社会開発調査部報告書

No. 202

Japan International Cooperation Agency

Department of Trade and Industry
Republic of the Philippines

THE MASTER PLAN STUDY FOR
CENTRAL LUZON DEVELOPMENT PROGRAM

FINAL REPORT Volume VIII
Project Report

THE MASTER PLAN
FOR
RAL T

September 1995

Nippon Koei Co., Ltd.
Pacific Consultants International

Exchange Rate

(as of August 1995)

US$ = P 26.0

US$ = ¥90.0

Japan International Cooperation Agency

Department of Trade and Industry
Republic of the Philippines

THE MASTER PLAN STUDY FOR CENTRAL LUZON DEVELOPMENT PROGRAM

FINAL REPORT

Volume VIII

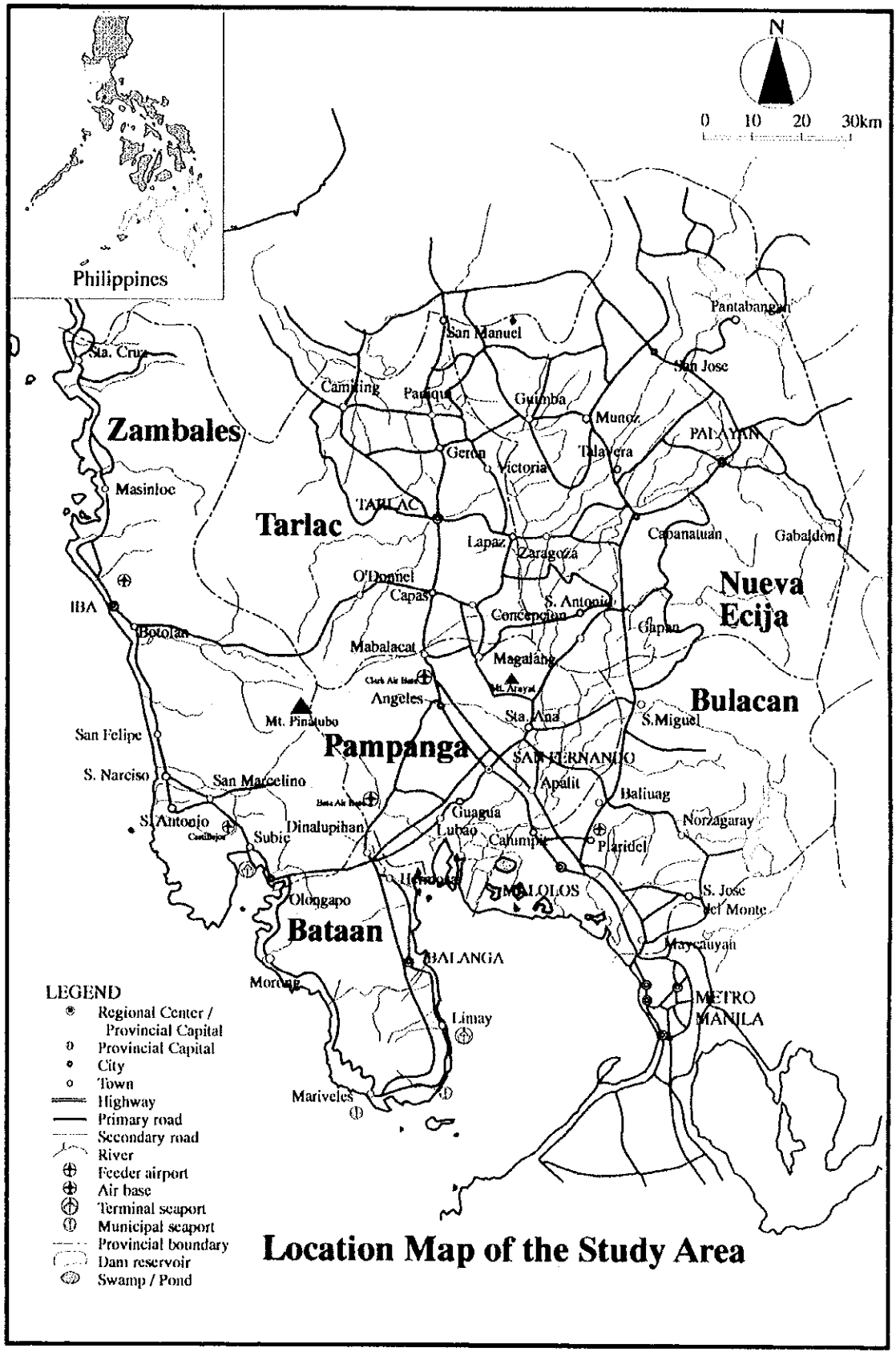
Project Report

September 1995

Nippon Koei Co., Ltd.
Pacific Consultants International

List of Reports

Volume	Title	
I	Executive Summary Report	
II	Main Report :	CLDP Master Plan
III	Sector Report 1 :	Agriculture and Rural Development
IV	Sector Report 2 :	Industry, Tourism and Trade
V	Sector Report 3 :	Infrastructure
VI	Sector Report 4 :	Environment and Land Husbandry
VII	Sector Report 5 :	Social Services and Development
VIII	Project Report	



Location Map of the Study Area

Table of Contents

List of Tables

Page

Chapter II

New Intra-Regional Artery Establishment Project (Rainbow Highway)

Sierra Madre (Marginal) Highway

Cabanatuan and Tarlac Bypasses Development

Chapter IV

List of Abbreviations

AFTA	-	Asean Free Trade Area
APEC	-	Asian Pacific Economic Cooperation
ARCs	-	Agrarian Reform Communities
ASEAN	-	Association of South East Asian Nations
BEPZ	-	Bataan Export Proceesing Zone
BOI	-	Board of Investments
BSWM	-	Bureau of Soil and Water Management
CAR	-	Cordillera Autonomous Region
CDC	-	Clark Development Corporation
CENRO	-	Community Environment and Natural Resources Office
CFPI	-	Cooperative Foundation of the Philippines Inc.
CLDP	-	Central Luzon Development Program
CLSU	-	Central Luzon State University
DA	-	Department of Agriculture
DAR	-	Department of Agrarian Reform
DECS	-	Department of Education, Culture and Sports
DENR	-	Department of Environment and Natural Resources
DILG	-	Department of Interior and Local Government
DOH	-	Department of Health
DOLE	-	Department of Labor and Employment
DOST	-	Department of Science and Technology
DOT	-	Department of Tourism
DOTC	-	Department of Transportation and Communications
DPWH	-	Department of Public Works and Highways
DSWD	-	Department of Social Welfare and Development
DTI	-	Department of Trade and Industry
EIA	-	Environmental Impact Assessment
EPZ	-	Export Processing Zone
EU	-	European Union
GDP	-	Gross Domestic Products
GIS	-	Geographic Information System
GNP	-	Gross National Product
GO	-	Government Organizations
GRDP	-	Gross Regional Domestic Products
GVA	-	Gross Value Added
HAIE	-	Hermosa Agro-Industrial Estate
IAs	-	Industrial Associations
IE	-	Industrial Estate
IRA	-	Internal REvenue Allotment
JICA	-	Japan International Cooperation Agency
LGU	-	Local Government Unit
LMU	-	Land Management Units
LWUA	-	Local Water Utilities Administration
MPC	-	Mount Pinatubo Commission
MSC	-	Manila-Subic-Clark
NAFTA	-	North American Free Trade Area
NCR	-	National Capital Region
NEDA	-	National Economic Development Authority
NFA	-	National Food Authority
NGO	-	Non-Government Organization
NIA	-	National Irrigation Administration
NIC	-	Newly Industrialized Country
NIPAS	-	National Integrated Protected Area System
NSO	-	National Statistics Office

NWRC	-	National Water Resources Council
PENRO	-	Provincial Environment and Natural Resources Office
PO	-	People's Organization
POS	-	Point of Sale
PRRM	-	Philippine Rural Reconstruction Movement
RDC	-	Regional Development Council
RSCs	-	Regional Service Centers
SBMA	-	Subic Bay Metropolitan Authortiy
SEPZ	-	Special Economic and Freeport Zone
SEZ	-	Special Economic Zone
SME	-	Small and Medium Enterprise
SRS	-	Social Reconnaissance Survey

Abbreviations of Measures

Length			Weight		
mm	=	milimrter	mg	=	miligram
cm	=	centimeter	g	=	gram
m	=	meter	kg	=	kilogram
km	=	kilometer	ton (MT)	=	metric ton
mbgs	=	meter below grounf surface	1 cavan	=	50 kilograms

Area			Volume		
cm^2	=	square centimeter	cm^3	=	cubic centimeter (cu. m)
m2	=	square meter	lit	=	liter
Km2	=	square kilometer (sq. km)	lb	=	pound
ha	=	hectare	m3	=	cubic meter
			MCM	=	million cubic meter

Other Measures		
%	=	percent
m^3 /s	=	cubic meter per second
lit /s	=	liter per second

Money		
P	=	Philippine Peso
¥	=	Japanese Yen
US$	=	US Dollor

Government of the Philippines Fiscal Year

From January 1 to December 31

CHAPTER 1

CHAPTER 1 INTRODUCTION

The Master Plan Study for Central Luzon Development Program has been carried out in phases. Phase 1 was for analysis of existing conditions and evaluation of development constraints and potentials. Phase 2 was for formulation of development frameworks and scenarios, and preparation of a draft Master Plan. The draft Master Plan presented in the Interim Report submitted in August 1994 contained a total of 113 projects and programs with short profiles of most of them.

These proposed projects and programs have been discussed extensively during Phase 3 with various government agencies, LGUs and other institutes as well as NGOs, POs and other local people. All the projects/programs were discussed during the second Regional Consultative Workshop held on 11 November in five simultaneous sessions. Most projects/programs were endorsed by the workshop participants, but for some, modifications were suggested. Most projects/programs have been extensively discussed between the NGOs involved in the Master Plan Study and the JICA Study Team for different occasions. The NGOs have also proposed several specific projects/programs for inclusion in the Master Plan.

Based on these consultation and dialogues as well as further studies by the Study Team, a list of projects/programs has been revised. The revised Master Plan now contains a total of 130 projects/programs. Most of them are common to the original set of projects/programs, but 33 projects/programs are new and some others are modification of the original proposals.

All the proposed projects/programs have been reviewed from an environmental point of view. They are classified into three categories: those requiring the initial environmental examination (IEE), those for which IEE is not required, and the rest requiring further project/program formulation to make judgements as to the need for IEE. The IEE has been conducted for all the proposed projects/programs in the first category.

For some projects/programs, more detailed profiles have been prepared. For a few projects, more detailed analyses have been carried out to examine their viability.

The revised Master Plan has identified also some specific aspects of Central Luzon regional development that should be looked into in more detail in the subsequent step. Terms of reference have been prepared for these follow-up studies.

This report is Volume VIII: Project Report of the Draft Final Report of the Master Plan Study for Central Luzon Development Program. This report presents all the detailed information on the proposed projects/programs as outlined above. Chapter II presents results of the more

detailed analyses on selected projects. Chapter III contains the terms of reference for follow-up studies to be carried out in the subsequent step. Chapter IV presents results of the initial environmental examination. Chapter V contains profiles of all the proposed projects/programs.

CHAPTER 2

CHAPTER 2 PRELIMINARY STUDIES OF SELECTED PROJECTS

This chapter presents results of preliminary studies of selected projects. Feasibility of a few road/highway projects has been examined at a preliminary level. These projects are as follows:

(1) Intra-Regional Artery Establishment (or Rainbow Highway),
(2) Sierra Madre (Marginal) Highway, and
(3) Cabanatuan and Tarlac Bypasses Development.

In addition, more detailed project formulation has been conducted for a few other projects:

(4) Crop-Livestock Integrated Farming,
(5) Designers' Village,
(6) Regional Telephone Services Improvement, and
(7) Central Luzon Optic Super Highway (CLOSH).

For some other projects/programs, more detailed profiles have been developed. They are contained in Chapter V.

2.1 New Intra-Regional Artery Establishment Project (Rainbow Highway)

2.1.1 Background

A future artery network for Central Luzon has been proposed in line with the National Triad Growth Centers and the proposed hierarchical structure of urban centers. It consists of inter-regional arteries and intra-regional arteries linking those centers in the upper tiers of the urban hierarchy. The proposed new structure of intra-regional arteries would strengthen links between key urban centers to support the CLDP paradigm. Specifically, the project road, called the "Rainbow Highway," would provide the shortest link between the Subic Free Port and the Clark International Aviation Complex and extend further to Cabanatuan city and Palayan City, Nueva Ecija.

2.1.2 Project Description

(1) Definition

The intra-regional artery intends to provide stronger linkages between major urban centers in Central Luzon as described above. It is not necessary to establish new roads for the entire stretch. Rather the linkages would be established by inter-connecting existing and planned highways. Assuming the extension of the North Luzon Expressway, the Angeles and Tarlac

section of the expressway can be utilized as a part of the intra-regional highway. Thus, additional links are required for the sections, Subic - Dinalupihan, Dinalupihan - Angeles, and Tarlac - Cabanatuan - Palayan. Since the Olongapo short-cut, which would provide a direct linkage to Subic Free Port from the existing national road, Gapan - San Fernando - Olongapo road, has been already studied and the Cabanatuan bypass initiated by the municipality government would strengthen the links between Palayan and Cabanatuan and other areas in the region, this preliminary study will explore the viability of the two remaining sections of Dinalupihan - Angeles and Tarlac - Cabanatuan.

(2) Objectives

The objectives of the project are:

1) to establish a strong intra-regional artery linking directly five provinces (except Bulacan) and four cities (except San Jose City) in the region,

2) to link between the two industrial/trade anchors at Subic and Clark with the shortest time distance, and

3) to change the patterns of commodity flows and people's movement away from Metro Manila.

(3) Expected effects

The intra-regional artery will form a strong tie among the provinces in Central Luzon and will enhance integrated economic activities throughout the region. It will also help to establish a sort of identity of Central Luzon.

2.1.3 Existing Road Conditions and Present Traffic Demand

Section 1: Dinalupihan - Porac - Angeles

The existing two-lane Dinalupihan - Porac - Angeles road has been damaged severely by lahar flows and most sections of the road are deeply buried under lahar. During the rainy season, the section crossing the Pasig-Potrero River is impassable due to collapse of a bridge. At present rehabilitation and improvement of the road is underway to sustain the movements of goods and people; however, it covers only pavement of the roadway but excludes the reconstruction of the bridges affected by lahar flows.

Traffic demand listed in the table below are estimated by DPWH based on the past traffic count survey and can be understood as the potential traffic demand since road links are cut off in the rainy season in the section.

Table 2.1 Present Traffic Demand on the Roadway in Section 1

(Unit: Number of vehicle trips per day for both direction)

Road Section	Car	Jeepney	Bus	Truck	Total	PCU	Data Source
Porac - Angeles	3,982	3,871	0	377	8,230	10,543	NTCP88 # 1918[1]
Florida Blanca - Dinalupihan	1,145	494	418	304	2,361	3,330	NTCP91 # 128

NTCP: National Traffic Count Program, DPWH

Section 2: Tarlac - Cabanatuan

Compared with Section 1, Section 2 is less damaged by lahar flows, although the southern side of the corridor is still threatened by lahar flows. The segment in the west-end belongs to the Luisita Realty Corporation, and used as an internal service road for the industrial estate. This segment would be open to public when the North Luzon Expressway is extended to Tarlac.

At present traffic demand on the corridor is not significant. Total number of vehicles in the section between Tarlac and Zaragosa is less than 2,000 vehicles per day. The section between Carmen and Sta. Rosa indicates about 2,800 vehicles per day, which is equivalent to about 4,000 passenger car units. The existing two-lane highway is sufficient in terms of roadway capacity for the present traffic demand except some built-up areas along the corridor.

Table 2.2 Present Traffic Demand on the Roadway in Section 2

(Unit: Number of vehicle trips per day for both direction)

Road Section	Car	Jeepney	Bus	Truck	Total	PCU	Data Source
Tarlac - La Paz	809	342	28	328	1,507	2,034	ALT93
La Paz - Zaragosa	528	319	33	266	1,146	1,605	NTCP91 #126
Carmen - Sta. Rosa	1,113	1,054	16	657	2,840	4,040	RRNDP

ALT93: Feasibility Study of the Proposed Alternate Arterial Roads in Central Luzon, 1994
NTCP: National Traffic Count Program, DPWH
RRDPS: Rural Road Network Development Project, 1990

[1]NTCP88 #1918 indicates that the traffic volumes are estimated based on the survey results at Station 1918 in the National Traffic Count Program conducted in as old as 1988. Similarly, NTCP91 #128 indicates the traffic volume are estimated by DPWH based on the survey data obtained at Station 128 in the National Traffic Count Program executed in 1991 .

2.1.4 Engineering Study

(1) Alignment

As described in the previous section, the two sections were selected for study from the entire stretch of the intra-regional highway:

Section 1: from Dinalupihan to Angeles
Section 2: from Tarlac to Cabanatuan

Alignment of the routes has been studied, taking land use and lahar affected areas into consideration. The project road aims at providing high mobility for inter-urban traffic by high grade highway. The project road was thus aligned to avoid passing through existing and prospective built up areas as well as lahar affected areas and the areas prone to lahar flows, siltation and flooding. The map layers showing the existing road network, the lahar affected areas, and land use have been overlaid by a GIS and utilized for the alignment study. The attached figures shows the topological relationship between each theme of layer and proposed alignment of both sections.

