

REPUBLIC OF THE PHILIPPINES  
DEPARTMENT OF PUBLIC WORKS & HIGHWAYS

**Pilot Study  
for the  
Rural Road Network Development Project**

FINAL REPORT  
EXECUTIVE SUMMARY

(VOLUME I)

FEBRUARY, 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

SDF

89-006(1/8)



JICA LIBRARY



1072818L6J

18831



REPUBLIC OF THE PHILIPPINES  
DEPARTMENT OF PUBLIC WORKS & HIGHWAYS

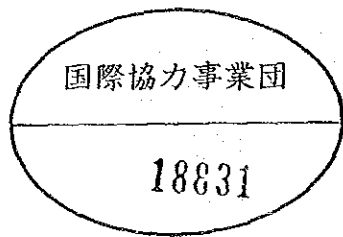
**Pilot Study  
for the  
Rural Road Network Development Project**

FINAL REPORT  
EXECUTIVE SUMMARY

(VOLUME I)

FEBRUARY, 1989

JAPAN INTERNATIONAL COOPERATION AGENCY



国際協力事業団

18831

## PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a study on the Pilot Study for the Rural Road Network Development Project, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team headed by Mr. Kenichi Takebe, comprised of members from Katahira & Engineers Inc. and Nippon Engineering Consultant Co., Ltd., three times from November 1987 to December 1988.

The Team held discussions with the officials concerned of the Government of the Philippines and conducted field surveys. After the Team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the development of the Project and to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Philippines for their close cooperation extended to the team.

February, 1989



---

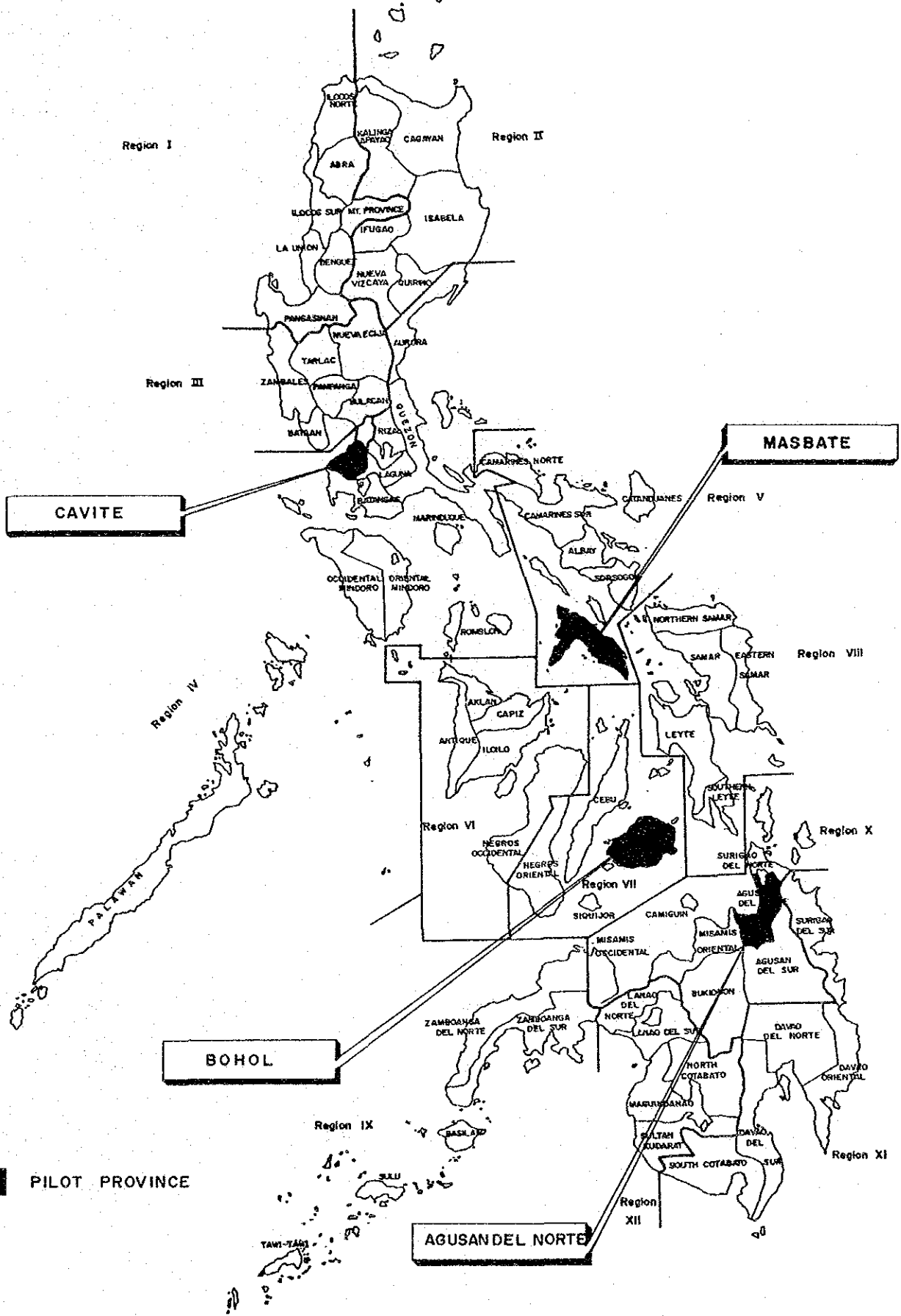
Kensuke Yanagiya  
President  
Japan International Cooperation Agency





# PHILIPPINES

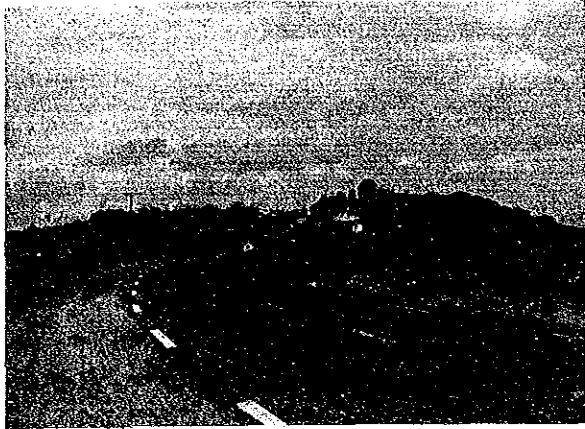
Scale 1:3,851,400  
KILOMETERS  
50 0 50 100 150



PILOT STUDY FOR THE RURAL ROAD NETWORK DEVELOPMENT PROJECT

LOCATION MAP





AC pavement in "good" condition  
N3-7: Tagaitay-Nasugbu



BM pavement in "bad" condition  
N9-4: Noveleta-Indang-Tagaitay

### National Roads



DBST pavement in "fair" condition  
P19-2: Gen. Trias-Amadeo



Gravel road in "very bad" condition  
P29-1: Alfonso-Maragoñon

### Provincial Roads



Earth road in "bad" condition  
B9-3: Palindong Road



Earth road in "impassable" condition  
B9-4: Panukan Gubat Road

### Barangay Roads

## ROADS IN CAVITE





DBST pavement in "fair" condition  
N9-1: Masbate-Malinta



Gravel road in "fair" condition  
N9-3: Malinta-Milagros

### National Roads



Gravel road in "bad" condition  
P31-1: Curvada-Pio V. Corpus



Earth road in "very bad" condition  
P25-1: Jct. Bangad-Bangad

### Provincial Roads



Newly constructed gravel road  
B8-3: Gaid-Divisoria



Earth road in "impassable" condition  
B12-1: Tabuc-Sta. Maria

### Barangay Roads

## ROADS IN MASBATE



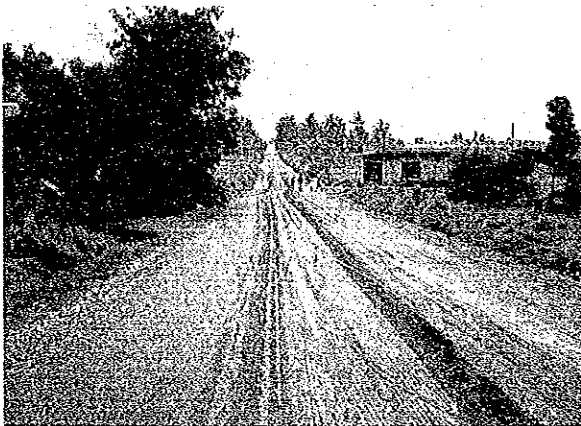


PCC pavement in "good" condition  
N5-3: Cortes-Jct. Antequera

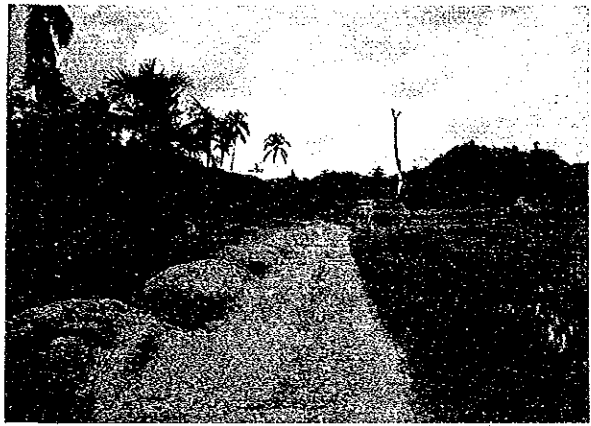


DBST pavement in "fair" condition  
N5-1: Tagbilaran-Cortes

### National Roads



Gravel road in "fair" condition  
P108-1: Guindulman-Anda

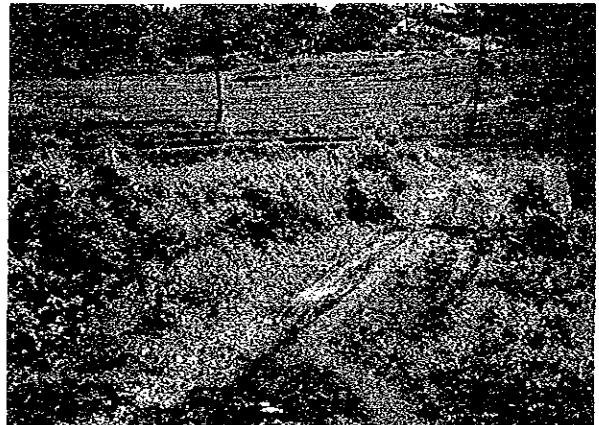


Gravel road in "very bad" condition  
P80-1: Canmanico-Anonang

### Provincial Roads



PCC pavement at the barangay center is used for multipurpose  
B28-5: Taug Barangay Road



Earth road in "impassable" condition  
B22-2: Lobogon-Danao

### Barangay Roads

## ROADS IN BOHOL







PCC pavement in "good" condition  
N1-1: Agusan-Misamis Oriental



Gravel road in "bad" condition  
N11-1: Jct. Tiniwisan-Maguinda

### National Roads

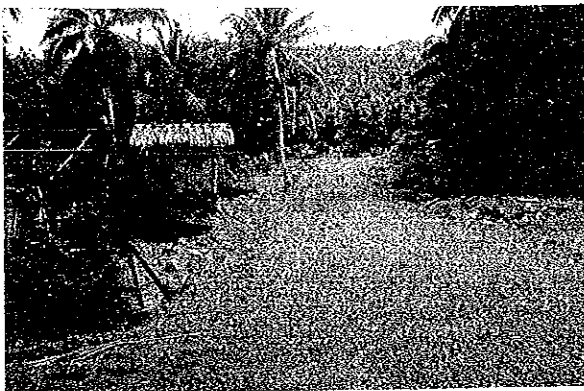


Gravel road in "bad" condition  
P10-70: Duna Rosario-Tubay

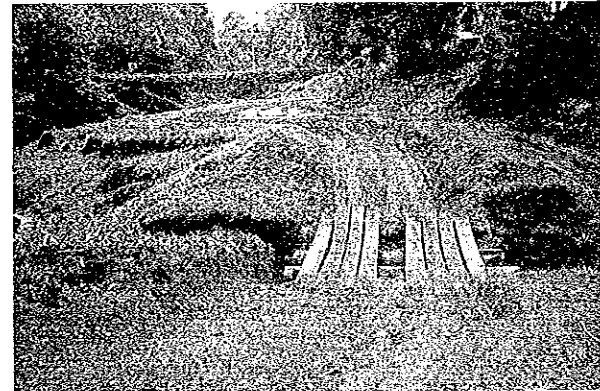


Gravel road in "very bad" condition  
P4-76: Jobanga-Badiang

### Provincial Roads



Gravel road in "fair" condition  
B10-61: Sta. Ana-Monteverde



Earth road in "very bad" condition  
B6-2: Mat I-Pinanaan

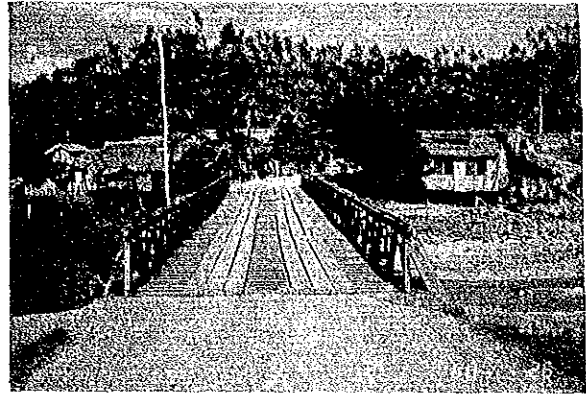
### Barangay Roads

## ROADS IN AGUSAN DEL NORTE





Bailey bridge over the deep valley  
P27-1: Magallanes-Maragondon, Provincial road, Cavite



Single lane bailey bridge  
N6-3: Masbate-Cataingan, National road, Masbate

### Bailey Bridges

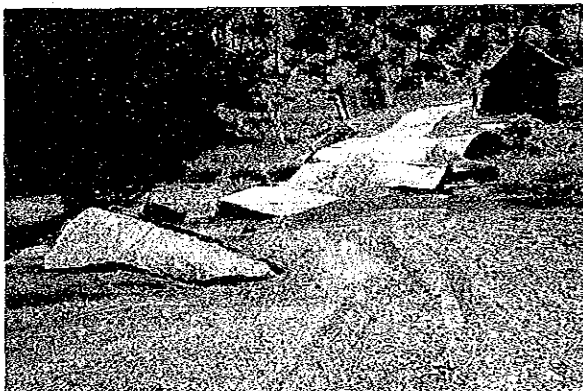


P124-1: Mabini-Cabulao-Lungsodaan, Provincial road, Bohol



Dilapidated timber bridge  
P6-43: Jct. T-Maguinda-Lasnieves,  
Provincial road, Agusan del Norte

### Timber Bridges



Collapsed spillway  
B0-1: Malinta-Lagta, Barangay road, Masbate



Ford crossing  
B2-11: Upper Tagbongabong Road,  
Barangay road, Agusan del Norte

### No Existing Bridge

## BRIDGES



# TABLE OF CONTENTS

Page

<b>I</b>	<b>INTRODUCTION</b> .....	<b>1</b>
<b>II</b>	<b>FINDINGS AND RECOMMENDATIONS</b> .....	<b>4</b>
<b>III</b>	<b>SUMMARY</b>	
	<b>1. ASSESSMENT OF ROAD DEVELOPMENT POTENTIALITY</b>	
	1.1 Basic Data and Indicators by Province .....	10
	1.2 Assessment of Regional/Provincial Development Potentiality .....	12
	1.3 Review of Adequacy of Road Network .....	14
	1.4 Classification of Provinces .....	17
	1.5 Selection of Pilot Provinces .....	19
	<b>2. PROJECT IDENTIFICATION AND SCREENING</b>	
	2.1 Project Identification and Screening Methodology .....	21
	2.2 Project Identification and Screening in the Pilot Provinces .....	24
	<b>3. PROJECT EVALUATION</b>	
	3.1 Project Evaluation Methodology .....	25
	3.2 Project Evaluation in Province of Cavite .....	27
	3.3 Project Evaluation in Province of Masbate .....	31
	3.4 Project Evaluation in Province of Bohol .....	35
	3.5 Project Evaluation in Province of Agusan del Norte .....	39
	<b>4. PROJECT IMPLEMENTATION</b>	
	4.1 Highway Development Plan .....	43
	4.2 Implementation Strategy and Plan of the Project .....	45
	4.3 Project Institution .....	49
	4.4 Subproject Identification .....	51
	4.5 Subproject Appraisal/Prioritization .....	52
	4.6 Fund Preparation .....	54
	4.7 Detailed Engineering .....	55
	4.8 Tendering .....	56
	4.9 Construction .....	57
	4.10 Maintenance .....	59

