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REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS & HIGHWAYS

Feasibility Study
on
The Rural Road Network Development Project

FINAL REPORT (Volume 8)

PROJECT EVALUATION
IN
THE PROVINCE OF OCCIDENTAL MINDORO

OCTOBER, 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

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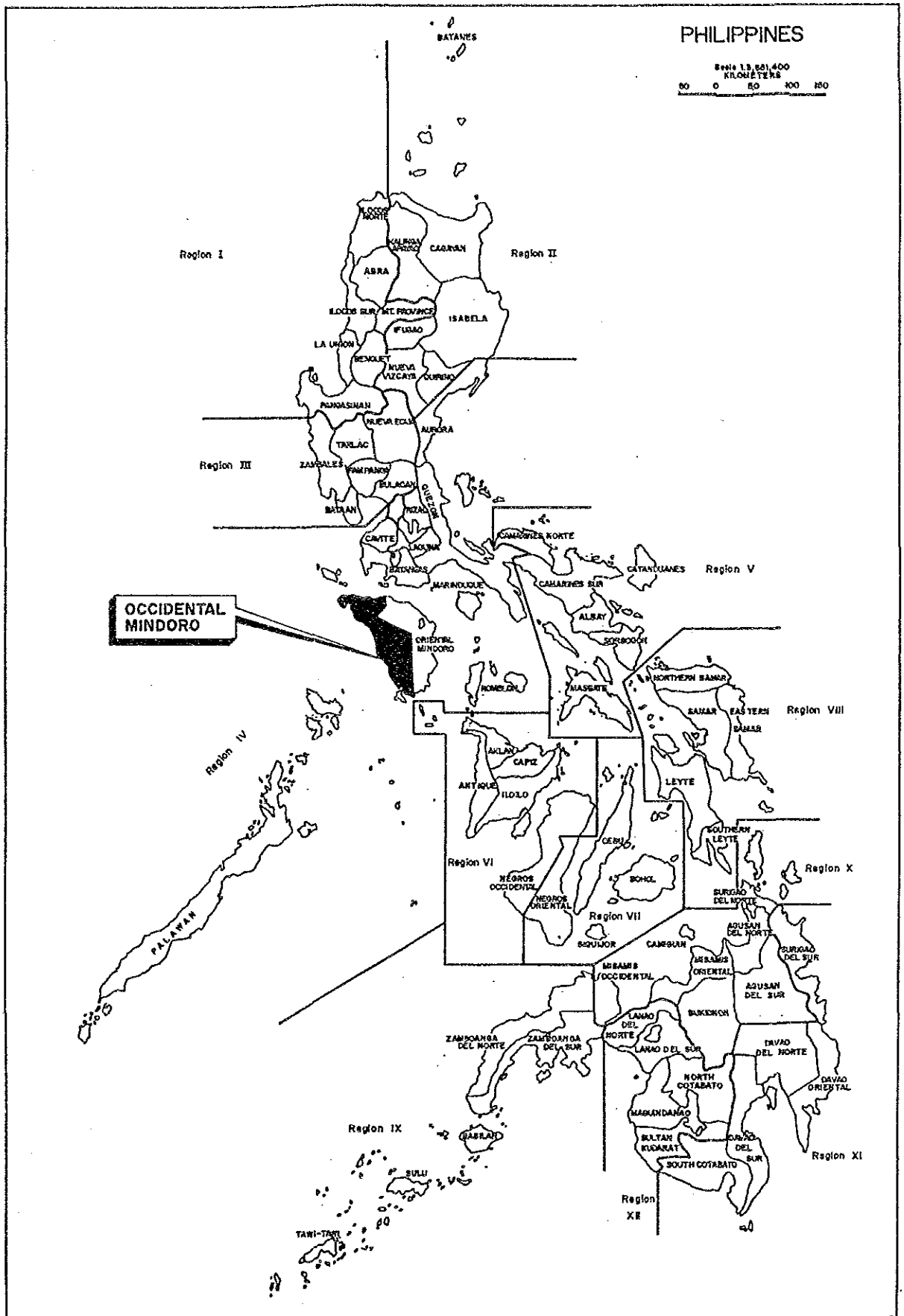

FEASIBILITY STUDY ON THE RURAL ROAD NETWORK DEVELOPMENT PROJECT	LOCATION MAP

VOLUME - 8
PROVINCE OF OCCIDENTAL MINDORO

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CHAPTER 1
SOCIO-ECONOMIC PROFILE OF THE PROVINCE

1.1 GENERAL

The Province of Occidental Mindoro was selected as one of the Study Provinces which represents the province of the following characteristics:

- Economically less developed
- Poor level in road development
- Topographically mountainous

1.2 GEOGRAPHY AND TOPOGRAPHY

The province is located in the western part of Mindoro Island which is composed of Occidental Mindoro and Oriental Mindoro. These two (2) province is separated by mountain ranges located in the center of the island that runs from north to south.

The province of Occidental Mindoro is predominantly mountainous with narrow flat area along the western coastal line. Due to these topographical characteristics, the province is one of the typical sea-side mountainous provinces.

Slope map of the province is shown in Figure 1.2-1.

1.3 POPULATION

The province is composed of eleven (11) municipalities, two (2) of which are island municipalities. The provincial capital is located at Mamburao.

Population in 1990 is estimated at 289,900. The average annual population growth rate for the period of 10 years from 1980 to 1990 was estimated 1.0% which is much lower than the national average of 2.4%. Population density of the province in 1990 is 49.3 persons per square kilometer which is only about a quarter of the national average of 205 persons per sq. km.

Population, the average annual population growth rate and population density by municipality are presented in Table 1.3-1. Distribution of municipal towns together with their population is shown in Figure 1.3-1. All municipal towns are located in the low land along the western coastal line.

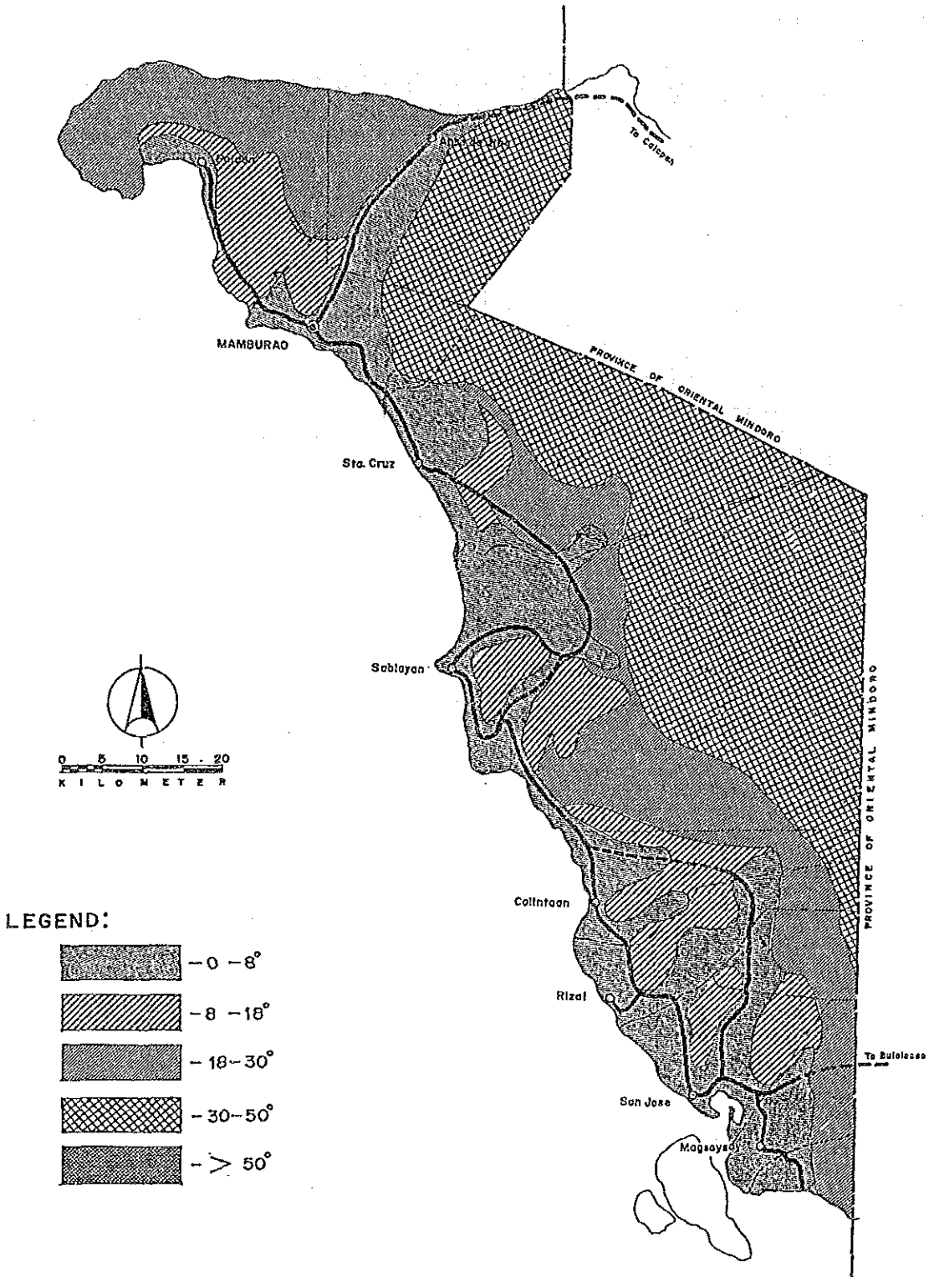

FIGURE 1.2 - 1 SLOPE MAP

Table 1.3-1

POPULATION, LAND AREA AND DENSITY (1990)
Province of Occidental Mindoro

	City/Municipality	Projected Population (1990)	Annual Growth Rate (%)	Land Area (km^2)	Density (p/km^2)
	1. Mamburao	20,688	2.9	339.5	60.9
	2. Abra de Ilog	17,204	2.9	533.7	32.2
	3. Calintaan	20,906	3.6	382.5	54.7
*	4. Looc	7,502	0.9	90.4	83.0
*	5. Lubang	14,989	1.0	113.1	132.5
	6. Magsaysay	23,388	2.9	296.7	78.8
	7. Paluan	9,907	2.9	564.5	17.6
	8. Rizal	25,708	3.3	242.5	106.0
	9. Sablayan	48,207	2.7	2,188.8	22.0
	10. San Jose	88,254	2.9	446.8	197.5
	11. Sta. Cruz	13,115	1.8	681.4	19.3
	T O T A L	289,868	1.0	5,879.9	49.3

Note: * Island Municipality

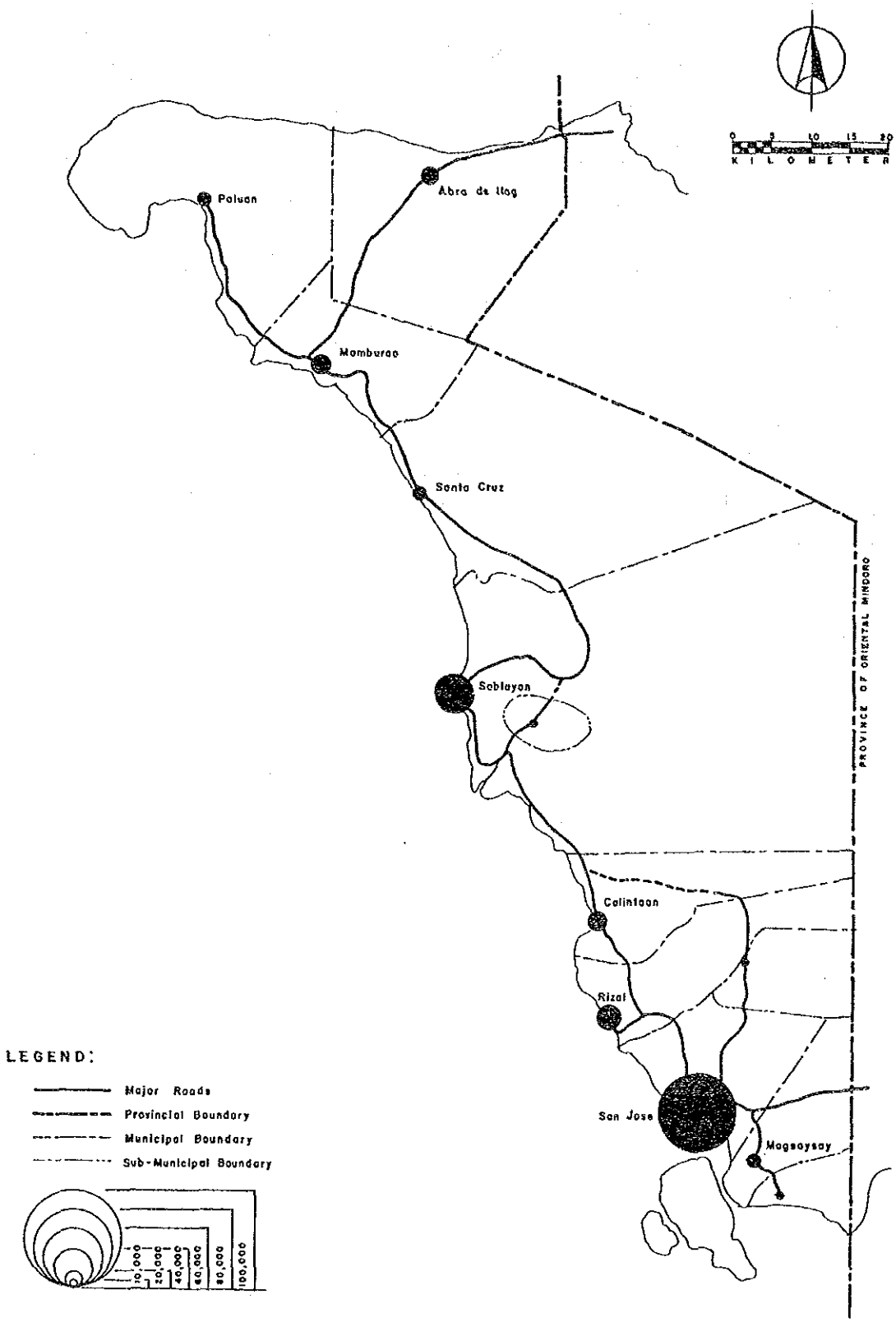

FIGURE 1.3-1 POPULATION BY MUNICIPALITY (1990)

1.4 SOCIO-ECONOMIC PROFILE

Table 1.4-1 shows major socio-economic data of the province in comparison with the national value.

Gross Regional Domestic Product which shows economic output of the province shares 0.4% of the total national output. In view of land area and population share of the province to the country, the province's economic output is in slightly lower level than the national average.

Per capita income of the province is higher by 1.24 times than the national average. Incidence of poverty shows the lower level than the national average. Unemployment and underemployment rates are much lower than the national average.

Agriculture is the predominant industry of the province and shares 73% in terms of number of workers.

Table 1.4-1
MAJOR SOCIO-ECONOMIC DATA OF PROVINCE OF OCCIDENTAL MINDORO

	Occ. Mindoro (A)	Philippines (B)	(A)/(B)
1. Total Land Area (sq.km.)	5,880	300,000	0.020
2. Population in 1990 (1000 persons)	290	61,483	0.005
3. Population Density (persons/sq.km.)	49	205	0.24
4. GRDP (Million ₱ at 1000 prices)	2,394	623,051	0.004
5. Per Capita Income in 1985 (₱/person)	6,935	5,593	1.24
6. Number of Workers by Industrial Sector in 1980 (1000 persons)			
* Agricultural	44.0 (73%)	7,303 (51%)	0.006
* Industry	3.6 (6%)	2,177 (15%)	0.002
* Service	12.5 (21%)	4,552 (32%)	0.003
* Total 1/	60.3 (100%)	14,197 (100%)	0.004
7. Incidence of Poverty in 1985 (%)	51.6	59.3	-
8. Unemployment Rate in 1988 (%)	0.0	8.3	-
9. Underemployment Rate in 1988 (%)	1.8	11.6	-

Note: 1/ Includes other workers who cannot be classified as any one of three (3) sectors.

1.5 AGRICULTURAL LAND USE AND MAJOR CROPS

Occidental Mindoro has a total land area of 5,880 square kilometers, representing 2.0% of the total land area of the Philippines. Table 1.5-1 shows general land use of the province. About 58% of the province are occupied by forest and 15% by grass land. Agricultural land shares only 12%.

Figure 1.5-1 illustrates the agricultural land use of the province. Table 1.5-2 shows major crops produced in the province. Five (5) major crops of the province are palay, coconut, corn, peanut, and mango. The province produces approximately one-fourth of Region IV's palay output.

Table 1.5-1
LAND USE OF OCCIDENTAL MINDORO

Land Use	Area in sq.km.	%
Agricultural Land	723.2	12.3
Forest	3,428.0	58.3
Grass Land	864.3	14.7
Fishpond	47.0	0.8
Idle Area	746.8	12.7
Built-up Area	70.6	1.2
Total	5,879.9	100.0

Source: Socio-Economic Profile of Occidental Mindoro

Table 1.5-2
MAJOR CROPS OF PROVINCE OF OCCIDENTAL MINDORO

Major Crops	Area Utilized (ha.)		Production (M.T.)	
	1985	1986	1985	1986
Palay	62,240	69,440	219,850	228,955
Coconut	-	5,993	-	6,153
Corn	4,570	4,630	5,905	6,265
Peanut	950	950	708	831
Mango	630	800	420	600

Source: Bureau of Agricultural Statistics

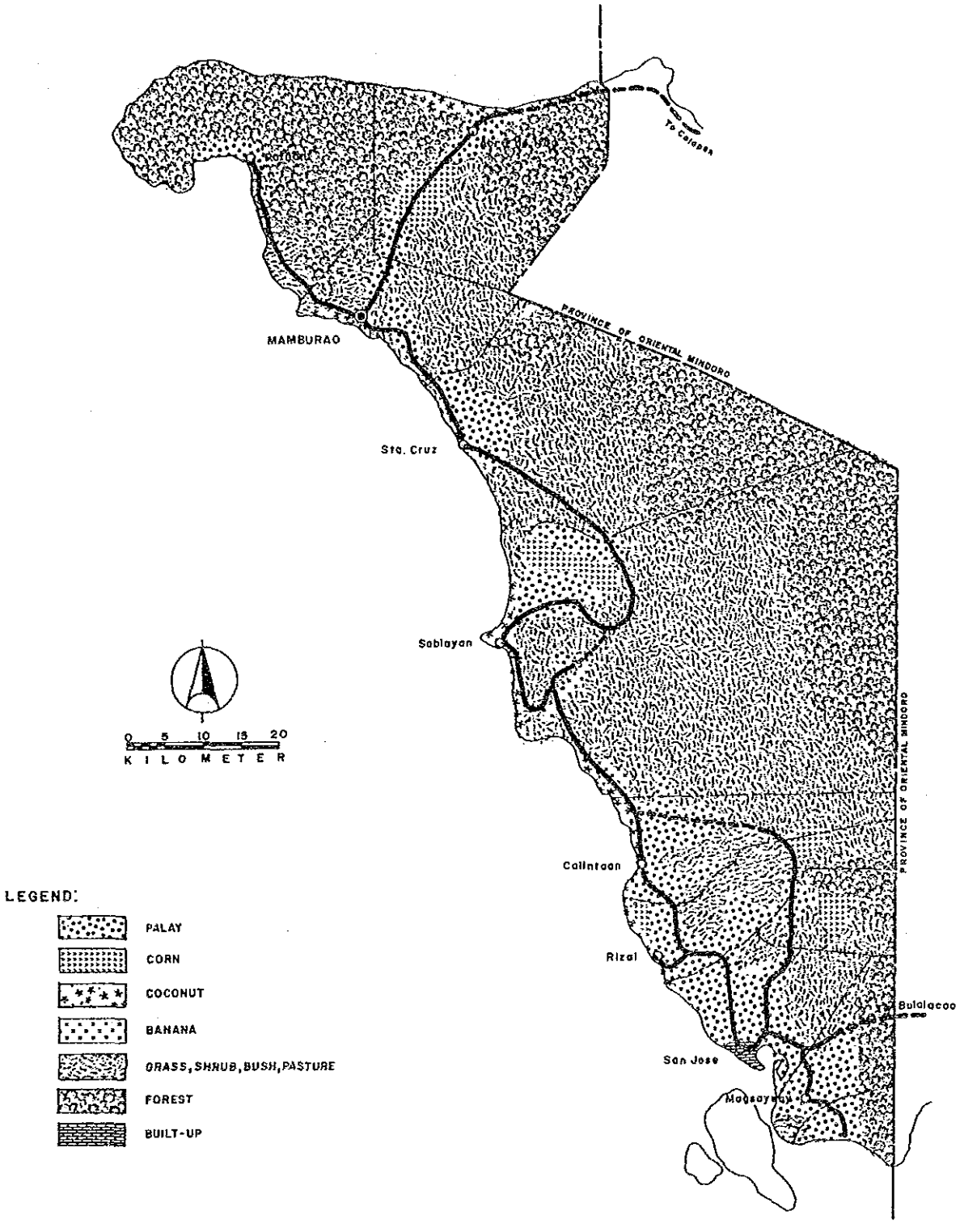

FIGURE 1.5 - 1 AGRICULTURAL LAND USE

CHAPTER 2
ROAD NETWORK OF THE PROVINCE

2.1 GENERAL

The province was classified as one of the provinces of which road network development represents the poor level in the Philippines. In this Chapter, present level of road network development is assessed more in details, then general direction of the future road network development is established. Based on the said assessment and the functional road classification criteria, the major road network for the Province is proposed.