(2) Highway design

It is expected that a considerable number of heavy vehicular trips would be attracted to/from the Clark International Aviation Complex as well as the Subic Free Port. It is desirable to avoid this type of heavy vehicles passing through the build-up areas by segregating heavy vehicle traffic from intra-urban and intra-village traffic. Provision of access-controled highway is costly but an ideal way, so that a four lane expressway was examined as an initial option for the project road in this preliminary study.

1) Geometric design standards

Geometric design standards for this preliminary study were adopted from the Luzon Island Strategic Road Network Development Project, among others; also referred to are the DPWH Design Guidelines Criteria and Standards for Public Works and Highways.

2) Typical cross section

The project road is proposed to be constructed as a four lane highway for both directions with 60.0 meter right-of -way. Typical cross section elements for the project road are as follows.

Carriageway	2 lanes for both directions
Lane Width	3.65 m
Outer Shoulder	3.00 m
Inner Shoulder	1.00 m
Median	12.00 m
Right of Way	60.00 m

2.1.5. Traffic Demand Forecast

(1) Methodology

Future traffic demand was projected by a commonly used four staged method. First, zonal trip generation and attraction were projected by trip generation and attraction models, then trip distribution, that is, origin-destination tables, was estimated by present pattern method based on the 1992 OD matrices established in the LISR study. Finally the estimated traffic demand was assigned onto the future road network to obtain traffic volumes on each roadway link. The following are parameters used in the traffic simulation.

1) Vehicle speed on road link

Vehicle speed on highway varies significantly according to roadside friction. Taking exclusion of intra-zonal trips in the OD matrices into account, initial speed was set at 50 km per hour for the highway links traversing rural area and 20 km per hour in urban area, in order to differentiate these link characteristics in the traffic simulation. This setting was based on the travel speed survey made in the Manila-Bataan Road BOT Project Preliminary Report, 1992[2].

2) Toll rate

Reviewing the previous studies, toll rates are assumed to be distance proportional at ₱1.0 per kilometer for light vehicles and ₱2.0 for heavy vehicles because the current toll rates are so low that it appears that tollway projects are not financially feasible. In the traffic simulation, tolls are regarded as additional impedance on travel, thus the tolls were converted into time-equivalent units and added to the travel time.

[2] According to the travel speed survey results, the highest average travel speeds on the North Luzon Expressway were observed at 84.5 km per hour and the lowest at 60.5 km per hour. On the other hand, the average travel speed on MacArthur Highway(Manila North Road) vary by sections. The lowest average speed was found at 12.3 km per hour in the section of Monumento - Malinta, and the highest at 53.0 km per hour in the Calumpit - Sto. Domingo section.

3) Value of time

Based on the value of time derived from DPWH, the costs of minutes were set at ₱1.0 per minute for cars and ₱2.0 per minute for heavy vehicles in the simulation. Consequently, the imposed tolls results in decreasing the free flow speed on expressway from 100 kmph to about 67 kmph.

(2) Projected traffic demand

Future traffic demand was projected on the proposed network, which includes construction of the Manila - Bataan Coastal Road between Calumpit and Lubao section[3], the extension of the North Luzon Expressway, and the Sierra Madre Expressway, among others.

1) Section 1: Dinalupihan - Porac - Angeles

Although the trips attracted to the Subic Free Port have been increased in line with the CLDP development scenario by adjusting socio-economic parameters, the projected traffic demand in the section merely account for 5,000 to 6,000 vehicle trips per day. This traffic demand can be accommodated by a ordinary two-lane highway.

Table 2.3 Projected Traffic Demand on the Roadways in 2010 Proposed Road Network

Unit: Number of vehicle trips per day

Section	Car	Jeepney	Bus	Truck	Total	PCU
Dinalupihan - Porac	2,490	290	350	1,770	4,900	7,170
Porac - Angeles	2,900	370	380	1,850	5,500	7,920

2) Section 2: Tarlac - Cabanatuan

The projected traffic volumes on the Section 2 will vary from section to section in the range between 7,300 vehicular trips per day and 14,200 trips per day. The projected traffic can be accommodated by a two-lane ordinary highway even in the heaviest section.

[3] The future traffic demand projected in this preliminary study deal with inter-zonal traffic. Thus intra-zonal traffic should be taken into consideration when sufficiency of roadway capacity is examined, in particular in urban area.

Table 2.4 Projected Traffic Demand on the Roadways in 2010 Proposed Road Network

Unit: Number of vehicle trips per day

Section	Car	Jeepney	Bus	Truck	Total	PCU
San Miguel - Luisita IC	2,800	2,650	210	1,640	7,300	10,480
Luisita IC - Caramutan	5,770	740	670	1,430	8,610	11,080
Caramutan - Zaragosa	8,090	2,330	700	2,980	14,100	18,950
Zaragosa - Sta. Rosa	5,400	1,450	680	1,240	8,770	11,420

2.1.6. Project Evaluation

(1) Project costs

1) Construction Costs

Construction costs were estimated approximately by multiplying unit cost per kilometer with distance. Assuming all the sections are to be constructed as a new four lane expressway, unit financial cost was assumed to be ₱69 million per kilometer for Section 1 and ₱63 million Peso per kilometer for Section 2[4]. For simplification it is assumed that economic costs accounts for 80% of the financial costs. Thus the economic unit cost for Section 1 was estimated to be ₱55 million per kilometer and Section 2, ₱50 million. The construction cost of the Section 1 could increase due to the needs of viaducts, since several sections are still subject to damages by lahar flows. Instead of conducting a further investigation of structure requirements, which is difficult to judge at present due to the possible changes of lahar flows, sensibility analysis was conducted for the increase of construction costs.

Table 2.5 Section 1: Dinalupihan - Porac - Angeles

Approximate Length	35.6	kilometers
Unit Economic Cost per Kilometer	55.0	million Pesos
Economic Construction Cost	2,002.0	million Pesos

[4]Unit cost of expressway construction was estimated based on the cost estimate for the New North Luzon Expressway made in the Master Plan Study on Luzon Strategic Road Network Development Project, 1993. The same unit cost was applied to the section 2 and the unit cost was increased by 10% for the section 1 due to the rolling surface. Moreover the cost was adjusted to 1994 price by inflation rate of 6% per annum.

Table 2.6 Section 2: Tarlac - Cabanatuan

Approximate Length	38.6	kilometers
Unit Economic Cost per Kilometer	50.0	million Pesos
Economic Construction Cost	1,930.0	million Pesos

2) Maintenance and operation costs

The previous study[5] examined that both tollway operation costs and maintenance costs were approximately ₱0.90 million per kilometer per annum for the year 1991, by reviewing the records of the Philippine National Construction Corporation(PNCC) submitted to the Toll Regulatory Board. It is assumed that both tollway maintenance costs and operation costs are ₱1.1 million per kilometer per annum for the year 1994, taking price escalation into account.

(2) Project benefits

Project benefits of road development are usually classified into direct and indirect benefits. In this preliminary study, project benefits are limited to direct benefits; therefore, they can be regarded as the least benefits that accrue from the road development.

The direct benefits consist of saving of vehicle operating costs and saving in travel time. Vehicle operation costs are further divided into running costs and fixed costs. DPWH provides the basic vehicle operating costs by vehicle type periodically. The latest table of the basic vehicle costs are shown in the table below.

Table 2.7 Basic Vehicle Operating Costs

Vehicle Type	Running Cost (Peso/km)	Fixed Cost (Peso/min.)	Time Cost (Peso/min.)
Car	2.29	0.09	0.667
Jeepney	1.61	0.46	0.747
Bus	3.65	0.96	4.240
Truck	4.93	1.09	0.000

Source: DPWH, PMO-F/S

The project benefits, the saving in vehicle operating costs and travel times, were calculated by subtracting the total costs in the "Without Project" case from those in the "With Project" case.

[5] Wilbur Smith Associates, TCGI Engineers, and SYCIP, GORRES, VELAYO & CO. Preliminary Report for Manila-Bataan Road BOT Project, 1992

The existing road network was used as the "Without Project" case for the present year, while the proposed network was used as the "With Project" case for the estimation of economic benefits in the year 2010.

(3) Project viability

1) Section 1: Dinalupihan - Porac - Angeles

Discounting the project costs and benefits at 15%, the net present value for the project over a 20-year period accounts for approximately ₱2,261 million, thus the benefit cost ratio is 1.13. The economic internal rate of return is estimated to be 17%. If the construction costs increase by 10% and 20%, the economic internal rate of return are slightly decreased to 15% and 14% respectively. On the basis of this preliminary economic analysis, the economic viability of the Section 1 appears marginal. The economic viability would be improved if additional traffic related to the Subic Free Port as well as the Clark International Aviation Complex was generated.

Table 2.8 Economic Evaluation for Section 1

	Base Case (55 million per km)	10 % Increase of Construction Costs	20 % Increase of Construction Costs
Benefit Cost Ratio	1.13	1.03	0.94
Economic Internal Rate of Return	17 %	15 %	14 %

2) Section 2: Tarlac - Cabanatuan Section

Discounting the project costs and benefits at 15%, the net present value for the project over a 20-year period accounts for approximately ₱1,397 million, and the benefit cost ratio is about 0.72. The economic internal rate of return was estimated to be 12%. This preliminary economic analysis does not guarantee the project to be viable because the cost benefit ratio is under 1.0 at the discount rate of 15%. However, taking the facts that indirect benefits are not included in the benefits, the viability of the project can be judged as marginal. Economic viability would be improved if the development benefits that accrue from the road are included.

Table 2.9 Economic Evaluation for Section 2

	Base Case
Benefit Cost Ratio	0.72
Economic Internal Rate of Return	12 %

2.1.7. Recommendation

Section 1: Dinalupihan - Porac - Angeles Section

(1) Necessity of Coordination with other road development projects

Coordination with other proposed road projects in the area is of great importance. In particular, construction of the Calumpit and Lubao section of the Manila - Bataan Coastal Road and construction of San Fernando - Dinalupihan viaducts and San Fernando flyovers have direct impacts on traffic demand on the project road. The economic viability of the project road would be undermined if these roads are developed.

(2) Stage development

Traffic demand on the road largely depends on the developments of the Subic Free Port and the Clark International Aviation Complex. Speed of these developments are still uncertain at present because large part would rely on the private sector; thus, stage development is recommended to deal with the uncertainty in growth of traffic demand and also relatively small amount of demand at an initial stage. Two lanes for both directions would provide sufficient capacity in the first stage. When traffic demand increases, another two lanes will be added and will formulate highway with two lanes per direction.

(3) Lahar problem

The section crossing the Pasig-Potrero River is still threatened by lahar flows. Stabilization of lahar flows might take four to five years in the Pasig-Potrero river basin. A medium term plan for construction of flood control structures will be established after the stabilization of lahar flows. If lahar control structures, such as dikes and levees, were not planned, the location of the bridges and viaducts and its required length as well as the height of piers could not be determined. Thus it is recommended to proceed with the road development project after the medium term plan for lahar control is completed.

Section 2: Tarlac - Cabanatuan Section

(1) Condition for proceeding with the project road

The development of the section aims to strengthen the linkage between Nueva Ecija, Cagayan Valley, and Aurora and the Clark International Airport and the Subic Free Port. The development of this section would function efficiently when the section of Tarlac - Mabalacat of the North Luzon Expressway is completed. Since the Mabalacat - Bamban section is still under lahar threat and the extension of the Expressway has been suspended, it is not necessary to take an immediate action for the project. Rather the project should be regarded as a long term strategic road project to change the commodity flows and people movements in Central Luzon. In addition, it can be justified by the facts that the present traffic demand is still small and roadway capacity of the existing road is sufficient except in built-up areas in the corridor.

(2) Stage development

Similar to Section 1, traffic demand in Section 2 is likely small in the initial stage. Consequently stage development is again recommended for this section, too.

(3) Connection to the Sierra Madre Highway

In the long term, this link, by extending to the east, will connect the North Luzon Expressway with the proposed Sierra Madre Expressway. The completion of the proposed network would provide an alternate route and secure mobility in case of road link cut by natural disasters.

Vehicle Operating Costs Excluding Taxes

Surface Type	Surface Condition	Vehicle Type	Running Costs (Peso/km)	Fixed Costs (Peso/min)	Time Costs (Peso/min)
Paved	Very Bad	Car/Van	3.664	0.220	1.557
		Jeepney	2.576	1.064	1.743
		Bus	6.935	2.276	10.022
		Truck	9.367	2.555	0.000
		Motorcycle	0.736	0.027	0.895
		Tricycle	0.848	1.395	1.060
	Bad	Car/Van	3.206	0.165	1.168
		Jeepney	2.254	0.798	1.307
		Bus	5.840	1.707	7.518
		Truck	7.888	1.916	0.000
		Motorcycle	0.645	0.202	0.671
		Tricycle	0.742	0.698	0.530
	Fair	Car/Van	2.748	0.110	0.779
		Jeepney	1.932	0.532	0.871
		Bus	4.745	1.121	4.936
		Truck	6.409	1.258	0.000
		Motorcycle	0.552	0.008	0.268
		Tricycle	0.636	0.399	0.303
	Good	Car/Van	2.290	0.094	0.667
		Jeepney	1.610	0.456	0.747
		Bus	3.650	0.963	4.240
		Truck	4.930	1.081	0.000
		Motorcycle	0.460	0.007	0.224
		Tricycle	0.530	0.349	0.265
Gravel	Very Bad	Car/Van	4.351	0.387	2.740
		Jeepney	3.059	1.872	3.066
		Bus	8.395	3.952	17.403
		Truck	11.339	4.436	0.000
		Motorcycle	0.874	0.027	0.895
		Tricycle	1.007	1.395	1.060
	Bad	Car/Van	3.664	0.230	1.627
		Jeepney	2.576	1.111	1.821
		Bus	6.935	2.347	10.337
		Truck	9.367	2.635	0.000
		Motorcycle	0.736	0.020	0.671
		Tricycle	0.848	0.698	0.530
	Fair	Car/Van	2.977	0.164	1.157
		Jeepney	2.093	0.790	1.295
		Bus	5.475	1.779	7.835
		Truck	7.395	1.998	0.000
		Motorcycle	0.598	0.010	0.336
		Tricycle	0.689	0.465	0.353
	Good	Car/Van	2.633	0.123	0.868
		Jeepney	1.851	0.593	0.971
		Bus	4.562	1.252	5.512
		Truck	6.162	1.405	0.000
		Motorcycle	0.529	0.008	0.268
		Tricycle	0.609	0.349	0.265

Source: DPWH

Roadway Capacity for Flat Terrain

(in P.C.U.)

Roadway Type	Carriageway Width (m)	Roadside Friction	Basic Hourly Capacity in Both Direction	Daily Capacity (Peak Ratio: 8%)
Highway	-4.0	None or Light	600	7,500
Highway	4.1-5.0	None or Light	1,200	15,000
Highway	5.1-5.5	None or Light	1,800	22,500
Highway	5.6-6.1	None or Light	1,900	23,750
Highway	6.2-6.5	None or Light	2,000	25,000
Highway	6.6-7.3	None or Light	2,400	30,000
Expressway	2 x 7.0	None or Light	7,200	90,000
Urban Street	-6.0	Heavy	1,200	15,000
Urban Street	6.1-6.5	Heavy	1,600	20,000
Urban Street	6.6-7.3	Heavy	1,800	22,500
Urban Street	2 x 7.0	Heavy	6,700	83,750

Note: Medium roadside friction reduces the highway capacity by 10%. If the shoulder width is less than 2.0 meters or non-existing, the capacity should be reduced by 10%.

Hourly Roadway Capacity for Multilane Highway

(in P.C.U.)

	Basic Hourly Capacity in One Direction	Daily Capacity in One Direction	Daily Capacity in Both Direction
2 Lanes per Direction	1,800	22,500	45,000
3 Lanes per Direction	1,750	21,875	43,750
4 Lanes per Direction	1,700	21,250	42,500

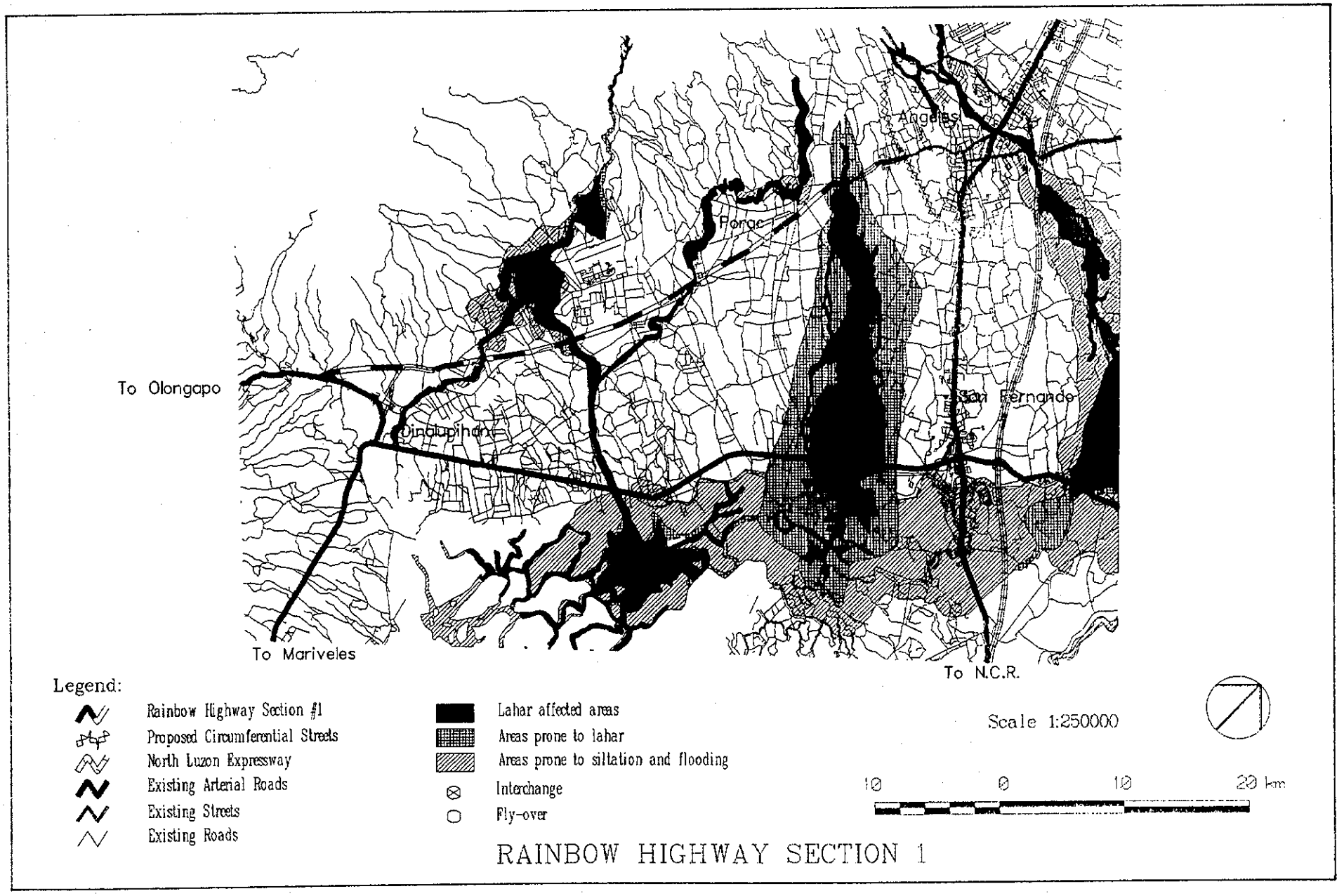
Source: Highway Planning Manual Volume 2, October 1992. Data Framework, Traffic Surveys, Traffic Assignment, Road Capapcity Chapter 5 Road Capacity (p.103). Planning Service, Ministry of Public Works and Highways.