## CURRENCY EQUIVALENTS

(As of June 1988)

₱ 1.00 = US\$ 0.0467 = ¥ 6.19

US\$ 1.00 = ₱ 21.00 = ¥ 130.0

## ABBREVIATIONS

AADT	-	Average Annual Daily Traffic
AC	-	Asphalt Concrete Pavement
ADB	-	Asian Development Bank
BCGS	-	Bureau of Coast and Geodesic Survey
BDC	-	Barangay Development Council
BHS	-	Barangay Health Station
BMP	-	Bituminous Macadam Pavement
BOC	-	Bureau of Construction
BOD	-	Bureau of Design
BOE	-	Bureau of Equipment
BOM	-	Bureau of Maintenance
BOS	-	Bureau of Soil
CCT	-	Community Construction Team
CEO	-	City Engineer's Office
CLATT	-	Central Labor-based Advisory and Training Team
DBM	-	Department of Budget and Management
DBST	-	Double Bituminous Surface Treatment
DEO	-	District Engineer's Office
DLG	-	Department of Local Government
DPWH	-	Department of Public Works and Highways
EO	-	Executive Order
EMK	-	Equivalent Maintenance Kilometer
F/S	-	Feasibility Study
GDP	-	Gross Domestic Products
GNP	-	Gross National Products
GRDP	-	Gross Regional Domestic Products
IBRD	-	International Bank for Reconstruction and Development
IRR	-	Internal Rate of Return
JICA	-	Japan International Cooperation Agency
LGU	-	Local Government Unit
MDC	-	Municipal Development Council
MEO	-	Municipal Engineer's Office
MPDC	-	Municipal Planning and Development Coordinator
NALGU	-	National Aid to Local Government Unit
NCR	-	National Capital Region
NCSO	-	National Census and Statistic Office
NEDA	-	National Economic and Development Authority
OD	-	Origin-Destination

PBAC - Prequalification, Bids and Awards Committee  
PCC - Portland Cement Concrete Pavement  
PD - Presidential Decree  
PDC - Provincial Development Council  
PEO - Provincial Engineer's Office  
PEVAC - Prequalification, Evaluation and Award Committee  
PMO - Project Management Office  
PPDD - Provincial Planning and Development Office  
RDC - Regional Development Council  
RHU - Rural Health Unit  
ROW - Right-of-way





## I INTRODUCTION



# I INTRODUCTION

## 1. BACKGROUND OF THE STUDY

The present (1985) public road network in the Philippines consists of: 26,300 km of national roads which form the main trunkline system, 45,200 km of provincial, municipal and city roads, and 90,200 km of barangay (or farm-to-market) roads.

The development program of the main and secondary road system has been pursued with increased momentum starting in the early 1970's. Presently, the extent of the main road network can in general be considered quite adequate in so far as providing the basic trunkline system for the country.

The Updated Highway Program stressed the urgent need of rural road improvement and has given high priority to such projects as spreading the benefits of transport services to a large segment of the population especially in the rural areas where these are most needed to enhance development.

As an initial step in formulating a systematic plan of implementation in providing the basic road network, with emphasis on the development of rural roads in the provinces throughout the country, the Government of the Republic of the Philippines (GOP) through the Department of Public Works and Highways (DPWH) sought technical assistance from the Government of Japan (GOJ) for the conduct of a Pilot Study for the Rural Road Network Development Project (the Study).

In response to the request of GOP, GOJ agreed to conduct the Study. The Japan International Cooperation Agency (JICA), which is the official agency responsible for the implementation of GOJ technical cooperation programs, organized a team of ten experts to be engaged in the study. The JICA Study Team, in close collaboration with the DPWH Counterpart Team, commenced work in November 1987 and completed its task in February 1989.

## 2. OBJECTIVES OF THE STUDY

The objectives of the study are to:

- 1) Establish basic technical and administrative procedures and methods for the functional development of road networks in the rural areas.
- 2) Recommend a system and investment program for the implementation of rural road projects.

## 3. SCOPE OF THE STUDY

The Study was carried out in four (4) main stages as follows:

### Stage 1: **Assessment of Road Development Potentiality**

The road development potentiality was evaluated for all provinces, and four (4) provinces were selected as pilot provinces.

### Stage 2: **Project Identification and Screening**

In the pilot provinces selected in Stage 1, the road projects were identified and high priority projects were selected for detailed evaluation.

### Stage 3: **Project Evaluation**

The road projects selected in Stage 2 were evaluated from the technical, social and economic points of view.

### Stage 4: **Study on Project Implementation**

On the basis of the assessments and analyses made in the previous stages, an effective system for the project implementation was studied.

The Study covered all roads except national primary roads defined in Executive Order No. 113 "Establishing the Classification of Roads" and roads serving as streets within built-up population centers. The Study dealt with rehabilitation/improvement/construction of roads and replacement/construction of bridges.

#### 4. REPORTS

The following reports were prepared during the Study:

Inception Report	(December 1987)
Progress Report	(January 1988)
Interim Report I	(March 1988)
Interim Report II	(August 1988)
Draft Final Report	(November 1988)

The Final Report was developed based on GOP comments on the Draft Final Report, and is presented in eight (8) volumes as follows:

Volume I	: Executive Summary
Volume II	: Main Report
Volume III	: Appendix
Volume IV	: Drawings 1 ( Cavite )
Volume V	: Drawings 2 ( Masbate )
Volume VI	: Drawings 3 ( Bohol )
Volume VII	: Drawings 4 ( Agusan del Norte )
Volume VIII	: Guide for Subproject Identification and Evaluation

The Study was undertaken jointly by the JICA Study Team and the DPWH Counterpart Team. Technical guidance in the conduct of the Study was provided through periodic review by the Steering Committee of GOP and the JICA Advisory Committee.



## **II FINDINGS AND RECOMMENDATIONS**





## II FINDINGS AND RECOMMENDATIONS

### FINDINGS

#### 1. CLASSIFICATION OF PROVINCES

73 provinces were classified by two indicators: socio-economic development (incidence of poverty) and adequacy of roads (road density).

**TABLE 1-1 CLASSIFICATION OF PROVINCES BY SOCIO-ECONOMIC DEVELOPMENT AND ADEQUACY OF ROADS**

		Adequacy of Roads (Represented by Road Density, $L' / \sqrt{P \cdot A}$ )		
		Bad	Average	Good
Socio-economic Development (Represented by Incidence of Poverty)	Developed	[BD]  —————	[AD]  ( 4 ) Cavite ( 1 ) Benguet ( 3 ) Pampanga ( 3 ) Bulacan ( 3 ) Zambales ( 4 ) Laguna ( 1 ) La Union	[GD]  —————
	Less Developed	[BL]  ( 4 ) Occidental Mindoro ( 2 ) Isabela (12) Sultan Kudarat (12) Lanao del Sur (11) Davao del Norte ( 2 ) Kalinga-Apayao ( 9 ) Zamboanga del Sur (11) Davao del Sur ( 9 ) Sulu ( 9 ) Tawi-Tawi (11) Davao Oriental (11) Surigao del Sur (12) Maguindanao ( 7 ) Negros Oriental (10) Agusan del Sur ( 8 ) Samar ( 4 ) Oriental Mindoro ( 4 ) Palawan ( 4 ) Quezon (12) North Cotabato ( 8 ) Northern Samar ( 8 ) Eastern Samar ( 9 ) Basilan ( 5 ) Masbate ( 4 ) Aurora	[AL]  ( 4 ) Rizal (10) Bukidnon ( 1 ) Pangasinan ( 2 ) Quirino ( 2 ) Cagayan ( 3 ) Nueva Ecija ( 3 ) Tarlac (11) South Cotabato ( 1 ) Mountain Province (10) Agusan del Norte ( 7 ) Cebu ( 2 ) Ifugao ( 8 ) Leyte ( 6 ) Aklan (10) Misamis Oriental ( 5 ) Albay ( 6 ) Iloilo ( 5 ) Camarines Norte ( 8 ) Southern Leyte ( 9 ) Zamboanga del Norte ( 5 ) Camarines Sur (10) Surigao del Norte ( 5 ) Catanduanes ( 6 ) Capiz ( 6 ) Negros Occidental ( 5 ) Sorsogon ( 6 ) Antique ( 4 ) Marinduque	[GL]  ( 3 ) Bataan ( 4 ) Batangas ( 2 ) Nueva Vizcaya ( 1 ) Ilocos Norte ( 1 ) Ilocos Sur (12) Lanao del Norte ( 1 ) Abra ( 2 ) Batanes ( 7 ) Bohol (10) Misamis Occidental ( 4 ) Romblon ( 7 ) Siquijor (10) Camiguin

Note: ( ) : Region number  
 L' : Fair condition road length in km  
 P : Population in 1,000  
 A : Land area in sq. km

## 2. SELECTION OF PILOT PROVINCES

The following provinces were selected as the "Pilot Provinces" for the Study:

TABLE 2-1 PILOT PROVINCES

Province	Characteristics
Cavite	Economically well developed Average road density, seaside, flat
Masbate	Economically less developed Low road density, island, narrow
Bohol	Economically less developed High road density, island, round
Agusan del Norte	Economically less developed Average road density, seaside, mountainous

### 3. ROAD LENGTH AND COST PROPOSED FOR IMPROVEMENT

The road improvement with IRR more than 15% was proposed to implement Phase I and between 7.5% to 15% for Phase II.

#### 4 Pilot Provinces

TABLE 3-1 ROAD LENGTH AND COST FOR IMPROVEMENT

	Existing Roads (km)				Total	Improvement Cost (MP)
	Cavite	Masbate	Bohol	Agusan del Norte		
National Roads	303.9	276.0	588.5	218.2	1,386.6	
Provincial/City Roads	521.1	83.9	987.6	298.9	1,891.5	
Barangay Roads	746.7	397.6	2,697.2	646.6	4,488.1	
Total	1,571.7	757.5	4,273.3	1,163.7	7,766.2	
	Road Length Proposed for Improvement (km)					
Phase I (IRR $\geq$ 15)						
Major Roads	148.9	134.5	14.7	52.6	350.7	P621.0
Minor Roads	157.5	73.5	107.3	12.2	350.5	P330.2
Total (%)	306.4 (19)	208.0 (27)	122.0 (3)	64.8 (6)	701.2 (9)	P951.2
Phase II (15 > IRR $\geq$ 7.5)						
Major Roads	-	152.8	46.5	49.3	248.6	P380.2
Minor Roads	113.6	28.2	83.4	48.0	273.2	P229.0
Total (%)	113.6 (7)	181.0 (24)	129.9 (3)	97.3 (8)	521.8 (7)	P609.2
Total (Phase I + Phase II)						
Major Roads	148.9	287.3	61.2	101.9	599.3	P1,001.2
Minor Roads	271.1	101.7	190.7	60.2	623.7	P 559.2
Total (%)	420.0 (27)	389.0 (51)	251.9 (6)	162.1 (14)	1,223.0 (16)	P1,560.4

## 73 Provinces

TABLE 3-2 ROAD LENGTH AND COST FOR IMPROVEMENT

	4 Pilot Provinces			73 Provinces		
	Existing Road Length (km)	Identified Road Length (km)	Improvement Cost (M <sup>p</sup> )	Existing Road Length (km)	Identified Road Length (km)	Improvement Cost (M <sup>p</sup> )
Phase I (IRR ≥ 15)	-	701.2	951.2	-	20,542.2	23,618.0
Phase II (15 > IRR ≥ 7.5)	-	521.8	609.2	-	18,977.4	22,111.5
Total	7,766.2	1,223.0	12,560.4	135,107.20	39,501.6	45,729.5

## 4. PROJECT IMPLEMENTATION

### 4.1 Fund Requirement

The Project may entail an annual investment of P5,000 million starting in 1991, about P1,900 million for locally funded and P3,100 million for foreign assisted projects. P2,500 million (80% of P3,100 million) will be funded as the foreign currency portion of the Project from international lending agencies.

### 4.2 Implementation Schedule

Road improvement classified as Phase I will be implemented for five (5) years from 1991 to 1995, with Phase II from 1996 to 2000.

FIGURE 4-1 IMPLEMENTATION SCHEDULE

	Investment		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	Phase I	Phase II										
Foreign Assisted Rural Roads	P14,865M	P13,917M	P3,147M(annual)					Phase II				
Locally Funded Rural Roads	P8,753M	P8,195M	P1,853M(annual)									
Total Budget for Rural Roads	P23,618M	P22,112M	P5,000M(annual)									

### 4.3 Project Administration

- In view of the magnitude of the program, it would be advisable to create a separate office in the Department of Public Works and Highways to oversee the implementation of the Rural Road Network Development Project.
- The existing regional and district offices should be reinforced to deal with the project implementation and should supervise the design and construction of the "Administration Type" subprojects under the direct supervision of DPWH engineers.
- "Community Construction Teams" should be organized to carry out the construction work of administration type subprojects.
- The foreign currency portion of the foreign assisted projects (P2,500 million per annum) will be prepared through the "Rural Road Development Sector Loan" system.
- Subprojects under the Project should be identified and prioritized in uniform format and procedures. The "Simplified Method" was proposed for actual application.

## RECOMMENDATIONS

1. The Medium-Term Philippine Development Plan addresses the goals of the national development efforts and aims to enlarge and reinforce the physical foundation of the economy.

Specifically, the Plan aims to install and improve the essential transport in the rural areas, giving priority to rural-based, small-and medium-sized, labor-based projects, particularly farm-to-market roads.

2. Since the early 1970's, the development program of the main road system has been pursued, and thus, the present extent of the system is in general considered quite adequate.

However, the present condition of many roads, especially provincial and barangay roads and even some national road sections, is poor and cannot be considered to be all-weather roads.

3. Consistent with the development policy and cognizant of the present road condition, the promotion of rural road network development is recommended to contribute to the goal of the development objectives of the country.

The Project should be implemented at the earliest possible time, utilizing at the maximum level the existing implementation institutions and procedures with the minimum modifications recommended in Section 4.

4. The Study covers only four (4) provinces among 73 in the country as the pilot provinces to exemplify the study procedures.

The continuation of the same study, therefore, is recommended for the remaining provinces to promote balanced growth among the regions.

### **III SUMMARY**





### III SUMMARY

#### 1. ASSESSMENT OF ROAD DEVELOPMENT POTENTIALITY

##### 1.1 Basic Data and Indicators by Province

For the assessment of the road development potentialities by province, the basic data were collected and based thereupon various indicators were established, as follows:

TABLE 1.1-1 BASIC DATA

Physical and Demographic Data	: Total land area, arable area, distance from Manila/Cebu/Davao whichever nearest, urban/rural/total population
Economic Data	: GRDP, per capita income, number of workers by industrial sector, un-/under-employment rate
Agricultural Data	: Cultivable area(cultivated/unutilized/total), crop area and production of palay, corn, sugarcane and coconut
Social Data	: Number of elementary classrooms, number of hospital beds, incidence of poverty
Road Data	: Length of road by administrative classification and by type of pavement

TABLE 1.1-2 INDICATORS

Physical and Demographic Indicators	: Topographical classification, arable area ratio, population density, arable area population density, urban population ratio, population growth rate
Economic Indicators	: Per capita GRDP, land productivity, per capita income, primary/secondary/tertiary sector worker ratio, un-/under-employment ratio
Social Indicators	: Elementary classroom ratio, hospital bed ratio, social facility ratio, incidence of poverty
Agricultural Indicators	: Major crops, yield by crop, unutilized agricultural area ratio, accessibility to Manila/Cebu/Davao, agricultural productivity
Road Development Indicators	: Road density per unit area, road density per unit area/population, road density per unit area/population per capita income, fair condition road ratio

Major basic data are presented in Table 1.1-3.

