.

Figure 2.6 Timeline for PSP



The lack of technical capability on the part of the NDC-PIC and SPC can be easily overcome. Part of it can be supplied under the existing scope of work of the CALA Study Team. The various units of DPWH can provide some of it. Others can be procured directly by the SPC, after its incorporation. The DPWH shall assist in the selection of a Construction Supervision Consultant, Design Engineer as well as Constructors for specific packages, but final approval shall rest with the SPC. Review of design and compliance with technical standards shall remain with DPWH.

2.5.6 Reserving the ROW

In an ideal situation, once the alignment and right of way of a proposed road had been chosen, no more permanent structures are built thereon. The LGUs would then impose the ROW on new subdivision plans subsequently brought to them for review and approval, and deny any building permit for construction. The Study Team has worked diligently in building consensus among stakeholders around the alignment, and to get the LGUs to reserve the corresponding ROW and back it up with local ordinances. The actual situation, however, is far from ideal. The three controls, ordinance, subdivision plan approval and building permit, are rarely applied. This is compounded when a major property developer ignore the alignment and proceed to develop their new subdivisions in conflict with the prior agreement. A case in point is the busway alignment where the NS-2 road segment was supposed to traverse. A property developer, who knew about the roadway plan way back in 2002 and did not object to it then, was found in 2006 to have built its subdivision in conflict with the road.

To prevent similar problems from recurring and thus reserve the future ROW, written agreements with property developers need to be sought. As part of the implementation support, the Study Team shall initiate the signing of MOUs with the identified major property developers in the area. Towards a harmonization of private plans with DPWH roadway plan, discussions have already been initiated with such developers as One Asia, Ayala Land, Cathay Land, and Greenfield Development Corporation. The intent is to accommodate and adjust each other's plans that will be mutually beneficial and before the lots are locked-in and sold to buyers by the developers. MOUs will serve as written manifestations of harmonized public and private plans, and will be disseminated to LGUs concerned so that they, in turn, can re-enforce the agreement.

While there is a decentralization policy for LGUs to be more active in road development, the reality is that few have the willingness and resources to do so. The most that can be expected from LGUs in the development of the target roads, in the order of likelihood of occurrence, are as follows:

- Enactment of council resolution or ordinance freezing the land use classification or zonal valuation of the lands affected by the proposed ROW
- Waiver of property tax on the designated ROW, pending transfer of land titles to the government (or DPWH)
- Assistance in the tagging of households that may be displaced or resettled, as well as supervision in the subsequent relocation
- Assistance in parcellary mapping and assembly of land titles in affected areas
- Persuasion on affected landowners to voluntarily yield their property;
- Provision of feeder and local roads;
- Financial contribution in the acquisition of ROW and relocation of displaced residents

2.5.7 Next Step for the Project

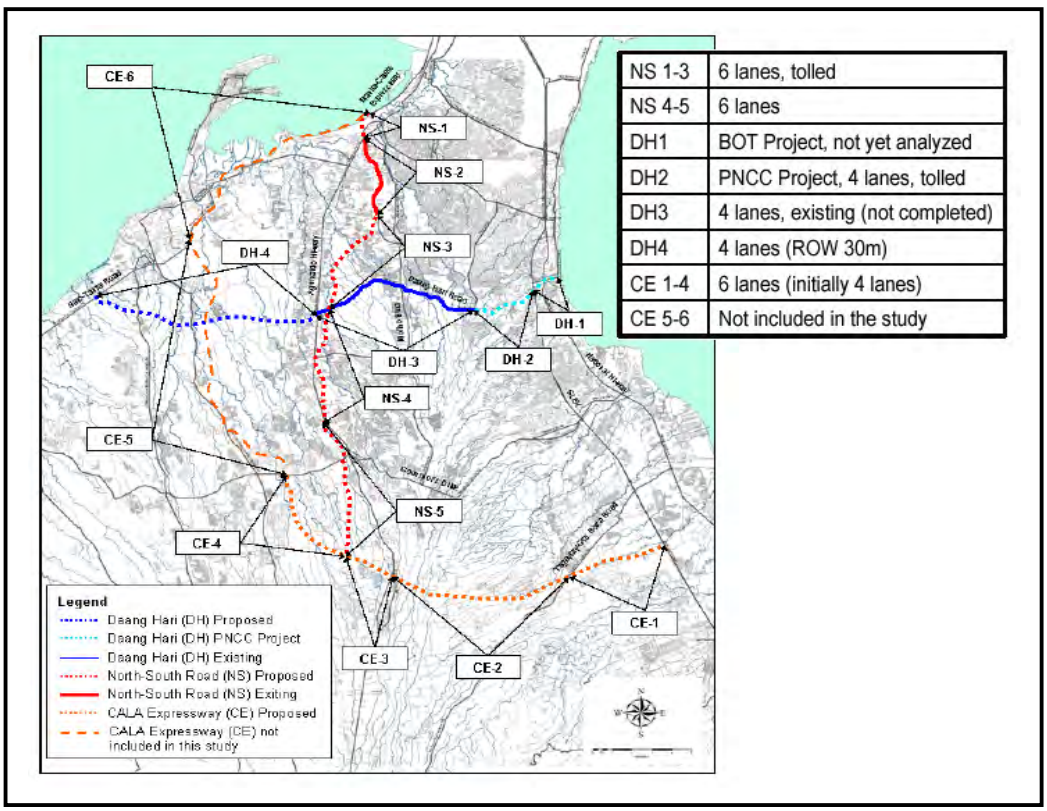
A Memorandum of Understanding between the NDC-PIC and DPWH has already been prepared and reviewed with the assistance of the JICA Study Team. In addition, there are several tasks or documents that need to be prepared or initiated, as follows:

- Enactment of a Department Order by DPWH classifying the existing Molino and Daang Hari roads into national roads. This will clear the way for the proposed upgrading and widening
- Inclusion of the CALA Expressway Stage 1 into the BOT program of DPWH
- Preparation of project documents for evaluation and approval of the NEDA-ICC, as to the PPP development of NS-1 - NS-3 into a toll road
- Interactions with major property developers to harmonize their subdivision plans with the road alignment, and the signing of corresponding MOUs
- Support to DPWH and NDC-PIC in securing a TCA from the TRB. This will involve detailed analysis of the commercial viability of the toll road, determination of a reasonable toll fee and formulation of key concession terms and conditions

2.6 IMPLEMENTATION SCHEDULE AND PROJECT COST

Based on the past studies and from a series of discussions in the Steering Committee, Technical Working Group Meetings, Seminar/Workshop and Stakeholder Meetings, the projects included in this study were determined as shown in *Figure 2.7.* Note, however, that DH-1, DH-2, CE-5, and CE-6 are already outside the scope of this study, although traffic demand analysis and environmental surveys cover DH-2 to assist PNCC to promote its implementation.

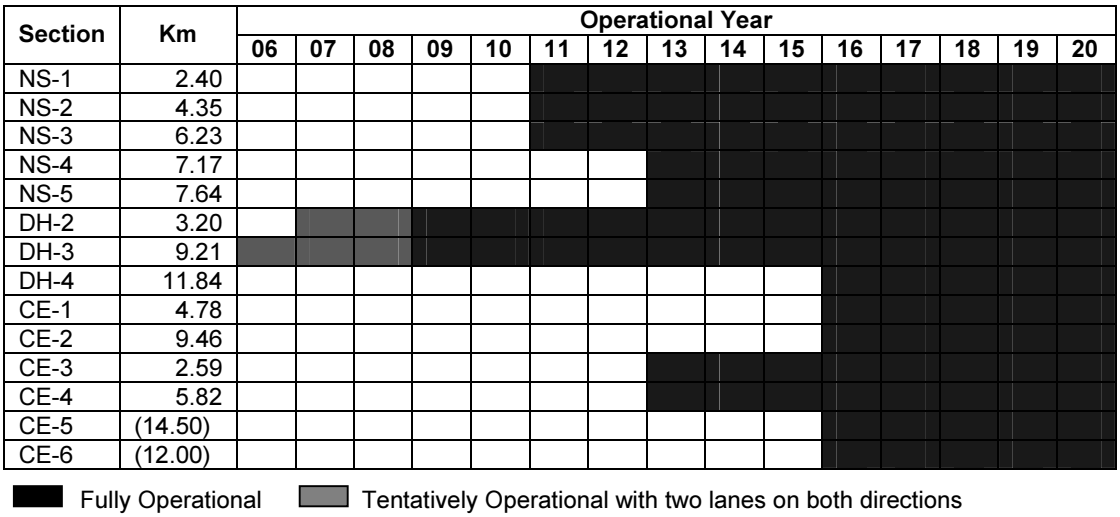
Figure 2.7 Project Components



NS 1-3	6 lanes, tolled
NS 4-5	6 lanes
DH1	BOT Project, not yet analyzed
DH2	PNCC Project, 4 lanes, tolled
DH3	4 lanes, existing (not completed)
DH4	4 lanes (ROW 30m)
CE 1-4	6 lanes (initially 4 lanes)
CE 5-6	Not included in the study

For NS-1 - NS-3, a modified BTO scheme is assumed to accelerate implementation. The rest of the target projects, i.e. NS-3 - NS-5, DH-4 and CE-1 - CE-4, assume the ordinary foreign assistance scheme. The implementation schedule for these target projects was assumed as shown in Figure 2.8.

Figure 2.8 Assumed Implementation Schedule of the Proposed Road Projects



2.7 FINANCIAL AND ECONOMIC ANALYSIS

2.7.1 Toll Setting

Current Toll Rate

Table 2.7.1 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 2.2 Current Toll Rate of Expressways in Manila

(Peso/km)