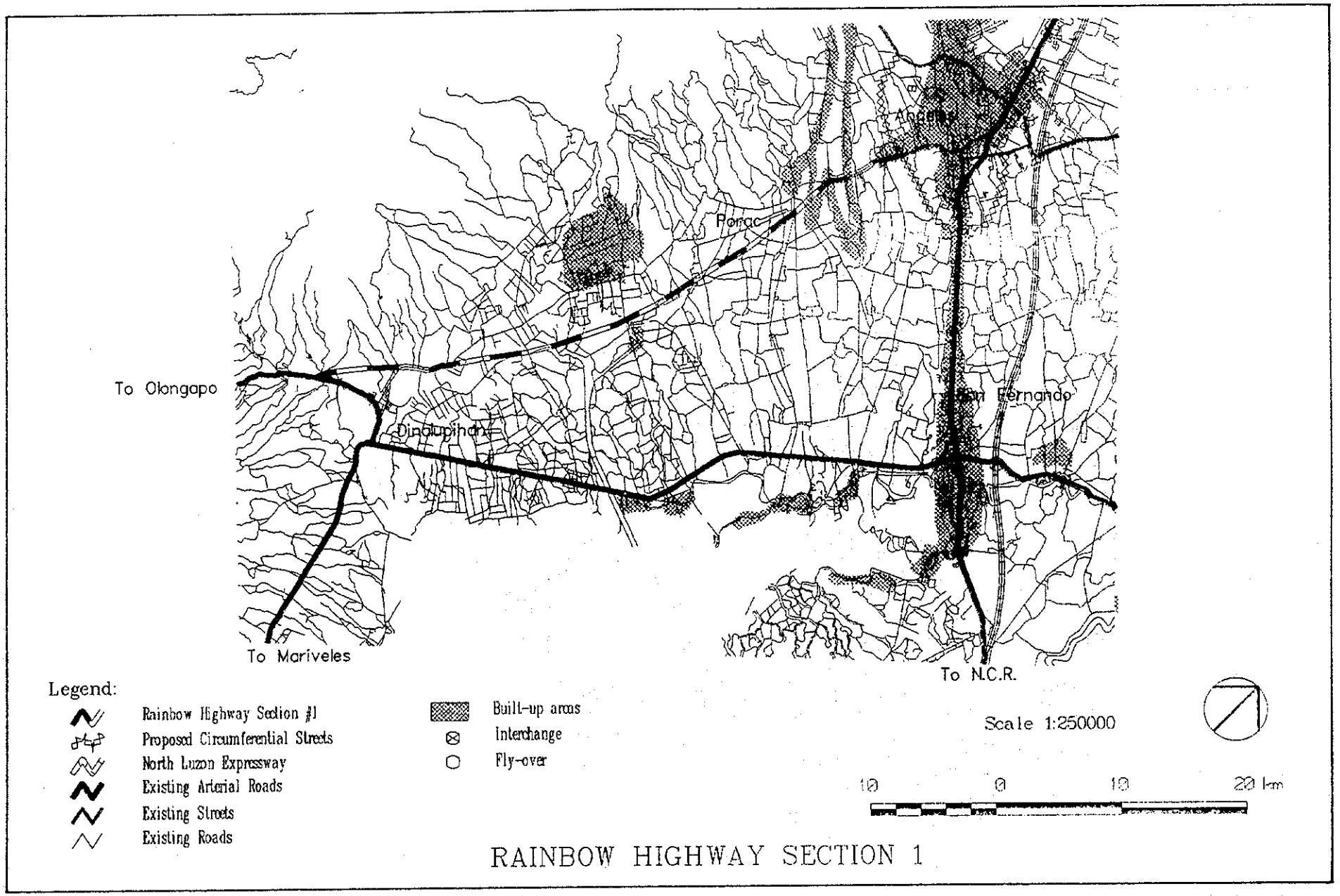
Note: Daily capacity is estimated under the condition that a peak ratio is 8%.

GEOMETRIC DESIGN STANDARDS

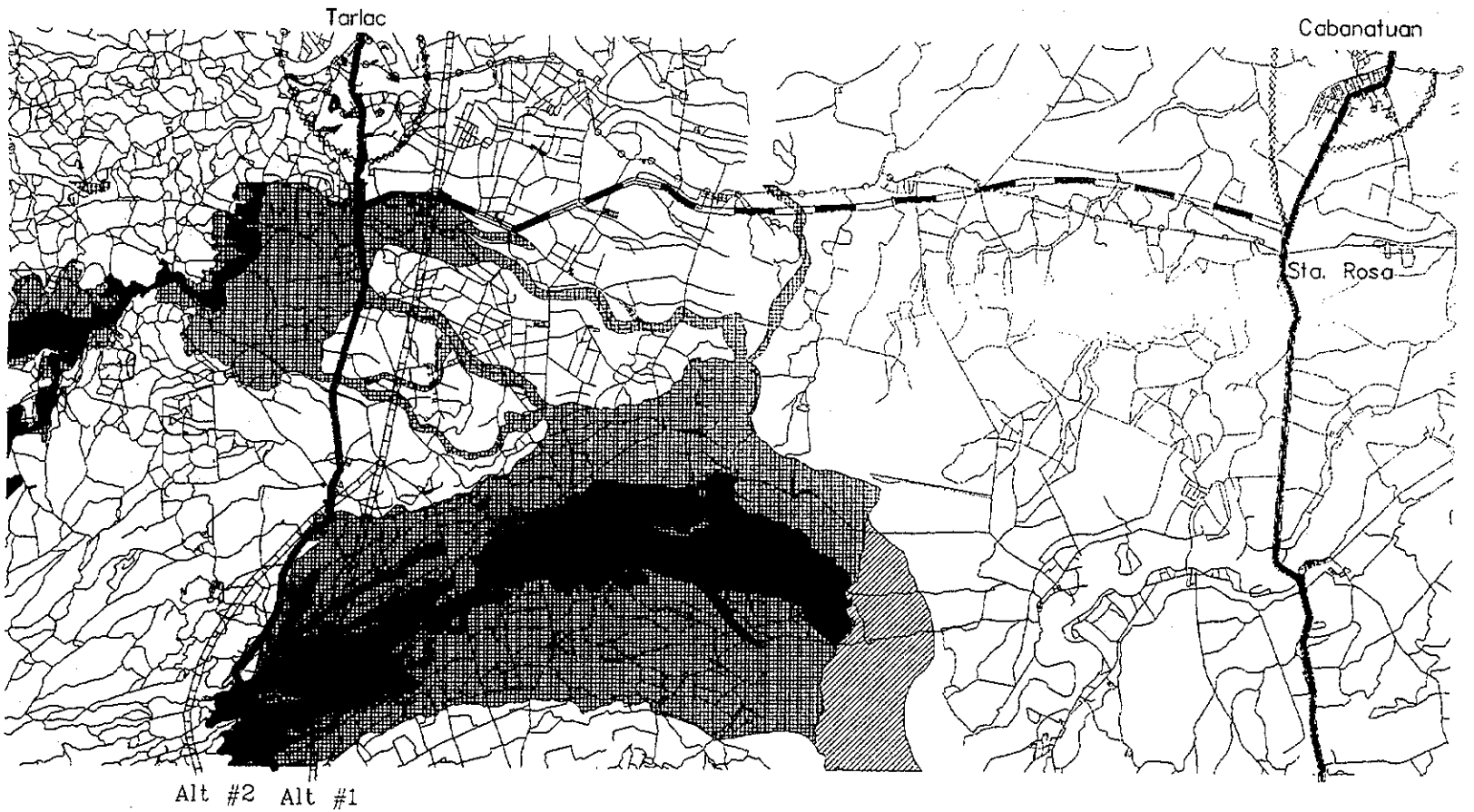
DESIGN ELEMENTS	UNIT	EXPRESSWAY			SECONDARY ROAD			RAMPS		
		TERRAIN								
		L	R	M	L	R	M	L	R	M
Design Speed	kph	110	95	80	80	60	60	50	50	40
Min. Radius of Curventure	M	550	385	240	225	185	85	130	85	60
Minimum Sight Distance										
Stopping	M	260	200	140	145	100	60	80	65	50
Passing	M	-	-	-	550	460	335	420	360	300
Maximum Grades	%	3	4	5	6	7	7	7	7	7
Max. Superelevation Rate	%	6	6	6	6	6	6	6	6	6
Pevement Crossfall	%	2	2	2	2	2	2	2	2	2
Vertical Clearance	M	4.88	4.88	4.88	4.27	4.27	4.27	-	-	-
Lane Width	M	3.65	3.65	3.65	3.50	3.50	3.50	3.05	3.05	0.05
Shoulder Width										
Outer	M	3.50	3.50	3.50	2.50	2.50	2.50	1.00	1.00	1.00
Inner	M	1.20	1.20	1.20	-	-	-	1.00	1.00	1.00
Median Width	M	11.00	11.00	4.50	1.50	1.50	1.00	-	-	-

L-Level; R-Rolling; M-Mountainous


To Olongapo
Angeles
Porac
Dinalupihan
San Fernando
To Mariveles
To N.C.R.
Legend:
Rainbow Highway Section #1
Proposed Circumferential Streets
North Luzon Expressway
Existing Arterial Roads
Existing Streets
Existing Roads
Lahar affected areas
Areas prone to lahar
Areas prone to siltation and flooding
Interchange
Fly-over
Scale 1:250000
10 0 10 20 km
RAINBOW HIGHWAY SECTION 1



RAINBOW HIGHWAY SECTION 1



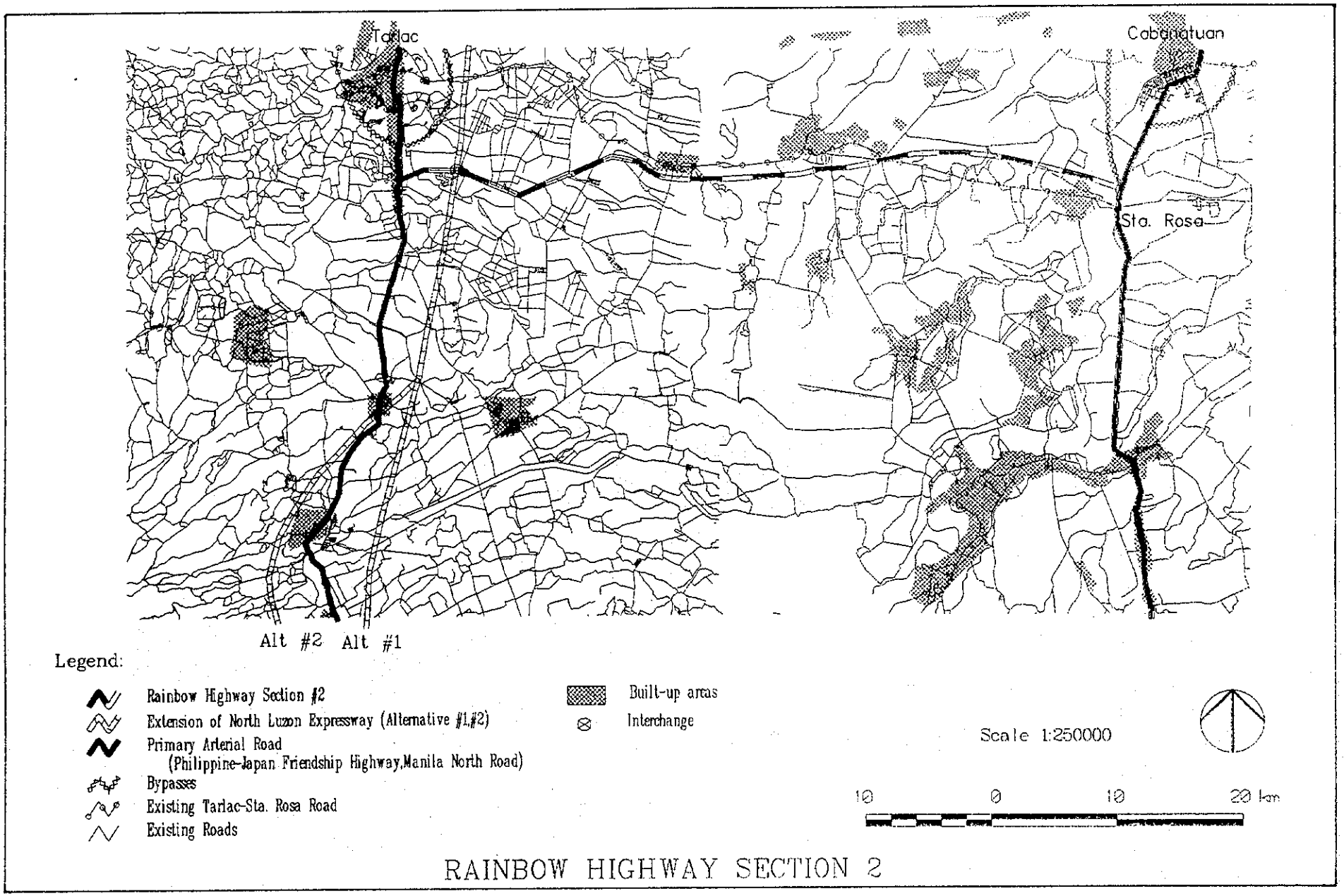
Legend:

- Rainbow Highway Section #2
- Extension of North Luzon Expressway (Alternative #1,#2)
- Primary Arterial Road (Philippine-Japan Friendship Highway,Manila North Road)
- Bypasses
- Existing Tarlac-Sta. Rosa Road
- Existing Roads
- Lahar affected areas
- Areas prone to lahar
- Areas prone to siltation and flooding
- Interchange

Scale 1:250000

10 0 10 20 km

RAINBOW HIGHWAY SECTION 2



RAINBOW HIGHWAY SECTION 2

2.2 Sierra Madre (Marginal) Highway

2.2.1 Background

The eruption of Mt. Pinatubo and subsequent lahar flows have made it difficult to proceed with the extension of the existing North Luzon Expressway. In particular, lahar activities are still on-going in the Bamban river basin. DPWH seeks to provide an alternate route to the existing expressway called the New North Luzon Expressway. The alignment of the proposed expressway starts at a segment of the planned C-5 and traverses the central area of the Central Luzon to avoid the lahar affected area.

However, the situation of lahar flows in the Bamban basin has been changed. The major sediment deposits will flow toward the Abacan river. It is expected that the lahar flows will be stabilized in the coming four to five years in the Bamban river basin.

Moreover, the lahar flows have not been changed in the upper basin to the east of Manila North Road and to the north of the planned Clark International Aviation Complex. Consequently, there is a possibility to construct a bridge or a viaduct crossing this section in the medium term.

Considering the time required for developing the proposed alternate route, the extension of the North Luzon Expressway is likely more economical and viable if the expressway can pass through the section in near future because the two expressways end in almost the same area.

The Study recommends to develop the Sierra Madre Expressway instead of constructing the proposed New North Luzon Expressway, not merely by the reason described above but for achieving more balanced economic development.

2.2.2 Project Description

(1) Definition

The project road would establish another north-south expressway linking Central Luzon with Metro Manila and the Cagayan Valley through undulating areas in eastern part of Provinces of Bulacan and Nueva Ecija.

It will start from a segment of the planned road, C-5 in Quezon City of Metro Manila and runs northward to San Jose del Monte and Angat. Then in runs parallel to the Maharlika Highway traversing on the foot of the Sierra Madre Mountains. The expressway lies about 5 km to the east of the Maharlika Highway and serves towns and villages along the existing national road, such as San Ildefonso, San Miguel, Gapan, Sta. Rosa, and Magasawang near

Cabanatuan City in Nueva Ecija. The expressway goes further northward up to San Jose City, Nueva Ecija.