TABLE 1.1-3 MAJOR BASIC DATA BY PROVINCE

	Land Area (ha <sup>2</sup> )	Farm Area (ha <sup>2</sup> )	Road Length (km)		Popu-lation 1985	No. of Workers 1980	GRDP (Pp)	Incidence of Poverty (%)
			Total	Fair Condition				
All Philippines	299,970.4	90,112.0	161,710.2	42,019.8	54,668,749	14,197,122	610,062	59.3
NCR	656.0	481.0	2,939.1	2,019.4	6,942,204	2,096,433	174,379	44.1
Region I	21,566.5	3,735.0	17,990.7	4,346.3	3,902,577	988,785	27,202	52.3
Abra	3,975.6	240.0	2,837.7	508.8	176,689	46,183	1,132	66.6
Benguet	2,655.4	426.0	1,837.4	509.2	408,973	114,712	3,566	36.1
Ilocos Norte	3,399.3	405.0	3,230.0	802.4	425,005	109,118	2,833	54.6
Ilocos Sur	2,579.6	434.0	2,874.3	605.5	487,987	127,387	3,311	62.4
La Union	1,493.1	411.0	1,314.3	393.4	508,316	122,237	3,402	42.8
Mountain Province	2,097.3	152.0	820.7	197.4	110,059	40,238	920	57.1
Pangasinan	5,368.2	1,682.0	5,056.3	1,329.7	1,785,548	428,930	12,038	53.7
Region II	36,403.1	5,682.0	13,167.0	3,124.9	2,520,978	642,475	17,785	54.6
Batanes	209.3	45.0	277.0	67.8	12,979	4,379	99	74.2
Cagayan	9,002.7	1,475.0	3,581.8	918.7	795,277	198,162	5,546	55.0
Ifugao	2,517.8	335.0	989.8	212.9	122,898	46,478	1,129	66.3
Isabela	10,664.6	2,223.0	3,741.0	940.0	992,984	242,666	6,920	51.7
Kalinaga-Apayao	7,047.6	786.0	1,300.3	261.1	211,061	57,260	1,420	60.5
Nueva Vizcaya	3,903.9	568.0	2,583.7	545.7	279,441	69,113	2,029	52.4
Quirino	3,057.2	250.0	693.4	176.7	100,338	24,437	642	53.7
Region III	18,230.8	4,685.0	13,312.8	4,004.5	5,456,130	1,388,123	60,501	44.4
Bataan	1,373.0	207.0	1,076.7	421.9	385,479	101,623	4,801	47.2
Bulacan	2,625.0	667.0	2,629.9	866.5	1,265,541	336,425	17,032	36.3
Nueva Ecija	5,284.3	1,837.0	3,251.5	941.7	1,194,410	282,380	10,353	55.1
Pampanga	2,180.7	717.0	2,409.2	697.7	1,346,340	328,794	15,137	36.5
Tarlac	3,053.4	971.0	2,643.1	664.1	757,377	191,166	7,655	56.2
Zambales	3,714.4	286.0	1,301.4	412.5	506,983	127,735	5,523	38.3
Region IV	46,924.2	11,263.0	18,919.9	5,372.7	7,089,369	1,825,029	91,073	55.9
Aucora	3,239.6	276.0	631.2	158.1	127,969	30,072	1,174	82.0
Batanga	3,165.8	1,273.0	3,663.4	1,014.0	1,312,287	362,531	18,491	52.4
Cavite	1,267.6	478.0	1,639.6	537.9	933,553	252,059	14,332	31.4
Laguna	1,759.7	674.0	1,474.3	818.5	1,142,909	304,582	17,038	38.8
Marikina	959.2	332.0	666.3	198.1	191,448	45,654	2,035	82.5
Occidental Mindoro	5,879.9	940.0	1,611.6	358.5	255,772	60,299	2,364	51.6
Oriental Mindoro	4,364.7	1,285.0	1,555.7	417.4	516,615	117,452	4,579	70.5
Palawan	14,896.3	2,034.0	3,086.8	593.5	438,801	105,260	4,077	72.0
Quezon	8,706.6	3,200.0	2,128.2	724.7	1,286,791	323,594	13,846	72.5
Rizal	1,308.9	280.0	1,227.9	416.3	673,066	171,348	10,739	49.7
Rosblon	1,355.9	485.0	1,434.9	315.8	208,158	52,178	2,398	83.0
Region V	17,632.5	9,456.0	8,878.3	2,746.0	3,921,555	920,308	20,750	73.2
Albay	2,552.6	1,451.0	1,691.3	584.4	906,215	230,285	5,381	68.8
Camarinan Norte	2,112.5	1,065.0	729.1	296.9	352,054	81,529	1,908	69.6
Camarinan Sur	5,266.8	2,609.0	3,463.8	976.9	1,247,063	289,934	8,428	71.5
Catanduanes	1,511.5	506.0	835.9	217.9	192,833	44,366	1,032	72.1
Marikina	4,047.7	2,592.0	1,053.8	266.0	656,623	149,941	3,161	78.9
Sorsogon	2,141.4	1,333.0	1,104.4	403.9	566,767	130,233	2,870	79.5
Region VI	20,223.2	7,458.0	13,301.0	3,539.0	5,092,415	1,320,035	45,671	73.1
Aklan	1,817.9	445.0	1,226.2	308.1	363,320	96,444	3,466	68.2
Antique	2,522.0	681.0	1,341.7	335.2	388,294	98,319	3,264	80.1
Capiz	2,633.2	869.0	1,745.6	429.3	558,745	141,679	4,623	74.0
Iloilo	5,324.0	2,462.0	4,192.9	1,134.6	1,595,198	412,539	14,252	69.4
Neoros Occidental	7,926.1	3,001.0	4,794.6	1,331.8	2,186,858	571,054	20,066	75.1
Region VII	14,951.5	5,297.0	11,111.8	2,887.3	4,198,009	1,236,141	41,710	68.8
Bohol	4,117.3	1,383.0	4,561.6	1,028.2	871,898	244,970	7,419	74.8
Cebu	5,088.4	1,633.0	4,090.3	1,181.4	2,329,803	707,639	27,153	66.2
Neoros Oriental	5,402.3	2,205.0	2,088.6	548.4	917,416	262,012	6,581	68.5
Siquijor	342.5	76.0	371.4	109.5	75,892	21,520	557	86.9
Region VIII	21,431.7	6,457.0	9,321.5	2,641.3	3,072,760	788,603	13,607	70.4
Leyte	6,268.3	2,740.0	4,602.0	1,302.1	1,428,321	373,727	6,651	68.0
Southern Leyte	1,734.8	645.0	1,362.6	369.3	334,273	81,904	1,403	69.9
Eastern Samar	4,339.6	784.0	1,616.1	365.4	357,623	86,668	1,465	76.6
Northern Samar	3,498.0	1,292.0	826.2	211.0	429,760	98,388	1,628	74.9
Samar	5,591.0	996.0	914.6	393.6	522,783	147,916	2,460	69.6
Region IX	18,685.1	7,698.0	9,201.6	2,051.5	2,862,983	681,943	21,187	65.3
Basilan	1,327.2	663.0	677.1	135.3	229,951	52,136	1,595	78.4
Sulu	1,600.4	982.0	799.1	205.2	404,800	99,246	2,975	63.0
Tawi-Tawi	1,087.4	385.0	332.5	70.4	217,957	42,757	1,262	66.0
Zamboanga del Norte	6,075.2	2,259.0	3,102.9	692.5	860,465	160,746	4,882	70.6
Zamboanga del Sur	8,594.9	3,403.0	4,290.0	948.0	1,349,810	327,058	10,473	60.9
Region X	28,327.8	8,923.0	15,984.0	3,661.0	3,178,586	762,706	30,486	66.2
Aosuan del Norte	2,590.3	871.0	1,255.0	390.3	419,937	98,897	4,697	64.1
Aosuan del Sur	8,965.5	1,261.0	1,763.1	449.9	310,463	69,133	2,207	68.7
Bukidnon	8,293.8	3,313.0	5,132.0	985.7	725,784	170,671	5,540	51.6
Camiguin	229.8	107.0	430.9	101.3	60,865	16,293	618	88.3
Misamis Occidental	1,935.3	862.0	2,430.4	486.7	435,843	112,274	4,370	78.4
Misamis Oriental	3,570.1	1,565.0	3,267.4	817.6	807,237	198,408	9,206	68.3
Surigao del Norte	2,739.0	944.0	1,705.2	429.5	420,457	97,030	3,650	71.6
Region XI	31,662.9	10,863.0	15,792.3	3,369.7	3,836,461	948,917	42,441	61.7
Davao del Norte	8,129.8	2,629.0	2,952.2	732.3	817,601	209,409	8,358	59.9
Davao del Sur	6,377.6	2,876.0	3,979.8	864.9	1,315,187	335,885	17,056	62.5
Davao Oriental	5,164.5	1,554.0	1,400.6	323.7	386,800	89,509	3,446	66.8
South Cotabato	7,468.8	2,488.0	5,934.9	1,061.5	881,136	212,661	9,111	57.1
Surigao del Sur	4,522.2	1,316.0	1,524.8	367.4	435,737	101,453	4,470	67.7
Region XII	23,293.1	8,114.0	11,790.2	2,275.9	2,597,722	597,624	23,270	65.2
Lango del Norte	3,092.0	1,385.0	4,536.5	758.9	531,397	130,500	5,572	65.3
Lango del Sur	3,672.9	1,459.0	1,878.5	384.6	445,791	97,746	4,229	56.0
Maguindano	5,474.1	1,676.0	2,082.5	494.9	802,829	139,261	5,283	68.4
North Cotabato	6,565.9	2,443.0	1,518.1	354.0	657,513	152,175	5,409	74.3
Sultan Kudarat	4,288.2	1,151.0	1,774.6	283.6	360,192	77,942	2,777	54.8

## 1.2 Assessment of Regional/Provincial Development Potentiality

### Regional Economic Development

Regional economic development was discussed mainly in relation with industrial structure. Table 1.2-1 shows the predominant sector and the region's contribution to GDP.

**TABLE 1.2-1 ECONOMIC DEVELOPMENT OF REGIONS**

Region	Predominant Sector in Industrial Structure	In 1985
		Region's Contribution to GDP
II, V, VIII, IX, XII	Predominantly agriculture	2.7 - 4%
I, VI, X, XI	Relatively agriculture	4 - 7%
III, IV, VII	Relatively industry and service	7 - 14%
NCR	Predominantly industry and service	30%

### Assessment of Provincial Development Potentiality

Provincial development potentiality was assessed based on the indicators established in Section 1.1. Major indicators and their ranges are as follows:

**TABLE 1.2-2 MAJOR INDICATORS**

Indicator	National Average	Highest (Province)	Lowest (Province)
Population Density (persons per sq.km)	182	725 (Cavite)	29 (Palawan)
Urban Population Ratio (%)	40	80 (Rizal)	4 (Mountain Province)
Per Capita GRDP (P/person)	11,159	15,955 (Rizal)	3,788 (Northern Samar)
Per Capita Income (P/person/year)	5,593	10,983 (Zambales)	2,373 (Northern Samar)
Primary Sector Worker Ratio (%)	51	86 (Ifugao)	19 (Rizal)
Incidence of Poverty (%)	59	88 (Camiguin)	31 (Cavite)
Agricultural Productivity (1) (%)	57	86 (Nueva Ecija)	26 (Siquijor)

Agricultural productivity (1) is considered to be a typical indicator suggesting development potentiality, which is defined as the ratio of present actual production to possible maximum production in existing farm areas. Figure 1.2-1 shows the distribution of this indicator.

# PHILIPPINES

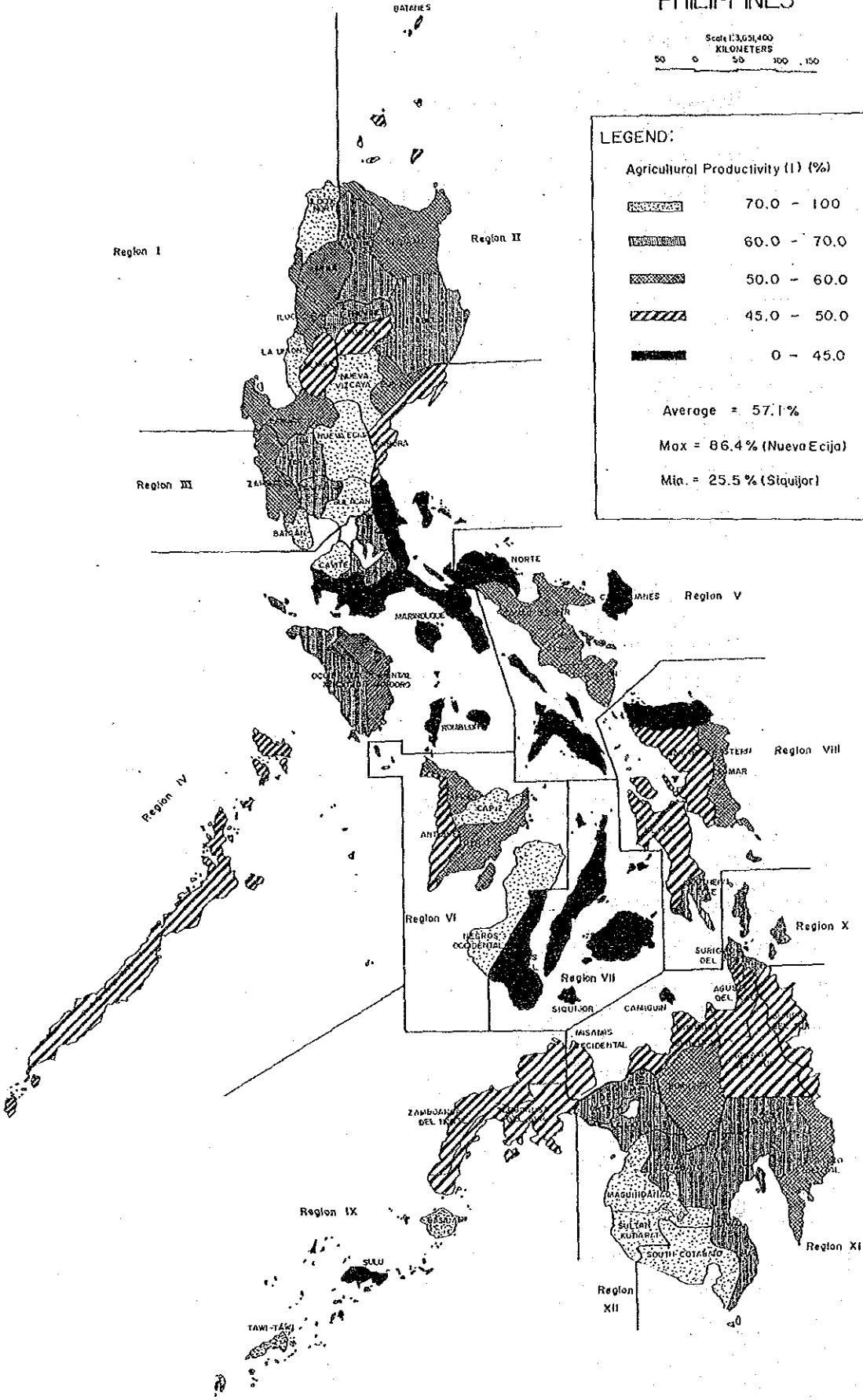
Scale 1:3,651,400  
KILOMETERS  
0 50 100 150

**LEGEND:**

Agricultural Productivity (I) (%)

	70.0 - 100
	60.0 - 70.0
	50.0 - 60.0
	45.0 - 50.0
	0 - 45.0

Average = 57.1%  
Max = 86.4% (Nueva Ecija)  
Min = 25.5% (Staquijor)