2.2 PRESENT LEVEL OF ROAD NETWORK DEVELOPMENT

Present level of the road network development level is assessed in terms of road extension (quantity of roads), surface type and conditions (quality of roads) and road network pattern.

2.2.1 Present Level of Road Development in terms of Road Extension

Occidental Mindoro has a total of 1,606.5 kms. of roads, comprising 358.9 kms. of National, 321.8 kms. of Provincial, 131.6 kms. of Municipal and 794.2 kms. of Barangay Roads in 1987.

Table 2.2-1 shows road density by class of road which is compared with national average. In comparison with the national average, road development level of the province in terms of road extension is summarized as follows:

National roads .....higher by 1.43 times
Provincial roads.....higher by 1.16 times
Barangay roads.....almost same as the national average
All roads.....almost same as the national average

In terms of road extension, road development level of the Province is considered to be standard.

2.2.2 Present level of Road development in terms of surface type and surface condition

The Study Team conducted an extensive field survey on the existing road conditions of which results are summarized in Table 2.2-2.

TABLE 2.2-1
EXISTING ROAD LENGTH AND ROAD DENSITY
Province of Occidental Mindoro

Road Class	Road Length In 1987 (kms.)	Road Density (L/ PA)		
		Occ. Mindoro	Philippines	Occ. Mindoro/Phils
National Rd.	358.9 (22.4)	0.2854	0.1994	1.43
Prov'l. Rd.	321.8 (20.0)	0.2559	0.2211	1.16
Sub-Total	680.7 (42.4)	0.5413	0.4205	1.29
City Rd.	- -	-	0.0304	-
Municipal Rd	131.6 (8.2)	0.1047	0.0981	1.07
Barangay Rd.	794.2 (49.4)	0.6316	0.6536	0.97
TOTAL	1,606.5(100.0)	1.2776	1.2026	1.06

SOURCE: DPWH Infrastructure Atlas, 1989

TABLE 2.2-2
EXISTING SURFACE CONDITION (SURVEYED ROADS ONLY)
Province of Occidental Mindoro

Road Class	Pavement Type	Surface Condition 1/			% of Pavement Type 2/	
		Good/Fair	Bad/Very Bad	Total (%)	Occ Mindoro	Phils.
National Road	PCC	19.9(100.0)	- -	19.9 (100.0)	4.1	23.6
	Bituminous	2.3 (74.2)	0.8 (25.8)	3.1 (100.0)	2.8	22.3
	Gravel	148.3 (70.1)	63.2 (29.9)	211.5 (100.0)	84.9	51.3
	Earth	- -	5.3 (100.0)	5.3 (100.0)	8.2	2.8
	Total:	170.5 (71.1)	69.3 (28.9)	239.8 (100.0)	100.0	100.0
Provincial Road	PCC	9.8(100.0)	- -	9.8 (100.0)	0.7	2.5
	Bituminous	- -	- -	- -	0.2	8.9
	Gravel	145.9 (67.8)	69.4 (32.2)	215.3 (100.0)	87.0	70.6
	Earth	0.4 (4.9)	7.8 (95.1)	8.2 (100.0)	12.1	18.0
	Total:	156.1 (66.9)	77.2 (33.1)	233.3 (100.0)	100.0	100.0
National and Provincial Road	PCC	29.7(100.0)	- -	29.7 (100.0)	2.4	12.5
	Bituminous	2.3 (74.2)	0.8 (25.8)	3.1 (100.0)	1.6	15.3
	Gravel	294.2 (68.9)	132.6 (31.1)	426.8 (100.0)	85.9	61.4
	Earth	0.4 (3.0)	13.1 (97.0)	13.5 (100.0)	10.1	10.8
	Total:	326.6 (69.0)	146.5 (31.0)	473.1 (100.0)	100.0	100.0

SOURCE: 1/ Survey by Study Team in 1989
2/ DPWH Infrastructure Atlas, 1989

Present level of road development in terms of surface type and surface condition (quality of roads) could be summarized as follows:

National Roads

- Only 7% of national roads are paved with PCC or bituminous surfaces in the Province, which is far below the national average of 46%.
- Although most national roads are still gravel roads, surface conditions are relatively well maintained and about 71% of national roads were assessed good or fair condition.
- In terms of road quality, national roads in the Province are still in very low level.

Provincial Roads

- Only 1% of provincial roads are paved with PCC or bituminous surfaces, which is far below the national average of 11%.
- Road surfaces are relatively well maintained and about 67% were rated good or fair conditions.
- Provincial roads in the Province are still in very low level in terms of quality of roads.

2.2.3 Present Road Network Pattern

Present road network is presented in Figure 2.2-1, which shows all existing national and provincial roads. Present road network of the province is assessed as follows:

- Existing road network pattern is a comb type.
- Due to mountainous terrain, roads connecting Oriental Mindoro are not yet completed, thus, there is no linkage by land transportation between the two (2) provinces.
- As the lowland area between Sta. Cruz and Sablayan is easily flooded during rainy season, there is no road along the coast, instead the existing road runs inland area.
- Most of the sections along the coast are provincial roads. National roads are mostly located inland area and become oftenly impassable.

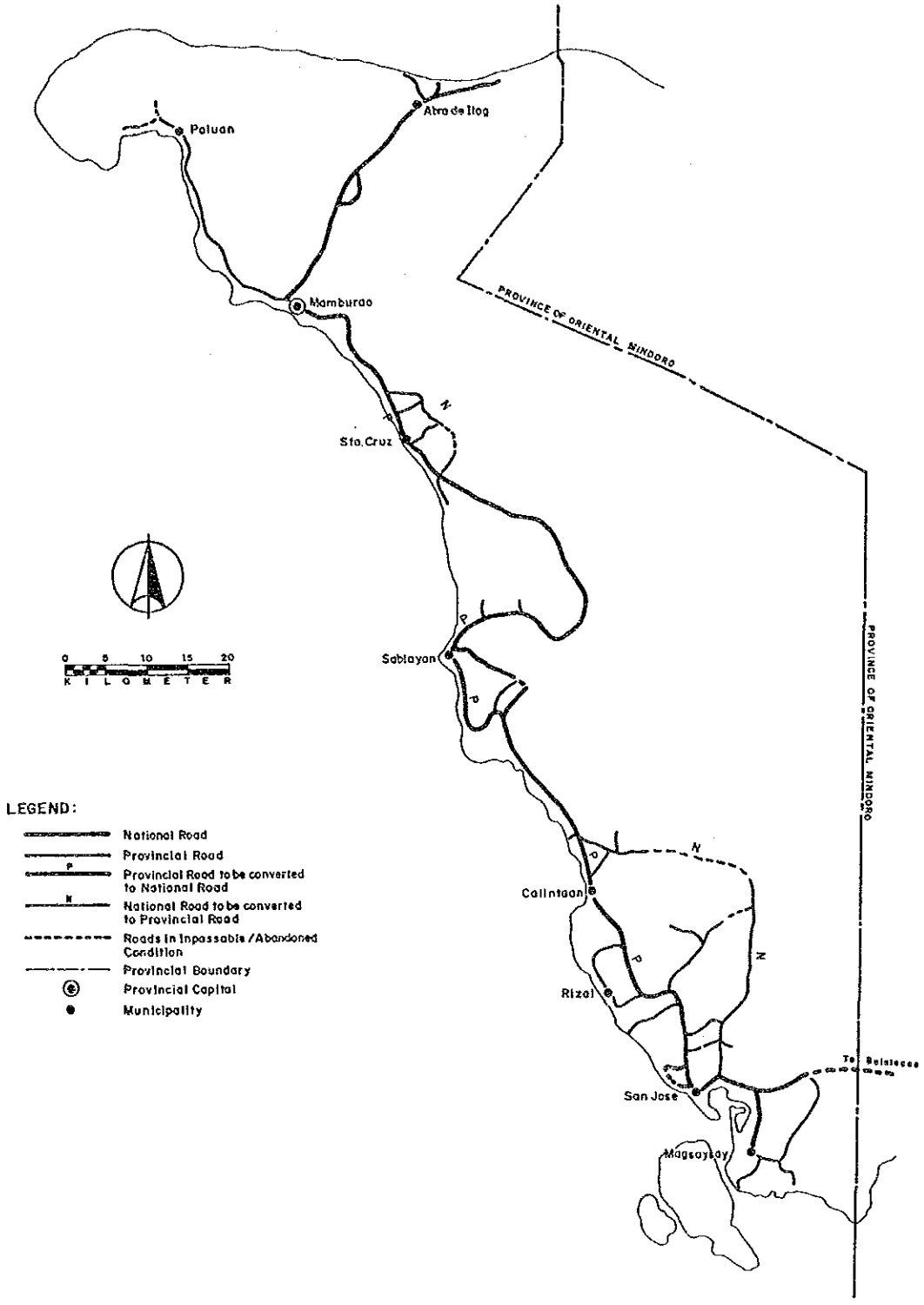

FIGURE 2.2-1 EXISTING ROAD MAP

2.3 GENERAL DIRECTION OF ROAD NETWORK DEVELOPMENT

Results of assessment of present road network' development level are summarized as follows:

- Although road extension is in the average level of the Philippines, quality of roads is still in a very poor level.

- The basic road network within the province is formed, however, major links become impassable during rainy season. Linkage with Oriental Mindoro is not yet achieved.

Based on the above assessment, general direction of road network development of the province will be as follows:

- Upgrading of pavement type of existing roads should be given priority.

- Improvement of major links which currently become impassable during the rainy season should be given priority in order to establish more stable and reliable road network.

- Completion of the roads in the northern and southern tips of the province which connects Oriental Mindoro should be seriously considered.

2.4 PROPOSED MAJOR ROAD NETWORK

2.4.1 Procedure

To identify major roads, all existing roads are firstly classified in accordance with the functional road classification criteria which is shown in Table 2.4-1. Functional classification groups roads according to importance and quality of services they are intended to provide. Individual road links of similar importance and quality of services are organized into systems so that a road network in accordance with the hierarchy of functions can be planned and formed. They can be efficiently managed with consistent policies, design and operation.

After identification of existing major roads, necessity of additional new links is assessed. For example, if a certain municipal town has no access, a new major road is added to the existing major road network. Thus, the initial major road network is proposed and subjected to evaluation whether the proposed one is well-balanced or not. Evaluation is made by two (2) indicators as follows:

a) Network Value

$$Nv = \frac{L}{\sqrt{PA}}$$

Where:
- Nv = Network Value
- L = Road length delineating a block
- P = Population in a block
- A = Land Area in a block
- Block = Area delineated by major roads

b) Accessibility

$$\text{Accessibility} \qquad AC = \sum pl$$

$$\text{Average Accessibility} \qquad A\,ave = \frac{\sum pl}{P}$$

Where
- p = Population of a Barangay
- l = Distance from a barangay center to respective major road
- P = Total population in a block

If indicators of some blocks show imbalanced value, additions or deletions of major road links are made until indicators show almost balanced values. After these adjustment, the major road network is finally proposed.

Table 2.4-1 Proposed Functional Road Classification Criteria for Rural Road Network

Functional Classification		General Definition	General Characteristics and Services Provided	Relationship with Administrative Classification				
				National Road	Provincial Road	City Road	Municipal Road	Barangay Road
Major Road	Primary Major Road	. Major inter-provincial roads. . Intra-provincial roads linking two (2) or more municipal towns to the Provincial Capital . Intra-provincial roads which form a skelton road network of a province	. Provides the highest level of service at the high speed for the long uninterrupted distance . Serves for long distance trips . Mobility is given the highest consideration	●				
	Secondary Major Road	. Roads linking municipal towns each other . Roads linking a municipal town to the Provincial Capital . Roads linking one (1) or more municipal towns to the primary major road network	. Provides high level of service . Serves for medium distance trips . Mobility is given high consideration	●	●	●		
Minor Road	Collector Road	. Roads linking secondary major roads each other or a primary road with a secondary road . Roads linking two (2) or more barangays to the municipal town or to the higher level network	. Provides rather low level of mobility . Serves for short distance trips . Collects traffic from feeder roads and connects them with major roads . Mobility and land access		●	●		●
	Feeder Road	. Roads linking one or more barangays centers to the higher level network . Roads linking farm areas to their respective barangay centers or to the higher level network	. Primarily provides access to abutting land with little or no through traffic . Serves for local traffic . Land access is given high			●		●
S t r e e t		. Roads within built-up population centers (Poblacion) with essentially urban rather than rural rural functions	. Primarily provides access to abutting land in urban areas . Through traffic usage discouraged			●	●	

NOTE: Relationship between functional classification and administrative classification gives only general guideline, therefore, some national roads may be classified as minor roads, or some barangay roads may be classified as major roads.

2.4.2 Proposed Major Road Network

The major road network for the Province of Occidental Mindoro was proposed as shown in Figure 2.4-1. For establishing the major road network, the following were taken into consideration:

- Existing network pattern of comb type was based to formulate a major road network.
- Existing provincial roads along the coast were proposed to be developed as primary major roads.
- In order to complete the major road network, roads in the northern and southern tips were proposed to be completed in the future, if not immediately, no new links were considered necessary.

Network value and accessibility of each block were computed to evaluate whether the proposed major road network is a balanced one. Based on these values, addition or deletion of road links was made and finally the major road network was proposed as shown in Figure 2.4-1.

Network value and accessibility of the proposed major road network are presented in Table 2.4-2.
Proposed major road network has a total length of 390.4 kms. and composed of the following roads.

National Road	274.6 kms.	(76 % of all national roads)
Provincial Road	115.8 kms.	(36 % of all provincial roads)
Total	390.4 kms.	

Table 2.4-2

NETWORK VALUE/ACCESSIBILITY
Province of Occidental Mindoro

Block No.	Population (1990)	Land Area (km^2)	Road Length (km)	Network Value	Access (p.km)	Average Access. (km.)
1	12,296	764.36	65.7	0.678	28,449	2.314
2	23,404	206.50	60.7	0.873	41,814	1.787
3	11,913	101.50	43.0	1.237	3,570	0.300
4	44,207	340.25	94.2	0.768	58,319	1.319
5	38,140	239.64	57.3	0.599	67,478	1.769
6	48,312	3,517.27	228.0	0.553	32,197	0.666
Ave.	29,712	861.59	91.5	0.572	38,638	1.300

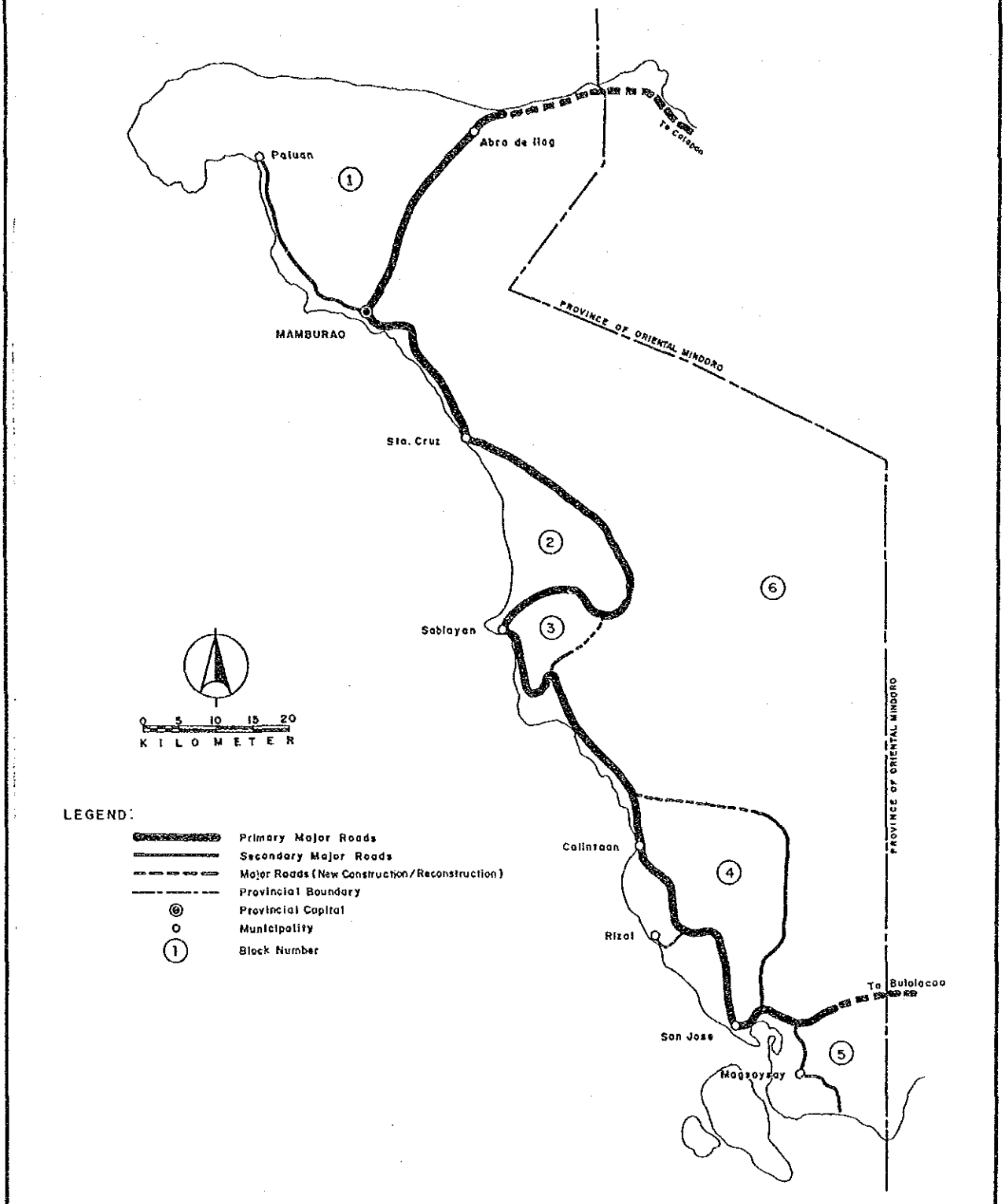

FIGURE 2.4-1 PROPOSED MAJOR ROAD NETWORK

CHAPTER 3
TRAFFIC

3.1 TRAFFIC SURVEY RESULTS

Roadside traffic count survey was conducted on selected roads. Traffic counts were carried out on two (2) consecutive days for 12 hours from 6:00 AM to 6:00 PM each day. Traffic volume was counted by direction and by vehicle type every hour. The vehicle type was classified as follows:

- Car
- Jeep
- Van
- Jeepney
- Bus (mini bus & large bus)
- Truck (including trailer)
- Motor-tricycle
- Motorcycle
- Animal drawn
- Pedestrian
- Others

Figure 3.1-1 shows the location of traffic count stations. Traffic survey results are summarized in Table 3.1-1.