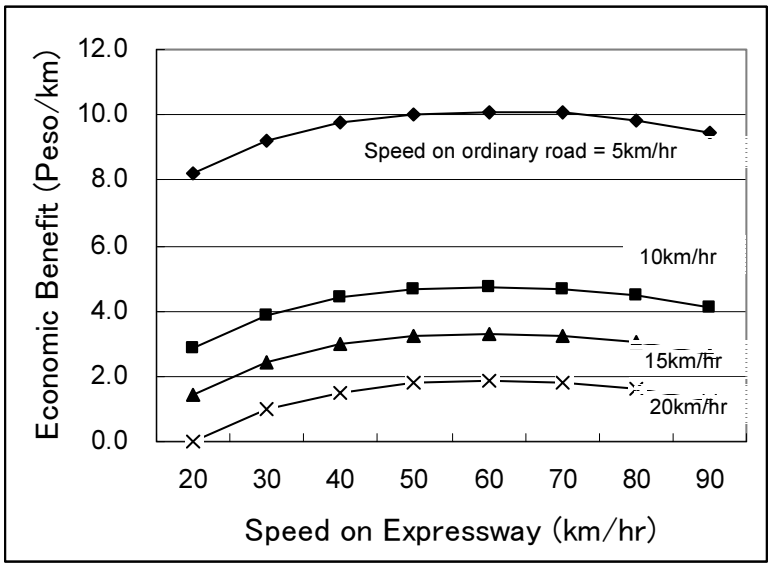
Toll Road		Class 1	Class 2	Class 3
		Car/Jeepney	Truck/Bus	Truck/Trailer
SLEX	at Grade	2.49	6.23	7.47
NLEX	at Grade	2.49	6.23	7.47
Coastal Road	at Grade	2.73	5.45	8.18
Skyway	at Grade	4.29	8.57	12.86
	Elevated	12.14	24.29	36.43

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 2.9, 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 2.9 User's Benefit by Using Expressway



Willingness to Pay

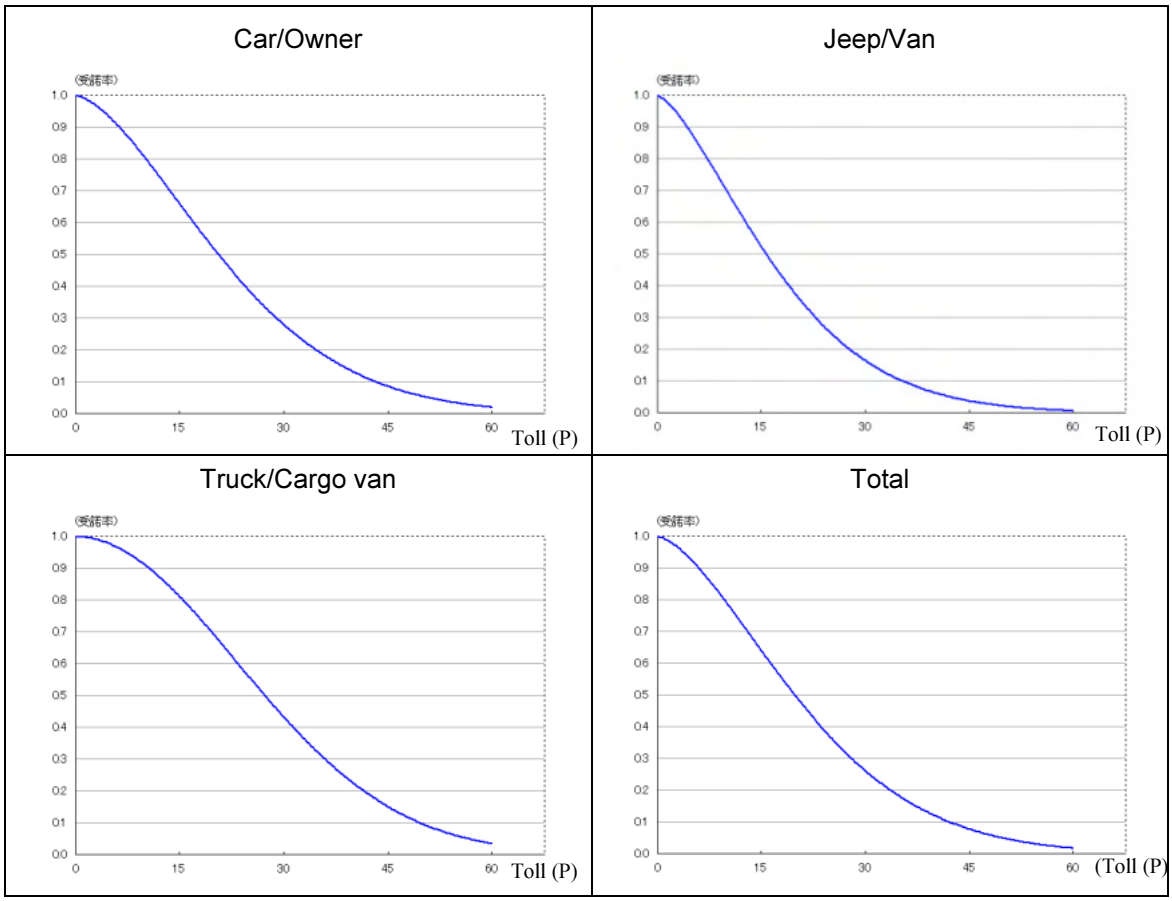
A Stated Preference Survey (SP Survey) was conducted in this Study to obtain a data to estimate the expressway user's willingness-to-pay for travel time reduction. About 1,200 car drivers were interviewed in May 2006, asking a double bound question of "Will you pay 20 (30 or 50) Pesos for 15 to 20 minutes 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 2.3, which seems rather low as compared with the current rate.