PILOT STUDY  
FOR  
THE RURAL ROAD NETWORK DEVELOPMENT PROJECT

FIGURE 1.2-1

AGRICULTURAL PRODUCTIVITY (I) (%)

### 1.3 Review of Adequacy of Road Network

#### Road Network Pattern

The present road network patterns of the provinces are classified into the following six (6) groups based on the topographic characteristics:

TABLE 1.3-1 CLASSIFICATION OF ROAD NETWORK PATTERN

Classification	Typical Province
Inland province with mostly mountainous terrain	Mountain Province
Inland province with relatively flat plain	Nueva Ecija
Seaside province with narrow plain along the sea with mountainous hinterland	Zambales
Seaside province with relatively flat plain	Iloilo
Province composed of round-shape island	Bohol
Province composed of narrow and long island	Cebu

#### Adequacy of Road Network by Quantity and Quality of Roads

To assess the adequacy of the road network, the following factors were considered:

- a) adequacy in quantity (road length)
- b) adequacy in quality (pavement type and surface condition)
- c) adequacy in locations (road distribution vs. transport demand)

Through an analysis of various indicators, "Road Density (2)" was selected to best represent the above factors.

$$\text{Road Density (2)} = L' / \sqrt{PA}$$

- where, L' : Fair condition road length in km  
P : Populataion in 1,000  
A : Total land area in sq.km

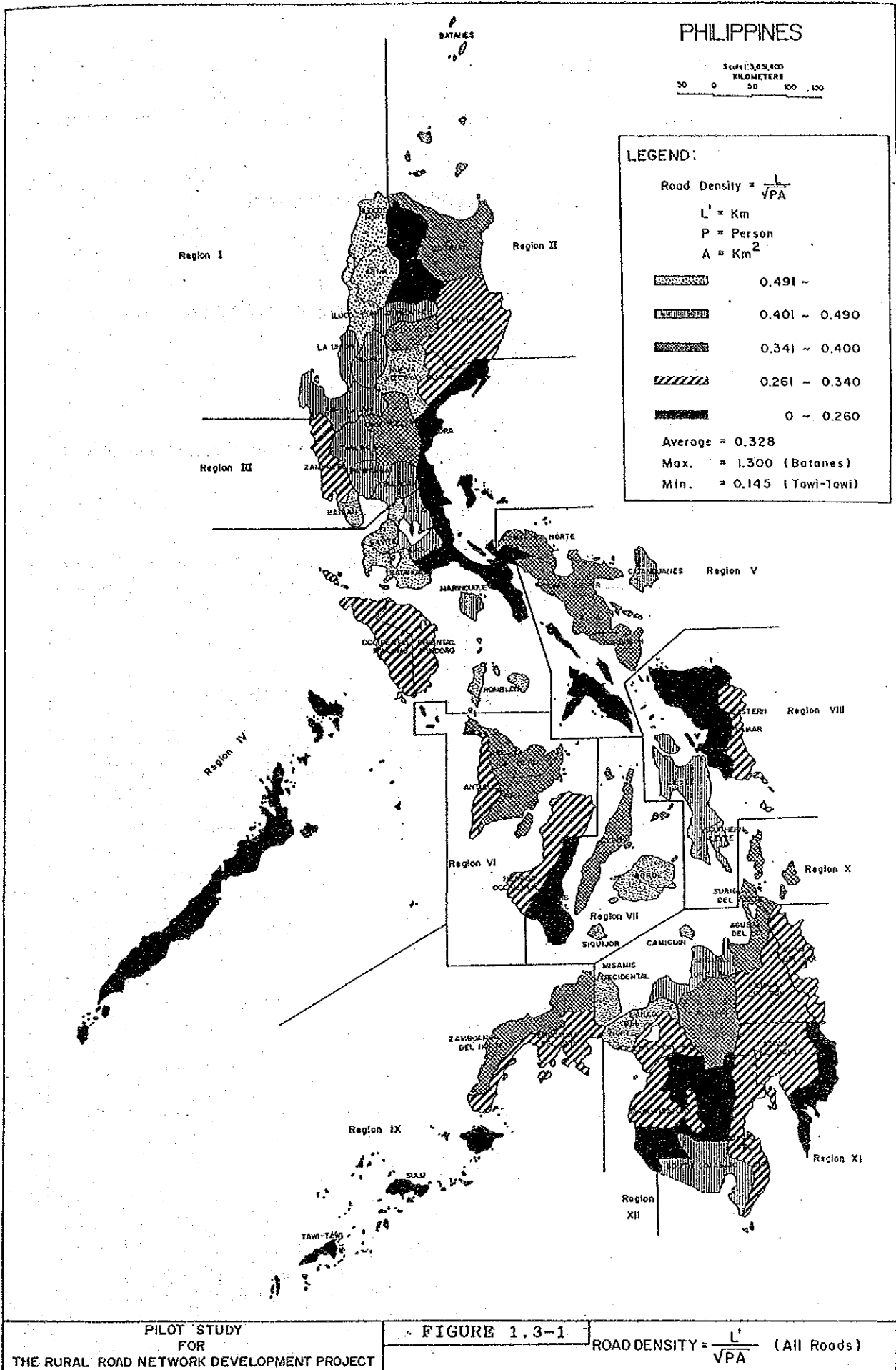
L' is calculated as follows:

$$L' = \alpha \cdot l_{PCC} + \beta \cdot l_{AC} + \gamma \cdot l_{GR} + \delta \cdot l_{ET}$$

where,  $l_{PCC}$ ,  $l_{AC}$ ,  $l_{GR}$ ,  $l_{ET}$ : Length of PCC, AC, gravel and earth roads, respectively

$\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ : Ratio of road in fair condition for each surface type (assumed based on present condition as  $\alpha = 1.0$ ,  $\beta = 0.6$ ,  $\gamma = 0.15$  for barangay roads and 0.3 for other roads, and  $\delta = 0$ )

The value of "Road Density (2)" of the provinces is illustrated in Figure 1.3-1.



#### 1.4 Classification of Provinces

In order to classify all provinces, representative indicators were analyzed by the following characteristics:

##### Classification According to Socio-economic Development

- Demographic Characteristics : Population Density
- Socio-economic Characteristics : Incidence of Poverty
- Agricultural Productivity : Agricultural Productivity (1) (at present level)

##### Classification According to Adequacy of Road

- Adequacy of Roads : Road Density (2)
- Geography/Topography : Geographical Location, Formation of Road Network

##### Overall Classification

The overall classification of all provinces was made employing the two final indicators: incidence of poverty and road density, representing socio-economic development and adequacy of roads, respectively.

TABLE 1.4-1 OVERALL CLASSIFICATION

		Adequacy of Roads (Represented by Road Density, $L'/\sqrt{PA}$ )		
		Bad	Average	Good
Socio-economic Development (Represented by Incidence of Poverty)	Developed	—	AD	—
	Less developed	BL	AL	GL

The result of the overall classification is shown in Table 1.4-2.



TABLE 1.4-2 CLASSIFICATION OF PROVINCE BY SOCIO-ECONOMIC DEVELOPMENT AND ADEQUACY OF ROAD

		Adequacy of Roads (Represented by Road Density, $L'/\sqrt{P.A}$ )		
		Bad	Average	Good
Socio-economic Development (Represented by Incidence of Poverty)	Developed	[BD]	[AD] ( 4 ) Cavite ( 1 ) Benguet ( 3 ) Pampanga ( 3 ) Bulacan ( 3 ) Zambales ( 4 ) Laguna ( 1 ) La Union	[GD]
	Less Developed	[BL] ( 4 ) Occidental Mindoro ( 2 ) Isabela (12) Sultan Kudarat (12) Lanao del Sur (11) Davao del Norte ( 2 ) Kalinga-Apayao ( 9 ) Zamboanga del Sur (11) Davao del Sur ( 9 ) Sulu ( 9 ) Tawi-Tawi (11) Davao Oriental (11) Surigao del Sur (12) Maguindanao ( 7 ) Negros Oriental (10) Agusan del Sur ( 8 ) Samar ( 4 ) Oriental Mindoro ( 4 ) Palawan ( 4 ) Quezon (12) North Cotabato ( 8 ) Northern Samar ( 8 ) Eastern Samar ( 9 ) Basilan ( 5 ) Masbate ( 4 ) Aurora	[AL] ( 4 ) Rizal (10) Bukidnon ( 1 ) Pangasinan ( 2 ) Quirino ( 2 ) Cagayan ( 3 ) Nueva Ecija ( 3 ) Tarlac (11) South Cotabato ( 1 ) Mountain Province (10) Agusan del Norte ( 7 ) Cebu ( 2 ) Ifugao ( 8 ) Leyte ( 6 ) Aklan (10) Misamis Oriental ( 5 ) Albay ( 6 ) Iloilo ( 5 ) Camarines Norte ( 8 ) Southern Leyte ( 9 ) Zamboanga del Norte ( 5 ) Camarines Sur (10) Surigao del Norte ( 5 ) Catanduanes ( 6 ) Capiz ( 6 ) Negros Occidental ( 5 ) Sorsogon ( 6 ) Antique ( 4 ) Marinduque	[GL] ( 3 ) Bataan ( 4 ) Batangas ( 2 ) Nueva Vizcaya ( 1 ) Ilocos Norte ( 1 ) Ilocos Sur (12) Lanao del Norte ( 1 ) Abra ( 2 ) Batanes ( 7 ) Bohol (10) Misamis Occidental ( 4 ) Romblon ( 7 ) Siquijor (10) Camiguin

Note: ( ) : Region number  
L' : Fair condition road length in km  
P : Population in 1,000  
A : Land area in sq. km

## 1.5 Selection of Pilot Provinces

The following considerations were given in selecting pilot provinces:

- To select a typical province from each group of provinces classified according to socio-economic development and adequacy of roads
- To cover various categories of geographic/topographical characteristics
- To widely distribute over the country by selecting at least one each from Luzon, Visayas and Mindanao
- To except provinces with on-going/committed road projects of considerable length

In view of the above, four provinces were selected.

The characteristics of selected provinces are summarized as follows and presented in Table 1.5-1:

- Cavite : represents provinces with average road density and economically well developed, and topographically classified as seaside, flat
- Masbate : represents provinces with low road density and economically less developed, and topographically classified as island, narrow
- Bohol : represents provinces with high road density and economically less developed, and topographically classified as island, round
- Agusan del Norte : represents provinces with average road density and economically less developed, and topographically classified as seaside, mountainous

TABLE 1.5-1 CHARACTERISTICS OF PILOT PROVINCES

Pilot Province	Cavite	Masbate	Bohol	Agusan del Norte
Region	IV	V	VII	X
Population in 1985	933,553	656,623	871,898	419,937
Population Density (/km <sup>2</sup> )	725	162	212	162
Land Area (km <sup>2</sup> )	1,287.6	4,047.7	4,117.3	2,590.3
Per Capita Income in 1985 (P)	7,157	3,018	3,151	4,347
Incidence of Poverty in 1985 (%)	31.4	78.9	74.8	64.1
Un/Underemployment Ratio in 1986 (%)	21.9	51.8	44.6	45.5
Employment by Sector: Agriculture (%)	31.0	79.7	63.6	52.6
Industry (%)	29.7	4.2	14.8	15.6
Service (%)	38.5	15.7	20.5	30.2
Agricultural Productivity (%)	79.8	36.1	40.0	49.4
Major Agricultural Products	Palay, coffee fruit, coconut Vegetables	Palay, corn	Palay, cassava coconut corn	Palay, bananas coconut root crops
Road Length (km)	1,639.6	1,053.8	4,561.6	1,255.0
Road Density: Total roads	1.495	0.646	2.408	1.203
Fair condition roads	0.509	0.163	0.543	0.374
Roads in Good/Fair Condition: National roads (%)	78.7	6.6	78.6	74.3
Provincial roads (%)	35.8	4.7	34.9	28.4
Geographic/Topographic Classification	Seaside Flat	Island Narrow	Island Round	Seaside Mountainous
Overall Classification : Socio-econ. Devt. Adequacy of Road	Developed Average	Less Bad	Less Good	Less Average

## 2. PROJECT IDENTIFICATION AND SCREENING

### 2.1 Project Identification and Screening Methodology

#### Data/Information Collection and Road Condition Survey

Socio-economic and transport data were collected and road conditions were surveyed. Road conditions of all major roads and some minor roads were investigated by field survey.

#### Functional Road Classification

In order to formulate a systematic road development plan, the following functional road classification was proposed:

TABLE 2.1-1 FUNCTIONAL ROAD CLASSIFICATION

Major Roads	
- Primary Major Roads	: Major inter-provincial roads or major intra-provincial roads linking two or more municipal towns to the provincial capital
- Secondary Major Roads	: Roads linking municipal towns with each other or to the provincial capital or to the primary major road network
Minor Roads	
- Collector Roads	: Roads linking two or more barangays to the municipal town or to the major road network
- Feeder Roads	: Roads linking one or more barangays to the higher level network or farm to market roads
Streets	: Roads within built-up population centers

Although the primary national roads are not covered by the Study, these were considered for the network study, particularly for establishing major road networks.

#### Engineering Standards

The following engineering standards were studied in accordance with road class, traffic volume and topographic condition following present practice:

**TABLE 2.1-2 ENGINEERING STANDARDS**

Items	Range
Design Speed (km/hr)	40 ~ 90
Carriageway Width (m)	4.0 ~ 6.7
Shoulder Width (m)	0.5 ~ 2.5
Right-of-way Width (m)	10 ~ 30
Radius (m)	25 ~ 280
Grade (%)	4 ~ 10
Recommended Pavement Type	Gravel, BMP, AC, PCC

**Proposed Improvement Works**

The improvement works were proposed according to the type and degree of road deficiencies identified, as shown in Table 2.1-2:

**TABLE 2.1-2 TYPES OF IMPROVEMENT**

Type	Description
Rehabilitation	Improvement of surface condition
Improvement-1/-2	Upgrading of substandard/bad surface condition
Widening	Widening of substandard road width
New Construction	Construction of abandoned/non-existing road

**Project Identification**

The roads with substandard criteria and conditions such as pavement type, road surface and carriageway width, were identified compared with the established engineering standards.

**Project Screening**

The major road projects were categorized into eight(8) groups according to the type of improvement and the economic internal rate of return (IRR) calculated based on roughly estimated values of construction cost and traffic cost savings. The minor road projects were categorized into eight(8) groups according to the type of improvement and the link value (P/L) which is defined as population served divided by length of road.