Survey results were converted to Average Daily Traffic (ADT) by using the hourly factors based on the data from the Nationwide Traffic Counts Program (NTCP). Considering other factors such as market days, harvest season, rainy season, etc., AADT were estimated by vehicle type.

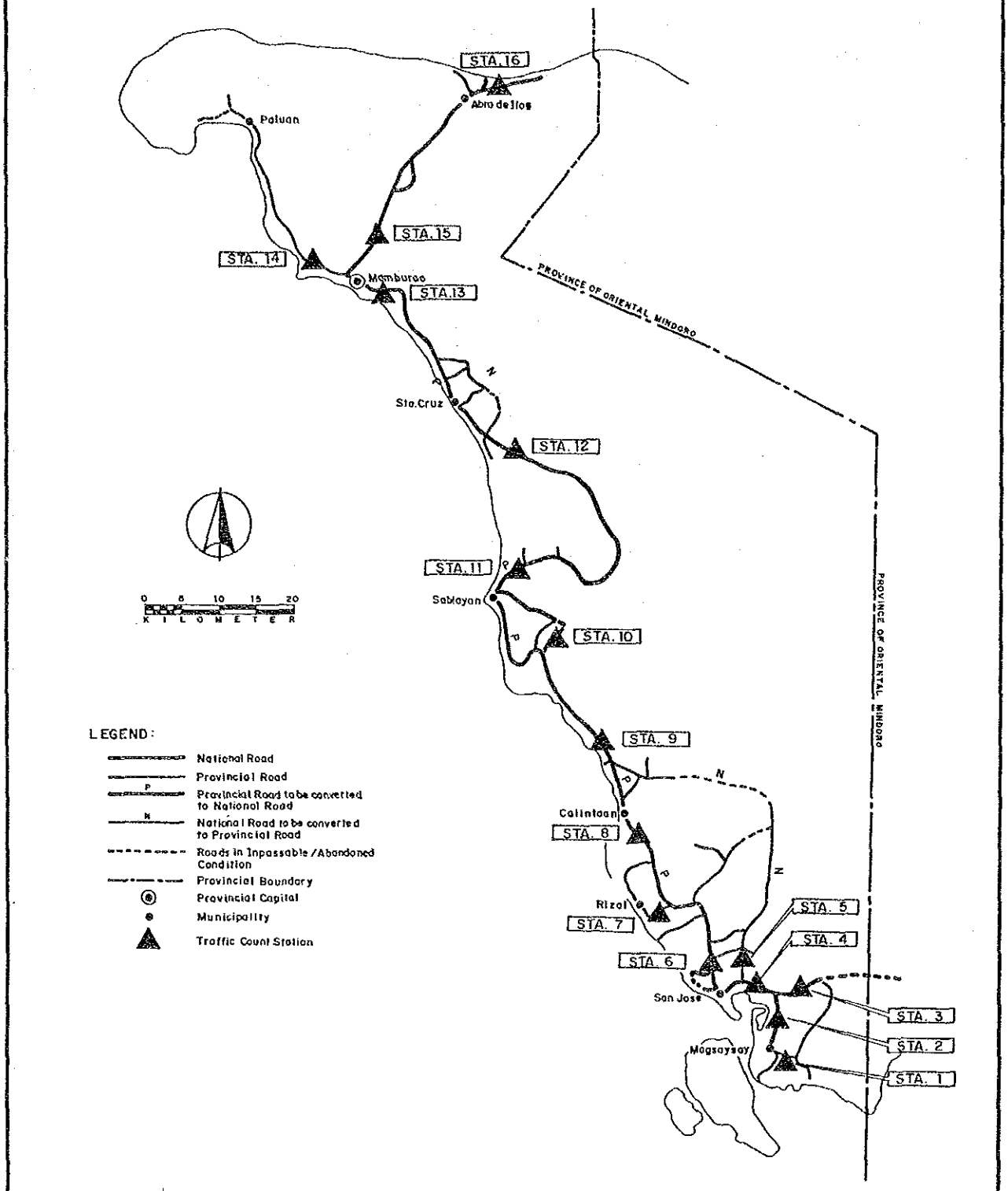

FIGURE 3.1-1 TRAFFIC COUNT STATIONS

TABLE 3.1-1 SUMMARY OF TRAFFIC SURVEY RESULTS
- OCCIDENTAL MINDRO -

(ADT as of Feb. 1990)

Station No.	Car	Jeep	Pickup /Van	Jeepney	Bus	Truck	Sub-Total	Tri-cycle	Motor-cycle	Animal Drawn	Total
1	0	16	18	83	0	26	143	197	97	8	444
2	0	47	26	107	0	19	198	114	109	1	423
3	0	12	7	39	0	4	61	50	40	2	152
4	0	48	27	162	0	72	309	279	147	0	735
5	0	48	34	141	0	14	237	265	143	0	645
6	0	68	30	235	8	70	411	72	115	0	598
7	0	7	1	22	0	1	31	17	81	0	129
8	0	25	7	86	6	33	156	56	52	2	266
9	0	9	10	46	4	13	83	4	24	1	113
10	0	10	1	13	0	10	35	14	23	28	100
11	0	9	29	65	9	56	168	402	360	4	933
12	0	4	4	22	4	7	41	2	15	3	62
13	3	35	30	98	6	33	204	309	113	3	630
14	0	8	3	20	0	6	36	65	14	0	115
15	0	8	9	46	0	15	79	6	12	0	96
16	0	17	4	65	0	9	95	243	28	6	371

Source: Traffic Survey by Study Team (Feb. 1990)

3.2 TRAFFIC ANALYSIS AND FORECAST: TRAFFIC PROJECTS.

3.2.1 Analysis of Present Traffic

1) General Procedure

Present traffic on each major road network was analyzed according to the procedure shown in Figure 3.2-1.

The analysis is divided into three major steps:

Step I : Analysis of Traffic Survey Results

The number of passengers and commodity tonnage were obtained from the results of the traffic survey. These data are, however, available only on the surveyed road links and used for calibration purposes for the traffic model described below.

Step II : Analysis by Traffic Model

Traffic generation and attraction, in terms of passengers and commodity tons, were estimated based on population and per capita traffic generation factors; traffic distribution (OD distribution) was estimated by the gravity model; then, OD distribution was assigned to the major road network expressed by the node and link system. In the analysis, since only traffic generation factors were unknown, assumed values were used in the first step.

Step III : Comparison of Both Figures

The number of passengers and commodity tonnage estimated by the traffic model were compared with those derived from the traffic survey. On the basis of the comparison, traffic generation factors were appropriately adjusted and the traffic model analysis was reiterated until the traffic model reflected the actual people and freight movements with a high accuracy.

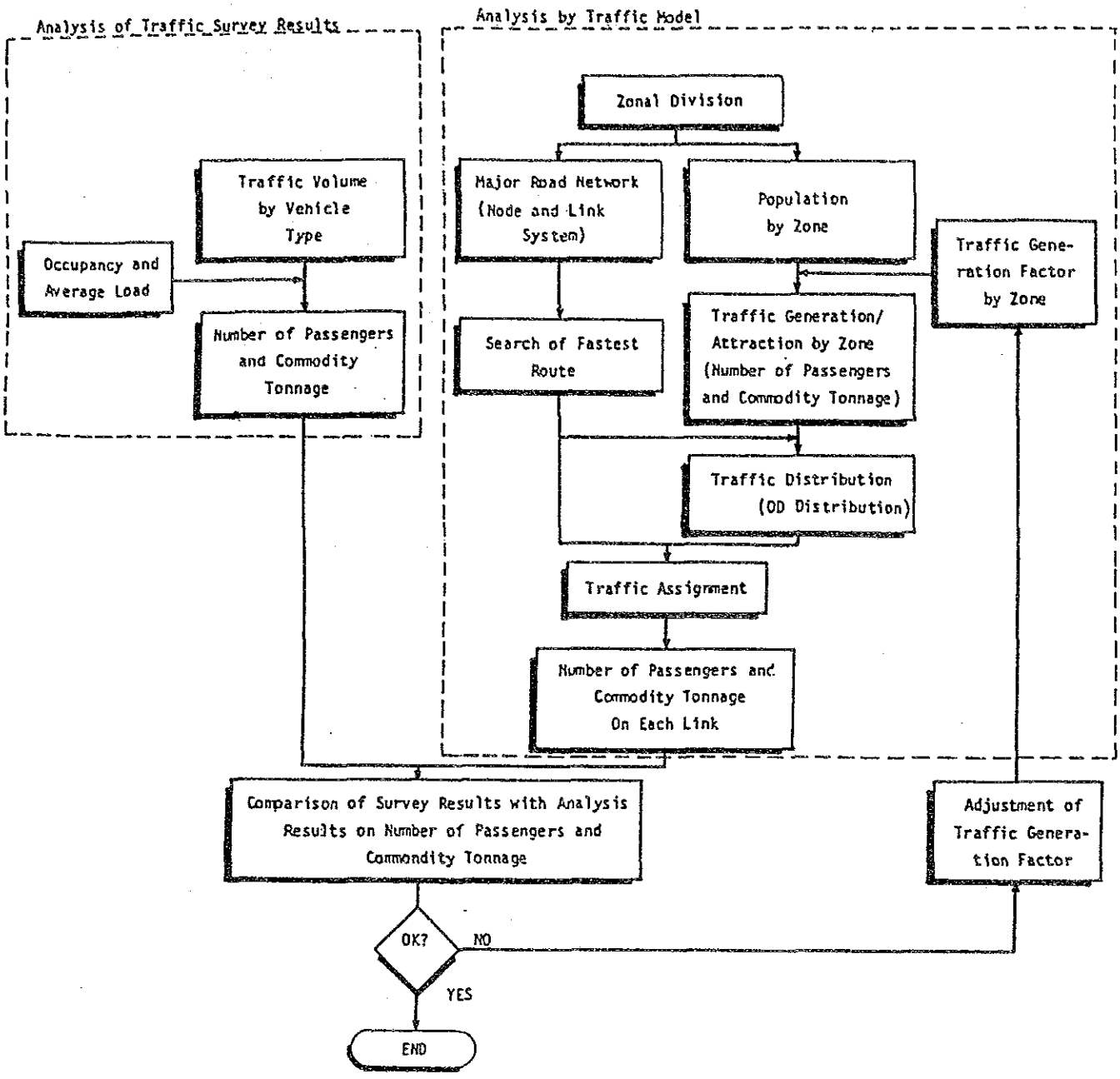

FIGURE 3.2-1
PROCEDURE OF ANALYSIS OF PRESENT TRAFFIC ON MAJOR ROAD NETWORK

2) Analysis of Traffic Survey Results

Traffic volume by vehicle type counted in the traffic survey was converted to number of passengers and commodity tonnage using the occupancy and average load shown in Table 3.2-1.

Table 3.2-1 OCCUPANCY AND AVERAGE LOAD
Province of Occidental Mindoro

	Average Number of Passenger per vehicle	Average Load (ton per vehicle)
Car/Taxi	3.40	1.00
Jeep	3.40	1.00
Van/Pickup	3.40	1.00
Jeepney	11.80	1.00
Bus	25.30	1.00
Truck	5.00	3.00
Motor-tricycle	2.90	0.30
Motorcycle	1.60	0.10
Animal Drawn	3.00	0.15

3) Analysis by Traffic Model

i) Zonal Division:
The province was divided into traffic zones corresponding to municipal divisions in principle.

ii) Major Road Network:
The major road network was expressed by a node and link system. Each link was given length and average speed according to the actual road condition. A node and link system of the Province is presented in Figure 3.2-2.

iii) Search for the Fastest Route:
The fastest route for each zone pair was calculated by Moore's Method.

iv) Traffic Generation Factor:
Per capita traffic generation factors (trip/person/day and ton/person/day) vary between zones even in the same province with many factors such as:

- Economic Activity
- Size of Population
- Distance from Provincial Capital
- Road Condition
- Other Physical Conditions

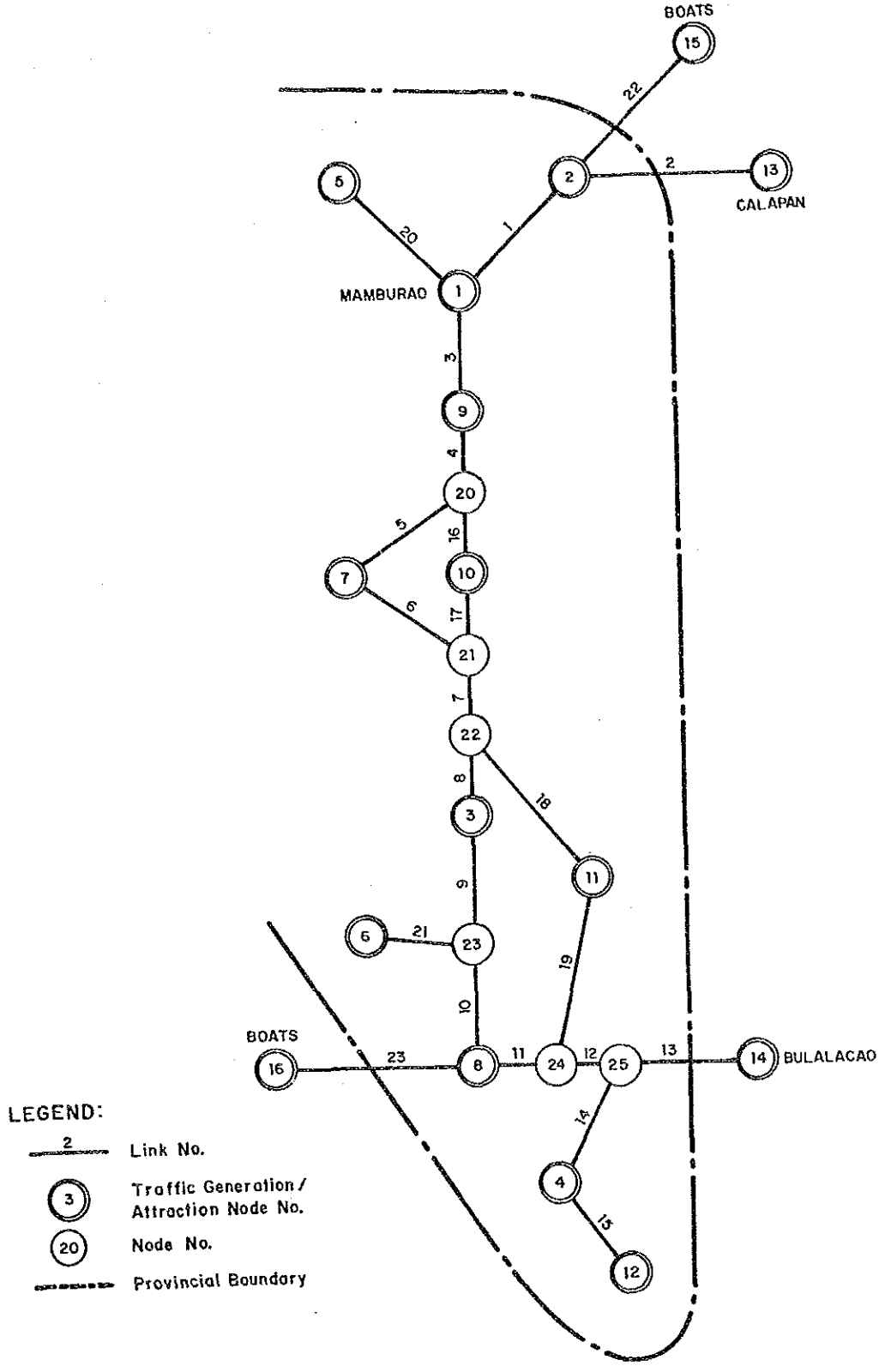

FIGURE 3.2-2 LINK / NODE SYSTEM
PROVINCE OF OCCIDENTAL MINDORO

The generation factors which best illustrate the observed people and freight movement were estimated by the iterative method. The traffic generation factors thus estimated are summarized in Table 3.2-2.

TABLE 3.2-2 PER CAPITA TRAFFIC GENERATION FACTORS (MAJOR ROAD, 1990 W/O) Province of Occidental Mindoro

	Passenger Movement (trip/person/day)	Commodity (kg/person/day)
Range	0.014 - 0.045	2.0 - 6.6
Mean Value	0.030	4.3

v) Traffic Generation and Attraction by Zone:

Traffic generation and attraction were obtained in terms of passengers and commodity tonnage as the product by generation factors.

vi) Traffic Distribution:

Traffic distribution (OD distribution) was estimated by the gravity model:

$$Xij = k\frac{Gi.Aj}{tiJ^2}$$

Where, Xij = Traffic from zone i to zone j
k = Parameter
Gi = Traffic generation in zone i
Aj = Traffic attraction in zone j
tij = Travel time from zone i to zone j along the fastest route

OD distribution was adjusted so as to satisfy the following conditions by the Frator Method:

$$Gi = \sum_{j+1}^{n} Xij$$

$$Aj = \sum_{i+1}^{n} Xij$$

Where, n = Number of zones

vii) Traffic Assignment:

Each OD traffic was assigned to the major road network expressed by the node and link system on an all-or-nothing basis. Thus, the number of passengers and commodity tonnage for each link were calculated.

3.2.2 Traffic Forecast

Figure 3.2-3 illustrates the procedure of traffic forecast.

The traffic model prepared for the analysis of present traffic was basically used for forecasting future traffic on the major road network with the following additions/ modifications:

1) Major Road Network and Fastest Route Search

The node and link system for the "with" case was prepared by changing the characteristics of the links included under this feasibility study as well as the links committed to be improved.

The fastest route search was carried out both in the "w/o" and "with" case networks.