Table 2.3 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 2.10 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 2.10 Weibull Distribution of Willingness to Pay



Maximization of Revenue

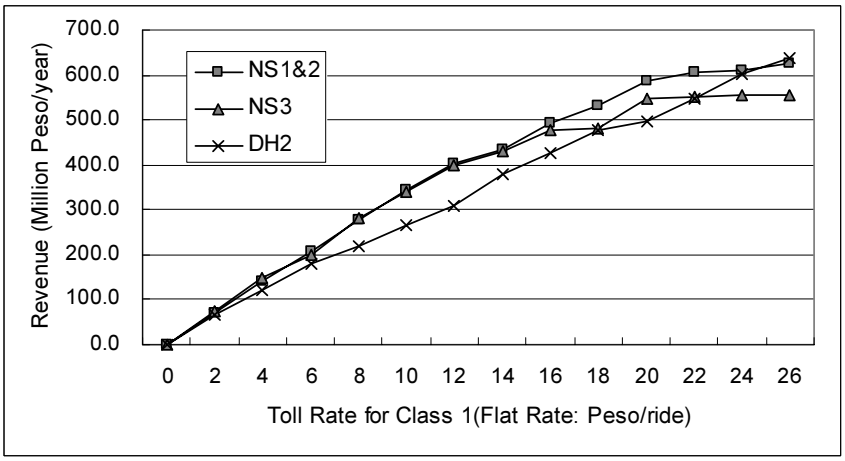
As the toll rate is raised from zero, total revenue will generally increase. However, if the rate becomes too high, traffic volume becomes less and less and the revenue will decline towards zero. Thus, the revenue will draw a concave to various toll rates, with a peak point. The toll rate which brings 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 2.11 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 2.11 Relationship of Toll Revenue and Toll Rate



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.

2.7.2 Demand Forecast for Project Roads

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 2.12. 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.

Base Case

For the base case explained in section 8.1, a series of traffic assignment was conducted. The result is illustrated in Figure 2.13 and Figure 2.14.

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 2.12 Traffic Distribution (Do-Nothing Case)

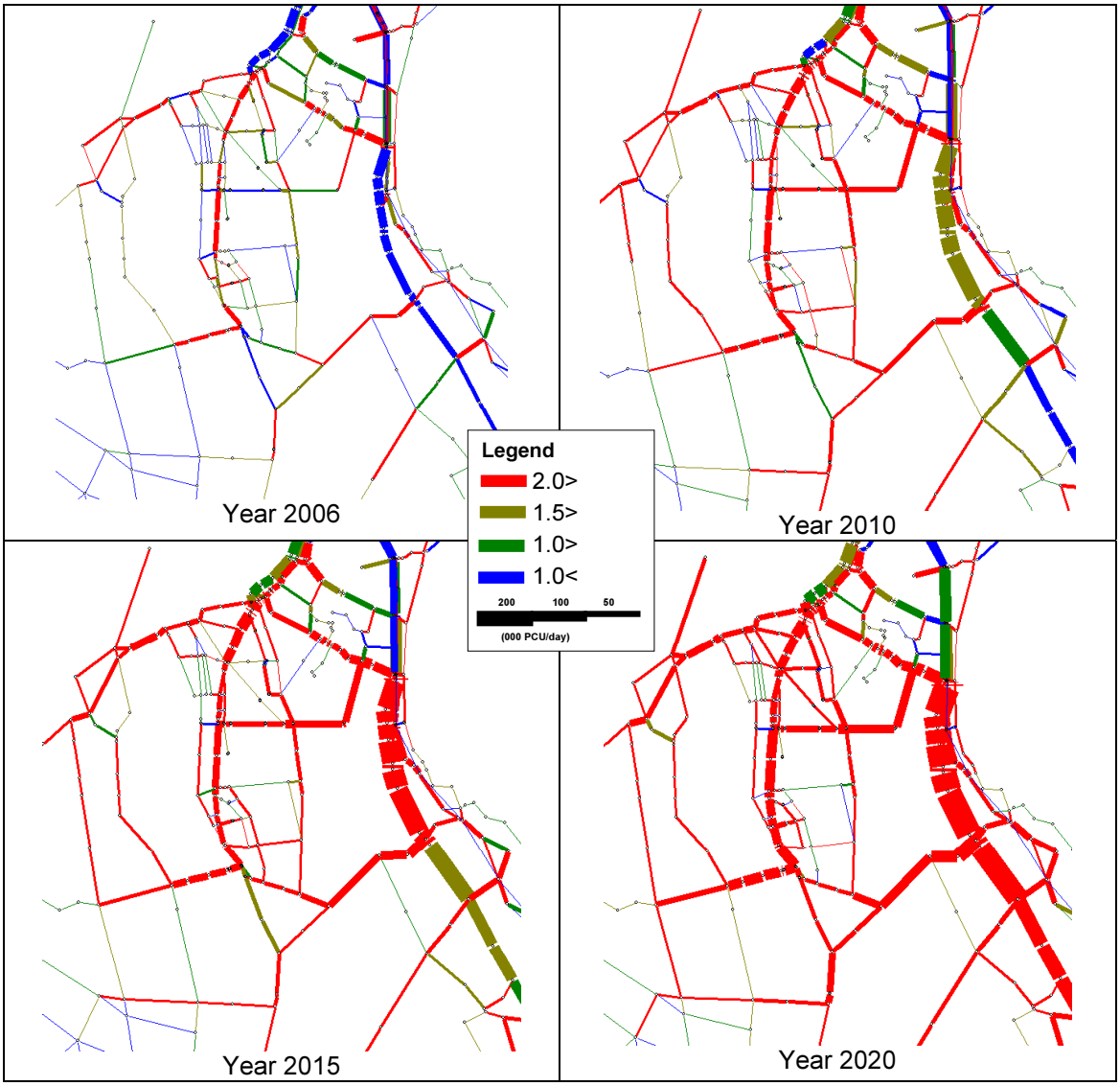


Figure 2.13 Traffic Distribution (Base Case)