The following roads were selected for further detailed evaluation:

Cavite:

- All roads

Masbate, Bohol, Agusan del Norte:

- Major roads : All roads except Improvement-2 and Widening with IRR less than 15 %
- Minor roads : All roads with P/L higher than 400

## 2.2 Project Identification and Screening in the Pilot Provinces

TABLE 2.2-1 SUMMARY OF PROJECT IDENTIFICATION/SCREENING

	Cavite	Masbate (Mainland)	Bohol	Agusan del Norte	Total
1. Population (1985)	933,600	490,400	871,900	419,900	2,715,800
2. Land Area (sq. km)	1,288	3,200	4,117	2,590	11,195
3. No. of Cities/Municipalities	23	15	48	12	98
4. Existing Road Length (1985) (km)					
. National Roads	303.9	276.0	588.5	218.2	1,386.6
. Provincial/City Roads	521.1	83.9	987.6	298.9	1,891.5
. Barangay Roads	746.7	397.6	2,697.2	646.6	4,488.1
Total	1,571.7	757.5	4,273.3	1,163.7	7,766.2
5. Proposed Major Road Network (km)					
. National Roads	224.5	276.0	586.5	197.2	1,284.2
. Provincial/City Roads	144.8	49.3	227.8	59.5	481.4
. Barangay Roads	-	170.1	-	34.6	204.7
Total	369.3	495.4	814.3	291.3	1,970.3
6. Studied Road Length (km)					
. National Roads	281.8	276.0	591.8	260.2	1,409.8
. Provincial/City Roads	414.8	83.9	705.0	245.7	1,449.4
. Barangay Roads	223.6	429.4	290.4	379.0	1,322.4
Total	920.2	789.3	1,587.2	884.9	4,181.6
7. Identified Road Projects (km)					
Major Roads					
. National Roads	86.5	257.7	248.1	63.4	655.2
. Provincial/City Roads	121.1	49.3	227.8	59.5	457.7
. Barangay Roads	-	170.1	-	34.6	204.7
Total	207.1	477.1	475.9	157.5	1,317.6
Minor Roads					
. National Roads	11.2	-	5.3	42.9	59.4
. Provincial/City Roads	230.3	32.0	344.5	153.3	760.1
. Barangay Roads	216.8	259.3	290.4	281.5	1,048.0
Total	458.3	291.3	640.2	477.7	1,867.5
Total					
. National Roads	97.2	257.7	253.4	106.3	714.6
. Provincial/City Roads	351.4	81.3	572.3	212.8	1,217.8
. Barangay Roads	216.8	429.4	290.4	316.1	1,252.7
Total	665.4	768.4	1,116.1	635.2	3,185.1
8. Selected Road Projects for Detailed Evaluation (km)					
. Major Roads	207.1	379.7	321.3	139.0	1,047.1
. Minor Roads	458.3	143.5	230.5	152.1	984.4
Total	665.4	523.2	551.8	291.1	2,031.5

### **3. PROJECT EVALUATION**

#### **3.1 Project Evaluation Methodology**

##### **Project Classification**

The project roads were grouped into two types:

- |  |   |  |
|--|---|--|
| Traffic Project (mostly major roads)     | : | Involving the restoration/ upgrading of the existing road which is accessible to motorized vehicle, where the impact of the investment would be generally confined to the transport sector.  |
| Development Project (mostly minor roads) | : | Providing all-weather access to an area which has either no motorized access or only seasonal access, where the impact of the investment would affect not only the transport sector but also other sectors in the local economy, especially the agricultural sector. |

##### **Supplemental Survey**

The following surveys were conducted for providing input data for project evaluation:

- Road Inventory Survey
- Traffic Survey
- Socio-economic Survey

##### **Traffic Forecast**

- |                     |   |   |
|---------------------|---|---|
| Traffic Project     | : | The present traffic on the overall major road network system in the province was analyzed, and based thereupon the changes in traffic flow after completion of the projects were estimated. |
| Development Project | : | Traffic demand was analyzed independently as a feeder road based on population and agricultural production in the area served by the road.  |



## **Preliminary Design and Cost Estimate**

Preliminary design was prepared including:

- Road improvement with adequate drainage
- Bridge construction/replacement
- Special treatment
  - Steep gradient section: PCC paving
  - Flood section: Embankment with slope protection by grouted riprap
  - Slope protection: Recutting/concrete spraying for cut slope, and stone masonry for embankment slope

The construction cost was estimated based on the unit cost analyses and quantity estimates for major construction items.

## **Economic Evaluation**

The economic analysis was conducted in the form of an economic cost-benefit analysis. The costs and benefits taken into account were as follows:

- Costs: Initial construction/improvement costs  
Periodic maintenance costs
- Benefits: Traffic benefits composed of:
  - Normal traffic benefit
  - Diverted traffic benefit (only for traffic project)
  - Generated traffic benefit
  - Development benefits (only for development project)
  - Maintenance cost savings

The basic assumptions adopted in cost-benefit analysis are as follows:

- Analysis Period
  - 1990: Detailed design
  - 1991: Construction
  - 1992 - 2016: Project life (25 years)
- Discount Ratio: 15% per annum

### 3.2 Project Evaluation In Province of Cavite

#### Socio-economic Profile

The socio-economic characteristics are summarized in Table 1.5-1.

Cavite is one of the most advanced provinces and located within Metro Manila's socio-economic influence area.

#### Road Network

The present level of road network development is assessed as average at the national level, and summarized as follows:

- In terms of road extension, national and provincial roads are relatively well developed; however, development of barangay roads is at a rather low level.
- In terms of quality of roads, national roads are at a quite high level; however, provincial and barangay roads remain at a relatively low level.
- A mesh type of road network is formed with relatively fine intervals. Strengthening of east-to-west direction roads should be pursued.
- In general, improvement of existing provincial and barangay roads should be given high priority.

TABLE 3.2-1 PRESENT LEVEL OF ROAD DEVELOPMENT (1985)

	Road Length (km)	Road Density (L'/√PA)	Pavement Type (%)			Surface <sup>1)</sup> Condition (%)	
			PCC	Bitum.	Grav./Earth	Good/Fair	Bad/V. Bad
National Roads	303.9	0.277	16.0	79.5	4.5	78.7	21.3
Provincial Roads	429.5	0.392	21.0	26.8	52.2	35.8	64.2
City Roads	91.6	0.084	25.9	32.9	41.2	NA	NA
Municipal Roads	67.9	0.062	62.2	8.0	29.8	NA	NA
Barangay Roads	746.7	0.681	0	0	100.0	NA	NA
Total	1,639.6	1.496	12.5	23.9	63.6	NA	NA

Note: 1) Survey by the Study Team, 1988

## Proposed Major Road Network and Identified Roads

A major road network was proposed based on an assessment of the present road network and proposed functional classification criteria and is composed of 369.3 km of national and provincial roads (about 24% of all roads) as shown in Table 3.2-2. See Figure 3.2-1.

The road length identified for F/S is also presented in Table 3.2-2.

**TABLE 3.2-2 COMPOSITION OF MAJOR/MINOR ROADS AND IDENTIFIED ROAD PROJECTS**

	Composition <sup>1)</sup>		Identified Projects	
	Major Roads	Minor Roads	Major Roads	Minor Roads
National Roads	224.5	79.4	64.5	16.2
Provincial/City Roads	144.8	376.3	79.3	204.3
Barangay Roads	—	746.7	—	210.3
Total	369.3 (23.5%)	1,202.4 (76.5%)	143.8	430.8

Note: 1) Proposed by the Study Team

## Economic Evaluation

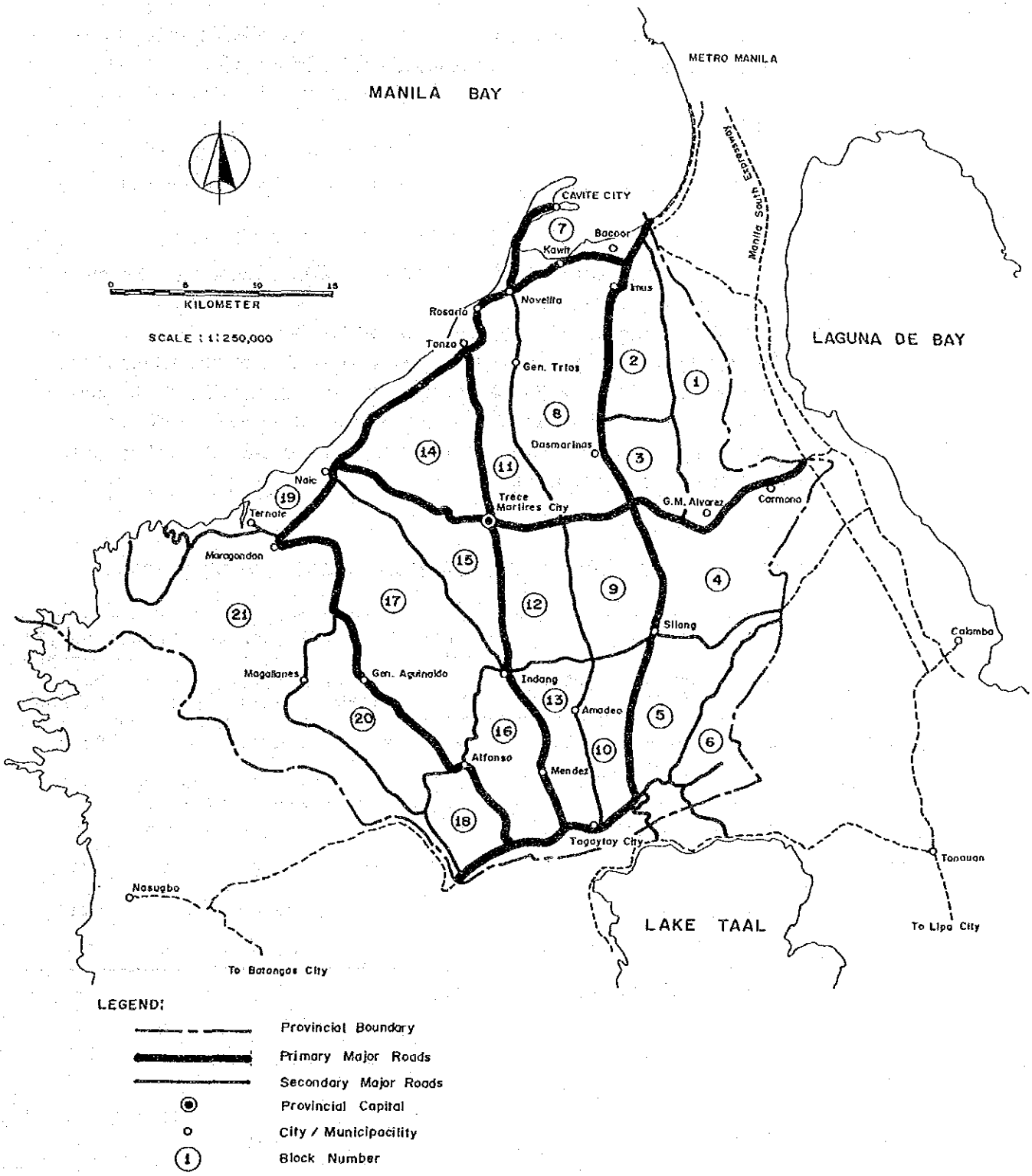
Table 3.2-3 shows a summary of economic evaluation. About 148.9 km or 93% of major roads subjected to F/S have IRR of more than 15%, of which construction costs were estimated at 361.9 million pesos. About 157.5 km or 38% of minor roads subjected to F/S have IRR of more than 15%, of which construction costs were estimated at 193.8 million pesos.

TABLE 3.2-3 SUMMARY OF ECONOMIC EVALUATION

IRR (%)	Type of Improvement			Total
	Rehabilitation/ Improvement-1	Improvement-2/ Widening	New Construction	
<b>Major Roads</b>				
IRR > 15	(20) 143.8 (P353.5)	(1) 5.1 (P8.4)	—	(21) 148.9 (P361.9)
7.5 < IRR < 15	—	—	—	—
IRR < 7.5	(1) 10.8 (P27.7)	—	—	(1) 10.8 (P27.7)
<b>Total</b>	<b>(21) 154.6 (P381.2)</b>	<b>(1) 5.1 (P8.4)</b>	<b>—</b>	<b>(22) 159.7 (P389.6)</b>
<b>Minor Roads</b>				
IRR > 15	(36) 147.7 (P189.1)	—	(2) 9.8 (P4.7)	(38) 157.5 (P93.8)
7.5 < IRR < 15	(29) 106.7 (P96.0)	—	(3) 6.9 (P3.0)	(32) 113.6 (P99.0)
IRR < 7.5	(44) 138.8 (P113.6)	—	(2) 2.4 (P1.2)	(46) 141.2 (P114.8)
<b>Total</b>	<b>(109) 393.2 (P398.7)</b>	<b>—</b>	<b>(7) 19.1 (P8.9)</b>	<b>(116) 412.3 (P407.6)</b>

Estimated construction cost in million  
 Improvement length  
 No. of links

# PROVINCE OF CAVITE



**FIGURE 3.2-1 PROPOSED MAJOR ROAD NETWORK**

### 3.3 Project Evaluation In Province of Masbate

#### Socio-economic Profile

The socio-economic characteristics are summarized in Table 1.5-1. Masbate is recognized as one of the most depressed provinces, but one of the top suppliers of cattle in the country.

#### Road Network

The present level of road network development is evaluated as bad and summarized as follows:

- Road network development in Masbate is still very primitive. There are many areas where no access is provided.
- Road density of all roads is only one half of the national average.
- Road quality is also far behind the national average. Only 24% of national roads and none of provincial roads are paved with PCC or bituminous surfaces. Only 18.3 km of national roads were rated in fair condition and the rest in bad or very bad condition.
- Network is not formed yet. National roads penetrate only limited areas. Most provincial roads function only as feeder roads.

TABLE 3.3-1 PRESENT LEVEL OF ROAD DEVELOPMENT (1985)

	Road Length (km)	Road Density (L'//PA)	Pavement Type (%)		Surface Condition (%) <sup>1)</sup>		
			PCC	Bitum.	Grav./Earth	Good/Fair	Bad/V. Bad
National Roads	276.0	0.220	0.7	23.5	75.8	6.6	93.4
Provincial Roads	83.9	0.062	0	0	100.0	4.7	95.3
City Roads	-	-	-	-	-	-	-
Municipal Roads	65.1	0.052	18.6	10.7	70.7	NA	NA
Barangay Roads	397.6	0.317	0	0	100.0	NA	NA
Total	822.6	0.651	1.7	8.7	89.6	NA	NA

Note: 1) Survey by the Study Team, 1988

### Proposed Major Road Network and Identified Roads

A major road network was proposed aimed at providing balanced access throughout the province, so that balanced development will be realized. Some barangay roads and new links were recommended to be developed as major roads. A total of 495.4 km of national, provincial and barangay roads as well as new links were proposed to form a major road network, as shown in Table 3.3-2. See Figure 3.3-1.

The road length indentified for F/S is also summarized in Table 3.3-2.

**TABLE 3.3-2 COMPOSITION OF MAJOR/MINOR ROADS AND IDENTIFIED ROAD PROJECTS**

	Composition <sup>1)</sup>		Identified Projects	
	Major Roads	Minor Roads	Major Roads	Minor Roads
National Roads	276.0	0	257.7	—
Provincial Roads	49.3	34.6	49.3	32.0
Barangay Roads	170.1 <sup>2)</sup>	308.9	170.1	259.3
Total	495.4 (59.1%)	343.5 (40.9%)	477.1	291.3

Note: 1) Proposed by the Study Team  
2) Includes 81.4 km of new roads

### Economic Evaluation

Table 3.3-3 shows a summary of economic evaluation. About 134.5 km or 36% of major roads subjected to F/S have IRR of more than 15%, of which construction costs were estimated at 142.8 million pesos. About 73.5 km or 51% of minor roads subjected to F/S have IRR of more than 15%, of which construction costs were estimated at 36.6 million pesos.