2) Traffic Generation/Attraction and Distribution

The future population was based on the NCSO 1980 Census of Population and Housing.

Per capita traffic generation factors in the "with" case were estimated referring to the generated transport demand/transport cost reduction elasticity shown in "Highway Planning Manual, Volume 3, MPWH" and also based on the results of the analysis of present traffic. For instance, a zone showing a small generation factor at present due to poor road conditions is expected to increase the factor to some extent by road improvement, and the degree of increase can be estimated referring to other zones in similar situations but with better road conditions.

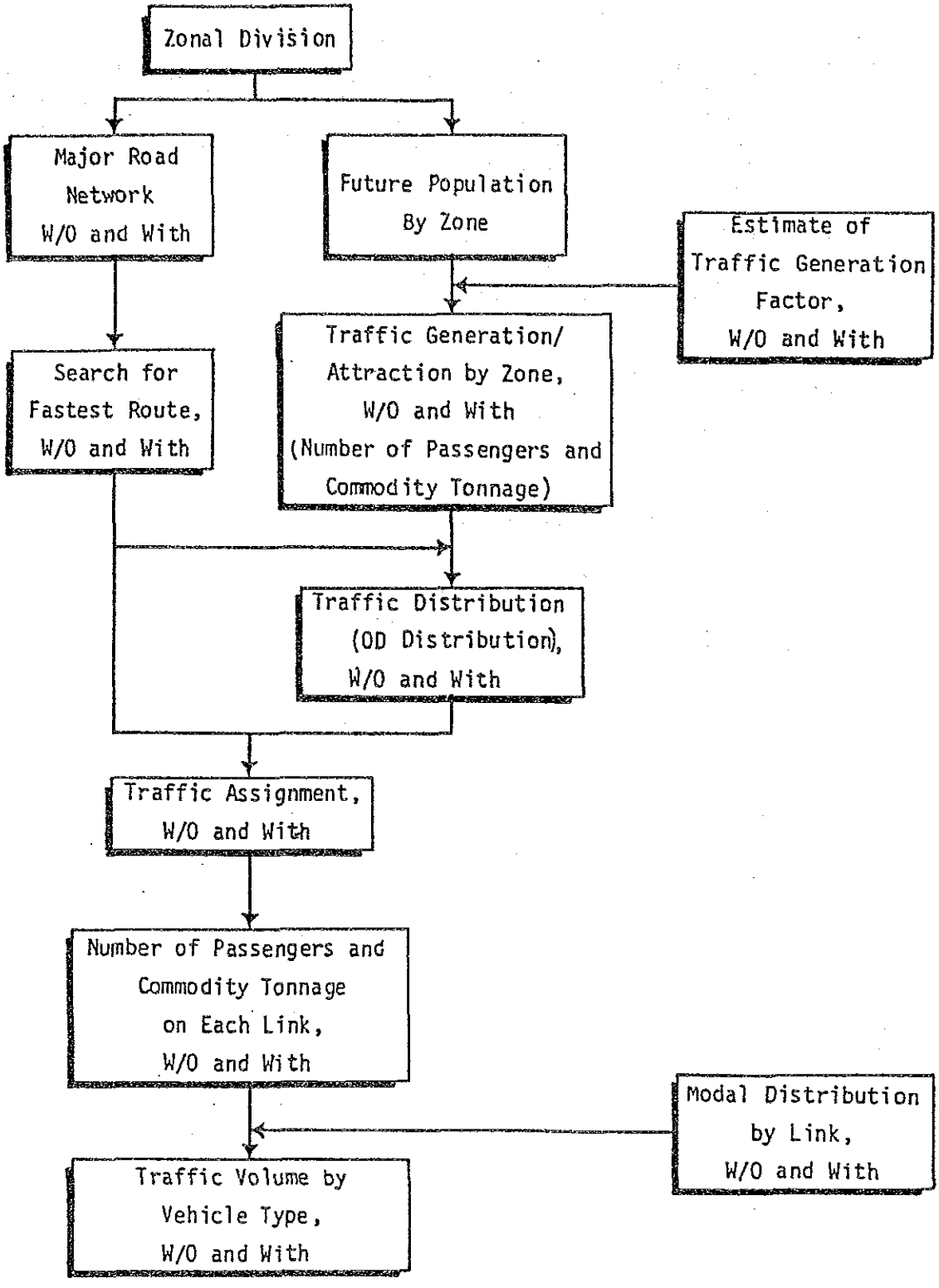

FIGURE 3.2-3
PROCEDURE OF FORECASTING TRAFFIC ON MAJOR ROAD NETWORK

The traffic generation factors thus estimated are summarized in Table 3.2-3.

TABLE 3.2-3 PER CAPITA TRAFFIC GENERATION FACTORS (MAJOR ROAD, 1990 WITH)
Province of Occidental Mindoro

	Passenger Movement (trip/person/day)	Commodity (kg/person/day)
Range	0.036 - 0.045	5.3 - 6.6
Mean Value	0.040	5.8

The transition period, i.e., the period which will elapse after opening of the improved road before the full impact on generation will take place, was assumed to be three years.

Traffic distribution for the "with" case was estimated by the same method as used in the analysis of present traffic.

3) Traffic Assignment

The number of passengers and commodity tonnage on each link in the "with" case was estimated by assigning OD traffic to the major road network in the "with" case. They were converted to the number of vehicles using the modal distribution in the "with" case. Changes in modal distribution with changes in road condition were estimated reffering to the present distribution in other road links in a similar situation but in the road condition. The transition period of a complete change in modal distribution was assumed to be three years.

The traffic in the "with" case was broken down into following four categories for convenience of traffic benefit estimation:

Normal Traffic: Flow of passengers and freight which will occur even without road improvement. However, changes in the number of vehicles is possible due to changes in modal distribution.

Diverted Traffic-1: Traffic which diverts to a certain road from other routes as a consequence of road improvement. This is usually called simply diverted traffic.

Diverted Traffic-2: Traffic which changes destination as a consequence of road improvement but for the same trip purpose as in the "w/o" case. This is possible in the case of improvement of the access road to the nearest town which is at present barely accessible due to poor conditions. This traffic is called "Diverted Traffic-2" in this Study, distinguished from Diverted Traffic-1.

Generated Traffic: Increased traffic brought about by road improvement.

3.2.3 Estimated Present and Future Traffic

Estimated present and future traffic on the major road is illustrated in Figure 3.2-4 and Figure 3.2-5, respectively.

Estimated present and future movements of passengers and commodity by link are presented in Table 3.2-4, and estimated traffic volumes are presented in Table 3.2-5.

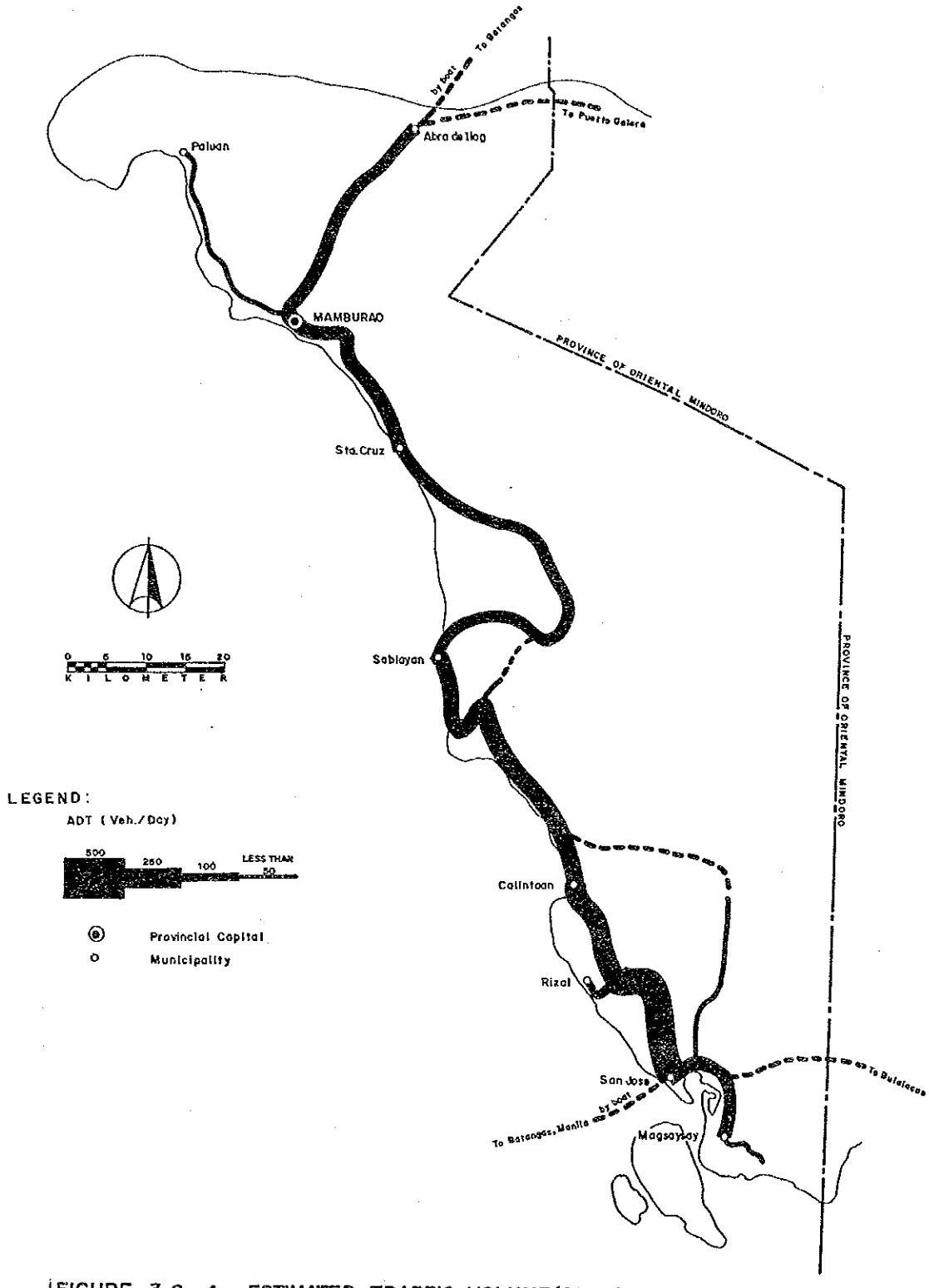

FIGURE 3.2-4 ESTIMATED TRAFFIC VOLUME(1990)

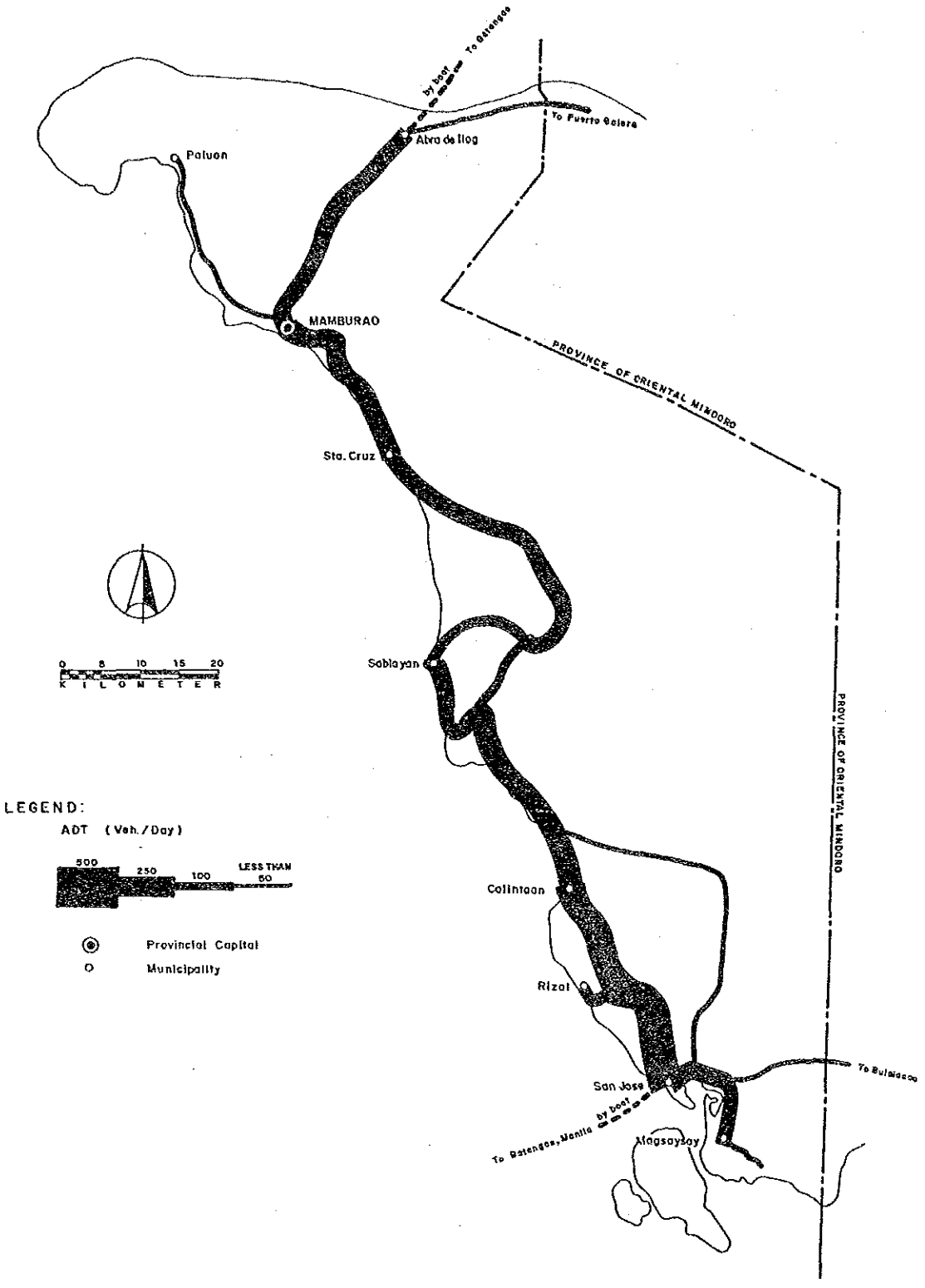

FIGURE 3.2-5 ESTIMATED TRAFFIC VOLUME (1993)
"WITH PROJECT" CASE

TRAFFIC PROJECTION OCCIDENTAL MINDORO

TABLE 3.2 - 4 (1)

Movement of Passengers and Commodity

Link	Year	Number of Passengers					Commodity Tonnage				
		Normal	Diverted-1	Diverted-2	Generated	Total	Normal	Diverted-1	Diverted-2	Generated	Total
1	1990	712				712	111.21				111.21
	1993	844	-	5	473	1321	128.11	-	.14	66.88	195.13
	1997	1059	-	6	1779	2844	154.69	-	.17	242.76	397.62
	2007	1790	-	10	3015	4815	237.56	-	.22	373.28	611.06
	2017	2887	-	16	4891	7794	348.01	-	.32	548.22	896.55
2	1990	-				-	-				-
	1993	-	-	-	473	473	-	-	-	66.88	66.88
	1997	-	-	-	1779	1779	-	-	-	242.76	242.76
	2007	-	-	-	3015	3015	-	-	-	373.28	373.28
	2017	-	-	-	4891	4891	-	-	-	548.22	548.22
3	1990	1030				1030	146.17				146.17
	1993	1211	-	-29	432	1614	166.80	-	-4.32	61.10	223.58
	1997	1502	-	-35	1626	3092	198.88	-	-5.07	221.87	415.68
	2007	2472	-	-56	2757	5173	295.69	-	-6.76	341.41	630.33
	2017	3902	-	-85	4476	8293	423.45	-	-9.44	501.70	915.71
4	1990	825				825	113.03				113.03
	1993	971	-	12	432	1414	129.18	-	1.26	61.10	191.53
	1997	1205	-	14	1626	2844	154.33	-	1.43	221.87	377.64
	2007	1987	-	22	2757	4766	229.80	-	2.70	341.41	573.91
	2017	3142	-	33	4476	7650	330.32	-	3.56	501.70	835.58
5	1990	825				825	113.03				113.03
	1993	971	-442	-	234	763	129.18	-57.17	-.21	33.16	104.95
	1997	1205	-547	-1	872	1528	154.33	-68.15	-.29	118.63	204.52
	2007	1987	-899	-2	1435	2521	229.80	-100.67	-.70	177.28	305.71
	2017	3142	-1416	-4	2270	3992	330.32	-144.01	-1.14	254.42	439.59
6	1990	1246				1246	169.75				169.75
	1993	1466	-442	1	137	1162	194.06	-57.17	.23	19.36	156.49
	1997	1821	-547	1	520	1795	231.93	-68.15	.31	70.27	234.37
	2007	3009	-899	2	895	3007	345.82	-100.67	.65	109.77	355.57
	2017	4764	-1416	5	1461	4814	497.06	-144.01	1.07	163.64	517.76
7	1990	1299				1299	175.96				175.96
	1993	1528	-	4	288	1820	201.08	-	.39	40.81	242.28
	1997	1898	-	4	1104	3006	240.20	-	.45	150.29	390.94
	2007	3133	-	7	1936	5077	357.54	-	1.80	239.28	598.62
	2017	4956	-	12	3225	8193	513.35	-	2.53	361.47	877.34
8	1990	1299				1299	175.96				175.96
	1993	1528	-	3	276	1808	201.08	-.06	.38	39.08	240.48
	1997	1898	-	4	1059	2961	240.20	-.07	.44	144.22	384.79
	2007	3133	-1	7	1867	5006	357.54	-.12	1.78	230.66	589.86
	2017	4956	-1	12	3120	8087	513.35	-.18	2.51	349.66	865.34

TRAFFIC PROJECTION OCCIDENTAL MINDORO

TABLE 3.2 - 4 (2)