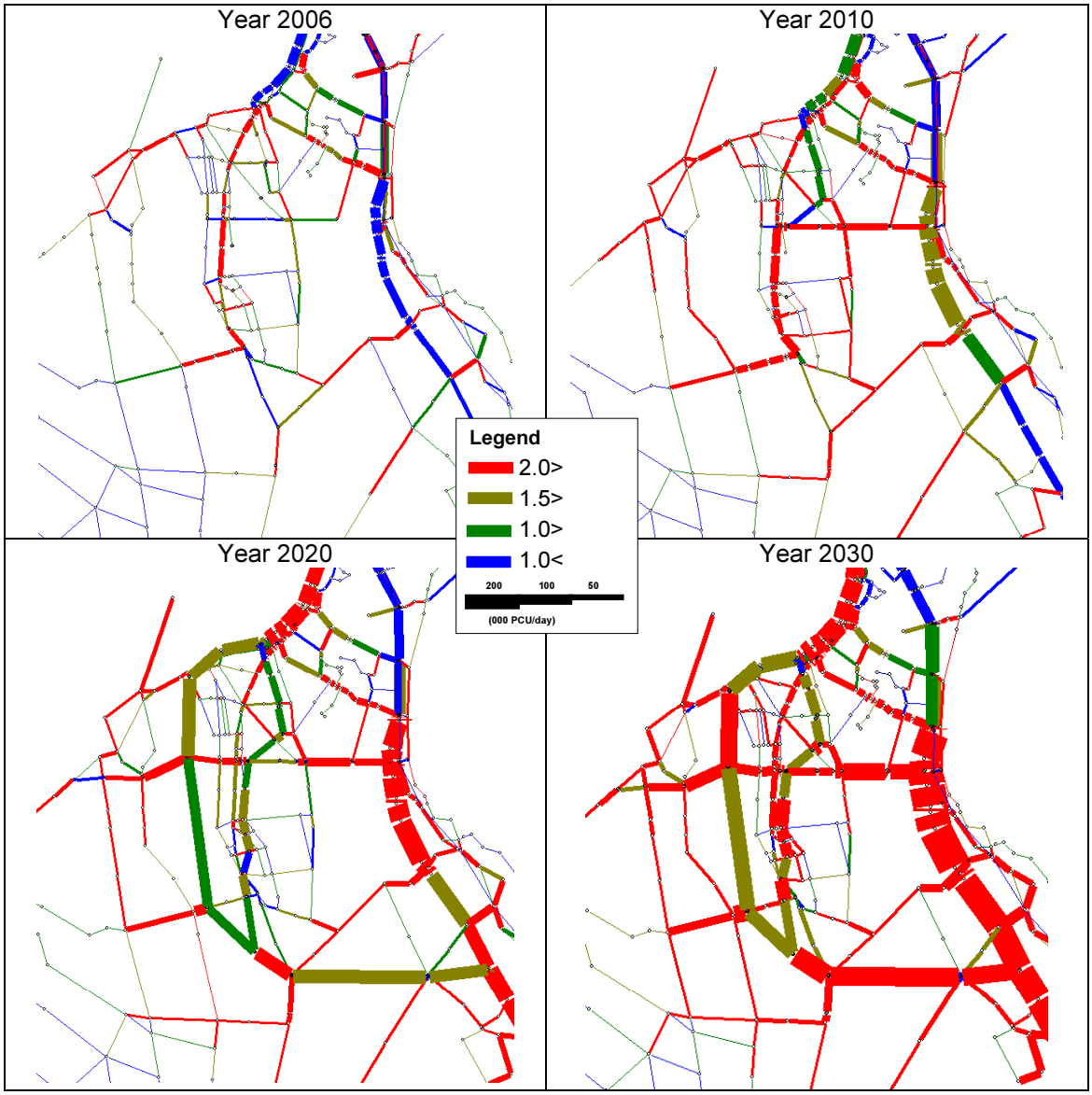
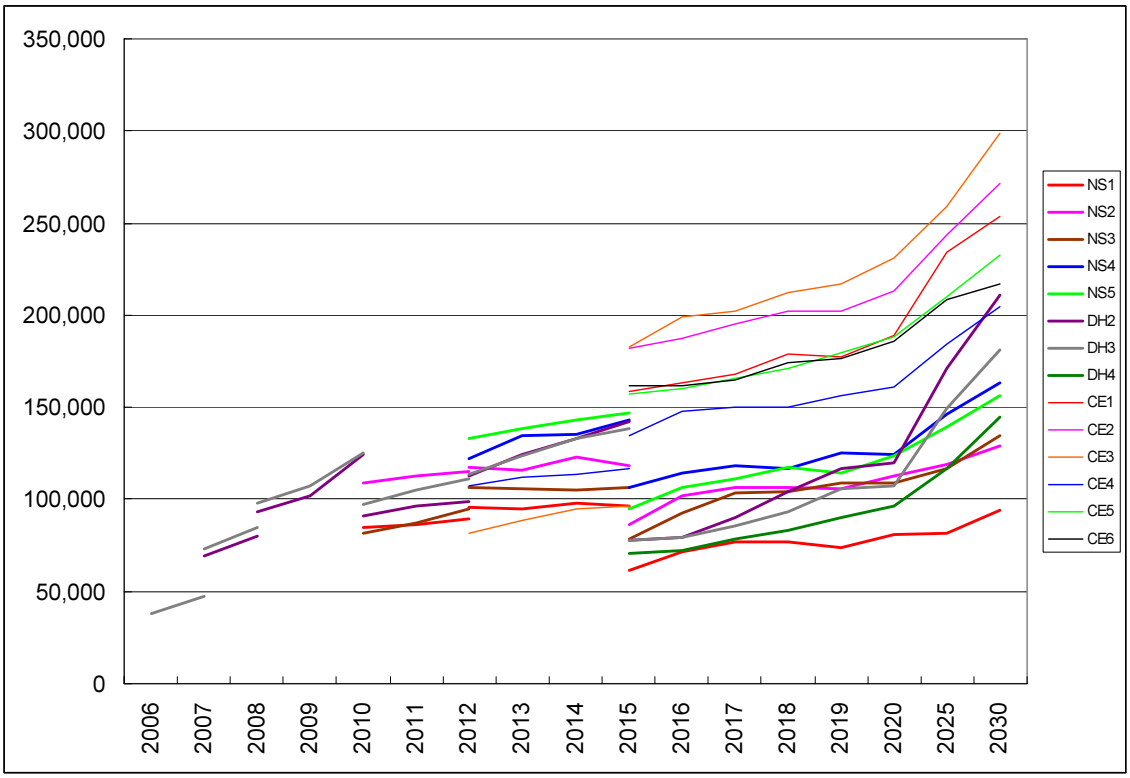