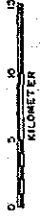
TABLE 3.3-3 SUMMARY OF ECONOMIC EVALUATION

IRR (%)	Type of Improvement			Total
	Rehabilitation/ Improvement-1	Improvement-2/ Widening	New Construction	
<b>Major Roads</b>				
IRR <sub>≥</sub> 15	(7) 84.8 (P77.3)	(2) 8.8 (P11.7)	(2) 40.9 (P53.8)	(11) 134.5 (P142.8)
7.5 < IRR < 15	(8) 114.7 (P174.3)	—	(4) 38.1 (P57.5)	(12) 152.8 (P231.8)
IRR < 7.5	(7) 47.7 (P82.7)	(1) 19.9 (P56.3)	(1) 15.0 (P21.4)	(9) 82.6 (P160.4)
<b>Total</b>	<b>(22) 247.2 (P334.2)</b>	<b>(3) 28.7 (P68.0)</b>	<b>(7) 94.0 (P132.7)</b>	<b>(32) 369.9 (P534.9)</b>
<b>Minor Roads</b>				
IRR <sub>≥</sub> 15	(10) 56.5 (P28.4)	—	(3) 17.0 (P8.2)	(13) 73.5 (P36.6)
7.5 < IRR < 15	(5) 18.7 (P9.8)	—	(3) 9.5 (P6.0)	(8) 28.2 (P15.8)
IRR < 7.5	(5) 9.9 (P5.3)	—	(3) 31.7 (P20.7)	(8) 41.6 (P26.0)
<b>Total</b>	<b>(20) 85.1 (P43.5)</b>	<b>—</b>	<b>(9) 58.2 (P34.8)</b>	<b>(29) 143.3 (P78.3)</b>

Estimated construction cost in million  
 Improvement length  
 No. of links



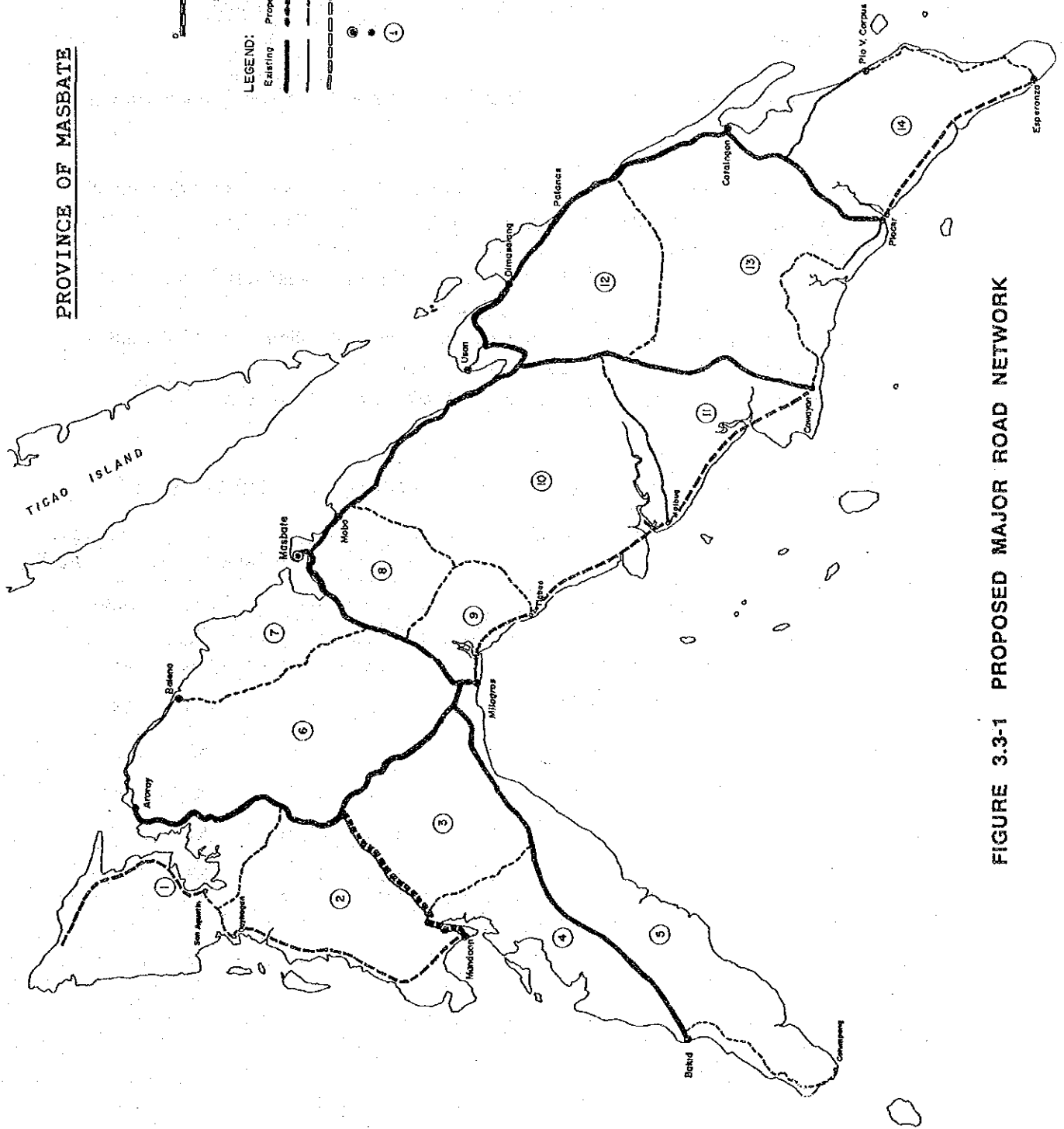
**PROVINCE OF MASBATE**



SCALE: 1:250,000

**LEGEND:**

- Existing: Proposed
- Primary Major Roads
- Secondary Major Roads
- Proposed Future Major Roads
- Provincial Capital
- Municipality
- Zone Number



**FIGURE 3.3-1 PROPOSED MAJOR ROAD NETWORK**

### 3.4 Project Evaluation In Province of Bohol

#### Socio-economic Profile

The socio-economic characteristics are summarized in Table 1.5-1. Bohol is one of the less-developed provinces in spite of its good road network.

#### Road Network

The present level of road network development is evaluated as good and summarized as follows:

- Road development in terms of road extension is at a quite high level. Road densities of national, provincial and barangay roads are higher by 1.5, 2.2 and 2.0 times than the national average, respectively.
- Road quality is still at a low level. About 35% of national roads and 1% of provincial roads are paved with PCC or bituminous surfaces.
- In spite of the low level of pavement type, the surface condition of national roads is well-maintained. About 79% were rated good or fair.
- A mesh type of road network pattern is formed with relatively fine intervals.

TABLE 3.4-1 PRESENT LEVEL OF ROAD DEVELOPMENT (1985)

	Road Length (km)	Road Density (L'///PA)	Pavement Type (%)			Surface Condition (%) <sup>1)</sup>	
			PCC	Bitum.	Grav./ Earth	Good/ Fair	Bad/ V. Bad
National Roads	588.5	0.311	3.4	31.8	64.8	78.6	21.4
Provincial Roads	922.2	0.487	0	1.3	98.7	34.9	65.1
City Roads	65.4	0.034	0	100.0	0	NA	NA
Municipal Roads	288.3	0.152	9.0	10.7	80.3	NA	NA
Barangay Roads	2,697.2	1.424	0	0	100.0	NA	NA
Total	4,561.6	2.408	1.0	6.5	92.5	NA	NA

Note: 1) Survey by the Study Team, 1988

### Proposed Major Road Network and Identified Roads

A major road network was proposed based on the assessment of present road network and proposed functional classification criteria and is composed of 814.3 km of national and provincial roads (about 19% of all roads) as shown in Table 3.4-2. See Figure 3.4-1.

The road length identified for F/S is also shown in Table 3.4-2.

**TABLE 3.4-2 COMPOSITION OF MAJOR/MINOR ROADS AND IDENTIFIED ROAD PROJECTS**

	Composition <sup>1)</sup>		Identified Projects	
	Major Roads	Minor Roads	Major Roads	Minor Roads
National Roads	586.5	2.0	248.1	2.0
Provincial/ City Roads	227.8	759.8	227.8	347.8
Barangay Roads	—	2,697.2	—	290.4
Total	814.3 (19.0%)	3,459.0 (81.0%)	475.9	640.2

Note: 1) Proposed by the Study Team

### Economic Evaluation

Table 3.4-3 shows a summary of economic evaluation. About 14.7 km or 5% of major roads subjected to F/S have IRR of more than 15%, of which construction costs were estimated at 21.2 million pesos. About 107.3 km or 47% of minor roads subjected to F/S have IRR of more than 15%, of which construction costs were estimated at 91.4 million pesos.

TABLE 3.4-3 SUMMARY OF ECONOMIC EVALUATION

IRR (%)	Type of Improvement			Total
	Rehabilitation/ Improvement-1	Improvement-2/ Widening	New Construction	
<b>Major Roads</b>				
IRR ≥ 15	—	(4) 14.7 (P21.2)	—	(4) 14.7 (P21.2)
7.5 ≤ IRR < 15	(3) 24.2 (P46.4)	(1) 22.3 (P19.3)	—	(4) 46.5 (P65.7)
IRR < 7.5	(19) 221.9 (P316.2)	(3) 24.6 (P35.9)	—	(22) 246.5 (P352.1)
<b>Total</b>	<b>(22) 246.1 (P362.6)</b>	<b>(8) 61.6 (P76.4)</b>	<b>—</b>	<b>(30) 307.7 (P439.0)</b>
<b>Minor Roads</b>				
IRR ≥ 15	(13) 94.2 (P84.4)	—	(5) 13.1 (P7.0)	(18) 107.3 (P91.4)
7.5 ≤ IRR < 15	(15) 72.6 (P69.5)	—	(2) 10.8 (P5.9)	(17) 83.4 (P75.4)
IRR < 7.5	(10) 28.2 (P20.6)	—	(3) 9.4 (P5.2)	(13) 37.6 (P25.8)
<b>Total</b>	<b>(38) 195.0 (P174.5)</b>	<b>—</b>	<b>(10) 33.3 (P18.1)</b>	<b>(48) 228.3 (P192.6)</b>

Estimated construction cost in million  
 Improvement length  
 No. of links



### 3.5 Project Evaluation In Province of Agusan del Norte

#### Socio-economic Profile

The socio-economic characteristics are summarized in Table 1.5-1. The economic development level of the province is almost the same as the national average. The wood industry is the province's major industry.

#### Road Network

The present level of road network development is assessed as average and summarized as follows:

- The province is a typical province representing the national average in terms of road quantity.
- In terms of road quality, national roads can be classified into two (2) extreme groups. The first group comprises the roads forming the most important trunk road network system of the country, which are all PCC paved and maintained in fairly good condition. The other group is composed of roads other than the former, which are gravel surfaced and are in poor surface condition.
- Three (3) national roads form a skeleton road network for the province. Other roads branch off from the skeleton roads.
- Due to topographical constraints, since a closed network could not be formed, the three (3) national roads function as axes.

TABLE 3.5-1 PRESENT LEVEL OF ROAD DEVELOPMENT (1985)

	Road Length (km)	Road Density (L'//PA)	Pavement Type (%)		Surface Condition (%) <sup>1)</sup>		
			PCC	Bitum.	Grav./ Earth	Good/ Fair	Bad/ V. Bad
National Roads	218.2	0.209	53.8	0	46.2	74.3	25.7
Provincial Roads	232.9	0.223	0	0	100.0	28.4	71.6
City Roads	66.0	0.063	30.4	0	69.6	NA	NA
Municipal Roads	91.3	0.088	14.1	0	85.9	NA	NA
Barangay Roads	646.6	0.620	0	0	100.0	NA	NA
Total	1,255.0	1.203	12.0	0	88.0	NA	NA

Note: 1) Survey by the Study Team, 1988

### Proposed Major Road Network and Identified Roads

Based on the present pattern of three (3) axes, a major road network was proposed. In view of the future development of the area west of Agusan River, the addition of one axis in that said area was proposed. The proposed major road network is composed of 291.3 km of national, provincial and barangay roads (about 25% of all roads), as shown in Table 3.5-2. See Figure 3.5-1.

The road length identified for F/S is also presented in Table 3.5-2.

**TABLE 3.5-2 COMPOSITION OF MAJOR/MINOR ROADS AND IDENTIFIED ROAD PROJECTS**

	Composition <sup>1)</sup>		Identified Projects	
	Major Roads	Minor Roads	Major Roads	Minor Roads
National Roads	197.2	21.0	63.4	42.9
Provincial Roads	59.5 <sup>2)</sup>	259.9	59.5	153.3
Barangay Roads	34.6 <sup>3)</sup>	630.3	34.6	281.5
Total	291.3 (25.0%)	911.2 (75.0%)	157.5	477.7

Note: 1) Proposed by the Study Team  
 2) Includes 20.5 km of new roads  
 3) Includes 18.3 km of new roads

### Economic Evaluation

Table 3.5-3 shows a summary of economic evaluation. About 52.6 km or 38% of major roads subjected to F/S have IRR of more than 15%, of which construction costs were estimated at 95.1 million pesos. About 12.2 km or 9% of minor roads subjected to F/S have IRR of more than 15%, of which construction costs were estimated at 8.3 million pesos.

TABLE 3.5-4 SUMMARY OF ECONOMIC EVALUATION

IRR (%)	Type of Improvement			Total
	Rehabilitation/ Improvement-1	Improvement-2/ Widening	New Construction	
<b>Major Roads</b>				
IRR ≥ 15	(5) 44.3 (P66.9)	(1) 2.8 (P4.5)	(1) 5.5 (P23.7)	(7) 52.6 (P95.1)
7.5 ≤ IRR < 15	(4) 41.4 (P73.2)	—	(1) 7.9 (P9.4)	(5) 49.3 (P82.7)
IRR < 7.5	—	—	(3) 34.9 (P45.4)	(3) 34.9 (P45.4)
<b>Total</b>	<b>(9) 85.7 (P140.2)</b>	<b>(1) 2.8 (P4.5)</b>	<b>(5) 48.3 (P78.6)</b>	<b>(15) 136.8 (P223.2)</b>
<b>Minor Roads</b>				
IRR > 15	(1) 3.7 (P2.3)	—	(1) 8.5 (P6.0)	(2) 12.2 (P8.3)
7.5 ≤ IRR < 15	(9) 45.0 (P37.2)	—	(1) 3.0 (P1.6)	(10) 48.0 (P38.8)
IRR < 7.5	(22) 63.3 (P42.9)	(2) 6.5 (P3.5)	(1) 1.4 (P0.9)	(25) 71.2 (P47.3)
<b>Total</b>	<b>(32) 112.0 (P82.4)</b>	<b>(2) 6.5 (P3.5)</b>	<b>(3) 12.9 (P8.5)</b>	<b>(37) 131.4 (P94.4)</b>

Estimated construction cost in million  
 Improvement length  
 No. of links



PROVINCE OF AGUSAN DEL NORTE

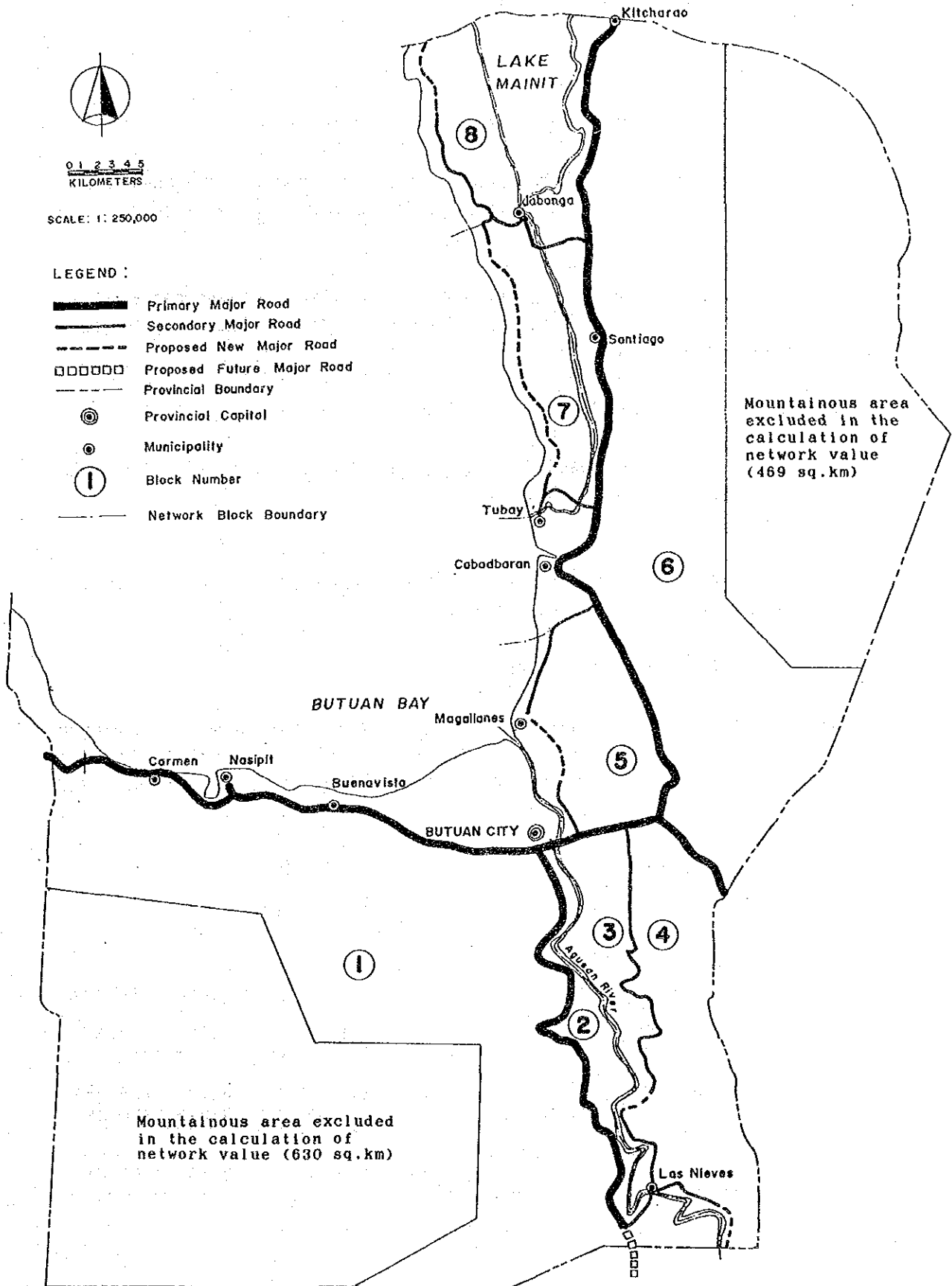


FIGURE 3.5-1 PROPOSED MAJOR ROAD NETWORK

## 4. PROJECT IMPLEMENTATION

### 4.1 Highway Development Plan

#### Medium-Term Philippine Development Plan 1987-1992

The Plan addresses the goals of the national development efforts: (a) alleviation of poverty, (b) generation of more productive employment, (c) promotion of equity and social justice, and (d) attainment of sustainable economic growth.