Movement of Passengers and Commodity

Link	Year	Number of Passengers					Commodity Tonnage				
		Normal	Diver-ted-1	Diver-ted-2	Gene-rated	Total	Normal	Diver-ted-1	Diver-ted-2	Gene-rated	Total
	1990	1570				1570	214.56				214.56
	1993	1856	-	1	238	2095	246.45	-.07	-.01	33.74	280.11
9	1997	2321	-	1	916	3238	296.48	-.09	-.04	124.66	421.01
	2007	3893	-1	1	1621	5515	449.12	-.15	1.01	200.23	650.22
	2017	6242	-1	2	2719	8962	653.77	-.22	1.33	304.84	959.72
	1990	2140				2140	296.49				296.49
	1993	2538	-	1	133	2672	341.62	-.07	.04	18.78	360.36
10	1997	3187	-	1	514	3702	412.65	-.09	.03	69.85	482.44
	2007	5395	-1	1	927	6322	631.79	-.15	1.09	114.29	747.03
	2017	8714	-1	1	1579	10293	926.21	-.22	1.50	176.99	1104.48
	1990	1117				1117	162.23				162.23
	1993	1325	-	-1	133	1456	186.85	-.07	-.13	18.78	205.43
11	1997	1663	-	-1	514	2175	225.60	-.09	-.16	69.85	295.20
	2007	2813	-1	-2	927	3736	346.73	-.15	-.52	114.29	460.35
	2017	4540	-1	-3	1579	6114	507.74	-.22	-.76	176.99	683.75
	1990	1066				1066	154.80				154.80
	1993	1264	-	-1	134	1397	178.30	-	-.12	18.94	197.12
12	1997	1587	-	-1	519	2104	215.28	-	-.14	70.48	285.61
	2007	2684	-	-2	937	3619	330.86	-	-.48	115.52	445.90
	2017	4332	-	-2	1598	5928	484.52	-	-.70	179.13	662.95
	1990	-				-	-				-
	1993	-	-	-	134	134	-	-	-	18.94	18.94
13	1997	-	-	-	519	519	-	-	-	70.48	70.48
	2007	-	-	-	937	937	-	-	-	115.52	115.52
	2017	-	-	-	1598	1598	-	-	-	179.13	179.13
	1990	1066				1066	154.80				154.80
	1993	1264	-	-1	-	1263	178.30	-	-.12	-	178.19
14	1997	1587	-	-1	-	1586	215.28	-	-.14	-	215.13
	2007	2684	-	-2	-	2682	330.86	-	-.48	-	330.38
	2017	4332	-	-2	-	4330	484.52	-	-.70	-	483.82
	1990	292				292	42.44				42.44
	1993	346	-	-	-	346	48.89	-	.01	-	48.90
15	1997	434	-	-	-	434	59.03	-	.02	-	59.05
	2007	735	-	-	-	735	90.78	-	-.04	-	90.74
	2017	1186	-	-	-	1187	133.00	-	-.06	-	132.94
	1990	-				-	-				-
	1993	-	442	12	197	651	-	57.17	1.47	27.94	86.58
16	1997	-	547	15	754	1316	-	68.15	1.72	103.25	173.11
	2007	-	899	24	1322	2245	-	100.67	3.40	164.13	268.20
	2017	-	1416	37	2205	3659	-	144.01	4.70	247.28	395.99

TRAFFIC PROJECTION OCCIDENTAL MINDORO

TABLE 3.2 - 4 (3)

Movement of Passengers and Commodity

Link	Year	Number of Passengers					Commodity Tonnage				
		Normal	Diverted-1	Diverted-2	Generated	Total	Normal	Diverted-1	Diverted-2	Generated	Total
17	1990	94				94	13.63				13.63
	1993	111	437	8	233	788	15.65	56.28	.89	32.92	105.74
	1997	138	541	10	887	1576	18.81	67.07	1.03	121.15	208.05
	2007	232	887	16	1544	2679	28.59	98.98	2.38	191.43	321.39
	2017	371	1397	25	2561	4354	41.55	141.51	3.24	287.15	473.45
18	1990	-				-	-				-
	1993	-	-	-	25	26	-	.07	.02	3.60	3.69
	1997	-	-	-	96	96	-	.09	.03	13.02	13.13
	2007	-	1	-	161	162	-	.15	.04	19.85	20.04
	2017	-	1	-	258	260	-	.22	.06	28.90	29.18
19	1990	51				51	7.47				7.47
	1993	61	-	-	8	68	8.60	-.07	-.02	1.14	9.66
	1997	76	-	-	31	107	10.39	-.09	-.02	4.16	14.44
	2007	129	-1	-	53	181	15.98	-.15	-.05	6.53	22.31
	2017	209	-1	-	87	294	23.40	-.22	-.07	9.76	32.87
20	1990	225				225	32.75				32.75
	1993	267	-	-	54	320	37.73	-	-	7.59	45.32
	1997	335	-	-	202	537	45.57	-	-	27.40	72.96
	2007	567	-	-	341	908	69.99	-	-.01	42.06	112.03
	2017	915	-	-	551	1467	102.55	-	-.02	61.79	164.32
21	1990	588				588	85.53				85.53
	1993	704	-	-	140	844	99.45	-	.03	19.74	119.23
	1997	895	-	-	532	1427	121.58	-	.04	72.40	194.03
	2007	1555	-	-	925	2480	192.08	-	-.09	114.20	306.19
	2017	2565	-	1	1525	4090	287.44	-	-.12	170.97	458.30
22	1990	82				82	2.99				2.99
	1993	98	-	-	-	98	3.45	-	-	-	3.45
	1997	123	-	-	-	123	4.18	-	-	-	4.18
	2007	210	-	-	-	210	6.46	-	-	-	6.47
	2017	341	-	-	-	341	9.54	-	-	-	9.54
23	1990	174				174	42.36				42.36
	1993	206	-	-	-	206	48.88	-	.02	-	48.90
	1997	260	-	-	-	260	59.18	-	.02	-	59.20
	2007	442	-	-	-	442	91.62	-	-.04	-	91.58
	2017	719	-	-	-	719	135.16	-	-.06	-	135.10

TABLE 3.2 - 5 (1)

Traffic Volume

Link	Year	w/o									with								
		Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-cycl	Mot. cycl	Ani-mal	Total	Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-cycl	Mot. cycl	Ani-mal	Total
	1990	54	70	-	19	143	12	22	-	178									
	1993	63	83	-	21	167	15	26	-	208	84	118	2	39	243	23	41	-	308
1	1997	78	103	-	26	206	18	33	-	257	123	208	11	106	449	49	89	-	587
	2007	124	169	-	40	332	31	56	-	419	203	347	19	163	731	83	150	-	965
	2017	189	265	-	58	513	50	90	-	653	319	552	31	239	1141	134	244	-	1519
	1990	-	-	-	-	-	-	-	-	-									
	1993	-	-	-	-	-	-	-	-	-	8	12	0	6	26	-	5	402	434
2	1997	-	-	-	-	-	-	-	-	-	89	137	7	61	294	-	56	-	349
	2007	-	-	-	-	-	-	-	-	-	145	229	12	93	479	-	94	-	573
	2017	-	-	-	-	-	-	-	-	-	226	366	19	137	748	-	153	-	901
	1990	44	90	6	27	168	42	32	-	242									
	1993	51	105	7	31	194	49	38	-	281	69	132	11	46	258	49	44	-	351
3	1997	62	129	9	36	236	59	47	-	342	133	220	29	104	485	32	58	-	575
	2007	95	206	15	54	370	92	77	-	539	215	358	49	158	779	54	97	-	930
	2017	142	316	23	78	559	138	122	-	819	335	559	79	229	1202	86	155	-	1443
	1990	35	72	5	21	132	33	26	-	191									
	1993	40	83	6	24	153	38	30	-	222	60	115	10	39	224	42	38	-	305
4	1997	49	102	7	28	186	46	38	-	270	121	201	27	94	444	29	53	-	527
	2007	75	164	12	42	293	73	62	-	428	198	328	45	143	715	49	89	-	853
	2017	112	252	19	61	444	109	98	-	651	309	514	73	209	1104	79	143	-	1327
	1990	35	72	5	21	132	33	26	-	191									
	1993	40	83	6	24	153	38	30	-	222	32	62	5	22	122	23	21	-	165
5	1997	49	102	7	28	186	46	38	-	270	65	108	14	51	239	16	29	-	284
	2007	75	164	12	42	293	73	62	-	428	105	174	24	76	379	26	47	-	452
	2017	112	252	19	61	444	109	98	-	651	161	269	38	110	578	41	75	-	694
	1990	52	108	7	31	199	50	39	-	287									
	1993	60	126	9	36	230	58	46	-	334	49	94	8	32	184	35	31	-	250
6	1997	73	154	11	43	281	70	57	-	408	76	126	17	59	278	19	34	-	330
	2007	113	248	18	63	442	110	94	-	646	124	206	29	89	448	31	56	-	535
	2017	169	382	28	91	671	165	149	-	985	193	322	46	129	691	50	90	-	831
	1990	54	112	8	32	206	52	41	-	299									
	1993	63	131	9	37	239	60	48	-	347	76	147	13	50	286	54	49	-	389
7	1997	76	161	11	44	292	73	59	-	424	127	211	29	98	465	31	56	-	553
	2007	118	257	19	66	459	114	98	-	671	209	348	48	150	755	53	95	-	903
	2017	176	397	29	94	696	171	155	-	1022	329	548	78	219	1174	85	154	-	1412
	1990	54	112	8	32	206	52	41	-	299									
	1993	63	131	9	37	239	60	48	-	347	76	146	13	49	284	54	49	-	387
8	1997	76	161	11	44	292	73	59	-	424	126	208	28	96	458	31	56	-	544
	2007	118	257	19	66	459	114	98	-	671	206	343	47	147	744	52	94	-	890
	2017	176	397	29	94	696	171	155	-	1022	324	541	77	216	1158	84	152	-	1394

TRAFFIC PROJECTION OCCIDENTAL MINDORO

TABLE 3.2 - 5 (2)

Traffic Volume

Link	Year	w/o Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-cycl	Mot. cycl	Ani-mal	Total	with Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-cycl	Mot. cycl	Ani-mal	Total
9	1990	66	136	9	39	251	63	49	-	363									
	1993	77	159	11	45	292	73	58	-	423	88	170	15	58	330	62	57	-	449
	1997	93	197	14	54	359	89	73	-	520	137	228	31	105	501	33	61	-	595
	2007	147	321	23	82	573	142	122	-	837	227	378	52	163	820	57	103	-	980
	2017	223	501	37	120	880	217	195	-	1292	360	600	85	240	1284	93	168	-	1545
10	1990	91	186	13	54	344	86	67	-	497									
	1993	106	219	15	63	402	101	79	-	582	112	217	19	74	423	80	72	-	575
	1997	129	272	19	76	496	124	100	-	719	157	261	35	121	573	38	69	-	681
	2007	206	446	32	116	800	198	169	-	1167	261	434	60	187	941	65	119	-	1125
	2017	313	702	52	170	1237	305	272	-	1814	413	689	98	276	1476	106	193	-	1775
11	1990	49	94	-	27	170	131	70	-	371									
	1993	57	110	-	31	198	154	83	-	435	56	125	2	39	222	121	76	-	419
	1997	70	137	-	38	244	190	104	-	538	62	197	9	69	336	38	68	-	442
	2007	111	224	-	58	393	310	176	-	878	101	330	15	107	553	64	117	-	734
	2017	168	352	-	85	605	482	284	-	1371	158	525	24	160	867	105	191	-	1164
12	1990	47	90	-	26	162	125	67	-	354									
	1993	54	105	-	30	189	147	79	-	415	53	120	2	37	213	116	73	-	402
	1997	66	130	-	36	233	181	99	-	513	60	191	8	67	325	36	66	-	427
	2007	106	214	-	55	375	295	168	-	838	98	319	14	104	535	62	113	-	711
	2017	161	336	-	81	577	460	271	-	1308	153	509	23	155	841	102	185	-	1128
13	1990	-	-	-	-	-	-	-	-	-									
	1993	-	-	-	-	-	-	-	-	-	3	3	.2	1	8	-	1	114	123
	1997	-	-	-	-	-	-	-	-	-	29	40	2	16	88	-	16	-	104
	2007	-	-	-	-	-	-	-	-	-	51	71	4	27	152	-	29	-	182
	2017	-	-	-	-	-	-	-	-	-	83	119	6	42	250	-	50	-	300
14	1990	54	90	-	23	167	107	100	-	374									
	1993	63	105	-	27	195	125	119	-	439	60	109	-	29	198	108	105	-	411
	1997	77	130	-	32	240	154	149	-	542	66	144	-	39	250	91	99	-	439
	2007	122	214	-	50	386	249	252	-	887	106	237	-	61	403	148	168	-	718
	2017	185	336	-	73	593	386	406	-	1385	160	372	-	89	621	230	271	-	1122
15	1990	8	18	-	7	33	58	27	-	119									
	1993	10	21	-	8	39	68	32	-	140	11	22	-	8	42	62	29	-	132
	1997	12	26	-	10	48	84	41	-	173	18	30	-	11	59	59	27	-	145
	2007	18	43	-	15	77	137	69	-	282	29	50	-	17	95	96	46	-	237
	2017	27	69	-	22	117	211	111	-	440	44	79	-	24	147	148	74	-	370
16	1990	-	-	-	-	-	-	-	-	-									
	1993	-	-	-	-	-	-	-	-	-	36	37	6	22	102	7	12	-	121
	1997	-	-	-	-	-	-	-	-	-	56	93	12	43	205	14	25	-	243
	2007	-	-	-	-	-	-	-	-	-	93	154	21	67	336	23	42	-	401
	2017	-	-	-	-	-	-	-	-	-	147	245	35	99	526	38	69	-	633

TRAFFIC PROJECTION OCCIDENTAL MINDORO

TABLE 3.2 - 5 (3)

Traffic Volume

Link	Year	w/o									with								
		Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-cycl	Mot. cycl	Ani-mal	Total	Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-cycl	Mot. cycl	Ani-mal	Total
	1990	5	7	-	2	15	7	12	-	34									
	1993	6	8	-	3	18	8	14	-	40	41	57	2	22	122	42	71	-	235
17	1997	8	10	-	3	21	10	17	-	49	67	111	15	52	245	16	30	-	291
	2007	13	17	-	5	34	17	29	-	80	111	184	25	80	401	28	50	-	479
	2017	19	26	-	8	52	26	46	-	125	175	292	41	118	627	45	82	-	754
	1990	-	-	-	-	-	-	-	-	-									
	1993	-	-	-	-	-	-	-	-	-	.5	.9	-	.2	2	-	.3	22	24
18	1997	-	-	-	-	-	-	-	-	-	5	10	-	3	18	-	3	-	21
	2007	-	-	-	-	-	-	-	-	-	9	16	-	4	28	-	5	-	33
	2017	-	-	-	-	-	-	-	-	-	13	25	-	6	44	-	8	-	52
	1990	2	5	-	1	8	3	5	-	16									
	1993	3	5	-	2	10	4	6	-	19	3	6	-	2	11	3	5	-	19
19	1997	3	7	-	2	12	4	7	-	23	6	11	-	3	19	-	3	-	23
	2007	5	11	-	3	19	7	12	-	38	10	18	-	4	32	-	6	-	37
	2017	8	17	-	4	29	11	20	-	60	15	28	-	7	50	-	9	-	59
	1990	10	20	-	6	36	13	21	-	70									
	1993	11	23	-	7	42	15	25	-	82	15	29	-	9	53	12	23	-	89
20	1997	14	29	-	8	51	19	31	-	102	30	53	-	15	98	-	17	-	115
	2007	22	48	-	13	83	31	53	-	167	49	88	-	22	159	-	28	-	188
	2017	34	75	-	19	128	49	86	-	262	76	139	-	33	247	-	46	-	293
	1990	17	63	-	6	86	83	110	-	280									
	1993	20	75	-	7	101	98	132	-	331	24	99	-	8	130	101	123	-	355
21	1997	24	93	-	8	125	122	168	-	415	39	194	-	13	245	114	89	-	449
	2007	38	152	-	13	204	203	292	-	698	61	321	-	20	403	188	155	-	745
	2017	57	238	-	19	315	321	481	-	1116	92	506	-	31	629	294	256	-	1178
	1990	-	7	-	1	8	-	-	-	8									
	1993	-	8	-	1	9	-	-	-	9	-	8	-	1	9	-	-	-	9
22	1997	-	10	-	1	12	-	-	-	12	-	10	-	1	12	-	-	-	12
	2007	-	18	-	2	20	-	-	-	20	-	18	-	2	20	-	-	-	20
	2017	-	29	-	3	32	-	-	-	32	-	29	-	3	32	-	-	-	32
	1990	-	15	-	14	29	-	-	-	29									
	1993	-	17	-	16	34	-	-	-	34	-	17	-	16	34	-	-	-	34
23	1997	-	22	-	20	42	-	-	-	42	-	22	-	20	42	-	-	-	42
	2007	-	37	-	31	68	-	-	-	68	-	37	-	31	68	-	-	-	68
	2017	-	61	-	45	106	-	-	-	106	-	61	-	45	106	-	-	-	106

3.3 TRAFFIC ANALYSIS AND FORECAST: DEVELOPMENT PROJECT

Traffic on development project roads was forecasted separately for passenger traffic, non-agricultural traffic and agricultural traffic. The number of passengers and commodity tonnage were estimated first, and then they were converted to the number of vehicles assuming modal distribution and occupancy/average load. Figure 3.3.-1 shows the schematic diagram of traffic forecast for development project.

3.3.1 Passenger Traffic and Non-Agricultural Traffic

The population residing within the road influence area, which is defined as the area from which local existing or potential traffic using the road derives, was obtained mainly from distribution of barangays shown in 1:50,000 topographical maps and the NCSO 1980 Census of Population and Housing, and supplemented by information obtained from barangay interviews. The population forecasts were prepared using the NCSO report.

The number of passengers and non-agricultural commodity tonnage were obtained as the product of population by the per capita generation factor. Table 3.3-1 shows the generation factors commodity used in the analysis, which was derived mainly based on the traffic survey and referring to previous studies. In the case of particular roads where the common values were deemed inapplicale, specific values were used.

TABLE 3.3-1 PER CAPITA TRAFFIC GENERATION FACTORS (MINOR ROAD):Province of Occidental Mindoro

Existing Road Condition	Passenger Movement (trip/person/day)		Non-Agricultural Commodity (kg/person/day)	
	w/o	with	w/o	with
Paved/Gravel				
Good/Fair	0.06	0.06	2.0	2.0
Bad	0.05	0.055	1.6	1.8
Very Bad	0.04	0.055	0.6	1.0
Earth Road	0.015	0.03	0.5	1.0
Impassable to motoried vehicle	0.005	0.015	0.4	1.0

The modal distribution and the occupancy/average load used in the conversion to traffic volume by vehicle type were estimated individually for each road based on the road

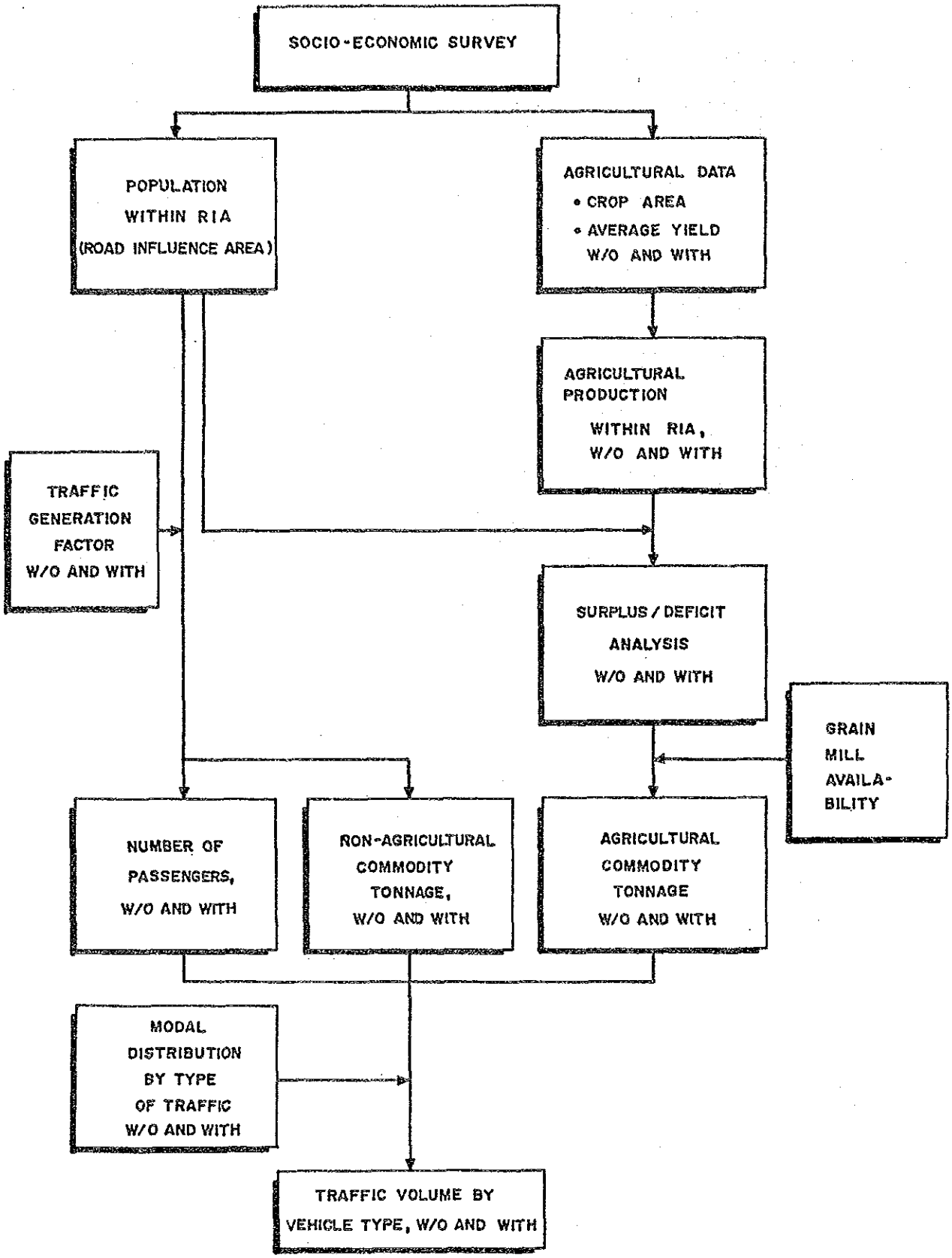

FIGURE 3.3-1
PROCEDURE OF TRAFFIC FORECAST FOR DEVELOPMENT PROJECTS

inventory survey and the traffic survey.