The entire stretch can be divided into the following three sections:

1) From C-5 in Metro Manila to San Miguel, Bulacan,
2) From San Miguel, Bulacan to Magasawang, Nueva Ecija, and
3) From Magasawang, Nueva Ecija to San Jose City, Nueva Ecija.

In this preliminary study, economic viability for the entire sections as well as that for Section 1 were analyzed.

(2) Objectives

The objectives of the project are;

- to open up the eastern side of Bulacan and Nueva Ecija and to link to the Cagayan Valley and the Aurora province,
- to contribute to better balanced regional development, and
- to provide an alternate route for traffic between Metro Manila and Province of Bulacan.

(3) Expected effects

1) The project road would contribute to better balanced economic growth in Central Luzon.

2) The project road would promote the regional development in the regions where economic activities are currently restrained by poor accessibility to the market.

3) The project road will provide another expressway linkage between the northern part of the Luzon Island and Metro Manila and thus it will secure reliable transportation services in case of cut of roadway links by natural disasters.

4) The project road would provide sufficient roadway capacity between Metro Manila and the neighboring province of Bulacan by linking to the urban road system.

2.2.3 Existing Road Conditions and Present Traffic Demand

The Sierra Madre Expressway is a entirely new road parallel to the existing national road, Maharlika highway, known also as the Philippine - Japan Friendship Highway. The section between Sta. Rita and Sta. Rosa has been rehabilitated recently and the subsequent section of Sta. Rosa - San Jose, Nueva Ecija is being rehabilitated.

The existing traffic demand on the national road was examined by reviewing the traffic count survey data in the previous study. It is remarkable that the section between Sta. Rosa and Cabanatuan has the heaviest volume in P.C.U. partly because a enormous amount of tricycles serve mainly for intra-urband demand.

Table 2.10 Present Traffic Demand on the Philippine Japan Friendship Highway

(Unit: Number of vehicle trips per day for both direction)

Roadway Section	Car Taxi Jeep	Pick-up Van	Jeep-ney	Mini Bus	Large Bus	2-Axis Truck	3-Axis Truck	Articulated Truck	Total	Motor cycle	Motor Tricycle	PCU per day
P. C. E. F.*	1.0	1.0	1.5	2.0	2.0	2.0	2.0	2.0		0.5	2.5	
Sta. Rita - Plaridel	4,317	3,417	2,294	6	744	951	656	136	2,520	258	923	18,595
Sn. Rafael - Sn. Ildefonso	2,854	2,096	1,574	0	887	1,011	626	301	9,349	287	413	14,136
Sn. Miguel - Gapan	2,248	925	116	0	918	722	563	207	5,699	124	313	9,035
Sn. Leonardo - Sta. Rosa	2,871	4,017	854	1	1,030	836	553	212	10,373	327	546	14,960
Sta. Rosa - Cabanatuan	4,086	2,264	3,378	165	840	1,224	664	276	2,896	472	3,204	26,000
Cabanatuan - Talavera	2,147	1,817	1,734	57	348	718	325	230	7,375	471	569	11,578

*) P. C. E. F.: Passenger Car Equivalent Factor
Source: Feasibility Study of the Proposed Alternate Arterial Roads in Central Luzon, 1994
Traffic count survey was conducted during May to August in 1993.

2.2.4 Engineering Study

(1) Alignment

The alignment of the expressway was determined to minimize the negative impacts on environment in the area; thus, it lies on the foot of the mountain range. Also potential urban and industrial areas as well as the existing built-up and industrial areas are taken into consideration because major traffic flows will be generated in those areas.

(2) Highway design

Since the project road was proposed as an alternative for the new North Luzon Expressway, the four lane expressway was examined for the viability of the project.

1) Geometric design standards

Geometric design standards for this preliminary study were adopted from the Luzon Island Strategic Road Network Development Project, among others; also referred to are the DPWH Design Guidelines Criteria and Standards for Public Works and Highways.

2) Typical cross section

The project road is proposed to be constructed as a four lane highway for both direction with 60.0 meter right-of -way. Typical cross section elements for the project road are as follows.

Carriageway	2 lanes for both direction
Lane Width	3.65 m
Outer Shoulder	3.00 m
Inner Shoulder	1.00 m
Median	12.00 m
Right of Way	60.00 m

2.2.5 Traffic Demand Forecast

(1) Methodology

Future traffic demand was projected by a commonly used four staged method. First, zonal trip generation and attraction were projected by trip generation and attraction models, then trip distribution, that is, origin-destination tables, was estimated by present pattern method based on the 1992 OD matrices established in the LISR study. Finally the estimated traffic demand was assigned onto the future road network to obtain traffic volumes on each roadway link. The following are parameters used in the traffic simulation.

1) Vehicle speed on road link

Vehicle speed on highway varies significantly according to roadside friction. Taking exclusion of intra-zonal trips in the OD matrices into account, initial speed was set at 50 km per hour for the highway links traversing rural area and 20 km per hour in urban area, in order to differentiate these link characteristics in the traffic simulation. This setting was based on the travel speed survey made in the Manila-Bataan Road BOT Project Preliminary Report, 1992[6].

2) Toll rate

Reviewing the previous studies, toll rate is assumed to be distance proportional at ₱1.0 per kilometer for light vehicles and ₱2.0 for heavy vehicles because the current toll rate is so low that it appears that tollway projects are not financially

[6] According to the travel speed survey results, the highest average travel speeds on the North Luzon Expressway were observed at 84.5 km per hour and the lowest at 60.5 km per hour. On the other hand, the average travel speed on Macthur Highway(Manila North Road) vary by sections. The lowest average speed was found at 12.3 km per hour in the section of Monumento - Malinta, and the highest at 53.0 km per hour in the Calumpit - Sto. Domingo section.

feasible in that circumstance. In the traffic simulation, tolls are regarded as additional impedance on travel, thus the tolls were converted into time-equivalent units and added to the travel time.

3) Value of time

Based on the value of time derived from DPWH, the costs of minutes were set at ₱1.0 per minute for cars and ₱2.0 per minute for heavy vehicles in the simulation. Consequently, the imposed tolls results in decreasing the free flow speed on expressway from 100 kmph to about 67 kmph.

(2) Projected traffic demand

Future traffic demand was projected on the proposed networks, which includes construction of the Manila - Bataan Coastal Road between Calumpit and Lubao section[7], the extension of the North Luzon Expressway, and the Sierra Madre Expressway, among others.

The projected traffic volume in the section between C-5 in N.C.R. and San Jose del Monte amounts to about 74,500 vehicles per day. The following section, San Jose del Monte to Angat, indicates a considerable amount of traffic demand of 57,000 vehicles. Traffic demands were projected to decrease gradually as the expressway goes further from Metro Manila as indicated in the Table 2.11.

Table 2.11 Projected Traffic Demand on the Roadways in 2010 Proposed Road Network

Unit: Number of vehicle trips per day

Section	Car	Jeepney	Bus	Truck	Total	PCU
C-5 - San Jose del Monte	49,940	6,620	5,790	12,110	74,460	95,670
San Jose del Monte - Angat	36,780	5,580	4,700	9,750	56,810	74,050
Angat - San Miguel	16,000	2,640	2,900	5,750	27,290	37,260
San Miguel - Magasawang	11,280	990	2,910	5,450	20,630	29,490
Magasawang - San Jose	7,190	1,580	2,700	4,240	15,710	23,440

[7] The future traffic demand projected in this preliminary study deal with inter-zonal traffic. Thus intra-zonal traffic should be taken into consideration when sufficiency of roadway capacity is examined, in particular in urban area.

2.2.6 Project Evaluation

(1) Project costs

1) Construction costs

Construction costs were estimated approximately by multiplying unit cost per kilometer with distance. Assuming all the sections are to be constructed as a new four lane expressway, unit financial cost was assumed to be ₱63 million per kilometer for Section 2[8]. For simplification it is assumed that economic costs accounts for approximately 80% of the financial costs. Thus the economic unit cost was estimated to be ₱50 million per kilometer.

Table 2.12 Section 1: C-5(NCR) to San Miguel, Bulacan

Approximate Length	50.6	kilometers
Unit Economic Cost per Kilometer	50.0	million Peso
Economic Construction Cost	2,530.0	million Peso

Table 2.13 All Sections: C-5 to San Jose City, Nueva Ecija

Approximate Length	119.6	kilometers
Unit Economic Cost per Kilometer	50.0	million Peso
Economic Construction Cost	5,980.0	million Peso

2) Maintenance and Operation Costs

The previous study[9] examined that both tollway operation costs and maintenance costs were approximately ₱ 0.90 million per kilometer per annum for the year 1991, by reviewing the records of the Philippine National Construction Corporation(PNCC) submitted to the Toll Regulatory Board. It is assumed that both tollway maintenance costs and operation costs are ₱1.1 million per kilometer per annum for the year 1994 taking price escalation into account.

[8]Unit cost of expressway construction was estimated based on the cost estimate for the New North Luzon Expressway made in the Master Plan Study on Luzon Strategic Road Network Development Project, 1993. The same unit cost was applied to the section 2 and the unit cost was increased by 10 percent for the section 1 due to the rolling surface. Moreover the cost was adjusted to 1994 price by inflation rate of 6 percent per annum.

[9] Wilbur Smith Associates, TCGI Engineers, and SYCIP, GORRES, VELAYO & CO. Preliminary Report for Manila-Bataan Road BOT Project, 1992

(2) Project benefits

Project benefits of road development are usually classified into direct and indirect benefits. In this preliminary study, project benefits are limited to direct benefits; therefore, they should be regarded as the least benefits which accrue from the road development.

The direct benefits consist of saving of vehicle operating costs and saving in travel time. Vehicle operation costs are further divided into running costs and fixed costs. DPWH provides the basic vehicle operating costs by vehicle type periodically. The latest table of the basic vehicle costs are shown in the table below.

Table 2.14 Basic Vehicle Operating Costs

Vehicle Type	Running Cost (Peso/km)	Fixed Cost (Peso/min.)	Time Cost (Peso/min.)
Car	2.29	0.09	0.667
Jeepney	1.61	0.46	0.747
Bus	3.65	0.96	4.240
Truck	4.93	1.09	0.000

Source: DPWH, PMO-F/S

The project benefits, the saving in vehicle operating costs and travel times, were calculated by subtracting the total costs in the "Without Project" case from those in the "With Project" case. The existing road network was used as the "Without Project" case for the present year, while the proposed network was used as the "With Project" case for the estimation of economic benefits in the year 2010.

(3) Project viability

1) Section 1: C-5 to San Miguel, Bulacan

Discounting the project costs and benefits at 15% the net present value for the project over a 20-year period accounts for approximately ₱ 2,530 million , and the benefit cost ratio is 1.23. The economic internal rate of return was estimated to be 18% If the value of time would increase at 3% per annum in real term, the economic internal rate of return would increase to be 30% and the benefit cost ratio would also increase to 2.38. On the basis of this preliminary economic analysis, the economic viability of the Section 1 of the project road can be justified as an economic basis.

Table 2.15 Economic Evaluation for Section 1

	Base Case	3 % Increase in Value of Time
Benefit Cost Ratio	1.23	2.38
Economic Internal Rate of Return	18 %	30 %

2) All Sections: C-5 in NCR to San Jose City, Nueva Ecija

Discounting the project costs and benefits at 15%, the net present value for the project over a 20-year period accounts for approximately ₱ 3,898 million , and the benefit cost ratio is about 0.65. The economic internal rate of return was estimated to be 8 % under the assumption of no increase of value of time in real term. However, if the value of time increases at 3% per annum, the economic internal rate of return would improve to be 17% and the benefit cost ratio would also increase to 1.14. The economic viability of the all the section depends largely on an increase in value of time perceived by road users, which is expected to grow as real income increases caused by the boost in economic activities in Central Luzon as well as the other regions.

Table 2.16 Economic Evaluation for the Entire Section

	Base Case	3 % Increase in Value of Time
Benefit Cost Ratio	0.65	1.14
Economic Internal Rate of Return	8 %	17 %

2.2.7 Recommendation

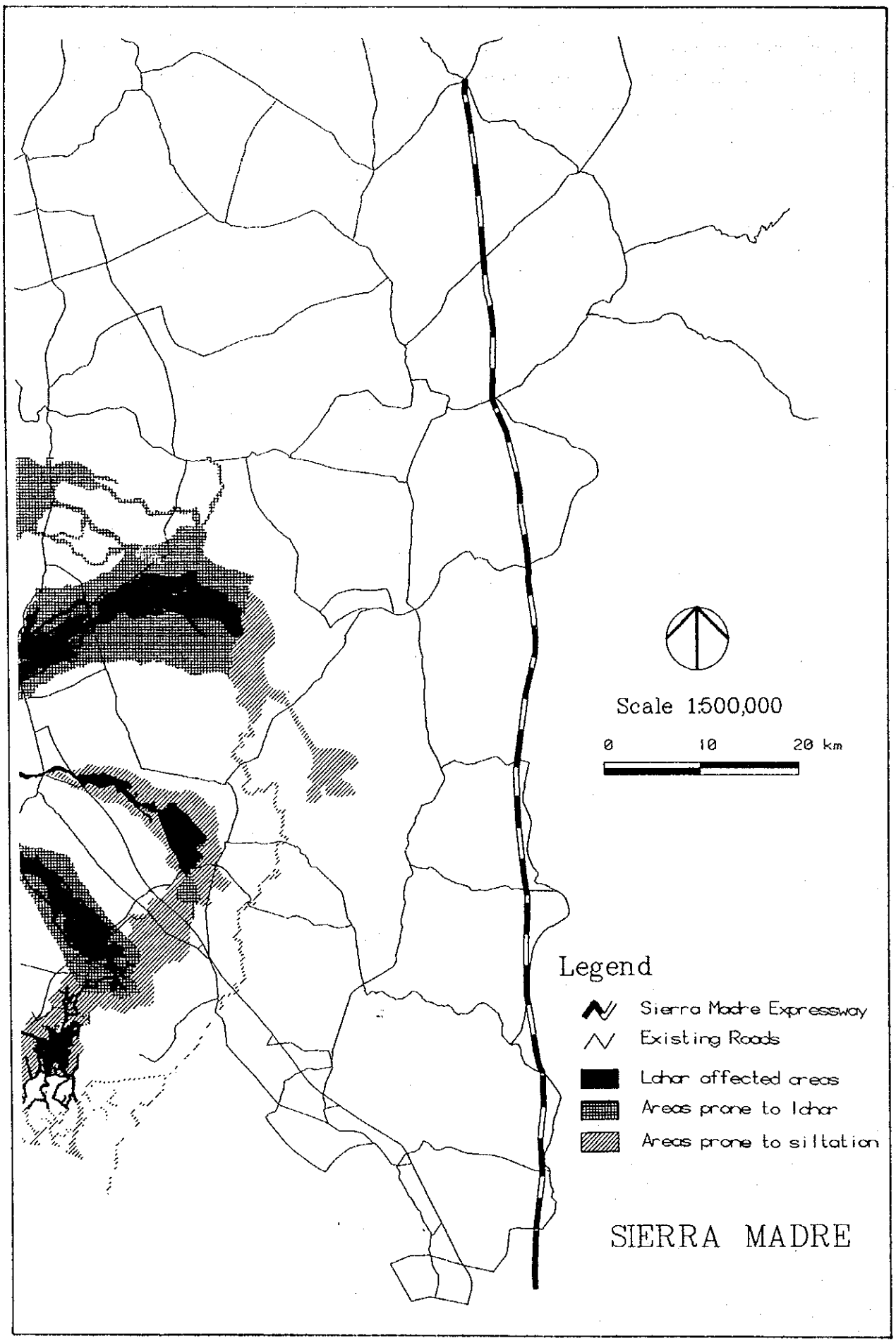
(1) Section 1: From C-5 in NCR to San Miguel, Bulacan Section

Since the Section 1 was justified on the economic basis and the projected traffic demand on the project road in this section are sufficiently large, it is recommended to explore feasibility of the Section 1 at the eariest time. First priority should go to rehabilitaion and improvement of the exsiting expressway, but, at the same time, preparation of the another expressway link is required urgently because it is anticipated that the existing expressway will be saturated in near future even after the planned capacity expansion by widening.

(2) Section 2 and Section 3:

As economic viability of the entire stretch turn out to be marginal, the development of the remaining sections 2 and 3 would be a medium to long term option. It is recommended to

continue to monitor the traffic demand on the existing national road and the related roads in the area. If traffic demand on the corridor grows rapidly, implementation of the projects for the sections 2 and 3 should be initiated earlier.


Scale 1:500,000
0
10
20 km
Legend
Sierra Madre Expressway
Existing Roads
Lahar affected areas
Areas prone to lahar
Areas prone to siltation
SIERRA MADRE

2.3 Cabanatuan and Tarlac Bypasses Development

2.3.1 Background

Most highways in Central Luzon are two lane roads, but road capacity in rural areas is still sufficient for the traffic demand at present and in the near future. Traffic congestion is seen mostly in urbanized areas. Construction of bypass roads for major urban centers, such as Cabanatuan and Tarlac is an effective way to divert inter-regional traffic flows from built up areas. Thus construction of bypasses is an economical way to give reasonable traffic capacity in the short and medium term.

2.3.2 Project Description

(1) Definition

1) Tarlac Bypass

The Tarlac Bypass consists of two sections, the West Tarlac Bypass and the East Tarlac Bypass. The West Tarlac Bypass connects San Rafael and Carangian traversing the south part of the Tarlac City, whereas the East Tarlac Bypass traverses the east side of the Tarlac City parallel to the existing Manila North Road.