The emphases in the infrastructure development plan were given to rural-based, small-and medium-sized and labor-based projects, i.e., farm-to market roads and the maintenance of existing and soon-to-be completed projects.

#### Updated 1988-1992 DPWH Highway Program

The Updated Program during the Plan will entail a total public investment of P49.9 billion with a remarkably sharp increase in the latter years.

See Table 4.1-1.

The investment requirement was programmed at P12.2 billion in 1991, which was assumed to be the commencement year of the Project implementation.

#### Rural Road Development Project

The Updated Program covers the list of on-going and new/proposed projects. According to the Program, the investment requirement in 1991 in P12,156 million, of which P5,000 million is allocated for rural/minor roads consisting of P1,853 million for locally funded and P3,147 million for foreign assisted projects. See Table 4.1-2.

TABLE 4.1-2 HIGHWAY INVESTMENT IN 1991

	1988	1991
Locally Funded Projects		
Rural/Minor Roads	—	1,853 (15.2%)
Other than Rural Roads	—	3,478 (28.6%)
Subtotal	2,566 (46.0%)	5,331 (43.8%)
Foreign Assisted Projects		
Rural/Minor Roads	575 (10.3%)	3,147 (25.9%)
Other than Rural Roads	2,436 (43.7%)	3,678 (30.3%)
Subtotal	3,011 (54.0%)	6,825 (56.2%)
Total	5,577 (100.0%)	12,156 (100.0%)

TABLE 4.1-1 HIGHWAY INVESTMENT  
(In Thousand Constant 1988 Prices)

Project	Investment Requirements					TOTAL
	1988	1989	1990	1991	1992	
Total	TP 5,577,559 P 4,485,832 \$ 51,987	8,105,033 6,339,738 81,163	10,553,437 7,356,946 150,070	12,156,400 8,087,525 191,027	13,575,900 9,141,751 208,176	49,968,329 35,411,792 682,423
On-going	TP 2,736,446 P 1,712,696 \$ 48,750	3,108,049 1,783,039 60,920	2,075,426 1,413,507 31,075	936,237 551,538 18,061	195,090 195,090 0	9,051,248 5,655,870 158,806
New/Proposed	TP 2,841,113 P 2,773,136 \$ 3,237	4,996,984 4,556,699 20,243	8,478,011 5,943,439 118,994	11,220,163 7,535,987 172,966	13,380,810 8,946,661 208,176	40,917,081 29,755,922 523,616

Source: Up-dated 1988-1992 DPWH Infrastructure Program

List of Agency Projects

Note: TP: Total pesos

P: Peso portion of project cost

\$: Foreign currency portion of project cost (\$1=₱21)

## 4.2 Implementation Strategy and Plan of the Project

### Implementation Strategies

The following strategies were recommended to be adopted for the Project:

- Investment Size to Rural Road Development  
Total (1991): P5,000 million
- Balanced Investment to Regions/Provinces
- Sector Loan System
- Labor-based Construction System
- Community Participation System

### Implementation Plan

The roads identified for improvement were classified into two (2) type in terms of IRR and proposed to be implemented under two (2) phases, as shown in Figure 4.2-1.

- Phase I : IRR  $\geq$  15% ; Implementation Period: 5-years  
 Phase II : 7.5%  $\leq$  IRR < 15% ; Implementation Period: 5-years

The road length and construction cost to be improved in all 73 provinces were estimated based on the study outputs of the four (4) pilot provinces.  
 See Table 4.2-1.

**FIGURE 4.2-1 IMPLEMENTATION SCHEDULE FOR RURAL ROAD DEVELOPMENT PROJECT (73 PROVINCES)**

	Investment		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000		
	Phase I	Phase II												
Foreign Assisted Rural Roads	P14,865M	P13,917M	Phase I					Phase II						
			← P3,147M (annual) →											
Locally Funded Rural Roads	P8,753M	P8,195M	← P1,853M (annual) →											
Total Budget for Rural Roads	P23,618M	P22,112M	← P5,000M (annual) →											

TABLE 4.2-1 IMPROVEMENT LENGTH AND COST BY CATEGORY

	National Roads 1)			Provincial Roads			Baregey Roads			Total 2)		
	Existing Length (km)	Proposed Length (km)	Estimated <sup>3)</sup> Cost (MP)	Existing Length (km)	Proposed Length (km)	Estimated Cost (MP)	Existing Length (km)	Proposed Length (km)	Estimated Cost (MP)	Existing Length (km)	Proposed Length (km)	Estimated Cost (MP)
4 Pilot Provinces IRR ≥15% <7.5% IRR	1005.2	125.7 (17.5%) 120.5 (17.0%)	209.5 207.2	1,668.5	344.2 (20.6%) 182.3 (10.9%)	553.7 200.8	4,488.1	231.3 (5.1%) 219.0 (4.9%)	188.0 201.2	7,161.8	701.2 (9.8%) 521.8 (7.3%)	951.0 609.1
Total	1005.2	246.2 (34.5%)	416.7	1,668.5	526.5 (31.5%)	754.5	4,488.1	450.3 (10.0%)	389.2	7,161.8	1,223.0 (17.1%)	1,560.4
73 Provinces IRR ≥15% <7.5% IRR	1,6703.8	3,613.7 (21.6%) 5,727.5 (34.3%)	5,921.1 9,085.4	28,424.6	7,428.6 (26.1%) 3,866.6 (13.6%)	8,807.2 4,299.3	89,978.8	9,481.8 (10.5%) 9,389.3 (10.4%)	8,889.6 8,725.8	135,107.2	20,524.2 (15.2%) 18,977.4 (14.0%)	23,618.0 22,111.5
Total	1,6703.8	9,341.2 (55.9%)	15,066.6	28,424.6	11,295.2 (39.7%)	13,106.5	89,978.8	18,865.2 (21.0%)	17,616.4	135,107.2	39,501.6 (29.2%)	45,729.5
Average Province IRR ≥15% <7.5% IRR	228.8	49.5 (21.6%) 78.5 (34.3%)	81.1 124.5	389.4	101.8 (26.1%) 52.9 (13.6%)	120.6 58.9	1,232.6	129.9 (10.5%) 128.5 (10.4%)	121.8 119.5	1,850.8	281.2 (15.2%) 260.0 (14.0%)	232.5 302.9
Total	228.8	128.0 (55.9%)	205.6	389.4	154.7 (39.7%)	179.5	1,232.6	258.4 (21.0%)	241.3	1,850.8	541.1 (29.2%)	626.4

Note: 1) Excluding primary national roads  
2) Excluding primary national, city and municipal roads  
3) Including UNDP Project in Masbate

## **Implementation Cycle of the Project**

The implementation cycle of the project works which will take place in several distinct stages is illustrated in Figure 4.2-2. In each stage of the cycle, the responsible agencies, executing and coordinating, which will be clearly assigned, should be responsible for producing objective outputs within a designated period.

The main executing agencies are as follows:

- Program Level
  - Regional/Provincial/City/Barangay Development Councils
  - NEDA
  
- Project Level
  - Regional/District /City Offices of DPWH
  - Project Management Office (newly established)

The technical guidelines for subproject identification and evaluation for rural roads were prepared to be fair in selecting subprojects with reasonable priority.

## **Classification of Project Types**

Subprojects were classified into "Contract Type" and "Administration Type" subprojects in order to inspire the labor-based construction system and community participation system.

Administration type subprojects may be defined as follows:

- Detailed topographic survey and geotechnical investigation may not be required for detailed design.
  
- Detailed engineering can be done without expert engineering knowledge.
  
- Construction work is relatively easy and requires only ordinary construction equipment and therefore can be done by community construction units.
  
- Project size in term of construction cost is relatively small.

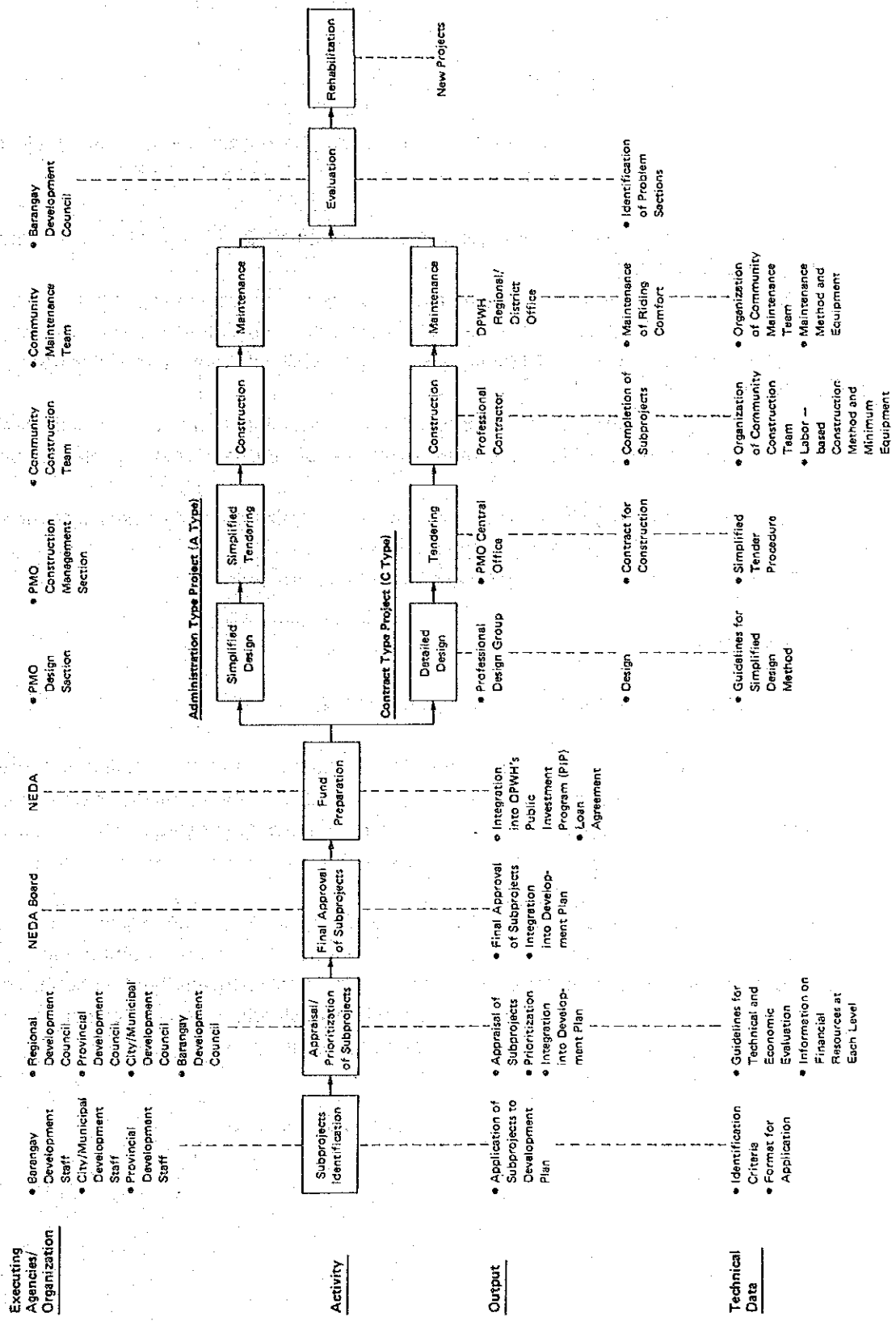


FIGURE 4.2-2 IMPLEMENTATION CYCLE OF RURAL ROAD DEVELOPMENT PROJECT

### 4.3 Project Institution

#### Principles In Organizing Project Institution

The following principles were employed in proposing the organization for the project implementation:

- To minimize creation of new organizations in order to avoid conflict with existing agencies/offices.
- To establish only one project management office as the coordination agency.
- To strengthen or improve part of the existing organization of line agencies, particularly that of regional offices and district offices, to cope with implementation of this special project.
- To adopt the "Experimental Component Implementation Scheme" in which new approaches in terms of both implementation method and technical aspects can be tested.
- To create "Community Construction Units" to inspire participation of community people in the project and to generate job opportunities.
- To employ the "Action-Learning System" to foster skilled staff.

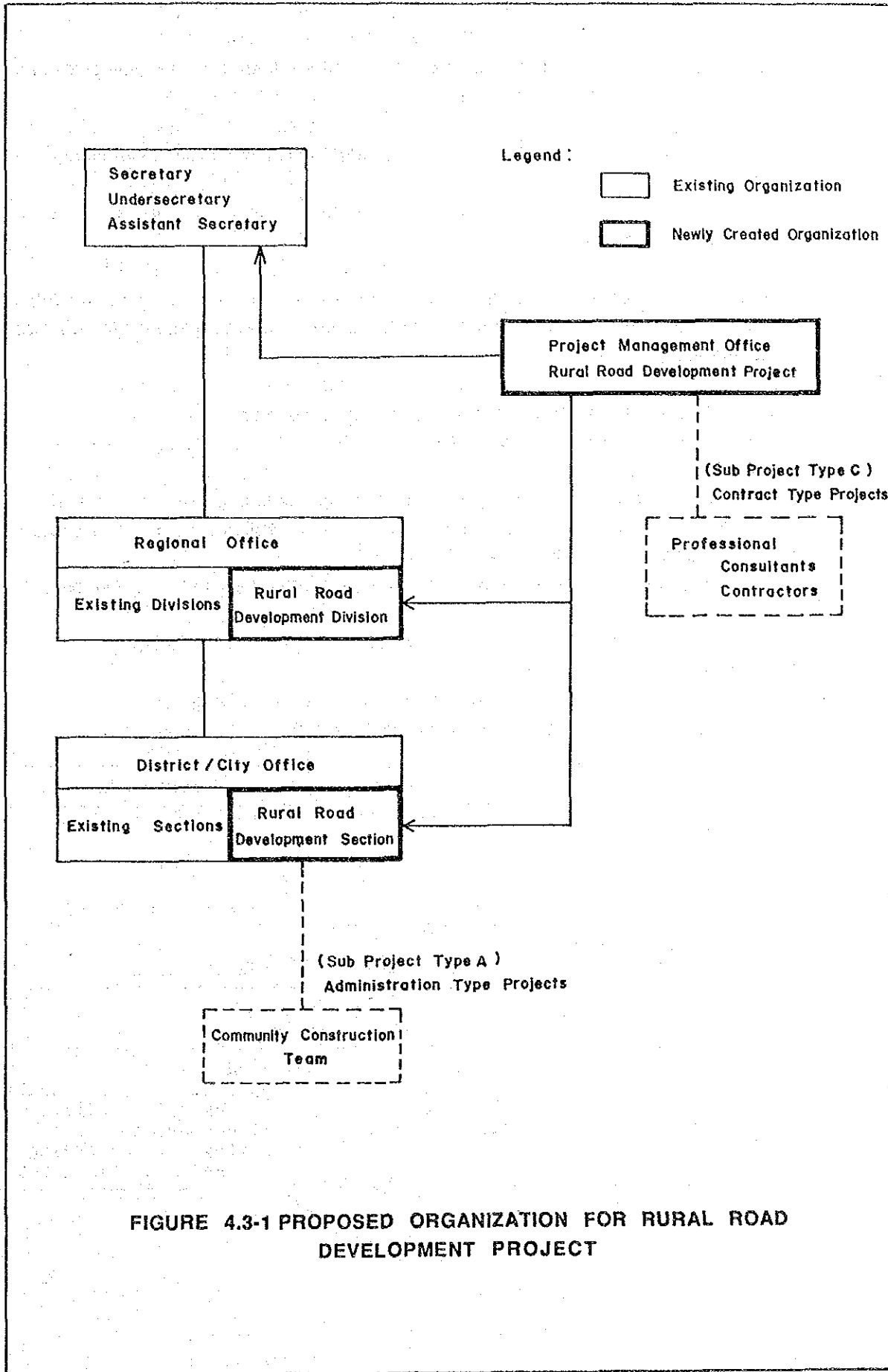
#### Proposed Organization

The proposed organization for the Project is shown in Figure 4.3-1.