3.3.2 Agricultural Traffic

Agricultural commodity tonnage was estimated based on the agricultural production within the road influence area, taking into consideration i) home consuption and surplus/ deficit and ii) availability of grain mill(s) in the road influence area, as regards food grain.

i) Home consumption of food grain was calculated as population times per capita grain consumption (assumed to be 130 kg in a milled form), and the surplus or deficit production was calculated based thereupon.

ii) In case of no mill in the road influence area, all net production is assumed to move out in the form of palay/unmilled corn. Milled grain products for home comsumption are then transported back. An eventual deficit moves into the road influence area in the form of milled products.

Provided one or more mills exist in the road influence area, the transport flows are assumed as follows:

- Home consumption remains in the road influence area (no transport movement assumed).
- Surplus production would be transported out, traditionally in the form of unmilled food grains.
- Deficit production would be moved into the road influence area in milled form.

Agricultural commodity tonnage was cnverted to number of vehicles using the modal distribution and average load, which were estimated individually for each road considering the transport circumstances.

3.3.3 Estimated Present and Future Traffic

Estimated present and future traffic is presented in Table 3.4-1 in the next Section.

3.4 SUMMARY OF TRAFFIC VOLUME ON STUDIED ROADS

Estimated present and future traffic volumes of the studied roads comprising of traffic and development projects are presented by each road project in Table 3.4-1.

TABLE 3.4 - 1 (1)

Traffic Volume by Vehicle Type OCCIDENTAL MINDORO

Class of Road	Type of Impr't	Road Number	w/o										with									
			Car	Jeep-ney	Bus	Truck	Total	Tri-cycle	Motor cycle	Ani-mal	Walk-ing	Boat	Car	Jeep-ney	Bus	Truck	Total	Tri-cycle	Motor cycle	Ani-mal	Walk-ing	Boat
Primary Major	Imp-2/Widen	N1-1	63	83	-	21	167	15	26	-	-	-	84	118	2	39	243	23	41	-	-	-
	New Const.	N23	63	83	-	21	167	15	26	-	-	-	84	118	2	39	243	23	41	-	-	-
Second'y Major	Rehab/Imp-1	N7-2	6	8	-	3	18	8	14	-	-	-	41	57	2	22	122	42	71	-	-	-
		P53-1	63	105	-	27	195	125	119	-	-	-	60	109	-	29	198	108	105	-	-	-
		P52-1	10	21	-	8	39	68	32	-	-	-	11	22	-	8	42	62	29	-	-	-
		P39	20	75	-	7	101	98	132	-	-	-	24	99	-	8	130	101	123	-	-	-
		P3	11	23	-	7	42	15	25	-	-	-	15	29	-	9	53	12	23	-	-	-
	Imp-2/Widen	P26-2	6	8	-	3	18	8	14	-	-	-	41	57	2	22	122	42	71	-	-	-
	New Const.	N25	-	-	-	-	-	-	-	-	-	-	36	37	6	22	102	7	12	-	-	-
		N26-1	-	-	-	-	-	-	-	-	-	-	1	1	-	0	2	0	0	22	-	-

TABLE 3.4 - 1 (2)

Traffic Volume by Vehicle Type OCCIDENTAL MINDORO

Class of Road	Type of Impr't	Road Number	w/o										with									
			Car	Jeep-ney	Bus	Truck	Total	Tri-cycle	Motor cycle	Ani-mal	Walk-ing	Boat	Car	Jeep-ney	Bus	Truck	Total	Tri-cycle	Motor cycle	Ani-mal	Walk-ing	Boat
Minor (Nat'l/ Prov'l)	Rehab/ Imp-1	P24-1	-	-	-	-	-	63	16	55	163	-	8	10	-	-	18	24	12	-	28	-
		P41	-	19	-	-	19	105	57	83	137	-	13	34	-	-	46	64	77	-	-	-
		P29	-	4	-	-	4	17	15	13	37	-	2	4	-	-	6	17	16	-	39	-
		N9	8	15	-	-	23	62	51	-	123	-	6	25	-	-	31	48	68	-	-	-
		P34	5	5	-	-	10	14	16	-	39	-	4	8	-	-	12	11	20	-	-	-
		P31	-	-	-	-	-	-	-	7	35	-	-	1	-	-	1	5	4	5	10	-
		P42	-	11	-	-	11	59	17	63	42	-	15	16	-	-	31	13	24	-	-	-
		P40	6	12	-	-	17	46	44	-	106	-	9	22	-	-	31	33	59	-	-	-
		P28	-	4	-	-	4	19	17	13	42	-	2	4	-	-	7	18	17	-	42	-
		P47	3	4	-	-	7	14	12	-	28	-	3	4	-	-	7	14	12	-	28	-
		P25	-	2	-	-	2	13	5	12	12	-	-	2	-	-	2	9	5	13	12	-
		N7-1	-	1	-	-	1	10	5	9	8	-	1	2	-	1	4	3	5	-	-	-
		P46	2	5	-	-	7	21	20	-	48	-	4	10	-	-	13	15	27	-	-	-
		P55	1	3	-	-	4	12	11	-	27	-	2	5	-	-	7	8	14	-	-	-
		N8-2	4	18	-	-	23	35	50	-	-	-	5	19	-	-	24	37	53	-	-	-
		P44	-	3	-	-	3	33	31	28	49	-	6	7	-	-	14	17	21	-	49	-
		N3	3	6	-	-	9	22	21	-	50	-	3	11	-	-	14	21	28	-	-	-
		N7-3	-	-	-	-	-	11	7	6	27	-	1	2	-	0	3	3	6	-	-	-
		P12	-	-	-	-	-	6	3	4	14	-	1	1	-	-	2	2	2	-	-	-
		N2	4	9	-	-	13	36	35	-	84	-	4	9	-	-	13	36	35	-	84	-
		P20	1	7	-	-	8	14	20	-	-	-	1	7	-	-	8	14	22	-	-	-
	Imp-2/ Widen	P19	6	7	-	-	13	19	12	-	28	-	6	5	-	2	13	8	15	-	-	-
		P1	-	-	-	-	-	-	-	12	10	21	4	4	-	-	8	3	6	-	-	-
		P11	-	3	-	-	3	14	13	10	30	-	2	6	-	-	7	11	16	-	-	-
	New Const.	P24-2	-	-	-	-	-	-	-	39	48	-	3	3	-	-	6	5	1	-	-	-
		P61	-	-	-	-	-	-	-	1	1	-	0	0	-	0	0	0	0	-	-	-

TABLE 3.4 - 1 (3)

Traffic Volume by Vehicle Type OCCIDENTAL MINDORO

Class of Road	Type of Impr't	Road Number	w/o										with									
			Car	Jeep-ney	Bus	Truck	Total	Tri-cycle	Motor cycle	Ani-mal	Walk-ing	Boat	Car	Jeep-ney	Bus	Truck	Total	Tri-cycle	Motor cycle	Ani-mal	Walk-ing	Boat
Minor (Barangay)	Rehab/Imp-1	B8-1	-	9	-	-	9	41	27	50	65	-	8	17	-	-	24	31	34	-	-	-
		B10-6	-	2	-	-	2	7	2	14	5	-	2	3	-	-	5	5	3	-	-	-
		B9-25	-	3	-	-	3	14	1	19	2	-	4	3	-	-	7	1	1	-	-	-
		B9-6	-	-	-	-	-	8	2	7	21	-	1	1	-	-	3	3	1	-	-	-
		B7-1	-	3	-	-	3	12	2	28	4	-	4	5	-	-	9	8	2	-	-	-
		B10-3	-	-	-	-	-	10	0	19	48	-	-	2	-	-	2	7	0	19	0	-
		B2-6	-	3	-	-	3	16	8	14	19	-	2	4	-	1	7	6	11	-	-	-
		B9-7	-	-	-	-	-	6	1	5	14	-	1	1	-	-	2	2	1	-	-	-
		B7-7	-	5	-	-	5	27	1	38	2	-	6	6	-	-	12	10	1	-	-	-
		B10-8	-	-	-	-	-	-	-	26	36	-	-	2	-	-	2	5	0	13	1	-
		B9-8	-	-	-	-	-	-	-	19	26	-	-	1	-	-	1	4	0	9	1	-
		B1-5	-	-	-	-	-	-	-	7	17	-	1	1	-	-	1	2	1	-	3	-
		B10-7	-	2	-	-	2	10	1	12	3	-	2	2	-	-	4	4	2	-	-	-
		B6-7	-	-	-	-	-	-	-	16	44	-	-	1	-	-	1	6	3	8	8	-
		B8-5	-	0	-	-	0	6	5	3	8	-	0	2	-	-	2	3	4	-	-	-
		B7-8	-	-	-	-	-	4	1	4	10	-	-	0	-	-	0	2	0	4	1	-
		B1-6	-	-	-	-	-	-	-	9	13	-	-	1	-	-	1	2	0	5	0	-
		B9-22	-	-	-	-	-	8	0	8	21	-	-	1	-	-	1	3	0	8	0	-
		B5-5	-	-	-	-	-	-	-	3	5	-	-	-	-	-	-	1	0	1	4	-
		B2-4	-	-	-	-	-	-	-	15	35	-	-	-	-	-	-	6	3	8	25	-
		B0-2	-	1	-	-	1	7	4	8	10	-	-	2	-	-	2	7	4	8	11	-
		B0-8	-	-	-	-	-	6	2	5	16	-	1	1	-	-	2	2	2	-	-	-
	Imp-2/Widen	B0-9	-	2	-	-	2	7	2	14	3	-	2	2	-	-	5	5	1	-	3	-
	New Const.	B1-2	-	-	-	-	-	-	-	4	8	-	0	0	-	-	1	1	1	-	1	-
		B8-9	-	-	-	-	-	-	-	7	11	-	-	0	-	-	0	2	0	4	1	-
		B6-2	-	-	-	-	-	-	-	5	7	-	-	0	-	-	0	1	0	2	0	-
		B8-8	-	-	-	-	-	6	2	5	15	-	-	1	-	-	1	3	1	5	3	-

CHAPTER 4
PROJECT IDENTIFICATION AND SCREENING

4.1 PROJECT IDENTIFICATION

4.1.1 Field Surveys

Field survey was conducted by the Study Team to assess present condition of all major roads and some other typical minor roads (these are referred to as "Surveyed Roads").

Road projects (mostly minor roads) proposed by the local officials were also collected and road conditions of these roads were obtained by the interview survey (these are referred to as " Road Projects proposed by local officials").

Road projects surveyed by the Study Team and proposed by the local officials were combined and integrated, because some road projects were both surveyed by the Study Team and also proposed by the local officials, and a list of Studied Roads was prepared.

Summaries of "Surveyed Roads", "Road Projects proposed by Local officials "and" Studied Roads" are shown in Table 4.1-1.

TABLE 4.1-1 SUMMARY OF SURVEYED ROADS
Road Projects Proposed by Local Officials and Studied Roads
Province of Occidental Mindoro

	Road Class	National Roads	Prov'l/City Roads	Barangay Roads	Total
Surveyed Road	Major Rd.	217.1	115.8	-	332.9
	Minor Rd.	49.2	120.0	-	169.2
	Total	266.3	235.8	-	502.1
Rd. Proj. Proposed by Local Officials	Major Rd.	90.7	51.4	-	142.1
	Minor Rd.	23.0	74.1	233.3	330.4
	Total	113.7	125.5	233.3	472.5
Studied Road	Major Rd.	274.6	115.8	-	390.4
	Minor Rd.	49.2	169.5	233.3	452.0
	Total	323.8	285.3	233.3	842.4

4.1.2 Project Identification

1) Project Identification Criteria

Project identification criteria are shown in Table 4.1-2.

TABLE 4.1-2 PROJECT IDENTIFICATION CRITERIA

Item	Condition of Identification	
	Major Roads	Minor Roads
(1) Existing Links		
* Carriageway Width	Less than 6.0 meter	Less than 4.0 meters
* Pavement Type	Inferior to recommended type in the engineering Standards	Inferior to gravel
* Surface Condition	Bad or very bad 1/	Bad or very bad2/
(2) New Links	Impassable Abandoned Non-existing	
(3) Bridges	Ford crossing Spillway Timber bridge Bailey bridge	Ford crossing Spillway in structurally unsound condition Bailey bridge for AADT more than 300

Notes: 1/ Gravel road which is proposed for improvement by local officials shall be identified, even though surface condition is "fair".

2/ Gravel road of which surface condition is "fair" shall be identified, as the surface condition of gravel minor roads is easily deteriorated.

2) Identified Road Projects

All studied Roads, except those of the national primary roads and committed roads, were evaluated in accordance with the identification criteria. Road projects identified are summarized in Table 4.1-3.

TABLE 4.1-3 SUMMARY OF IDENTIFIED ROAD PROJECTS
Province of Occidental Mindoro

Road Class		National Road	Prov'l/City Road	Barangay Road	Total
Major Road	Length (kms.)	92.1	55.6	-	147.7
	(% to Studied Roads)	(34%)	-	-	(38%)
Minor Road	Length (kms.)	38.3	157.4	233.3	429.0
	(% to Studied Roads)	(78%)	(93%)	(100%)	(95%)
Total	Length (kms.)	130.4	213.0	233.3	576.7
	(% to Studied Roads)	(40%)	(75%)	(100%)	(68%)

4.2 PROJECT SCREENING

4.2.1 Categorization

Road projects are categorized by the following factors in order to establish comprehensive prioritization criteria:

(1) Class of Roads

Major Roads	Minor Roads
* Primary major roads	*National/provincial/city roads
* Secondary major roads	* Barangay roads

(2) Urgency of work

Improvement criteria for roads and bridges are established as shown in Tables 4.2-1 and 4.2-2, respectively. Improvement works are classified into five (5) types as shown in Table 4.2-3. In view of the urgency of work to be implemented, the types of improvement are grouped into two (2) as follows:

Type A (Urgent Projects)

* Rehabilitation: Improvement of deteriorated road surface, but standard or superior class pavement, to acceptable condition.
* Improvement -1: Improvement of deteriorated road surface and substandard class pavement, to acceptable and standard pavement.
* New Construction: Construction of new road including re-construction of abandoned road.

Type B (Less Urgent Projects)

* Improvement -2: Upgrading of substandard pavement class to standard pavement class, though existing road surface condition is acceptable.
* Widening : Widening of roads with substandard carriageway width, other conditions meet engineering standards.

Note: Road projects which include only improvement of bridges are classified as "Rehabilitation".

(3) Economic Viability

Major Roads

Simplified economic evaluation is conducted for major roads. Internal Rate of Return (IRR) is calculated based on roughly estimated construction cost and traffic cost savings. Categorization is made as follows:

Improvment Type A:

* IRR of 7.5% or more
* IRR of less than 7.5%

Improvement Type B:

* IRR of 15% or more
* IRR of less than 15.0%

Minor Roads

Minor road Pre-evaluation Indicator (MPI) is developed based on Phase-1 Study results. Categorization of minor roads is made based on calculated MPI as follows:

* MPI of 7.5 or more
* MPI of less than 7.5

TABLE 4.2-1 IMPROVEMENT CRITERIA FOR ROAD

Road Class	Major Road		Minor Road	
	Standard/ Superior	Substandard	Standard/ Superior	Substandard
Good/Fair	No improvement or widening (widening)	Upgrading of pavement type (improvement-2)	No improvement	No improvement
Bad/Very bad	Improvement of surface condition (Rehabilitation)	Upgrading of pavement type (improvement-1)	Improvement surface con (Rehabilitation)	Upgrading of pavement type (Improvement-1)
Abandoned/ Non-existing	Construction of new road (New Construction)			

Note: 1) In case of carriageway width less than 6.0 meters.

TABLE 4.2-2 IMPROVEMENT CRITERIA FOR BRIDGES

Existing Bridge Type	Proposed Improvement		
	Major Road	Minor Road	
Ford Crossing	2-lane permanent bridge	Carriageway width 4.0 m: 1-lane spillway Carriageway width 6.0 m: 2-lane spillway	
Spillway	2-lane permanent bridge	No improvement	
Timber Bridge	2-lane permanent bridge	AADT less than 200	1-lane permanent bridge
		AADT more than 200	2-lane permanent bridge
Bailey Brridge	2-lane permanent bridge	AADT less than 300	No improvement
		AADT more than 300	2-lane permannet bridge

Note: 1) Where the site condition is not favorable for a spillway, a permanent bridge should be planned in accordance with the criteria for a timber bridge.

2) When the existing spillway is structurally sound and traffic disturbance is estimated less, the existing one can be utilized. Under other conditions, a permanent bridge should be planned in accordance with the criteria for a timber bridge.

TABLE 4.2-3 TYPES OF IMPROVEMENT

Type	Existing Pavement Type	Existing Surface Condition	Proposed Improvement Work
Rehabilitation	Standard or superior	Bad/ very bad	Improvement of surface condition
Improvement-1	Substandard	Bad/ very bad	Upgrading of surface type
Improvement-2	Substandard	Good/Fair	Upgrading of surface type
Widening	Standard (carriageway is narrowed than standard)	Good/Fair	Widening of existing road
New Construction	Impassable/abandoned non-existing		Construction of new road

Note: Improvement-2 and widening are not applied to minor roads.

4.2.2 Prioritization and Selection Criteria

Prioritization and selection criteria of road projects for feasibility studies are established as shown in Tables 4.2-4 and 4.2-5.