Figure 2.14 Estimated Traffic Volume by Section and by Year (Base Case)



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 2.15 and Figure 2.16 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 2.15 Traffic Distribution (NS4 and NS5 tolled)

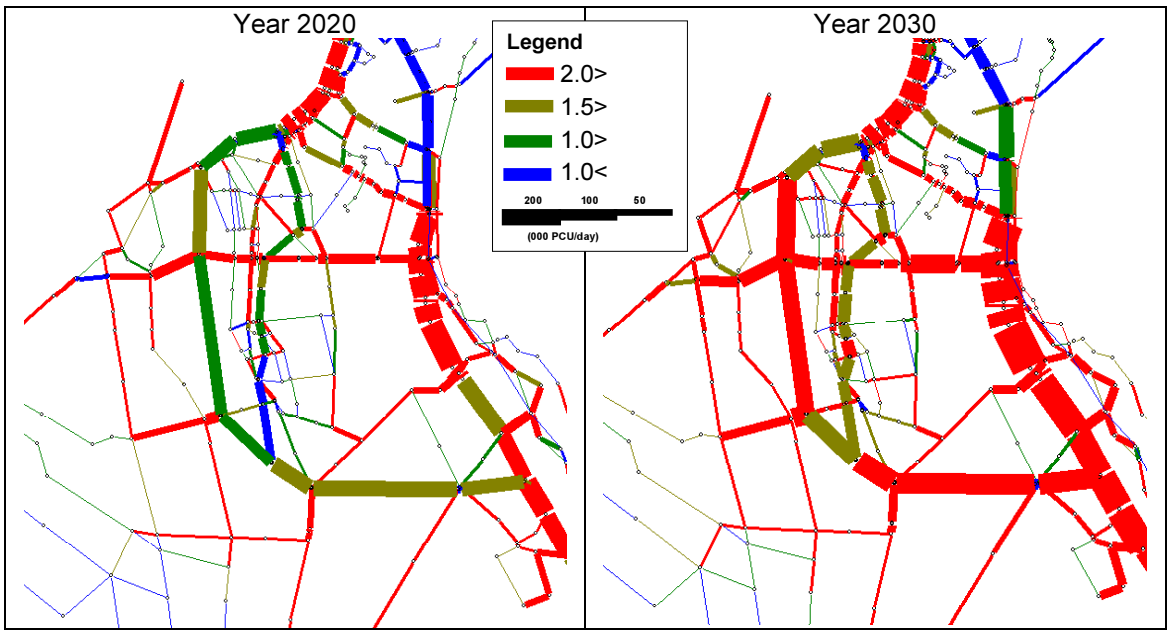
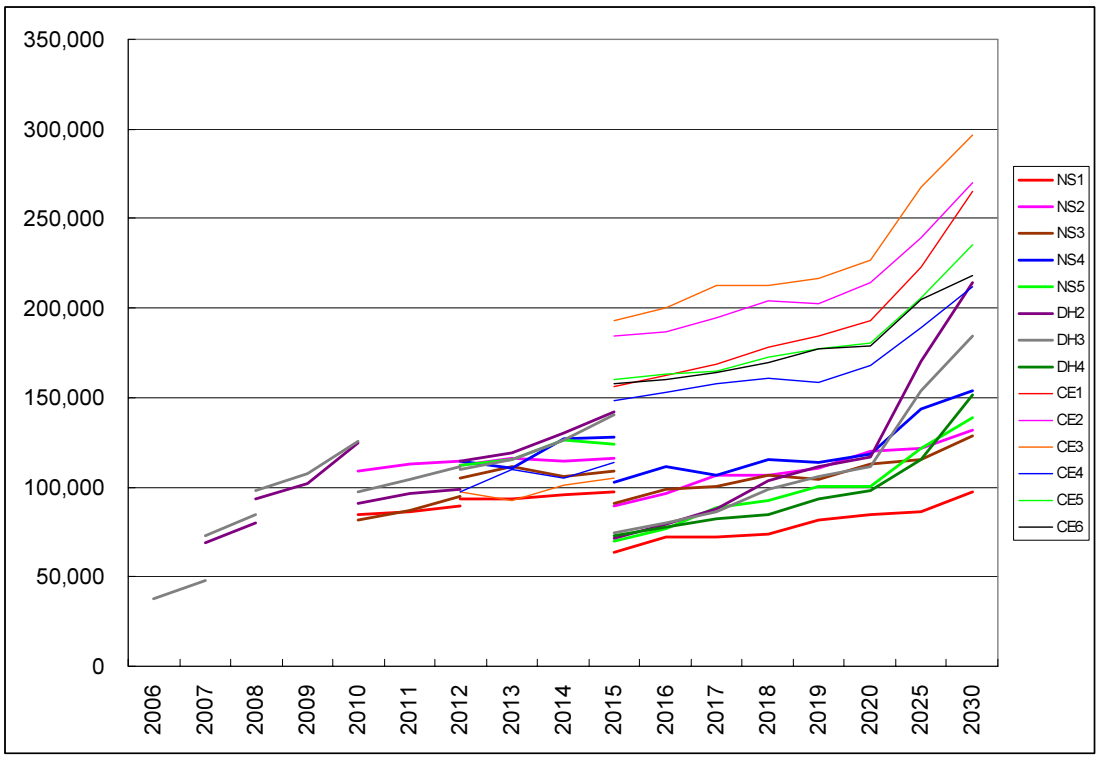