The newly established Project Management Office should act as the coordination and core agency of implementation of the whole project, and at the same time be directly responsible for execution of "Contract Type" subprojects, with the professional assistance of consultants and contractors.

The divisions and sections newly created in the existing region and district offices should be directly responsible for survey, detailed engineering, tendering, maintenance of construction equipment and construction supervision of "Administration Type" subprojects. The construction should be done by "Community Construction Teams" composed of people in the project area, under the technical guidance of the divisions and sections.





**FIGURE 4.3-1 PROPOSED ORGANIZATION FOR RURAL ROAD DEVELOPMENT PROJECT**

#### 4.4 Subproject Identification

Based on the present subproject identification system, the following identification procedure and criteria for subprojects were proposed.

A manual for subproject identification and evaluation was prepared to formulate the "Simplified Method".

##### Identification Procedure

At the barangay/municipal level, subprojects should be initially identified in line with DPWH operational policy to encourage greater participation of the people in infrastructure development.

At the provincial level, the following activities should be conducted:

- Formulation of basic road network in the province
- Review of proposed projects
- Proposal of additional projects from the aspect of overall provincial road network development, e.g., construction/improvement of missing/substandard links necessary to complete the basic road network
- Consolidation/adjustment of projects and preparation of the list of candidate projects for appraisal/rating

##### Identification Criteria

A. One or more of the following conditions should be met:

	Major Roads	Minor Roads
(1) Existing Link		
- Carriageway Width	Under 6.0 m	—
- Pavement Type	Inferior to recommended type	Inferior to gravel
- Surface Condition	Bad or worse	Bad or worse
(2) New Link		Impassable Non-existing
(3) Bridges	Ford Spillway Timber bridge Bailey bridge	Ford Spillway in structurally unsound condition Timber bridge Bailey bridge serving AADT more than 300

- B. (1) In the case of a major road presently in good/fair condition, AADT in the opening year should be more than 150.
- (2) In the case of a major road presently in bad or worse condition, AADT in the opening year should be more than 100.
- (3) In the case of a minor road, the population served per km of road should be more than 300.

#### 4.5 Subproject Appraisal/Prioritization

##### DPWH Prioritization Formula

DPWH has established four (4) ranking formulas, one of which is as follows:

Formula for National Roads/Bridge Project

$$PR = 70 \% FYB/C + 20 \% HI + 10 \% SB$$

where: PR = Project rating  
 FYB/C = Merit points of first year benefit-cost ratio  
 HI = Merit points of household income per month  
 SB = Merit points of social benefits

##### Proposed Prioritization Formula

Respecting DPWH's formulas, the formula below was proposed because of the following considerations:

- Uniform expression is preferable (DPWH has four (4) different formulas)
- IRR is a simple and reliable economic indicator, if easily obtained

$$PR = 70 \% MP(IRR) + 20 \% MP(HI) + 10 \% MP(SB)$$

where: PR = Project rating  
 MP(IRR) = Merit points of economic internal rate of return (IRR)  
 MP(HI) = Merit points of household income per month (HI)  
 MP(SB) = Merit points of social benefits (SB)

**TABLE 4.5-1 MERIT POINTS**

	DPWH Formula	Proposed Formula
<u>FYB/C</u>		
= 10 %	50	< 40 % : 20 + 2 x IRR
10 - 30 %	$50 + (FYB/C - 10) \times 50 / 20$	> 40 % : 100
> 30 %	100	
<u>HI</u>		
> P5,000	25	Same as DPWH
2,000 ~ P5,000	$150 - HI / 40$	
P2,000	100	
<u>SB</u>		
High	100	Same as DPWH
Medium	65	
Low	30	

**Proposed Procedure for Simplified Subproject Evaluation/Rating**

Based on analyses of the evaluation results in the pilot provinces, worksheets were prepared for simplified computation of cost estimates, economic evaluations and ratings of subprojects.

**Data Required**

- AADT in opening year (major roads only)
- Length of subproject
- Terrain
- Existing pavement and condition
- Proposed bridge type, length
- Cultivated area in road influence area (minor roads only)
- Household income per month
- Social benefit

**Outputs**

- Construction cost
- B/C ratio and IRR
- Rating

#### 4.6 Fund Preparation

The rural road development project is recognized as the integration of individual rural road improvement/construction projects (subprojects), some locally funded, others foreign assisted. For foreign assisted projects, two types of loans are applicable: project loans and sector loans. The sector loan system is recommended for the project due to its characteristics of covering numerous roads with a short length.

A sector loan is a form of assistance for the capital investment needs in a specified sector in the light of its development perspective, and involves financing a group of subprojects in the sector which are consistent with the sector development plan. The selection, formulation and appraisal of subprojects are generally the responsibility of the executing agency. For sector loans to be possible, well-designed sector investment plans, capable institutions and clearly specified criteria for subproject selection and appraisal are required.

The outline of a sector loan is as follows:

##### **Initial Year**

A loan agreement covering the following will be exchanged:

- Project objectives
- Proposed improvement types
- Total project costs roughly estimated
- Total implementation schedule
- Annual cash requirements
- Candidate subprojects for first year
- Concurrence of loan amount for first year

##### **Succeeding Year**

- Candidate subprojects for following year
- Concurrence of loan amount for following year

## 4.7 Detailed Engineering

### Administration Type Subprojects

The detailed engineering design of this type of project is recommended to be carried out by the Regional and District/City Offices. The maximum involvement of these offices will be essential for implementation of rural road projects which are composed of numerous small size projects scattered nationwide.

The current investment level for rural road projects will be more than doubled by the year 1991. In proportion to the increase in work load, the organization of the Regional and District/City Offices will have to be strengthened by employing regular staff and/or project-hired contractual staff.

Highway alignments of this type of project follow more or less the existing alignments; therefore, the expected volume of earth work will be minimal. The detailed engineering design may simply be done by preparing standard cross sections and a straight road diagram indicating work activities.

### Contract Type Subprojects

The detailed engineering design of this type is recommended to be undertaken by the Project Management Office, which is recommended to be newly created for the rural road projects.

The present procedure should be followed, i.e., PMO should hire consulting firms for detailed engineering services. Review of designs should be done by PMO and the Bureau of Design.

As many consulting firms can be expected to be involved, standardization of design criteria for various class of roads should be established.

To expedite review work, proper coordination should be maintained between PMO and the Bureau of Design.

## 4.8 Tendering

### Administration Type Subprojects

This type of project is proposed to be undertaken by administration at the Regional or District/City Offices; therefore, no tendering is required except for labor supply contracts (Pakyaw contracts).

### Contract Type Subprojects

For this type of project, the present tendering procedure is recommended to be followed. Tendering will be undertaken at the following different level agencies depending on the size of the project and the source of fund:

**TABLE 4.8-1 TYPE OF BIDDING AND RESPONSIBLE AGENCY**

Type of Bidding	Source of Funds	Size of Project	Responsible Agency
Local Bidding	National	Below ₱1.0 M	PBAC, District/ City Office
Local Bidding	National	₱1.0-₱5.0 M	PBAC, Regional Office
Local Bidding	National	Above ₱5.0 M	PBAC, Central Office
International Bidding	Foreign + National	All	PBAC, Central Office <sup>1)</sup>
Local Bidding	National Aid Fund to Local Government Units	Below ₱0.2 M	PBAC, Respective LGU

Note: 1) Project Management Office for the Project may undertake the tendering

Shortening the time required for tendering will be one of the key factors to expedite project implementation. It is recommended that the Government make all possible efforts to shorten the time for evaluation of prequalification documents and bids submitted by contractors as well as the time for approval.

## 4.9 Construction

### Administration Type Subprojects

This type of project is recommended to be undertaken by administration and implemented by Regional and District/City Offices.

One of the most important objectives of the rural roads projects is to create as many job opportunities for rural people as possible. To achieve this objective, the labor-based construction method is most suitable; however, some construction activities, such as compaction, rolling and hauling for long distance, require the support of equipment to assure quality of work as well as to construct roads economically and faster. It is recommended that this type of project be carried out by a labor-based/equipment-supported construction method.

To promote and extensively adopt a labor-based/equipment-supported construction method, a system and organization should be established. In Regional and District/City Offices, the following engineering supervising team should be organized:

- Project Engineer (PE)
- Resident Engineers (RE)
- Site Supervisors (SS)
- Mobile Equipment Crew (MEC)

In municipalities and/or barangays, the following construction team should be organized:

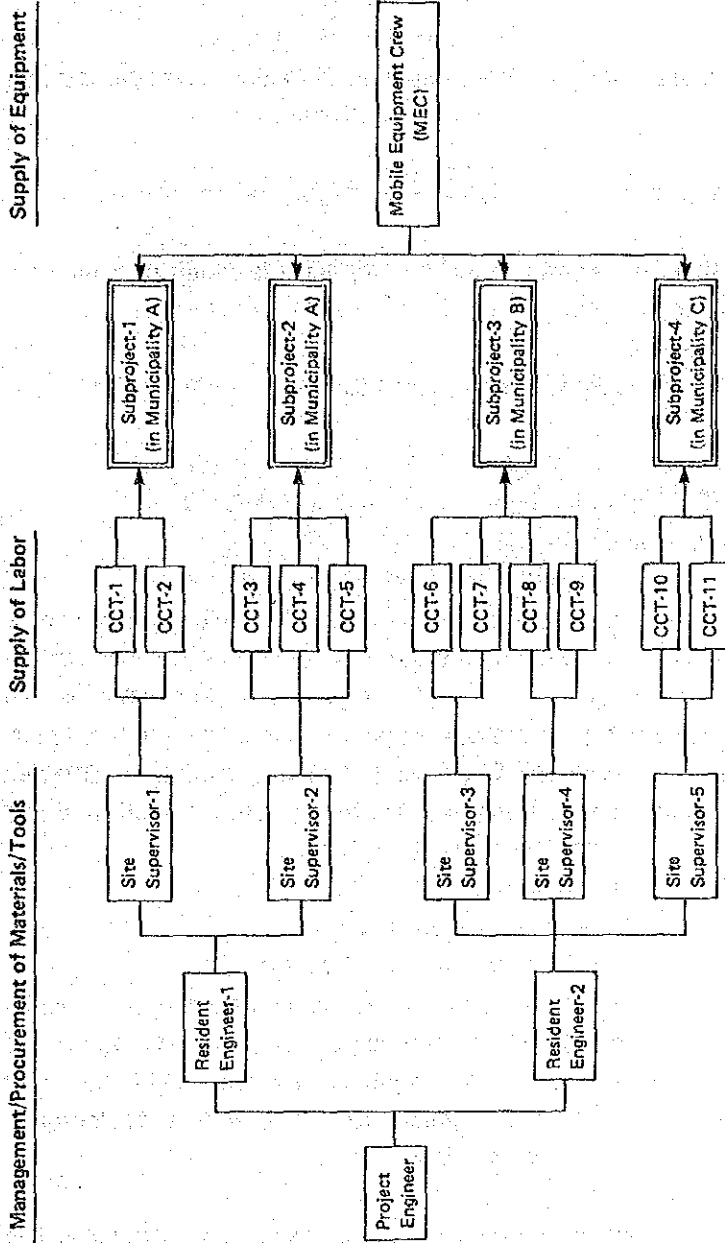
- Community Construction Teams (CCT)

Construction work should be undertaken by utilizing these organizational forces in accordance with the requirements of the subprojects.

### Contract Type Subprojects

This type of project is recommended to be undertaken by the Project Management Office, following the present procedure. Subprojects should be constructed by contractors and supervised by consulting firms under the management of PMO.





Note:

Regional and/or District/City Offices

- Project Engineer (P E ) responsible for overall management of 4 to 5 subprojects
- Resident Engineer (R E ) responsible for construction supervision of 2 to 3 subprojects
- Site supervisor (S S ) responsible for Management of 2-3 CCTs
- Mobile Equipment Crew (MEC) under control of Project Engineer will mobilize equipment in accordance with needs of subproject
- Community Construction Team (CCT)
  - Composed of about 20 laborers

FIGURE 4.9-1 EXAMPLE OF ORGANIZATION FOR CONSTRUCTION OF ADMINISTRATION TYPE SUBPROJECTS

## 4.10 Maintenance

### Maintenance Problems

The following common maintenance problems were reported by agencies concerned with road maintenance:

- Insufficient maintenance fund
- Delay in releasing fund
- Poor condition and frequent breakdown of equipment, delay in repair of equipment and insufficient amount of equipment
- Non-availability of some materials
- Many sections beyond economically maintainable condition

### Recommendations on Maintenance System

#### 1) Present Highway Maintenance System

The present maintenance system is in its fourth year of operation. The system can be expressed as a "maintenance activity oriented system", whereas the previous system was rather a "maintenance crew oriented system". The present system can cope with current maintenance needs flexibly; therefore, maintenance fund can be utilized most efficiently and effectively. It is recommended that the present system be maintained with occasional modifications and revisions to make the system more efficient and effective.

#### 2) Maintenance Fund

From the viewpoint of national budgetary limitations, the maintenance fund will not be easily increased; however, the basic cost per EMK should be reviewed annually. As expressed in the Medium Term Philippine Development Plan 1987-1992, revival of the "Highway Special Fund" should be considered as one way to increase maintenance fund.

The Government should make every possible effort to release funds as scheduled. It is also recommended that the the present system to release equal amount of fund each quarter be restudied. The release of larger amounts just before and during the rainy season may more suitably meet maintenance needs.

### 3) Assessment of Road Surface Condition

In order to estimate national level maintenance needs as well as to evaluate the effects of maintenance efforts, a nationwide assessment of road surface conditions should be carried out regularly. These data will be useful not only for maintenance purposes but also for planning purposes.

### 4) Prioritization Criteria for Maintenance Activities

Clear prioritization criteria for maintenance activities should be established, so that the limited amount of maintenance fund will be most effectively utilized.

### 5) Maintenance Equipment

More close coordination between Regional/Area Equipment Services and District/City Offices should be made, so that available equipment will be more efficiently utilized.

A system to supply spare parts constantly and management of these should be established, so that equipment under or awaiting minor repairs will be repaired without delay.

A thorough study of the following will be needed to determine the optimum solution for improving the equipment status:

- Necessity of improvement/rehabilitation of base and area shops
- Equipment required for major repairs which can be economically repaired
- What should be done with non-operational equipment
- Necessity of procurement of additional equipment

### 6) Community Level Participation in Maintenance

**Monitoring:** A system should be established for monitoring road conditions by residents, and a representative selected from them should report any deficiency or defects to the respective agency.

**Maintenance of barangay roads:** A system should be established for maintaining barangay roads aimed at the active participation of barangay people, thus creating continuing jobs for them.