2) Cabanatuan Bypass

The Cabanatuan Bypass consists of two sections, the West Cabanatuan Bypass and the East Cabanatuan Bypass. The West Cabanatuan Bypass connects San Gregorio and Alibangbang and provides a shortcut for the traffic Sta. Rosa to Muñoz. Another link, the East Cabanatuan Bypass, would establish a ring road and serve for the traffic from Sta. Rosa to Palayan City. The Cabanatuan common bus terminal is currently planned to be built along this road.

(2) Objectives

The objectives of the project are:

- to construct bypasses on major highways to mitigate traffic congestion in Cabanatuan City and Tarlac City, and
- to contribute to form efficient links among major urban centers.

(3) Expected effects

The construction of bypasses would bring about:

- reduction in traffic congestion and air pollution in urbanized areas, and
- reduction of travel time between major urban centers.

2.3.3 Existing road conditions

The primary national primary arterial roads, the Manila North Road and the Philippine Japan Friendship Highway are mostly in good condition.

2.3.4 Engineering Study

(1) Alignment

The alignments of the bypasses were studied taking the expansion of the urbanized area in the future into account. The bypasses are placed so as to encircle the built-up areas. The alignments of the bypasses are illustrated in the attached figures.

(2) Highway design

1) Geometric design standards

Geometric design standards for this preliminary study were adopted from the Luzon Island Strategic Road Network (LISR) Development Project, among others; also referred to are the DPWH Design Guidelines Criteria and Standards for Public Works and Highways.

2) Typical cross section

The project road is proposed to be a four lane ordinary highway for both directions with 60.0 meter right-of-way. Typical cross section elements for the project road are as follows.

Carriageway	2 lanes for both direction
Lane Width	3.65 m
Shoulder	3.00 m
Median	2.00 m
Right of Way	60.00 m

2.3.5 Traffic Demand Forcast

(1) Methodology

Future traffic demand was projected by a commonly used four staged method. First, zonal trip generation and attraction were projected by trip generation and attraction models, then trip distribution, that is, origin-destination tables, was estimated by present pattern method based on the 1992 OD matrices established in the LISR study. Finally the estiamted traffic demand was assigned onto the future road network to obtain traffic volumes on each roadway link. The followings are parameters used in the traffic simulation.

1) Vehicle speed on road link

Vehicle speed on highway varies significantly according to roadside friction. Taking exclusion of intra-zonal trips in the OD matrices into account, initial speed was set at 50 km per hour for the highway links traversing rural area and 20 km per hour in urban area, in order to differentiate these link characteristics in the traffic simulation. This setting was based on the travel spedd survey made in the Manila-Bataan Road BOT Project Preliminary Report, 1992.

2) Value of time

On the basis of value of time derived from DPWH, the costs of minutes were set at ₱1.0 per minute for cars and ₱2.0 per minute for heavy vehicles in the simulation.

(2) Projected traffic demand

1) Tarlac Bypass

Future traffic demand was projected on the existing road network with the proposed bypass. The projected traffic volume amounts to about 8,700 vehicles per day o the West Tarlac Bypass and 16,300 vehicles on the East Tarlac Bypass as indicated in the Table 2.17.

Table 2.17 Projected Traffic Demand on the Roadways in 2010 Tarlac Bypass

Unit: Number of vehicles trips per day

Section	Car	Jeepney	Bus	Truck	Total	PCU
West Tarlac Bypass	4,020	350	540	3,750	8,670	13,130
East Tarlac Bypass	7,550	810	1,440	6,480	16,280	24,610

2) Cabanatuan Bypass

Future traffic demand was projected on the existing road network with the proposed bypass. The projected traffic volume amounts to about 6,700 vehicles per day on the West Cabanatuan Bypass and 5,100 vehicles on the East Cabanatuan Bypass as indicated in the Table 2.18.

Table 2.18 Projected Traffic Demand on the Roadways in 2010 Cabanatuan Bypass

Unit: Number of vehicles trips per day

Section	Car	Jeepney	Bus	Truck	Total	PCU
West Cabanatuan Bypass	3,030	240	840	2,630	6,740	10,330
East Cabanatuan Bypass	2,470	520	580	1,490	5,060	7,390

2.3.6 Project Evaluation

(1) Project costs

Construction costs were estimated approximately by multiplying unit cost per kilometer with distance. Assuming all the sections are to be constructed as a new four lane ordinary road, unit financial cost was estimated to be ₱30 million for the West Cabanatuan Bypass which includes a 205 meter bridge crossing the Pampanga River, and ₱22.5 million per kilometer for the other sections. For simplification it is assumed that economic costs account for approximately 80% of the financial costs. Thus the economic unit cost was estimated to be ₱24 million per kilometer for the West Cabanatuan Bypass and ₱18 million for the other bypasses. Although maintenance costs should be included in the project cost, the costs are not included because they are not significant compared with the construction costs at the level of this preliminary study.

Table 2.19 Project Cost of Cabanatuan Bypass

	West	East	
Approximate Length	3.7	6.10	kilometers
Unit Economic Cost per Kilometer	24.0	24.0	million peso
Economic Construction Cost	88.8	146.4	million peso

Table 2.20 Project Cost of Tarlac Bypass

	West	East	
Approximate Length	11.1	10.4	kilometers
Unit Economic Cost per Kilometer	18.0	18.0	million peso
Economic Construction Cost	199.8	187.2	million peso

(2) Project benefits

Project benefits of road development are usually classified into direct and indirect benefits. In this preliminary study, project benefits are limited to direct benefits; therefore, they should be regarded as the least benefits which accrue from the road development.

The direct benefits consist of saving of vehicle operating costs and saving in travel time. Vehicle operation costs are further divided into running costs and fixed costs. DPWH provides the basic vehicle operating costs by vehicle type periodically. The latest table of the basic vehicle costs is shown in the table below.

Table 2.21 Basic Vehicle Operating Costs

Vehicle Type	Running Cost (Peso/km)	Fixed Cost (Peso/min.)	Time Cost (Peso/min.)
Car	2.29	0.09	0.667
Jeepney	1.61	0.46	0.747
Bus	3.65	0.96	4.240
Truck	4.93	1.09	0.000

Source: DPWH, PMO-F/S

The project benefits, the saving in vehicle operating costs and travel times, were calculated by subtracting the total costs in the "Without Project" case from those in the "With Project" case. The existing road network was used as the "Without Project" case.

(3) Project viability

1) West Tarlac Bypass

Discounting the project costs and benefits at 15%, the net present value for the project over a 20-year period accounts for approximately P500 million, and the benefit cost ratio is 2.5. The economic internal rate of return was estimated to be 34%. The economic viability of the West Tarlac Bypass is justified as an economic basis.

Table 2.22 Economic Evaluation for West Tarlac Bypass

Net Present Value (million peso)	499.6
Benefit Cost Ratio	2.5
Economic Internal Rate of Return	34%

2) East Tarlac Bypass

Discounting the project costs and benefits at 15%, the net present value for the project over a 20-year period accounts for approximately ₱447 million, and the benefit cost ratio is 2.4. The economic internal rate of return was estimated to be 34%. On the basis of this preliminary economic analysis, the viability of the project road can be justified as an economic basis.

Table 2.23 Economic Evaluation for East Tarlac Bypass

Net Present Value (million peso)	447
Benefit Cost Ratio	2.4
Economic Internal Rate of Return	34%

3) West Cabanatuan Bypass

Discounting the project benefits at 15%, the net present value for the project over a 20-year period accounts for approximately ₱641 million, and the benefit cost ratio is about 7.2. The economic internal rate of return was estimated to be 84%.

Table 2.24 Economic Evaluation for West Cabanatuan Bypass

Net Present Value (million peso)	641
Benefit Cost Ratio	7.2
Economic Internal Rate of Return	84%

4) East Cabanatuan Bypass

Discounting the project costs and benefits at 15%, the net present value for the project over a 20-year period accounts for approximately ₱145 million, and the benefit cost ratio is 1.0. The economic internal rate of return was estimated to be 15%. Thus the project viability is marginal. The viability would be improved if the economic development is Aurora Province.

Table 2.25 Economic Evaluation for East Cabanatuan Bypass

Net Present Value (million peso)	145
Benefit Cost Ratio	1.0
Economic Internal Rate of Return	15%

2.3.7 Recommendation

(1) Tarlac Bypass

The East Tarlac Bypass is parallel to the planned extension of the North Luzon Expressway. The role as an access road to the Tarlac City should be taken into consideration.

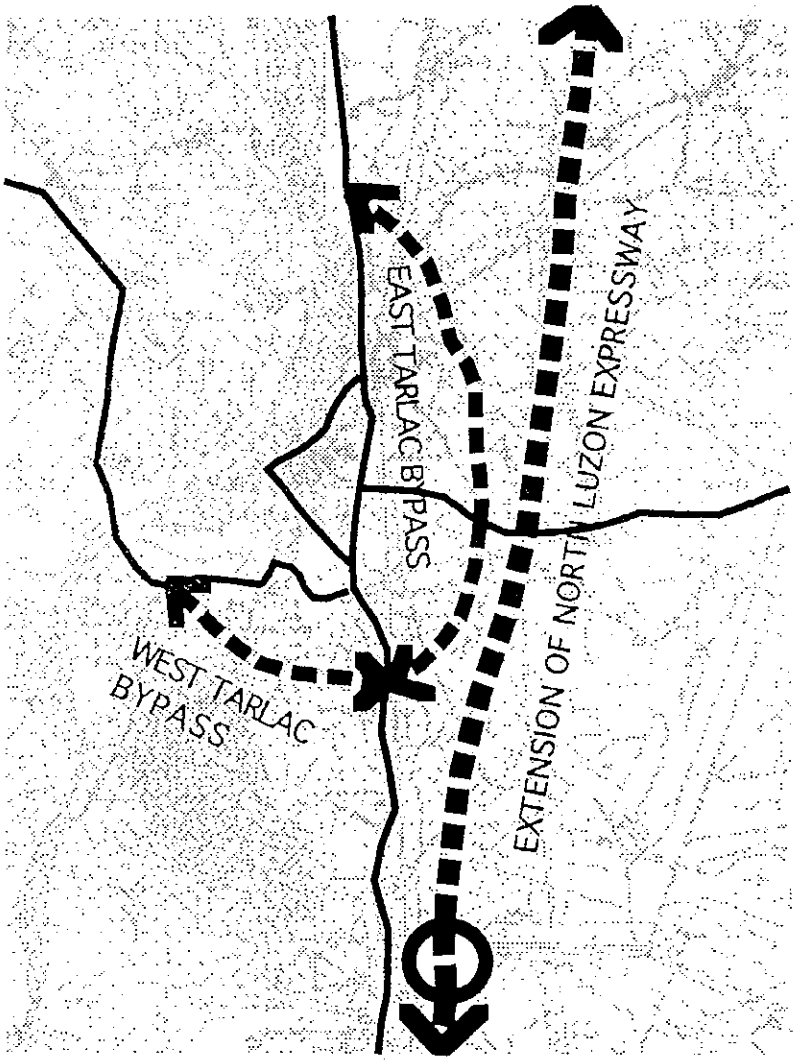
(2) Cabanatuan Bypass

The West Cabanatuan Bypass is effective to prevent inter-regional traffic passing through the urbanized area. On the other hand, the East Cabanatuan Bypass would form a frame for urban land use.

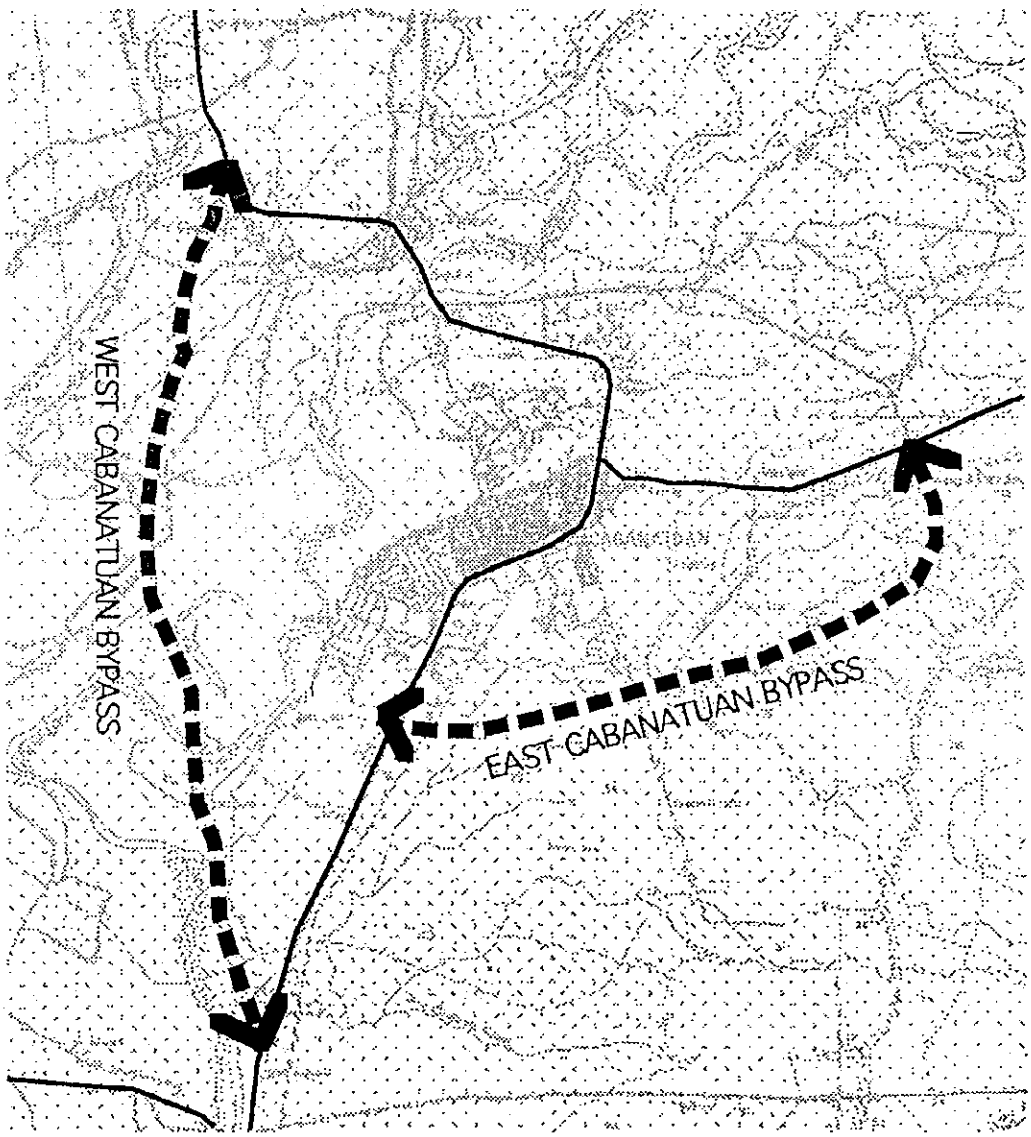
In order that bypasses function for diverting traffic, cities should restrict land use along the bypasses; otherwise its original traffic function would not be attained. Thus coordination with city land use plan is of great importance.

A further engineering study should be undertaken in particular for the West Tarlac Bypass and the West Cabanatuan Bypass.

Tarlac Bypass



Cabanatuan Bypass



2.4 Crop-Livestock Integrated Farming

2.4.1 Rationale

The integrated farming system as an approach has now been receiving more attention because of the growing concern to maximize productivity through optimum utilization of resources in a world undergoing rapid population growth and diminishing per capita resources. A recent study made by FAO entitled "Agriculture Toward 2000", has predicted that by the year 2000 a world population of more than 6 billion will require an agricultural output of 50-60% greater than attained in 1980 and that demand for food and agricultural products in developing countries will double.

In the Philippines, it is estimated that population will be about 75 million by the year 2000, a situation which really calls for greater production of agricultural products in order to meet the growing needs of the people. For rice alone, an increase of 1.7 tons/ha is needed to cope with the population pressure (PhilRice Report, 1991). Due to population growth and the conversion of agricultural lands to industrial use, the average landholding has decreased to less than 2 hectares. Since small scale farmers comprises the bulk of the country's population, the major challenge is to help them raise agricultural productivity. The promotion of integrated farming is one of the approaches that may help alleviate the impending food crises.

The integrated farming has two major features: waste or by-product utilization and improved space utilization. The first feature encourages the use of waste from one sub-system as input to another subsystem. The second is essentially utilization of one space by two or more subsytem which normally utilized by one subsystem.

Integrating crop and livestock increases farmer's income with a relatively small cost of production input. Crops and livestock raised simultaneously in a farming system can profit on a natural symbiotic relationship. Crop residues can be utilized as animal feeds while wastes (manure) can be used as fertilizers for the crops. Moreover, land utilization in this system is increased.

2.4.2 Project Description

Suitable crop-livestock farming schemes will be identified and implemented in both lowland and upland areas. The lowland cropping will be more of a rice based operations while the upland will involve plantation crops on rolling terrains, including the Pinatubo devastated areas of Zambales and Bataan.