TABLE 4.2-4 PRIORITIZATION AND SELECTION OF ROAD PROJECTS
- Major Roads -

Category	Road Class	Type of Improvement	IRR	Priority Criteria	Selection Criteria
1	Primary	A	7.5 ≦ IRR	MA-1	↑
2	Secondary	A	7.5 ≦ IRR	MA-1	
3	Primary	B	15.0 ≦ IRR	MA-2	To be selected for F/S
4	Secondary	B	15.0 ≦ IRR	MA-2	
5	Primary	A	IRR < 7.5	MA-2	
6	Secondary	A	IRR < 7.5	MA-2	
7	Primary	B	IRR < 15.0	MA-3	
8	Secondary	B	IRR < 15.0	MA-3	

TABLE 4.2-5 PRIORITIZATION AND SELECTION OF ROAD PROJECTS
- Minor Roads -

Category	Road Class	Type of Improvement	MPI	Priority Criteria	Selection Criteria
1	National/Provincial/ City	A	7.5 ≦ MPI	MI-1	↑
2	Barangay	A	7.5 ≦ MPI	MI-1	To be selected for F/S
3	National/Provincial/ City	A	MPI < 7.5	MI-2	
4	Barangay	A	MPI < 7.5	MI-2	

Note: Improvement Type A: Rehabilitation, Improvement-1, New Construction
Improvement Type B: Improvement-2, Widening

4.2.3 Priority of Identified Road Projects

Identified projects were evaluated and prioritized in accordance with criteria discussed and summarized in Tables 4.2-6 and 4.2-7.

TABLE 4.2-6 PRIORITY OF IDENTIFIED MAJOR ROADS
Province of Occidental Mindoro

Category	Road Class	Type of Improvement	IRR	Priority Group	Road Length	No. of Road Links
1	Primary	A	7.5 ≤ IRR	MA-1	-	-
2	Secondary	A	7.5 ≤ IRR	MA-1	11.5	2
3	Primary	B	15.0 ≤ IRR	MA-2	-	-
4	Secondary	B	15.0 ≤ IRR	MA-2	-	-
5	Primary	A	IRR<7.5	MA-2	56.7	2
6	Secondary	A	IRR<7.5	MA-2	77.5	7
7	Primary	B	IRR<15.0	MA-3	-	-
8	Secondary	B	IRR<15.0	MA-3	2.0	1
	Total				147.7	12

Table 4.2-7 PRIORITY OF IDENTIFIED MINOR ROADS
Province of Occidental Mindoro

Category	Road Class	Type of Improvement	MPI	Priority Group	Road Length	No. of Rd.Links
1	Nat'l/Provi/ City	A	7.5 ≤ MPI	MI-1	61.0	13
2	Barangay	A	7.5 ≤ MPI	MI-1	56.2	15
3	Nat'l/Provi/	A	MPI < 7.5	MI-2	134.7	21
4	Barangay	A	MPI < 7.5	MI-2	177.1	52
	Total				429.0	101

4.2.4 Selection of Road Projects For Feasibility Studies

In accordance with selection criteria discussed above, road projects under priority groups MA-1 and MA-2 for major roads and priority groups MI-1 for minor roads were initially selected, and these were plotted on 1:100,000 map to evaluate the following:

- Distribution of initially selected road projects (when these are concentrated in certain area, some minor roads were deleted, and where road projects are scarce, some minor roads were added.)

- Linkage of road projects
  (There is a case that a selected lower class road is connected with a higher class road, however, the latter is not selected due to lower priority. Such a case, a higher class road is also selected to maintain similar condition of road after implementation.)

After adjustment mentioned above, road projects were finally selected and summarized as follows:

Major Road	144.3 kms.	(10 projects)
Minor Road	259.8 kms.	(53 projects)
Total	404.1 kms.	(63 projects)

CHARTER 5
PROJECT EVALUATION

5.1 PRELIMINARY DESIGN AND COST ESTIMATE

5.1.1 Preliminary Design

1) Design Concept
There are two options in design concept for rural road improvement, as follows :

* Designing rural roads with optimum standards aimed at improving all aspects including horizontal and vertical alignments, which sometimes require massive earth works and is costly.

* Designing rural roads by basically concentrating on improving surface conditions, thus improving horizontal and vertical alignments is limited to the required minimum.

Rural roads are extensive in the number of road links as well as in length, and their present conditions are still at a poor level. Thus, requirements for rural road improvement are quite huge, while financial resources are limited. Under these circumstances, the Study Team placed priority on improving surface conditions of more roads. The preliminary design was undertaken in line with the concept of the second option.

2) Preliminary Design
On the basis of the findings of the road inventory survey, the type of improvement was determined for each subsection of road in accordance with the engineering standards and the improvement criteria.

Typical road sections for each type of improvement/rehabilitation are summarized as shown in Table 5.1-1.

Special considerations were given to steep gradient sections and flood section.

"PCC pavement for steep gradient section" was applied to sections with steep gradients where otherwise gravel surfacing might be applied, as a countermeasure against excessive gravel losses during heavy rains and impossibility for vehicles to climb. "Grade raising in flood area", was applied to sections located in flood areas.

Table 5.1-2 shows the proposed improvement for each road project subjected to the feasibility study.

TABLE 5.1-1 EXISTING CONDITION VS PROPOSED IMPROVEMENT/REHABILITATION

Type of Improvement	Road Section Type	Existing Pavement Type	Existing Pavement Condition	Proposed Pavement Type	Pavement Structure (cm) Surface Course	Base	Subbase
Rehabilitation	1 - 1	PCC	Bad/Very Bad	PCC	20 - 23	-	10
	1 - 2	PCC	Bad/Very Bad	AC Overlay	5	-	-
	1 - 3	Bituminous	- do -	AC	5	20	10
	1 - 4	Bituminous	- do -	AC Overlay	5	-	-
	1 - 5	Bituminous	- do -	BMP/DBST	5.5/1.6	15	5
	1 - 6	Gravel	- do -	Gravel	15	-	10
Improvement - 1	2 - 1	Bituminous	Bad/Very Bad	PCC	20 - 23	-	10
	2 - 2	Gravel	- do -	PCC	20 - 23	-	20
	2 - 3	Gravel	- do -	AC	5	20	20
	2 - 4	Gravel	- do -	BMP/DBST	5.5/1.6	15	15
	2 - 5	Earth	Any Condition	PCC	20 - 23	-	20
	2 - 6	Earth	- do -	AC	5	20	20
	2 - 7	Earth	- do -	BMP/DBST	5.5/1.6	15	15
	2 - 8	Earth	- do -	Gravel	15	-	10
Improvement - 2	3 - 1	Bituminous	Good/fair	PCC	20 - 23	-	10
	3 - 2	Gravel	- do -	PCC	20 - 23	-	10
	3 - 3	Gravel	- do -	AC	5	20	10
	3 - 4	Gravel	- do -	BMP/DBST	5.5/1.6	15	5
Widening	4 - 1	PCC	Good/fair	Widening w/PCC	20 - 23	-	20
	4 - 2	Bituminous	- do -	Widening w/AC	5	20	20
	4 - 3	Bituminous	- do -	Widening w/BMP/DBST	5.5/1.6	15	15
	4 - 4	Gravel	- do -	Widening w/Gravel	15	-	10
New Construction	5 - 1	-	-	PCC	20 - 23	-	20
	5 - 2	-	-	AC	5	20	20
	5 - 3	-	-	BMP/DBST	5.5/1.6	15	15
	5 - 4	-	-	Gravel	15	-	10
Special Treatment	6	PCC pavement for steep gradient section					
	7	Grade raising in flood area					

TABLE 5.1 - 2 (1)

Summary of Proposed Improvement OCCIDENTAL MINDORO

Primary Major

Type of Impr't	Road Number	Length (km)	1993 AADT w/o	1993 AADT with	Existing Condition L	Existing Condition Width	Existing Condition Type	Existing Condition Condition	Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso) Road	Cost (Million Peso) Bridge	Cost (Million Peso) Total	IRR (%)
Imp-2/ Widen	N1-1	34.2	167	243	5.0	6.1-6.8	PCC	Good	-	2-lane Br (n=13,L=268m)	83.92	23.52	107.43	7.9 (T)
					.8	6.1	BT	Bad	Rehab(6.0-BMP)					
					24.0	6.0	GRV	Fair	Imp-2(6.0-BMP)					
					3.1	6.0	BT	Good	-					
					1.0	6.0	GRV	Bad	Imp-1(6.0-BMP)					
					.3	6.1	PCC	Fair	Rehab(6.0-PCC)					
New Const.	N23	26.0	167	243	26.0		None		New-C(6.0-BMP)	2-lane Br (n= 7,L= 95m)	79.24	9.94	89.18	26.2 (T)

(T):Traffic Project
(D):Development Project

TABLE 5.1 - 2 (2)

Summary of Proposed Improvement OCCIDENTAL MINDORO

Secondary Major

Type of Impr't	Road Number	Length (km)	1993 AADT w/o	1993 AADT with	Existing Condition L	Existing Condition Width	Existing Condition Type Condition	Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso) Road	Cost (Million Peso) Bridge	Cost (Million Peso) Total	IRR (%)
Rehab/ Imp-1	N7-2	2.7	18	122	2.4	6.0	GRV Bad	Rehab(6.0-GRV)		1.85	.00	1.85	82.2 (T)
					.3	5.5	PCC Good	Widen(6.0-PCC)					
	P53-1	5.4	195	198	3.9	6.0	GRV Fair	Rehab(6.0-GRV)		3.24	.00	3.24	21.1 (T)
					1.5	5.2	GRV Fair	Widen(6.0-GRV)					
	P52-1	7.0	39	42	4.0	5.0-5.5	GRV Fair	-		2.07	.00	2.07	12.6 (T)
					3.0	5.0	GRV V.Bad	Rehab(6.0-GRV)					
	P39	6.1	101	130	4.3	4.5	GRV Bad	Rehab(6.0-GRV)		9.08	.00	9.08	4.7 (T)
					1.8	6.0	GRV Fair	-					
	P3	31.1	42	53	30.6	5.0-6.0	GRV Fair	-	2-cell BC (n= 4,L= 27m)	.00	7.33	7.33	1.6 (T)
					.5	6.0	PCC Fair	-	2-lane Br (n= 2,L= 26m)				
									1-lane Br (n= 2,L= 40m)				
Imp-2/ Widen	P26-2	2.2	18	122	2.2	4.5	GRV Fair	Widen(6.0-GRV)		1.24	.00	1.24	100.0 (T)
New Const.	N25	6.0	0	102	6.0		None	New-C(6.0-GRV)	2-lane Br (n= 2,L= 35m)	10.16	3.13	13.28	23.7 (T)
	N26-1	23.6	0	2	8.7	3.2-6.0	GRV Fair/Bad	Rehab(6.0-GRV)	2-lane Sp (n= 7,L=520m)	29.51	9.44	38.95	6.4 (T)
					12.3		None	New-C(6.0-GRV)					
					2.6	5.0-5.5	EAR Bad/V.Bad	Imp-1(6.0-GRV)					

(T):Traffic Project
(D):Development Project

TABLE 5.1 - 2 (3)

Summary of Proposed Improvement OCCIDENTAL MINDORO

Minor(National/Provincial)

Type of Impr't	Road Number	Length (km)	1993 AADT w/o	1993 AADT with	Existing Condition L	Existing Condition Width	Existing Condition Type Condition	Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso) Road	Cost (Million Peso) Bridge	Cost (Million Peso) Total	IRR (%)
Rehab/ Imp-1	P24-1	4.7	0	18	3.0 1.7	4.0-6.0 3.6-4.0	GRV Bad/V.Bad EAR V.Bad/Impa	Rehab(6.0-GRV) Imp-1(6.0-GRV)	2-lane Sp (n= 2,L=540m)	8.86	9.80	18.66	23.7 (D)
	P41	17.6	19	46	9.2 4.2 4.2	3.2-5.0 4.0-5.2	GRV Bad/V.Bad GRV Fair None	Rehab(6.0-GRV) Widen(6.0-GRV) New-C(6.0-GRV)		16.79	.00	16.79	16.7 (D)
	P29	1.9	4	6	.1 1.8	5.5 5.0	PCC Good GRV Bad	- Rehab(6.0-GRV)		1.25	.00	1.25	14.9 (D)
	N9	4.0	23	31	3.0 1.0	6.8-8.0 6.5	PCC Good BT V.Bad	- Rehab(6.0-BMP)		1.62	.00	1.62	13.8 (D)
	P34	6.5	10	12	.1 2.9 2.5 1.0	4.0 4.0-4.2 4.5 4.0	PCC Bad GRV Bad GRV Fair EAR Bad	Rehab(4.0-PCC) Rehab(4.0-GRV) - Imp-1(4.0-GRV)		2.30	.00	2.30	13.1 (D)
	P31	1.7	0	1	1.7	2.4-3.2	EAR Bad/Impas	Imp-1(4.0-GRV)	1-lane Sp (n= 1,L=250m)	.83	3.30	4.13	11.5 (D)
	P42	8.0	11	31	8.0	5.5	GRV V.Bad	Rehab(6.0-GRV)		16.38	.00	16.38	7.9 (D)
	P40	11.4	17	31	4.2 7.2	6.0 4.0-6.0	GRV Fair GRV Bad	- Rehab(6.0-GRV)		4.96	.00	4.96	6.5 (D)
	P28	1.8	4	7	1.8	4.0	GRV Bad	Rehab(4.0-GRV)		.91	.00	.91	6.4 (D)
	P47	1.9	7	7	1.1 .8	5.0 4.5-5.0	GRV Fair GRV Bad	- Rehab(4.0-GRV)	1-lane Br (n= 2,L= 32m)	.41	2.14	2.55	6.3 (D)
	P25	1.9	2	2	1.9	3.6	GRV V.Bad	Rehab(4.0-GRV)		1.44	.00	1.44	6.3 (D)
	N7-1	8.7	1	4	6.0 2.7	3.2-4.5 3.2	GRV Bad/V.Bad EAR V.Bad	Rehab(4.0-GRV) Imp-1(4.0-GRV)	1-lane Sp (n= 1,L= 30m)	4.23	.40	4.63	5.9 (D)
	P46	1.1	7	13	.9 .2	6.0 5.0	GRV Bad PCC Fair	Rehab(6.0-GRV) -		.62	.00	.62	4.9 (D)
	P55	3.8	4	7	3.8	4.6	GRV Bad	Rehab(4.0-GRV)		1.80	.00	1.80	4.2 (D)
	N8-2	5.8	23	24	1.8 4.0	6.1 4.5	PCC Good GRV Bad	- Rehab(6.0-GRV)		2.76	.00	2.76	4.1 (D)
	P44	4.3	3	14	4.3	6.0	GRV Bad	Rehab(6.0-GRV)		2.98	.00	2.98	3.8 (D)
	N3	1.4	9	14	.9 .5	6.0 6.1	GRV Bad PCC Good	Rehab(6.0-GRV) -		.67	.00	.67	2.7 (D)
	N7-3	6.6	0	3	6.6	4.5-5.2	GRV Bad/Impas	Rehab(4.0-GRV)	1-lane Sp (n= 5,L=845m) 1-lane Br (n= 3,L= 55m)	3.30	14.61	17.91	1.6 (D)

(T):Traffic Project

TABLE 5.1 - 2 (4)

Summary of Proposed Improvement OCCIDENTAL MINDORO

Minor(National/Provincial)(Continued)

Type of Impr't	Road Number	Length (km)	1993 AADT w/o	1993 AADT with	Existing Condition L	Existing Condition Width	Existing Condition Type Condition	Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso) Road	Cost (Million Peso) Bridge	Cost (Million Peso) Total	IRR (%)
Rehab/ Imp-1	P12	5.7	0	2	5.4 .3	3.6-4.0 4.0	GRV Bad/Impas PCC Fair	Rehab(4.0-GRV) -	1-lane Br (n= 4,L= 68m) 1-lane Sp (n= 1,L= 18m)	2.62	4.88	7.50	.0 (D)
	N2	5.5	13	13	1.2 4.3	3.2 5.0	GRV Bad GRV Fair	Rehab(4.0-GRV) -	1-lane Br (n= 1,L= 42m)	3.42	2.20	5.63	.0 (D)
	P20	5.6	8	8	5.6	5.5	GRV V.Bad	Rehab(6.0-GRV)		10.17	.00	10.17	.0 (D)
Imp-2/ Widen	P19	3.6	13	13	2.8 .8	4.5-5.5 4.5	GRV Fair GRV Bad	Widen(6.0-GRV) Rehab(6.0-GRV)		2.63	.00	2.63	10.4 (D)
	P1	13.0	0	8	6.9 6.1	4.5 4.5	GRV Fair EAR Impas	Widen(6.0-GRV) Imp-1(6.0-GRV)	2-lane Sp (n= 5,L=300m)	7.96	5.45	13.40	3.6 (D)
	P11	.9	3	7	.9	4.5	GRV Fair	Widen(6.0-GRV)		1.28	.00	1.28	3.3 (D)
New Const.	P24-2	4.5	0	6	4.5		None	New-C(4.0-GRV)	1-lane Sp (n= 1,L=100m)	2.90	1.32	4.22	13.4 (D)
	P61	15.0	0	0	15.0		None	New-C(4.0-GRV)		10.69	.00	10.69	4.6 (D)

(T):Traffic Project
(D):Development Project

TABLE 5.1 - 2 (5)

Summary of Proposed Improvement OCCIDENTAL MINDORO
Minor(Barangay)