Figure 2.16 Estimated Traffic Volume by Section and by Year (NS-4 and NS-5 tolled)



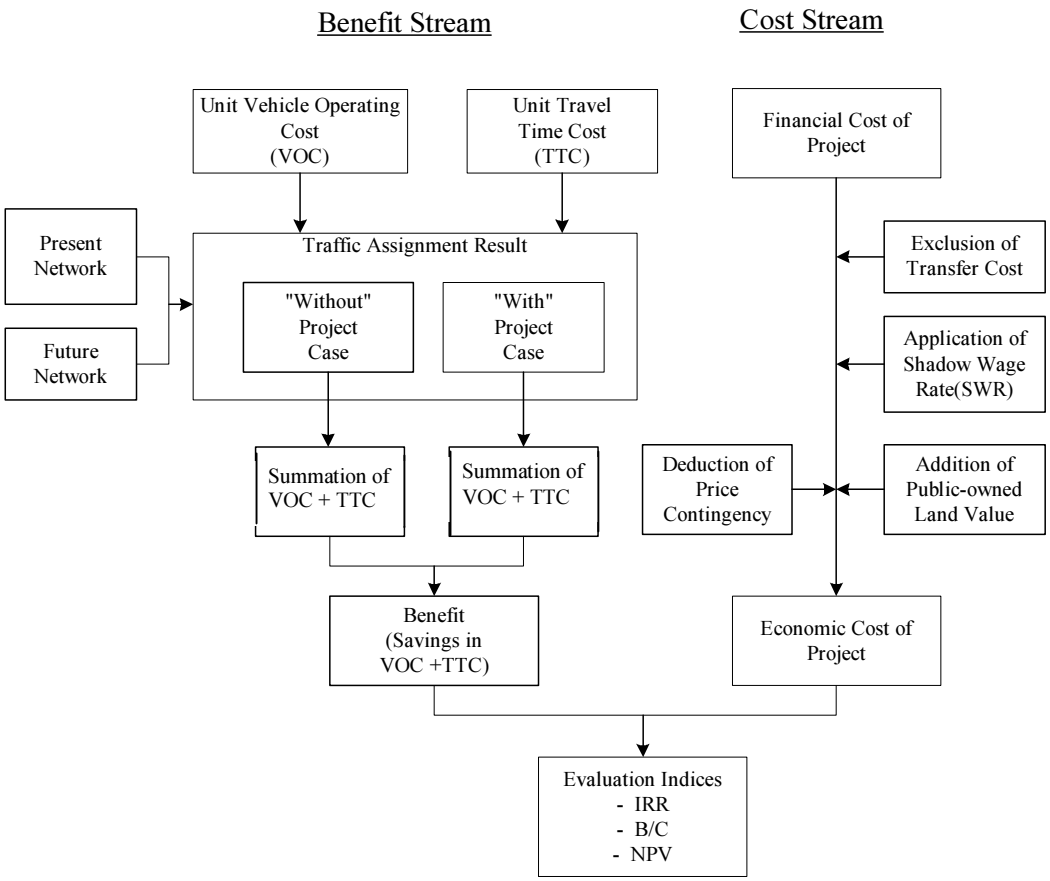
2.7.3 Economic Evaluation

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 2.17.