The number of livestock to be raised in each module will be identified based on proven crop-livestock integrated farming, using an economic family farm size module (EFFS) as a model. The following are the possible schemes of operations for verification and implementation:

A. Lowland

Modules	Farm Size	Animal Component
1. Paddy-Swine	1-ha Pddy farm	Sow Fattening, 2 sows producing weanlings and fatterners
2. Paddy-Layer	1-ha Paddy farm	100 layer
3. Paddy-Goat	1-ha Paddy farm	10 breeder doe producing breeder buck/doe and 5 months old fatterners
4. Paddy-Cattle	1-ha Paddy farm	5 fatteners steers reared for 5 months
B. Upland		
5. Corn/Peanut/Goat	2-ha farm	10 breeder doe producing breeder buck/doe and fatteners
6. Corn/Mungbean Cattle	2-ha farm	5 fattening steers reared for 5 months
7. Agro-forest/Goat	3-ha fruit trees	10 breeders doe producing breeder buck/doe and 5 month old fatteners

2.4.3 Project Components

Research and development

The research and development component of the Project shall identify appropriate combinations of the two subsystems that would be integrated. Taking in consideration the natural, social and cultural uniqueness of the environment, the integration should create a farm system that would lead to increased productivity through effective utilization of resources. Hence, R&D should be able to provide the site specific technology required for each project location.

Credit

Farm family units that will be taken in as models in pilot testing of the Project shall be assisted by credit for the initial capital for the first cycle. However, the capital for the succeeding cycle shall be given in the form of loan. Loans shall also be made available for qualified applicants after the pilot testing of the Project.

Technical assistance

Extension services shall be an important component of the Project. At the onset, trainings shall be provided for the farm families that would qualify to participate in the Project. An intensive extension services shall be given to the participants throughout the duration of the Project. It is expected that the technology shall have been assimilated in the area after the Project.

Institutional development

The participants of the Project in one location shall be organized into associations (peoples' organization) to facilitate implementation of the Project. These associations shall be organized by the project participants themselves with the assistance of NGOs that will collaborate with the implementing government agencies.

Market development

Market research and development shall be an integral part of a study to be conducted during the pilot implementation of the Project. It shall be geared towards creation of marketing strategies.

2.4.4 Project Schedule

The Project shall be implemented in two phases. The first phase will constitute a project study to be implemented for 14 months. Under this stage the technology will be developed and established and pilot tested to some 100 Economic Family Farm Size (EFFS) probably located in one barangay which will be called an economic zone. In the micro-level piloting, the technology generated under the local conditions will be prototyped to a barangay while it will simulate the approaches in that level. All data generated from the establishment of this EFFS module will serve as a baseline data for the implementation of the project in the second phase.

The second phase of implementation is the project proper to be implemented for five years to create a significant impact in the farm family income and agricultural production. Technology generated in the first phase shall be disseminated throughout the region. At this phase, the number of project beneficiaries shall be expanded. Thus, the activities in the first phase shall be carried out in this phase. The credit component of the project shall be a major undertaking of the project at this phase.

2.4.5 Implementing Arrangement

The Project shall be implemented through an inter-agency committee composed of relevant government agencies. It shall be headed by the Department of Agriculture with the Bureau of Plant Industry and Bureau of Animal Industry taking significant participation. Other member agencies shall also include the Agriculture Credit and Policy Council and the Cooperative Development Authority under the umbrella organization of DA, the Central Luzon State University and the Land Bank of the Philippines. A project office headed by a project manager shall be set up at DA -Region III. This project office shall administer the implementation of the Project. It shall plan, execute and monitor the activities of the Project. The project office shall contract the services of province-based NGOs to undertake organization and extension works.

2.4.6 Required Experts

The following experts will be required for the implementation of the Project.

Phase I

- Team leader
- Animal husbandry expert
- Agronomist
- Agricultural economist
- Institutional planner

Phase II

(Consulting Group)

- Project manager
- Animal husbandry expert
- Agronomist
- Agricultural economist
- Marketing specialist
- Institutional planner
- Credit specialist

2.4.7 Project Costs

Construction costs involved in the livestock component of each economic family size module consist of costs of a house and associated facilities. The total cost ranges from ₱10,500 for most modules to ₱13,500 for the modules with swine and layrer.

Operating expenses include costs of stocks, feed, veterinary services and drugs, utilities and others. The pilot implementation of the Project with 100 economic family farm size modules would involve some ₱1.2 million for the fixed cost and ₱5 million annually as the total operating expense.

2.5 Designers' Village

2.5.1 Background/Rationale

There are a total of 7,705 manufacturing establishments in Central Luzon, representing 9.9% of the total manufacturing establishments in the country. These establishments employ 94,681 workers and produce an output value of P37.6 billion. These establishments are dominated by small and medium sized enterprises (SME's).

Of this total, 35% are design related industries such as wearing apparel, leather and leather products, footwear, wood products, furniture and fixtures, paper and paper products, pottery, china and earthenware, among others. These industries have a combined output value of ₱ 5.9 Billion or almost 15.7% of the total industries in Central Luzon.

Similarly, these industries are among the region's top export earners. In 1992, garments, gifts, toy & housewares (GTH), paper and paper products and ceramics, registered export earning amounting to US$ 180.8M or 44% of the region's total exports. These products, together with jewelry and marble were also included among the fourteen "export winners" identified in the Medium Term. Philippine Export Development Plan (MTPEDP) up to year 2000. According to the MTPEDP, these products were chosen from among 154 profitable products on the basis of the following criteria: (1) high worldwide potential, (2) less sensitivity to protectionist measures of importing countries, and (3) minimum requirements for efficient infrastructure, production capability and high-skilled labor.

In the plan, exports of GTH, furniture, garments, marble and jewelry are projected to grow by 21.3%, 21.2%, 23.1%, 31.3% and 30% by 1998, respectively. This means that these industries have considerable potentials and are expected to propel the economy, not only of Central Luzon but of the whole country as well.

Recent surveys and interviews, however, have revealed that many obstacles hinder these industries from fully developing these potentials and achieving the desired targets. One of

these hindrances is poor product quality and low productivity. At present, the design and quality of products of these industries depend to a great extent on the skills and levels of technology being adopted, which are mostly outdated and not within the standards of the world market. To make these products competitive in the world market, there is an urgent need to improve and update on product quality, implement good manufacturing practices and invest in new equipment.

For these industries to achieve global competitiveness, and in pursuit of DTI's strategy to come up with distinctive designs and continuous product development for high end, high quality consumer products, the establishment of a Designers' Village is proposed in Central Luzon. Considering the region's rich human resources, the Designers' Village may serve as the venue to attain high productivity without sacrificing the local people's artistry and craftsmanship.

This project is envisioned to bring significant impact to SME's, which are considered to be the sector which provides the production base for sustaining economic growth.

2.5.2 Objectives

(1) General

1) To elevate Central Luzon's position as the "Milan of the East" - a trendsetter in total fashion and interior design and an excellent source of highly creative consumer products.

(2) Specific

1) To help Central Luzon's manufacturers upgrade design and develop a global competitive edge through design;

2) To assist the design industry to upgrade the pool of design talents through manpower development and recognition;

3) To educate consumers to be appreciative and discerning of good design;

4) To provide for the establishment of facilities which will be the center not only of design, but for other support services to SMEs to sustain its viability of operations;

5) To increase productivity through modern and appropriate technology development without sacrificing the inherent design capacity of the local people; and

6) To provide the SMEs the proper exposure through information networking and appropriate promotional activities.

2.5.3 Project Description

The Designers' Village is envisioned to be a culmination of efforts of both the government and the private sector to actively develop and promote the region's design movement, which has gained momentum over the last few years. This project will house a mix of activities and facilities that will cater to the needs of manufacturers, designers, design students, tourists and ordinary citizens.

Candidate sites for the Designers' Village include the Clark Field, the SBMA area, and the former Philippine Refugee Processing Center in Morong. Conditions to be satisfied by the project site include the following:

(1) area large enough for the village,
(2) existing facilities including buildings to be converted, utilities and other basic infrastructure,
(3) good access to/from Metro Manila,
(4) planned development of related activities in and around the site such as convention, entertainment and other commercial activities,
(5) links to the world through transport and telecommunication facilities, and
(6) availability of incentive packages.

The Designers' Village will have the following components.

Industrial clusters formation

Design related industries will be formed into clusters adapting the street - culture type strategy. This concept entails the establishment of designated zones per type of industry. Two of the Zones to be established may be the : Total Fashion Industry Zone and the Total Interior Design Industry Zone. Mini-standard buildings shall be constructed so that manufacturers may be able to lease at very reasonable rates. These small buildings will be equipped with small individual showrooms, small production areas where some aspects of production can be done for demonstration purposes and office spaces where business transactions can be held.

This component will basically provide incubation function to these industries for them to survive and grow given the various support services and incentives offered by the village, without totally sacrificing the inherent craftsmanship of the local people. Some of the support services are as follows:

(1) Common service facilities

Machineries and equipment will be procured for the common use of manufacturers on a pre-arranged schedule. Installation of these production facilities would be very beneficial to the SME's because acquisition of machineries and equipment is not affordable due to high investment costs. The most cost effective way to avail of its use is through a facility and equipment sharing program.

(2) Raw materials procurement

Bulk procurement of raw materials by the manufacturers will be encouraged in order to avail of discounted prices. Decrease in production costs will make their selling prices more competitive.

(3) Quality control and testing facilities

Facilities and equipment for product testing and quality control will be installed in order to attain improved quality and highly competitive products.

(4) Storage/warehousing facilities

This will attain assured raw material supply by providing wider storage area.

(5) Transportation/distribution system

Delivery or distribution can be undertaken jointly to minimize cost. This division of work will be conducive to strengthening the competitiveness of SME's in Central Luzon.

(6) Trade consolidation

Better prices will be obtained if marketing of the products is organized through a single marketing group. Likewise, producers can be able to meet export volume requirements.

(7) Product showcase

Individual showrooms or display centers will provide the manufacturers' the proper exposure to market their products.

Establishment of an International Design Academy

As support to the clusters of manufacturing industries that will locate in the village, an International Design Academy would be established inside the Designers' Village. The IDA is intended to provide discipline and sophistication to the village to be able to attain world class status, in the field of design. The Academy would continuously educate creative

designers, thereby ensuring availability of design experts and at the same time attain a level of sophistication acceptable in the international market.

The IDA will have the following programs:

(1) Regular courses on design engineering, computer software (CAD/CAM), computer assisted instructions (CAI) etc.

(2) Design conference and seminars

This program shall be organized to increase design awareness among manufacturers, keep local manufacturers and designers abreast of technology development, enhance the skills of designers and stimulate creativity among students. Well known personalities in the field of design may be invited as resource speakers or lecturers who will not only share their knowledge to aspiring designers but also serve as an inspiration or role model for them.

(3) Design scholarship and fellowship

This program is designed to give scholarships to local designers or aspiring designers to study in prestigious design academies or institutions overseas to be funded by private organizations. Upon graduation, these scholars must work with the sponsoring private organizations until such time that their service contract is fully served.

(4) Design awards

Design competitors will regularly be held to identify outstanding creative individuals and design-conscious manufacturers. The award may have two categories: (1) for individual designers and (2) for manufacturers.

(5) World Class Designers Invitation Program

This program entails inviting well-known designers from abroad to be able to see the design capability of the Filipinos and at the same time transfer their own design concepts to the local people. This program would not only help in promoting the image of the region as a world class design center thru "word of mouth" but is expected to provide additional job opportunities and income to the local manufacturers through franchise arrangements.

(6) Product specialists/local counterpart program

This is an ongoing program of the Design Center of the Philippines in coordination with DTI. Operating as a trainors' training program wherein international or well known product specialists are tapped to train local counterparts who shall then re-train the local people, this program may be integrated into the Academy's programs.

Information networking

Interfacing the two components cited above is the establishment of the Life Style Research and Information Center. The Center will be housed inside the International Design Academy. It will establish a data base for design related industries not only in terms of design related information but also technology development, market matching and trends, raw material sourcing, among others.

Other features of the Center are (1) bookshop which will sell a wide range of books and materials broadly related to lifestyle and trend setting, and (2) library or documentation center which will house a collection of information, materials, on all aspects of production, including design.

The Center will also establish linkages with existing international institutions of the fashion and interior design industries for information sharing.

2.5.4 Project Schedule

The Project will be carried out in four phases:

Phase I	:	Preparation of a master plan for the establishment of a Designers' Village - 8 months;
Phase II	:	Preparation of a feasibility study for each component - 4 months;
Phase III	:	Detailed engineering design and construction - 18 months; and
Phase IV	:	Actual operation - upon completion of construction and all documentary and legal requirements complied with.

The master plan study shall cover among others studies on the general features and socio-economic profile of the proposed site, suitability of the site for the project, site development and support systems, financial and economic analysis and implementation programs.

2.5.5 Implementing Arrangement

The Designers' Village shall be managed by an appropriate industry association identified in the master plan study with the assistance of the Department of Trade and Industry. The following are the roles and responsibilities of the different agencies concerned.

Industry association

The relevant industry association to be identified by the master plan study shall have the sole responsibility of managing the day - to- day operations of the Designers' Village. As such, this association will be in charge of preparing and implementing an operation plan to include among others, the identification of types of industries to locate in the village;

conceptualization of income-generating measures to sustain the project and to determine other types of assistance or incentive package to attract locators.

DTI

The DTI's role shall be very limited, mostly on monitoring the operations of the project and in facilitating required documents from government

2.5.6 Expertise Required

The following experts may be required for the satisfactory completion of the proposal:

Phase I

1. Team leader
2. Urban planner
3. Industry development planner
4. Institutional development planner
5. Investment analyst
6. Economist

Phase II

1. Team leader
2. Civil engineer
3. Design engineer
4. Architect
5. Urban planner
6. Environmental planner
7. Industry development planner
8. Economist
9. Investment analyst

Phase III

1. Project manager
2. Architect
3. Civil engineer - water, wastewater and drainage
4. Civil engineer - roads
5. Electrical engineer

2.6 Regional Telephone Services Improvement

2.6.1 Background

A key growth strategy of the Central Luzon Development Program Master Plan is to strengthen linkages between various economic activities in different areas within the region. An improved telecommunication system is a prerequisite to fostering economic linkages. It will also contribute to the improvement in social services delivery.

Telephone services constitute a main mode of telecommunications at present. The establishment of an integrated, efficient and reliable telephone network throughout the Country is therefore a national goal. In Central Luzon, 103 out of 122 municipalities have already been served or planned to be served by a telephone network. Service coverage is particularly low in Nueva Ecija, while the integration of Nueva Ecija economies with the rest of Central Luzon has a strategic meaning for the development of the entire region.

2.6.2 The Project

The Regional Telephone Services Improvement Project will install telephone lines in six more provinces in Nueva Ecija. It will contribute also to the interconnection of networks among operators for reliable and efficient services throughout Central Luzon and the Country, as planned by DOTC.

Number of lines

Switching capacities and the number of primary cable pairs to be installed are summarized below.

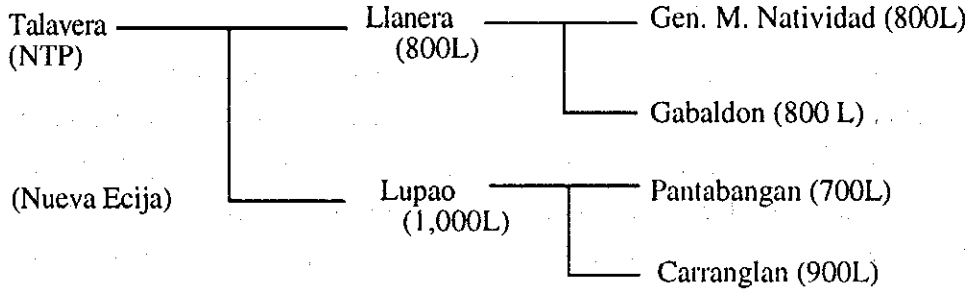
Number of Lines to be Installed

Province	Municipalities	Switching Capacity (Lines)	No. of Primary Cable Pairs
Nueva Ecija	Llanera	800	1,400
	Gen. M. Natividad	800	1,300
	Gabaldon	800	1,300
	Lupao	1,000	1,700
	Pantabangan	700	1,100
	Carranglan	900	1,600
	Total	5,000	8,400

Homing and routing plan

A homing and routing plan is illustrated below. Local exchanges will be connected to the Talavera primary center of NTP.

Homing and Routing Plan



Transmission plan

Types and the number of transmission systems for each section of the Project are summarized below.

Types and Number of Transmission Systems

Province	Section	System	Distance (Km)	Note
Nueva Ecija	Talavera (NTP)-Llanera	OF-34M 1+1	23	Interconnection link
	Llanera-Gen. Natividad	OF-8M 1+1	7	
	Llanera-Gabaldon	DR-8M 1+1	40	
	San Jose City (NTP) - Lupao	OF-34M 1+1	14	Interconnection link
	Lupao-Pantabangan	DR-8M 1+1	27	
	Lupao-Carranglan	DR-8M 1+1	20	

2.6.3 Financial Evaluation

Costs of the Project have been estimated as follows.

Estimated Project Costs

(Unit:US$Million)

	Foreign	Local	Total
Switching System	3.8	1.6	5.4
Transmission System	2.2	1.0	3.3
Outside Plant	1.0	1.0	2.0
Supporting Facilities	0.1	0.8	0.9
Consultant & Engineering	1.0	0.2	1.2
Contingency	0.8	5.0	1.3
Total	8.9	5.0	13.9

The financial internal rate of return for the Project has been calculated at 3.06%. A regional cross subsidy of ₱ 6,000 per line or ₱ 540 million would be needed annually to maintain the internal rate of return at 11 to 12%.

2.7 Central Luzon Optic Super Highway (CLOSH)

2.7.1 Background

Multi-media represent a new concept of advanced communication technology, which will allow two-way and mutually responsive communication. Potentials for multi-media application are very high, encompassing various economic activities, social services, community and cultural activities. In line with the CLDP paradigm, Central Luzon should serve as a pilot case for future multi-media society.

The CLDP Master Plan proposes the Optic Fiber Network project as one of regional projects to be implemented in steps. As the first step, the Master Plan proposes a master plan study for the Project to be conducted in Phase I. The concept of the Project is further developed here in the form of the Central Luzon Optic Super Highway or CLOSH. A basic system configuration and cable routes are presented and a rough cost estimate given. Exchanges, computers and peripherals are not included in the cost estimate.

2.7.2 The Project

The proposed CLOSH system has following configurations:

Transmission capacity:	140Mbits
Stations configuration:	Optical line terminal equipment, Multiplexer, Skip multiplexer, Fiber distribution frame, Power supply unit
Interface at exchanger:	2Mbits interface
Fiber optic cable:	Single moded, 8 cores in lap seath steel armour self supportingtype, 2 cores for working, 2 cores for stand-by, 2 cores for future expansion, 2 cores for spare

The system will cover all the major cities in Central Luzon. A total of 122 stations will be established, consisting of 12 in Bataan, 24 in Bulacan, 32 in Nueva Ecija, 22 in Pampanga, 18 in Tarlac and 14 in Zambales.

Cable routes have been determined to cover all the stations with the shortest distances as shown in the attached figure. Distance between each station pair is summarized in the attached table.

2.7.3 Project Cost

The total cost of the Project is roughly estimated at US$132 million. The cost includes hardware and software including engineering fee for the installation of the fiber optic network:

Cost element	Cost (US$ million)
Optic transmission facilities	62
Optic fiber cable	51
Measuring equipment and training	12
Engineering fee	7
Total	132

The costs have been estimated on the following basis:

(1) The system is established on a full turn-key base,
(2) Building works are not included,
(3) Optic fiber cables are installed overhead,
(4) Maintenance tools and spares are included, and

(5) Training is included.

2.7.4 Implementation Program

Implementation of the CLOSH project should be phased to match funding. The project will establish the optic fiber network for high speed and large capacity data transmission. Other facilities such as switching exchangers, computers and peripheries necessary to utilize the network shall be provided separately under different projects.

Province	City		Distance (km)
	From	To	
Bataan	Sinalupinas	Hermosa	9
	Hermosa	Orani	3
	Oranin	Samal	4
	Samal	Abucay	8
	Abucay	Balanga	6
	Balanga	Pilar	3
	Pilar	Orion	6
	Orion	Limay	9
	Limay	Marivele	35
	Balanga	Bagac	22
Sub-total			**105**
Bulacan	San Miguel	San Ildefonso	12
	San Ildefonso	Baliuag	18
	Baliuag	Bustos	2
	Baliuag	Plaridel	12
	Plaridel	Pulilan	7
	Pulilan	Malolos	12
	Malolos	Paombong	7
	Paombong	Hagonoy	9
	Malolos	Guiguinto	11
	Guiguinto	Balagtas	3
	Balagtas	Bocaue	3
	Balagtas	Bulacan	3
	Bocaue	Marilao	7
	Marilao	Meycauayan	3
	Meycauayan	Obando	6
	Bocaue	Pandi	12
	Bocaue	Sta. Maria	8
	Bocaue	San Jose del Monte	18
	Norzagaray	Angat	3
	Angat	San Rafael	12
	San Rafael	Baliuag	9
Sub-total			**177**
Nueva Ecija	Nampicuan	Cuyapo	6
	Talugtug	Guimba	18
	Guimba	Quezon	15
	Quezon	Licab	8
	Quezon	Aliaba	9
	Aliaga	Cabanatuan	15
	Lupao	Muñoz	21
	Muñoz	San Jose	15
	Muñoz	Santo Domingo	18
	Santo Domingo	Talavera	12
	Talavera	Cabanatuan	14
	Carranglan	Pantabangan	21
	Pantabangan	Rizal	18
	Rizal	Llanera	12
	Llanera	Cabanatuan	30
	Laur	Palayan	15
	Palayan	Bonganong	14
	Palayan	Natinidaol	12
	Palayan	Cabanatuan	21
	Cabanatuan	Sta. Rosa	11
	Sta. Rosa	San Leonardo	9
	San Leonardo	Peñaranda	9
	Peñaranda	General Tinio	6
	Sta. Rosa	San Isidro	20
	San Isidro	Jaen	3
	San Isidro	San Antonio	9
	San Isidro	Cabiao	9
	Peñaranda	Gapan	9
	Cuyapo	Guimba	20
	Gabaldon	Laur	30
Sub-total			**429**

Province	City		Distance
	From	To	(km)
Pampanga	Mabalacat	Angeles	14
	Angeles	Magalang	14
	Angeles	Parac	12
	Angeles	San Fernando	18
	San Fernando	Macabebe	24
	Macabebe	Masantol	3
	San Fernando	Bacolor	6
	Bacolor	Guagua	6
	Bacolor	Santa Rita	9
	Guagua	Lubao	8
	Lubao	Floridablanca	15
	San Fernando	Mexico	8
	Arayat	Santa Ana	9
	Santa Ana	Candaba	6
	San Simon	Apalit	6
	Mexico	San Luis	3
	Mexico	Santa Ana	3
	Apalit	San Fernando	17
	Minalin	San Fernando	11
Sub-total			**192**
Tarlac	San Clemente	Camiling	8
	Camiling	Mayantoc	12
	Camiling	Moncada	21
	Moncada	Paniqui	8
	Paniqui	Gerona	9
	Gerona	San Jose	9
	Gerona	Tarlac	18
	Tarlac	San Manuel	24
	Capas	Bamban	9
	Tarlac	San Manuel	11
	Ramos	Pura	6
	Pura	Victoria	9
	Concepcion	Bamban	15
	Ramiqui	Ramos	6
	Moncada	Anao	6
	San Manvel	La Paz	10
Sub-total			**181**
Zambales	Sta. Cruz	Candelaria	20
	Candelaria	Masinloc	12
	Masinloc	Palauig	20
	Palauig	Iba	18
	Iba	Botolan	8
	Botolan	Cabangan	21
	Cabangan	San Felipe	12
	San Felipe	San Narciso	8
	San Narciso	Candelaria	2
	Candelaria	San Antonio	9
	San Antonio	San Marcelino	9
	San Marcelino	Castillejos	9
	Castillejos	Subic	9
	Subic	Olongapo	12
Sub-total			**169**
Total area	Olongapo	Morong	25
	Olongapo	Dinalupihan	30
	Dinalupihan	Lubao	21
	Calumpit	San Fernando	21
	Bamban	Mabalacat	8
	Manila	Meycauayan	17
	San Miguel	Gapan	20
	Nampicuan	Anag	1
Sub-total			**143**
Grand Total			***1396***

CHAPTER 3

CHAPTER 3 PROPOSALS FOR URGENT STUDIES

The CLDP Master Plan has earmarked a set of projects/programs to be implemented over the 15 year plan period upto the year 2010. The Master Plan has prioritized some projects to be implemented immediately. Many other projects/programs contained in the Master Plan have study components to identify/formulate more projects to be implemented subsequently with the common project concepts. Formulation of certain projects, however, are subject to more detailed analysis on specialized aspects that have not been addressed by the Master Plan in sufficient detail.

Those specialized aspects should be studied in more detail in the subsequent stage. To facilitate urgent implementation of those specialized studies, terms of reference have been prepared for them as follows:

(1) Central Luzon Regional Mass Transport Development Study,
(2) Central Luzon Comprehensive Regional Energy Strategy Formulation Study,
(3) Central Luzon Comprehensive Irrigation Development and Management Study, and
(4) San Fernando-Angeles Metropolitan Area Development Study.

3.1 Central Luzon Regional Mass Transport Development Study

3.1.1 Background

A spatial strategy of the Central Luzon Development Program (CLDP) is to change the dominant flow of goods and the dominant flow of people which at present are linked strongly with Metro Manila. Development of a mass transportation system is naturally an important component of this strategy. An envisioned mass transport system for Central Luzon consists of the extension of the existing railway system as the most effective mass transport mode, expansion/improvement of bus and truck services to utilize existing and future highways, and water transport.

In particular, railways are proposed as an alternative transport mode to serve the National Triad Growth Centers in Central Luzon. Stage-wise rehabilitation/upgrading of the Main Line North is proposed to improve links between the Bulacan-Metro Manila conurbation and the Clark International Aviation Complex. A new railway is proposed to strengthen links between the Subic Bay area and the Clark Field.

In general, highways tend to induce the development along the route to result in a "ribbon-type" development, while railway induced development tends to be more concentrated centering around each station. Thus the railway system fits better with another spatial

strategy of the CLDP to contain urbanization/industrialization in limited areas - typically in the National Triade Growth Centers: Subic Bay Metropolitan Area, San Fernando-Angeles Metropolitan Area, and Bulacan Conurbation.

3.1.2 Objectives

A study is proposed to examine the possibility of establishing in the long run a railway system as a dominant mode of mass transportation in Central Luzon and to plan for its development in stages together with other mass transport means based on highways and waterways.

Specific objectives of the Study are the following:

(1) To establish a long-term development strategy for the mass transportation in Central Luzon, clarifying roles of the railway system in relation to road and water transport;
(2) To prepare a stage-wise development plan for the railway system and associated urban/housing development together with other mass transport means;
(3) To formulate policy measures to make the railway system more viable socially, economically and environmentally, and to realize better spatial development patterns in Central Luzon; and
(4) To prepare an action program particularly for rail transport, including institutional mechanisms to discuss and resolve critical issues involved in realizing better spatial development patterns in Central Luzon.

3.1.3 Study Area

The Study will cover the entire Central Luzon consisting of six provinces. Other areas outside Central Luzon will also be studied as necessary to analyze traffic demand and supply and transport nodes and links, including Metro Manila.

3.1.4 Scope of Work

The Study will comprise the following tasks.

(1) Study of existing conditions of the transportation sector in Central Luzon covering infrastructure, traffics, industries and institutions;
(2) Examination of existing transport policies and their implications to Central Luzon transport issues;
(3) Review of existing plans for transportation development;
(4) Clarification of issues and constraints related to transportation;

(5) Establishment of long-term policies and strategy for the mass transportation in Central Luzon with clarification of roles to be played by the railway system in relation to roads and water transport;

(6) Formulation of socio-economic frameworks for transport development in view of future urbanization;

(7) Establishment of future transportation networks covering all the modes;

(8) Examination of environmental impact of transport development, covering both social and natural environment;

(9) Formulation of policy measures to make the railway system more viable socially, economically and environmentally and to realize better spatial development patterns;

(10) Preparation of a stage-wise development plan for the railway system and associated urban/housing development in relation to other mass transport modes; and

(11) Preparation of an action plan for transport development focusing particularly on the railway system, including institutional mechanisms to discuss and resolve critical issues such as social and environmental effects as well as technical issues.

Specific issues to be addressed by the Study particularly related to railways may include the following:

(1) urgent rehabilitation/upgrading of the Main Line North to serve the Clark International Aviation Complex,

(2) new rail link between Subic and Clark,

(3) further extension of the Main Line North,

(4) possible railway link as an alternative to the Manila Coastal Road,

(5) other proposed links such as Metro Manila-Bulacan-Quezon, and

(6) housing development associated with railway system.

Viability of water transport using a canal system to serve coastal communities and lahar affected area will be clarified. A plan for rehabilitation/dredging of creeks and rivers will be formulated in this connection. The exact scope of work should be defined during the inception work period, including transport nodes and links outside Central Luzon.

3.1.5 Implementing Arrangements

The Study will be carried out by a team of international class experts working closely with relevant government agencies and NGOs/POs. The following experts will be involved: (1) team leader, (2) urban and regional planner, (3) transportation planner, (4) railway engineer, (5) commodity flow analyst, (6) regional economist, (7) financial analyst, (8) environmentalist, (9) social sector expert, (10) telecommunication planner, (11) privatization expert, and (12) land use planner.

The planning process will be participatory. Viable NGOs/POs will form a consortium and be involved in the entire process of the Study. In particular, baseline surveys on environment and social aspects will be entrusted to the NGO consortium. Critical issues related to environment and social needs will be identified through the surveys.

A Steering Committee will be set up to discuss and resolve critical issues involved in the Study. The Committee will consist of both GO and NGO members.

3.2 Central Luzon Comprehensive Regional Energy Strategy Formulation Study

3.2.1 Background

Power facilities in Central Luzon contribute to 15% of the total generating capacity and 11% of the total energy generated in the Luzon grid as of 1992. These shares are higher than the Central Luzon shares with respect to land area (6.1%), population (10.2%) and GRDP/GDP (8.8%). Thus Central Luzon is subsidizing the rest of Luzon, particularly Metro Manila, for the power supply.

New power plants are planned in Central Luzon including the Bataan combined cycle power plant with 300 MW to be constructed adjacent to the Bataan Thermal Power Plant (BTPP) complex in Limay, and a coal-fired thermal plant in Masinloc. Conversion of the gas turbine power facilities in the BTPP complex into a combined cycle power plant is consider by NPC. While these thermal power plants would contribute to a better balanced generating plant mix and more reliable power supply in the Luzon grid, a question from a regional development point of view is to what extent Central Luzon should continue to subsidize other regions and at what cost - social and environmental.

Central Luzon, being agricultural areas, has advantages for certain rural energy with abandunt plant and animal wastes. Technology for biogas digester using animal wastes is well established and readily adoptable for use primarily for cooking to reduce the use of fuel wood. Cooking stoves using rice husk may be commercialized, and other biomass may also be used such as cassava, sugarcane byproduct and lucaena.

Mini-hydro may be viable option for electrification in remote rural areas. Solar energy has potential for wide application, including solar dryers, solar water heaters and various photovoltaic application.

3.2.2 Objectives

A study is proposed to examine all the energy-related issues from the viewpoint of Central Luzon regional development and to formulate comprehensive regional energy strategy to

support the new development paradigm pursued through the Central Luzon Development Program (CLDP).

Specific objectives of the Study are the following.

(1) To formulate comprehensive energy strategy for Central Luzon to support both its globalization drive and community-based development;
(2) To assess priority of power development projects from economic, social and environmental as well as technical points of view;
(3) To prepare a comprehensive package of measures to encourage energy savings and to promote non-conventional types of energy; and
(4) To formulate a comprehensive rural energy program that can be implemented by community-based approach.

3.2.3 Study Area

The Study will cover the entire Central Luzon consisting of six provinces. Energy policies will be reviewed and proposed nationally. Energy situations and strategy in other regions may also be referred to as necessary.

3.2.4 Scope of Work

The Study will comprise the following tasks.

(1) Study of existing conditions of the energy sector, covering demand and supply, facilities, industries and institutions;
(2) Examination of existing energy policies and their implications to the CLDP;
(3) Review of existing/proposed energy plans and projects;
(4) Clarification of issues and constraints related to energy;
(5) Formulation of comprehensive energy strategy for Central Luzon in line with its glocalization scenario;
(6) Formulation of socio-economic frameworks and projection of demand for energy development, covering electricity, fuelwood and other forms of energy;
(7) Assessment of priority for power development projects to satisfy the projected demand on a broad basis covering economic, social and environmental as well as technical aspects;
(8) Formulation of policy and institutional measures to encourage energy savings and to promote the use of non-conventional and renewable types of energy;
(9) Proposal of institutional mechanisms to bear social costs of major energy development and to compensate for local communities hosting facilities for such development;

(10) Recommendation of institutional mechanisms to allow community participation in energy development planning and implementation; and

(11) Preparation of a comprehensive rural energy program that can be implemented by community-based approach.

Specific issues to be addressed by the Study may include the following:

(1) How to bear social costs of power development,
(2) Applicability of discriminating pricing,
(3) Applicable extent of community-based rural energy development,
(4) Viability of alternative/non-conventional energy sources, and
(5) Incentive measures for energy savings and use of alternative energy.

A typical social issue is related to power supply. A thermal power plant usually produces two kinds of output: electricity and environmental degradation or economic goods and externalities. The problem is that most users of electricity enjoy only the economic goods, while local people around the plant site suffer the economic externalities. That is, in terms of environmental costs, the local people, usually the rural poor, are in effect subsidizing the electricity users, including the urban rich and industrial users.

This situation needs to be corrected by the society as a whole. One way is to minimize the pollution at the source, but this would involve high costs. Another way is to charge higher tariffs to electricity users, especially those in high income categories, and compensate the local people in the form of resettlement with sufficient livelihood opportunities. However, the average electricity tariff in the Philippines is already on the high side as compared with otherAsian countries, and higher tariffs would undermine international competitiveness of industrial activities.

If there is a general consensus in the society that industrial activities should be much promoted as they would benefit the society as a whole, there should be a proper institutional mechanism to balance the costs and the benefits of the economic goods and externalities within a broad regional framework.

3.2.5 Implementing Arrangements

The Study will be carried out by a task force to be created for the purpose. The task force will have a balanced representation of GOs and NGOs. To augment financial and manpower resources for the Study, cooperation of an international aid organization will be sought. A team of international class experts to work closely with the task force may consist of the following: (1) team leader, (2) regional and rural planner, (3) energy planner, (4) energy

economist, (5) power supply planner, (6) non-conventional/rural energy expert, (7) social sector experts, (8) environmentalist, and (9) energy policy analyst.

3.3 Central Luzon Comprehensive Irrigation Development and Management Study

3.3.1 Background

Irrigation systems in Central Luzon including national, communal and private ones are most developed, covering the combined service area of 270,166 ha in 1992. This service area corresponds to 61% of the potentially irrigable area estimated at 441,083 ha, corresponding to 44% of the land area in Central Luzon.

Despite the high level of irrigation development, many irrigation service areas in Central Luzon are not actually served properly. The ratio of irrigated area to service area for the last five years was 58% for dry seasons and 67% for wet seasons.