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 2.17 Work Flow for Economic Evaluation



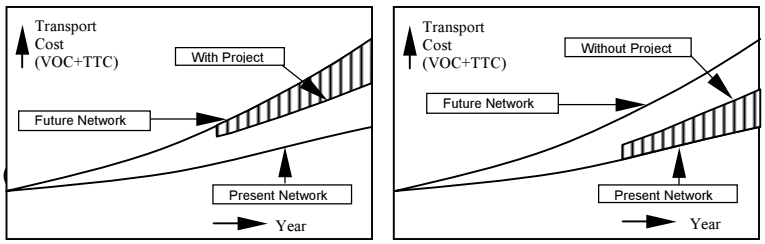
Economic benefit is defined as a amount saved in travel costs by a project. Travel costs consist of two components, vehicle operating cost (VOC) and travel time cost (TTC). These are the benefits most direct and comparatively easy to quantify.

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 2.18.

Figure 2.18 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.

2.7.4 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 2.4 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 2.4 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 2.4 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.

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 2.5. 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 2.4.

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 2.5 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

Evaluation Results

1) Entire Projects

As the cost-benefit cash flow of the projects shows in Table 2.6, 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 2.6 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 2.7 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 2.8 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 2.8 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 2.9 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 2.9 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

2.7.5 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

1) Investment Schedule

The investment amount and disbursement schedule were estimated and planned in Chapter 7.9 as shown in Table 2.10.

Table 2.10 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 2.11. 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 2.11 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 2.12. 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 2.12 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 2.13 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 2.14 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 2.15 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

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%

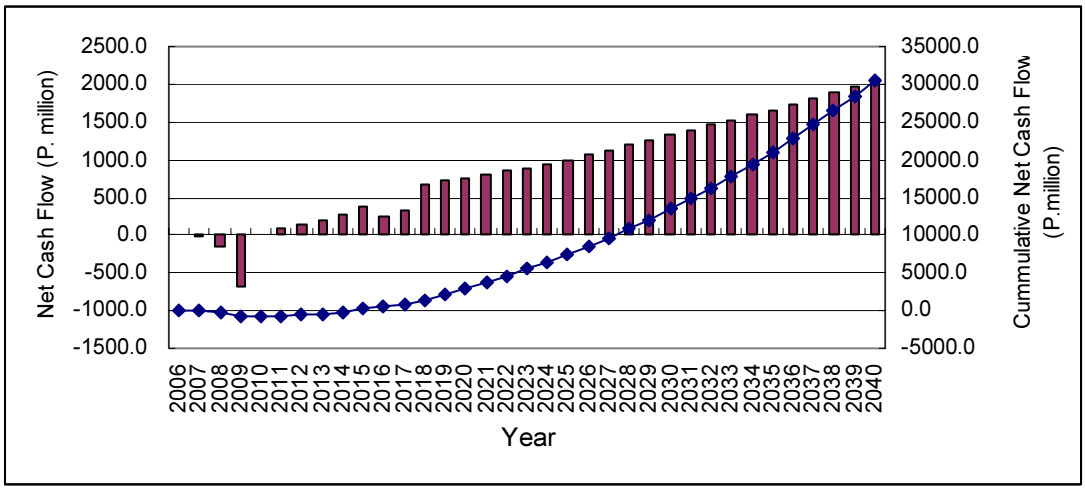
Days in Year is assumed 340 days, assuming a half revenue in the weekend.

- 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.

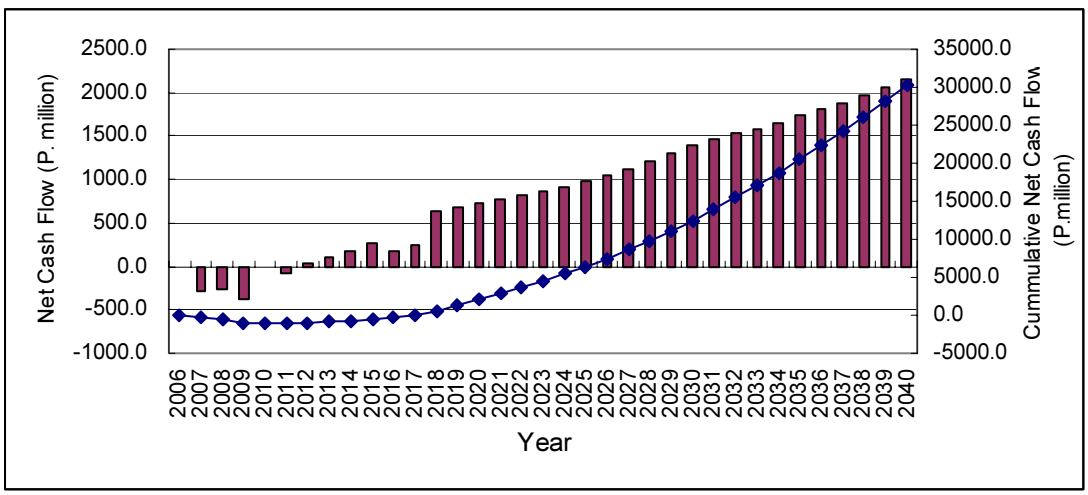
Under such conditions, the cash flow of the SPC was forecasted as shown in Figure 2.18. The company will not suffer from a deficit even in the early stage during repayment period, with no need of additional borrowing as a working capital. The both cases of NS-1&2 and NS-3 are quite similar. The cash flows were drawn at current price under 4.5% of inflation.

Figure 2.18 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 2.15). 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 2.15 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 2.16 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