The Mt. Pinatubo eruption and subsequent lahar have caused damages to irrigation facilities and service areas. No less than five national irrigation systems by NIA totalling 15,732 ha were damaged by lahar, corresponding to 64% of their combined service area or 24,494 ha. Of these, the Tarlac-San Miguel-O'Donnel river irrigation system and the Sto. Tomas river irrigation system were severely devastated losing 73% and 81% of the respective service areas.

While some damaged irrigation systems may be rehabilitated or converted to other crops cultivation, others may have to be abandoned. In the meantime, new irrigation schemes, including pump irrigation, may be identified for early implementation. No less important is more effective utilization of existing irrigation systems not affected by Mt. Pinatubo derived lahar through improved operation and management.

3.3.2 Objectives

A study is proposed to review the existing conditions of irrigation systems and irrigable areas and to formulate comprehensive strategy for irrigation development and management in Central Luzon. The strategy will establish priority for development and rehabilitation, and clarify directions for improving operation and management of existing and new irrigation systems.

Specific objectives of the Study are the following.

(1) To formulate comprehensive strategy for irrigation development in Central Luzon;

(2) To identify new irrigation development schemes and prioritize implementation of new schemes and rehabilitation of existing schemes; and

(3) To formulate measures to improve operation and management of new and existing irrigation schemes.

3.3.3 Study Area

The Study will cover the entire Central Luzon consisting of six provinces. Other areas outside Central Luzon will also be studied as necessary for analysis on irrigation water availability and additional irrigation service areas.

3.3.4 Scope of Work

The Study will comprise the following tasks.

(1) Study of existing conditions of irrigation systems, covering physical conditions, water availability, crops, management organizations and others,

(2) Study of irrigable areas and their assessment with respect to vulnerability to lahar and other natural calamities as well as slope, soil and other natural conditions,

(3) Review of existing plans for development/rehabilitation of irrigation systems,

(4) Clarification of issues and constraints related to irrigated agriculture, covering crop/variety selection, input requirements, productivity, management organizations, marketing and others,

(5) Identification of new irrigation development schemes and establishment of their feasibility,

(6) Formulation of comprehensive strategy for irrigation development and management in Central Luzon,

(7) Prioritization of development and rehabilitation of new and existing irrigation schemes, and

(8) Formulation of measures to improve operation and management of new and existing irrigation schemes, covering environmental effects, on-farm water management, water allocation in multipurpose schemes, social aspects, financial management, marketing and others.

The Study approach will be two-pronged. On the one hand, feasibility will be established for those schemes to be developed or rehabilitated at early times. On the other, more fundamental issues will be addressed such as the following:

(1) better irrigation development and management as part of watershed management,

(2) priority of irrigation development compared with other measures such as more water saving irrigation technologies and less water intensive crops,

(3) sustainability of irrigated agriculture in terms of social implications, input requirements, environmental effects and farm budget,

(4) appropriate scales of irrigation development and corresponding management organizations, and

(5) priority of irrigation development in multipurpose schemes.

3.3.5 Implementing Arrangements

The Study will be carried out by a team of international class experts, both expatriate and local, working closely with relevant government agencies and NGOs/POs. A Steering Committee will be set up with GO and NGO members to discuss and resolve critical issues involved in the Study.

3.4 San Fernando-Angeles Metropolitan Area Development Study

3.4.1 Background

The Central Luzon Development Program (CLDP) Master Plan has defined the National Triad Growth Centers for accelerated urbanization, as part of the CLDP spatial development strategy. They are (1) the San Fernando-Angeles Metropolitan Area, (2) the Subic Bay Metropolitan Area, and (3) the Bulacan-Metro Manila conurbation. These three broad areas will have a combined population of 4.2 million in the year 2010, corresponding to 52% of the projected total urban population in Central Luzon.

The San Fernando-Angeles Metropolitan Area is defined including the neighbouring municipalities of Mabalacat, Magalang, Sto. Tomas, Mexico and Guagua. The combined population in these municipalities and the City will increase from 686,000 in 1990 to 1.48 million by 2010. Orderly development in the Area should be pursued not only to create comfortable urban environment but also to protect productive agricultural land and rural environment in the vicinities.

The establishment of the San Fernando-Angeles Metropolitan Area is essential for realizing the CLDP paradigm particularly in the following aspects:

(1) creation of a large number of employment opportunities, solving the unemployment problems caused by the Baguio earthquake, the Mt. Pinatubo eruption, and the Clark Air Base closure;

(2) creation of urban/industrial agglomeration large enough to counter the dominant effects of Metro Manila to change dominant flow of goods and movement of people away from Metro Manila;

(3) provision of multiple urban functions and services including some higher-order functions/services as well as regional administrative functions for the entire region; and

(4) strengthening of development planning and administration capacities of local government units in line with the 1991 Local Government Code.

3.4.2 Objectives

As the first step to establish the San Fernando-Angeles Metropolitan Area, a master plan study should be conducted. The Study aims at formulating various urban projects focusing on infrastructure and social services. These projects shall effectively support functions of the Metropolitan Area strengthening the basis of the economic and social growth and international gateway functions as well.

Specific objectives of the Study are:

(1) To effect improved efficiency of economic and social services from the metro-wide viewpoint;

(2) To promote orderly urban development for improved quality of living conditions; and

(3) To promote project planning and programming capabilities of the Local Governments.

3.4.3 Study Area

The Study will cover San Fernando, Angeles City, Mabalacat, Magalang, Santo Tomas, Mexico and Guagua as a whole. The areas for socio-economic analysis are not limited to these areas, but may include its vicinity influenced by the Metropolitan Area.

3.4.4 Scope of Work

(1) General

The Study shall start with reviewing existing development resources and on-going projects/programs. The Master Plan Study for Central Luzon Development Program by JICA, and the Pinatubo Master Plan Study by Mt. Pinatubo Commission (MPC) are to be thoughtfully reviewed from urban and regional point of view.

For the project formulation, the Study will also call for pursuing a multi-dimensional planning consistent with (1) the interpretation of the national and regional policy framework, (2) sectoral linkages, (3) intra- and inter-regional economic activities, (4) relations among development institutions and administration, and (5) time framework for

priority projects/programs implementation. These shall all provide rationales and plausible justification of projects/programs to be proposed. As one of the major outputs of the Study, an implementation program for selected urgent projects shall be prepared.

The Study will be conducted in three stages as described in the following.

(2) Stage 1 : Study of Development Scenarios

Work 1.1 Review of existing plans and on-going projects/programs

The major task fo Stage 1 is to establish an appropriate development scenario, with medium and long term perspectives toward the year 2010.

To this end, analysis in this stage may start with reviewing previous studies and plans and past investments for development projects in terms of:

1) Benefits accruing from the past investments;
2) Changes in urbanization and urban activities affected by the implemented projects/programs;
3) Factors causing the delays and/or hindrance of implementation of proposed projects/programs; and
4) Project linkages necessary to maximize benefits from the past investment.

Work 1.2 Analysis of present conditions and identification of planning issues

Analysis to clarify existing resources, constraints and issues in both socio-economic and spatial aspects shall be conducted in depth, based on field surveys and statistical data.

1) Study existing socio-economic, natural and physical conditions and resource endowments in the Metropolitan Area and its vicinity, and assess them in terms of development constraints and/or potentials. Attention should be paid to:

   - existing land use,
   - urban development pattern and development constraints,
   - road transport conditions and problems,
   - water drainage condtion including lahar flow,
   - present economic activities and structure,
   - unemployment and social problems, and
   - urban environment.

2) Identify the economic structure with backward and forward linkages within and outside the Metropolitan Area in view of :

- goods and passenger transport,
- industrial linkages,
- commercial/services/business interactions, and
- social linkages.

3) Identify major planning issues to be tackled based on outcomes of the analyses through the above works.

Work 1.3 Future demand analyses

The existing development projects and programs in the Metropolitan Area will be reviewed from the standpoint of whether the metropolitan economy will become strong enough to support its hinterland activities, and accommodate the increasing industrial opportunities for sustainable economic growth.

Keeping this view, the Study will determine the most realistic future projections of socio-economic growth in terms of urbanization, employment and economic activities, and set up a development framework including:

1) Projection of socio-economic growth and possible future structure,
2) Projections of employment and labor force,
3) Urbanization and land use demand,
4) Traffic demand forecast,
5) Projection of public funds requirement to sustain the projected socio-economic growth, and
6) Projection of possible amount of investment of both the public and the private sectors.

Work 1.4 Development scenario building

Based on alternative studies, the most appropriate and realistic development scenario for the Metropolitan Area will be formulated targeting at the year 2010 addressing:

1) Development goals,
2) Development targets and strategies,
3) Socio-economic framework, and
4) Spatial urban structure.

(3) Stage 2 : Formulation of Projects/Programs

Based on the outcomes in Stage 1, projects/programs will be formulated in Stage 2.

Work 2.1 Urban development planning in the Metropolitan Area

The projects/programs to be formulated should be coherent with the urbanization and land use policies as well as the established development scenario, and cover the following aspects:

1) Urban land use including socialized housing area,
2) Formulation of a sustainable urban spatial structure,
3) Urban transport network system,
4) Urban utilities system (water, sewerage and solid waste treatment and drainage) development,
5) Electric power supply and system, and
6) Telecommunication system.

Work 2.2 Industrial development planning

An industrial development study will start with identification of critical planning issues and clarification of development strategies, looking into the regional activities in:

- Rural and urban areas,
- External and internal trading economy,
- Public and private investment/expenditure,
- Agriculture,
- Manufacturing,
- Tourism industry, and
- Commercial, financial and other services.

At the same time, the natural resources management to support the industrial activities will be examined in the aspects of :

- Environmentally sound and rational land use patterns,
- Forest conversion/preservation programs, and
- Agricultural resource management.

Based on the above analyses, industrial sector development programs for agriculture, manufacturing, tourism, commercial and services sectors are to be formulated including the following discussions:

1) Development scenario in the long-run,
2) Development frameworks,
3) Development policies/strategies, and
4) Project/programs to be undertaken.

Work 2.3 Project priority and implementation program

The major task of this work is to give priorities to all the projects/programs in a time framework upto the year 2010, taking account of horizontal and vertical project linkages. For this purpose, the following criteria and/or considerations should be taken.

1) Social and environmental impact

   All the projects identified in the plan shall preliminarily be assessed from viewpoints of their social and environmental impact.

2) Implementability and financial capabilities of related public agencies

   Costs for implementation of selected projects/programs shall be figured out, and financial constraints/shortcomings attached to the implementation agencies shall be assessed. This will be based on projections of the agencies' investment capability which will be strengthened by increase in tax income as a result of economic growth.

3) Linkage effects of investment programs

   To pursue the effective investment program, backward and forward linkages shall be envisaged to maximize benefits.

4) Involvement of private sector

   Direct and indirect effects on the private sector's activities are the prime concern in planning for the Metropolitan Area. Projects/programs which are expected to facilitate private investments should be given high priority.

(4) Stage 3 : Feasibility Study for Priority Projects/Programs

Feasibility studies for selected priority projects/programs will be undertaken as follows.

Work 3.1: Economic feasibility analyses

Economic evaluation of viability of the priority projects/programs shall be conducted, taking into consideration institutional arrangements for the implementation of the projects as well as environmental aspects.

Work 3.2 : Preparation of TORs for detailed design of urgent projects

Preparation of terms of reference for detailed design for the selected priority projects/programs shall be undertaken. At the same time recommendation should be made for the Government to coordinate with international financial agencies toward the implementation of the projects/programs.

Work 3.3 : Institutional programming

Present organization and procedure for planning, financing and project implementation including tax system should be studied to facilitate the implementation of the priority projects/programs.

(5) Study Schedule

The Study is expected to be completed within 14 months with stage-wise schedule as follows:

Stage 1 : Study of Development Scenarios - four months,
Stage 2 : Formulation of Projects/Programs and Implementation Time Framework - four months, and
Stage 3 : Feasibility Study for Priority Projects/Programs for the implementation - six months.

3.4.5 Implementing Arrangement

The National Economic and Development Authority (NEDA) assumes a role of the implementing agency of the Study. The Study will be conducted by a study team to be dispatched by the Japan International Cooperation Agency (JICA) together with counterparts of the executing agencies: NEDA, Housing and Urban Development Coordinating Council (HUDCC) and the related City and Municipalities.

3.4.6 Assistance Requested

The Study will be carried out by experts with sufficient experiences in city and regional planning. Urban and transport planners will have a central role to coordinate the sector analyses. Adding other necessary experts and engineers to cover all sectors, a total of about 95 man-months will be required for the 14 months study. Specifically the following experts will be required:

(1) Urban planner,
(2) Regional planner,
(3) Transport planner,
(4) Land use planner,
(5) Highway engineer,
(6) Environmental specialist,
(7) Industrial development planner,
(8) Institutional specialist,
(9) Municipal engineer,

(10) Sanitary engineer,

(11) Social services specialist,

(12) Tourism development planner,

(13) Project economist/financial analyst, and

(14) Systems engineer.

CHAPTER 4

CHAPTER 4 INITIAL ENVIRONMENTAL EXAMINATION

4.1 Objectives and Procedure of IEE

(1) Objectives

An initial environmental examination is a first-round environmental impact assessment. As such, the assessment is necessarily preliminary and crude. The IEE conducted at an early stage of project development, however, could be an effective tool to identify possible environmental effects and guide the further project development. Original formulation of any project/program may be modified, if significant negative impact is predicted by the IEE.
The IEE has been carried out for the proposed projects and programs of the CLDP Master Plan. Main objectives of the IEE are:

1) to identify possible environmental impact of implementing the proposed projects and programs based on available data/information and limited field reconnaissance, and
2) to make judgments as to needs for an environmental impact assessment (EIA).

(2) Procedure

A total of 130 projects and programs are proposed in the Master Plan. These projects and programs are classified in three categories related to the IEE:

1) those requiring the IEE,
2) those not requiring the IEE, and
3) those not completely formulated to allow the IEE.

All the proposed projects and programs have been subjected to screening to classify them into the three categories. Judgment on whether or not the IEE is required depends on types of projects/programs, scale of development, activities involved in projects/programs, and environmental site conditions. As a result of the screening, 30 projects and programs have been selected for the IEE as summarized in Table 4.1.

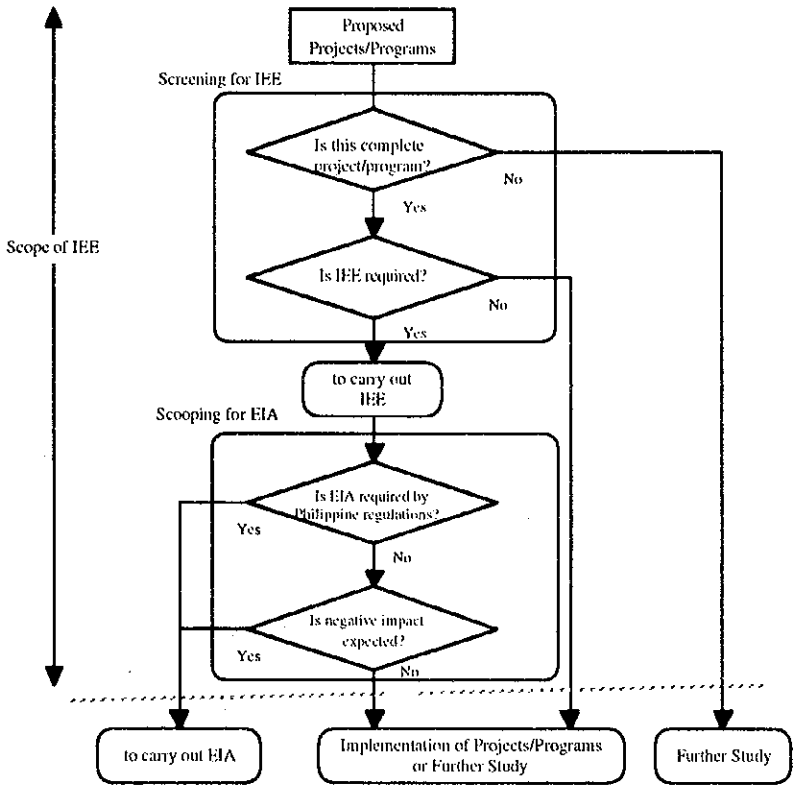
For each of 30 projects and programs selected by the screening, the IEE is carried out by using an environmental impact matrix, which provides in effect a checklist of environmental effects. Classification of environmental elements, based on the DENR Administrative Order No. 21 of 1992, is as follows.

Class	Elements
A. Natural biological environment	Surface water
	Groundwater
	Soil
	Geology
	Climate
	Wildlife habitat
	Ecology of fisheries
	Natural vegetation
B. Environmental hazards	Hazardous substances
	Solid waste
C. Resource conservation and use	Water resources
	Agricultural production
	Timber production
	Mining and energy resources
D. Air quality and noise environment	Air quality
	Noise
E. Community facilities/service and structure	Community facilities and services
	Infrastructure
	Transportation
	Community population
	Resettlement
	Income
	Racial/ethnic distribution
	Lifestyle
F. Open space and recreation	Accessibility
	Activities
G. Historic resources	Historical sites and structure
	Archaeological or palaeontological sites

H.	Visual Resources	Natural landscape
		Cultural landscape
I.	Economics and development	Elimination or relocation of commercial and industrial enterprises
		Employment
		Local economy

Activities of each project/program are divided into three phases: pre-construction phase, construction phase, and operation and maintenance phase. The procedure of the IEE is illustrated in the figure below.

The IEE identifies environmental elements that are likely to be more seriously affected by activities of any project/program. For more serious negative environmental impact, mitigation measures are indicated. Projects and programs for which the EIA is required are identified.



Procedure of Initial Environmental Examination