Type of Impr't	Road Number	Length (km)	1993 AADT w/o	1993 AADT with	Existing Condition L	Existing Condition Width	Existing Condition Type Condition	Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso) Road	Cost (Million Peso) Bridge	Cost (Million Peso) Total	IRR (%)
Rehab/ Imp-1	B8-1	7.8	9	24	7.8	4.5	GRV Bad	Rehab(4.0-GRV)		3.91	.00	3.91	24.1 (D)
	B10-6	2.2	2	5	2.2	4.0	GRV Fair/Bad	Rehab(4.0-GRV)		1.00	.00	1.00	21.8 (D)
	B9-25	5.5	3	7	2.9 2.6	4.5-6.0 4.0	GRV Bad/V.Bad EAR V.Bad	Rehab(4.0-GRV) Imp-1(4.0-GRV)		4.27	.00	4.27	15.5 (D)
	B9-6	2.7	0	3	2.7	4.5	GRV Bad/V.Bad	Rehab(4.0-GRV)		1.34	.00	1.34	11.6 (D)
	B7-1	4.3	3	9	3.1 1.0 .2	4.5 4.5 6.0	GRV Bad GRV Fair PCC Good	Rehab(4.0-GRV) - -		2.51	.00	2.51	10.4 (D)
	B10-3	1.2	0	2	1.2	3.6	GRV Bad	Rehab(4.0-GRV)		1.78	.00	1.78	10.3 (D)
	B2-6	5.5	3	7	5.3 .2	3.2-3.6 6.0	EAR Impas PCC Good	Imp-1(4.0-GRV) Rehab(6.0-PCC)	1-lane Sp (n= 1,L= 30m)	8.27	.40	8.67	10.0 (D)
	B9-7	5.9	0	2	4.4 1.5	4.0 3.2-4.0	GRV Bad/V.Bad EAR V.Bad	Rehab(4.0-GRV) Imp-1(4.0-GRV)	1-lane Sp (n= 3,L=110m)	2.96	1.45	4.41	7.7 (D)
	B7-7	5.8	5	12	2.1 3.7	3.6 3.2-3.6	GRV Fair GRV Bad/V.Bad	Widen(4.0-GRV) Rehab(4.0-GRV)	1-lane Br (n= 1,L= 10m)	6.32	.86	7.18	6.0 (D)
	B10-8	4.2	0	2	3.6 .6	2.4-4.0 3.2	EAR Bad/V.Bad GRV V.Bad	Imp-1(4.0-GRV) Rehab(4.0-GRV)		6.34	.00	6.34	5.1 (D)
	B9-8	6.0	0	1	3.5 2.5	4.0-5.5	GRV Bad None	Rehab(4.0-GRV) New-C(4.0-GRV)	1-lane Sp (n= 1,L=300m)	5.69	3.96	9.65	4.7 (D)
	B1-5	2.0	0	1	2.0	3.0	GRV Bad	Rehab(4.0-GRV)		1.12	.00	1.12	4.0 (D)
	B10-7	6.4	2	4	2.9 1.1 2.4	3.2 3.2 2.8-3.2	GRV Fair EAR V.Bad GRV Bad	Widen(4.0-GRV) Imp-1(4.0-GRV) Rehab(4.0-GRV)	1-lane Sp (n= 1,L=150m)	5.42	1.98	7.40	3.7 (D)
	B6-7	3.9	0	1	.3 2.2 1.4	4.0 4.5 4.5	PCC Good GRV Bad EAR Impas	- Rehab(4.0-GRV) Imp-1(4.0-GRV)	1-lane Br (n= 1,L= 60m) 2-cell BC (n= 1,L= 6m)	1.80	3.58	5.38	3.6 (D)
	B8-5	2.4	0	2	2.4	3.6	GRV V.Bad	Rehab(4.0-GRV)		1.20	.00	1.20	3.5 (D)
	B7-8	4.5	0	0	2.5 2.0	3.2 3.2	GRV Bad EAR Bad	Rehab(4.0-GRV) Imp-1(4.0-GRV)		2.25	.00	2.25	3.5 (D)
	B1-6	2.0	0	1	1.0 1.0	3.2	GRV Bad None	Rehab(4.0-GRV) New-C(4.0-GRV)	1-lane Br (n= 1,L= 10m) 1-lane Sp (n= 1,L= 80m)	1.17	1.91	3.09	3.3 (D)
	B9-22	3.1	0	1	.5 2.6	4.0 2.8-4.0	GRV Bad EAR Impas	Rehab(4.0-GRV) Imp-1(4.0-GRV)	2-cell BC (n= 1,L= 7m)	1.55	.53	2.07	3.2 (D)

TABLE 5.1 - 2 (6)

Summary of Proposed Improvement OCCIDENTAL MINDORO

Minor(Barangay) (Continued)

Type of Impr't	Road Number	Length (km)	1993 AADT w/o	1993 AADT with	Existing Condition L	Width	Type Condition	Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso) Road	Bridge	Total	IRR (%)
Rehab/ Imp-1	B5-5	.8	0	0	.7	3.2	GRV V.Bad	Rehab(4.0-GRV)		.40	.00	.40	2.8 (D)
					.1	2.4	EAR V.Bad	Imp-1(4.0-GRV)					
	B2-4	4.0	0	0	1.5	5.0	GRV Fair	-	1-lane Sp (n= 1,L=100m)	1.25	1.32	2.57	2.5 (D)
					2.5	4.0	EAR Impas	Imp-1(4.0-GRV)					
	B0-2	7.0	1	2	.8	6.1	PCC Good	-	2-cell BC (n= 3,L= 19m)	2.78	1.52	4.30	2.4 (D)
					1.0	4.5	GRV Fair	-					
					5.0	3.2	GRV Bad	Rehab(4.0-GRV)					
					.2	3.2	GRV Fair	Widen(4.0-GRV)					
	B0-8	5.0	0	2	1.1	4.0	GRV Fair	-	1-lane Br (n= 3,L= 35m)	2.06	3.28	5.33	.2 (D)
					.5	4.0	GRV Bad	Rehab(4.0-GRV)	2-cell BC (n= 1,L= 6m)				
					3.4	4.0-4.5	EAR Bad	Imp-1(4.0-GRV)					
Imp-2/ Widen	B0-9	2.7	2	5	1.7	3.2	GRV Fair	Widen(4.0-GRV)		1.40	.00	1.40	19.5 (D)
					1.0	3.2	GRV Bad	Rehab(4.0-GRV)					
New Const.	B1-2	4.6	0	1	.2	4.0	PCC Fair	Rehab(4.0-PCC)	1-lane Sp (n= 1,L= 80m)	4.02	1.06	5.07	3.2 (D)
					.4	3.2	GRV Bad	Rehab(4.0-GRV)					
					4.0		None	New-C(4.0-GRV)					
	B8-9	3.7	0	0	.8	4.5	GRV Bad	Rehab(4.0-GRV)		2.04	.00	2.04	1.7 (D)
					.9	3.2	EAR Impas	Imp-1(4.0-GRV)					
					2.0		None	New-C(4.0-GRV)					
	B6-2	3.9	0	0	1.0	3.2-4.0	GRV V.Bad	Rehab(4.0-GRV)		2.14	.00	2.14	.0 (D)
					.9	4.0	EAR Impas	Imp-1(4.0-GRV)					
					2.0		None	New-C(4.0-GRV)					
	B8-8	5.8	0	1	2.0	3.2-3.6	GRV Bad	Rehab(4.0-GRV)	2-cell BC (n= 1,L= 6m)	3.35	.53	3.88	.0 (D)
					.8	4.0	EAR Impas	Imp-1(4.0-GRV)					
					3.0		None	New-C(4.0-GRV)					

(T):Traffic Project
(D):Development Project

5.1.2 Cost Estimate

1) Unit Cost

Unit prices for construction equipment, materials and labor were obtained from Associated Construction Equipment Lessors, Inc. (ACEL), the Price Monitoring Section of DPWH, market price survey by the Study Team and relevant studies. Based on the data collected, unit prices at April 1990 prices were developed. Exchange rates used were : P22.50 = US$1.00 = Y155.

Unit costs for major construction items are presented in Table 5.1-3.

2) Construction Cost Estimate

Based on the results of the road inventory survey and proposed type of improvement, the quantity of each construction item was computed for each road project. Then the constuction cost was estimated.
Table 5.1-4 presents estimated quantities and construction cost of each road project.

TABLE 5.1-3 UNIT COST OF MAJOR CONSTRUCTION ITEMS

Unit: Pesos at April 1990 Prices

Item No.	Description	Unit	Unit Price
100	Clearing nad Grubbing	sq.m.	2.10
102	Stripping	cu.m.	52.00
106	Roadway and Drainage Excavation	cu.m.	58.00
107	Borrow	cu.m.	110.00
108	Aggregate Subbase	cu.m.	225.00
118-1	Preparation Of Previously Constructed Road (Gravel)	sq.m.	7.00
118-2	Preparation Of Previously Constructed Road (Asphalt)	sq.m.	8.00
118-3	Preparation of Existing Pavement Surface (PCC)	sq.m.	22.50
118-4	Preparation of Existing Pavement Surface (AC)	sq.m.	17.00
200	Crushed Aggregate Base Course	cu.m.	305.00
300	Crushed Aggregate Surface Course	cu.m.	305.00
302	Bituminous Prime Coat	MT	11,100.00
303	Bituminous Tact Coat	MT	11,500.00
306	Bituminous Macadam Pavement	sq.m.	95.00
310	Bituminous Concrete Surface Course	MT	1,350.00
314	Double Bituminous Surface Treatment	sq.m.	45.00
316-1	PCC Pavement (t = 23cm)	sq.m.	320.00
316-2	PCC Pavement (t = 20cm)	sq.m.	280.00
316-3	PCC Pavement (t = 18cm)	sq.m.	250.00
413-1	RCPC (Ø 910mm)	sq.m.	1,550.00
413-2	Headwal T for RCPC (Ø 910mm)	set	2,900.00
500	Grouted Riprap	sq.m.	625.00
517	Side Ditch (Grouted Riprap)	m	360.00
Bridge Cost			
	2-lane Superstructure	m	43,500.00
	Abutment for 2-lane bridge	each	330,000.00
	Pier for 2-lane bridge	each	285,000.00
	1-lane Superstructure	m	32,000.00
	Abutment for 1-lane bridge	each	230,000.00
	Pier for 1-lane bridge	each	200,000.00
Reinforced Concrete Box Culvert			
	1-Cell RCBC	m	20,600.00
	2-Cell RCBC	m	36,000.00
	Wing wall and Apron for 1-Cell RCBC	set	132,000.00
	Wing wall and Apron for 2-Cell RCBC	set	155,000.00
Spillway			
	2-lane Spillway	m	16,500.00
	1-lane Spillway	m	12,000.00
Slope Protection Cost			
	Cut Slope Protection	m	23,000.00
	Embankment Slope Protection	m	25,000.00

TABLE 5.1 - 4 (1)

Quantity and Construction Cost OCCIDENTAL MINDORO

	Unit	N1-1	N23	N7-2	P53-1	P52-1	P39	P3	P26-2	N25	N26-1	P24-1
Total Road Length	km	34.2	26.0	2.7	5.4	7.0	6.1	31.1	2.2	6.0	23.6	4.7
Improvement Length	km	26.1	26.0	2.7	5.4	3.0	4.3	.0	2.2	6.0	23.6	4.7
Proposed Pavement Type		6.0-BMP 5.0-PCC	6.0-BMP	6.0-GRV 6.0-PCC	6.0-GRV	6.0-GRV	6.0-GRV		6.0-GRV	6.0-GRV	6.0-GRV	6.0-GRV
Quantity												
100 Clearing & Grubbing	m2	-	611000	-	-	-	-	-	-	127600	270600	-
Stripping	m3	-	66300	-	-	-	-	-	-	13740	29520	-
102 Roadway & Drainage Excavation	m3	37544	286000	2573	5965	2250	3225	-	2838	28800	96849	2925
104 Borrow	m3	168500	39000	1356	1534	1695	21511	-	759	19940	35262	25417
200 Aggregate Subbase	m3	46383	49830	1962	210	1980	2838	-	462	3960	12870	3102
Preparation of Prev.Road(Grvl)	m2	155420	-	15840	31200	19800	28380	-	9900	-	70480	29740
Preparation of Prev.Road(Asph)	m2	6710	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	-	-	-	-	-	-
202 Crushed Aggregate Base Course	m3	26393	26598	-	-	-	-	-	-	-	-	-
300 Crushed Aggr. Surface Course	m3	-	-	2160	4860	2700	3870	-	1980	5400	21240	4230
301 Bituminous Prime Coat	M.T.	186	187	-	-	-	-	-	-	-	-	-
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
305 Bituminous Macadam Pavement	m2	154800	156000	-	-	-	-	-	-	-	-	-
310 Bitum.Concrete Surface Course	M.T.	-	-	-	-	-	-	-	-	-	-	-
304 Double Bitum.Surface Treatment	m2	-	-	-	-	-	-	-	-	-	-	-
311-1 PCC Pavement (t=23 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-2 PCC Pavement (t=20 cm)	m2	1800	-	150	-	-	-	-	-	-	-	-
311-3 PCC Pavement (t=18 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
500 RCPC (dia.910mm)	m	1365	1560	75	165	90	390	-	60	330	1095	315
Headwall for RCPC (dia.910mm)	Set	91	104	5	11	6	26	-	4	22	73	21
504 Grouted Riprap	m3	21118	-	-	-	-	4801	-	-	-	335	3747
Side Ditch (Grouted Riprap)	m	8600	20800	-	1100	-	-	-	-	3540	9010	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge,Superstructure	m	268	95	-	-	-	-	26	-	35	-	-
1-lane Bridge,Superstructure	m	-	-	-	-	-	-	40	-	-	-	-
2-lane Bridge,Abutment	Each	26	14	-	-	-	-	4	-	4	-	-
1-lane Bridge,Abutment	Each	-	-	-	-	-	-	4	-	-	-	-
2-lane Bridge,Pier	Each	4	1	-	-	-	-	-	-	-	-	-
1-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	-	-	520	540
1-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
2-cell RCBC	m	-	-	-	-	-	-	39	-	-	-	-
Wingwall for 1-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 2-cell RCBC	Set	-	-	-	-	-	-	4	-	-	-	-
Miscellaneous	l.s.	1	1	1	1	1	1	1	1	1	1	1
Road Construction Cost	M.p.	83.92	79.24	1.85	3.24	2.07	9.08	.00	1.24	10.16	29.51	8.86
Bridge Construction Cost	M.p.	23.52	9.94	.00	.00	.00	.00	7.33	.00	3.13	9.44	9.80
Total Construction Cost	M.p.	107.43	89.18	1.85	3.24	2.07	9.08	7.33	1.24	13.28	38.95	18.66
Road Construction Cost/Impr't km	M.p.	3.22	3.05	.69	.60	.69	2.11	.00	.56	1.69	1.25	1.88
Total Construction Cost/Total km	M.p.	3.14	3.43	.69	.60	.30	1.49	.24	.56	2.21	1.65	3.97

TABLE 5.1 - 4 (2)

Quantity and Construction Cost OCCIDENTAL MINDORO

	Unit	P41	P29	N9	P34	P31	P42	P40	P28	P25	P47	N7-1
Total Road Length	km	17.6	1.9	4.0	6.5	1.7	8.0	11.4	1.8	1.9	1.9	8.7
Improvement Length	km	17.6	1.8	1.0	4.0	1.7	8.0	7.2	1.8	1.9	.8	8.7
Proposed Pavement Type		6.0-GRV	6.0-GRV	6.0-BMP	4.0-PCC 4.0-GRV	4.0-GRV	6.0-GRV	6.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV
Quantity												
100 Clearing & Grubbing	m2	92400	-	-	-	-	-	-	-	-	-	-
Stripping	m3	10080	-	-	-	-	-	-	-	-	-	-
102 Roadway & Drainage Excavation	m3	58122	1350	1452	1897	1275	5250	5400	1463	-	600	8177
104 Borrow	m3	12069	1017	-	4127	886	41183	4068	993	5824	452	3403
200 Aggregate Subbase	m3	9804	1188	1444	1986	782	5280	4752	828	874	368	4002
Preparation of Prev.Road(Grvl)	m2	75330	11880	-	17940	7820	52800	47520	8250	8550	3680	35210
Preparation of Prev.Road(Asph)	m2	-	-	6500	400	-	-	-	-	-	-	-
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	-	-	-	-	-	-
202 Crushed Aggregate Base Course	m3	-	-	1023	-	-	-	-	-	-	-	-
300 Crushed Aggr.,Surface Course	m3	15840	1620	-	2340	1020	7200	6480	1080	1140	480	5220
301 Bituminous Prime Coat	M.T.	-	-	7	-	-	-	-	-	-	-	-
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
305 Bituminous Macadam Pavement	m2	-	-	6000	-	-	-	-	-	-	-	-
310 Bitum.Concrete Surface Course	M.T.	-	-	-	-	-	-	-	-	-	-	-
304 Double Bitum.Surface Treatment	m2	-	-	-	-	-	-	-	-	-	-	-
311-1 PCC Pavement (t=23 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-2 PCC Pavement (t=20 cm)	m2	-	-	-	400	-	-	-	-	-	-	-
311-3 PCC Pavement (t=18 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
500 RCPC (dia.910mm)	m	660	60	30	64	24	660	210	32	32	16	136
Headwall for RCPC (dia.910mm)	Set	44	4	2	8	3	44	14	4	4	2	17
504 Grouted Riprap	m3	-	-	-	-	-	8239	-	-	-	-	-
Side Ditch (Grouted Riprap)	m	3150	-	-	-	-	-	-	-	-	-	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge,Superstructure	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Superstructure	m	-	-	-	-	-	-	-	-	-	32	-
2-lane Bridge,Abutment	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Abutment	Each	-	-	-	-	-	-	-	-	-	4	-
2-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Spillway	m	-	-	-	-	250	-	-	-	-	-	30
1-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
2-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 1-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 2-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	l.s.	1	1	1	1	1	1	1	1	1	1	1
Road Construction Cost	M.p.	16.79	1.25	1.62	2.30	.83	16.38	4.96	.91	1.44	.41	4.23
Bridge Construction Cost	M.p.	.00	.00	.00	.00	3.30	.00	.00	.00	.00	2.14	.40
Total Construction Cost	M.p.	16.79	1.25	1.62	2.30	4.13	16.38	4.96	.91	1.44	2.55	4.63
Road Construction Cost/Impr't km	M.p.	.95	.70	1.62	.57	.49	2.05	.69	.51	.76	.51	.49
Total Construction Cost/Total km	M.p.	.95	.66	.41	.35	2.43	2.05	.43	.51	.76	1.34	.53

TABLE 5.1 - 4 (3)

Quantity and Construction Cost OCCIDENTAL MINDORO

	Unit	P46	P55	N8-2	P44	N3	N7-3	P20	N2	P12	P19	P1
Total Road Length	km	1.1	3.8	5.8	4.3	1.4	6.6	5.6	5.5	5.7	3.6	13.0
Improvement Length	km	.9	3.8	4.0	4.3	.9	6.6	5.6	1.2	5.4	3.6	13.0
Proposed Pavement Type		6.0-GRV	4.0-GRV	6.0-GRV	6.0-GRV	6.0-GRV	4.0-GRV	6.0-GRV	4.0-GRV	4.0-GRV	6.0-GRV	6.0-GRV
Quantity												
100 Clearing & Grubbing	m2	-	-	-	-	-	-	-	-	-	-	-
Stripping	m3	-	-	-	-	-	-	-	-	-	-	-
102 Roadway & Drainage Excavation	m3	-	2032	3000	3225	-	4950	3600	900	4050	4638	13476
104 Borrow	m3	779	1702	2260	2430	1184	3729	18400	11691	2351	608	4302
200 Aggregate Subbase	m3	594	1748	2640	2838	594	3036	3696	552	2484	1046	5475
Preparation of Prev.Road(Grvl)	m2	5940	17480	26400	28380	5940	30360	36960	5520	24840	17540	71310
Preparation of Prev.Road(Asph)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	-	-	-	-	-	-
202 Crushed Aggregate Base Course	m3	-	-	-	-	-	-	-	-	-	-	-
300 Crushed Aggr. Surface Course	m3	810	2280	3600	3870	810	3960	5040	720	3240	3240	11700
301 Bituminous Prime Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
305 Bituminous Macadam Pavement	m2	-	-	-	-	-	-	-	-	-	-	-
310 Bitum.Concrete Surface Course	M.T.	-	-	-	-	-	-	-	-	-	-	-
304 Double Bitum.Surface Treatment	m2	-	-	-	-	-	-	-	-	-	-	-
311-1 PCC Pavement (t=23 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-2 PCC Pavement (t=20 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-3 PCC Pavement (t=18 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
500 RCPC (dia.910mm)	m	30	64	120	135	30	104	495	56	88	105	390
Headwall for RCPC (dia.910mm)	Set	2	8	8	9	2	13	33	7	11	7	26
504 Grouted Riprap	m3	-	-	-	-	-	-	6641	2052	-	-	-
Side Ditch (Grouted Riprap)	m	-	-	-	-	-	-	-	-	-	1450	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge,Superstructure	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Superstructure	m	-	-	-	-	-	55	-	42	68	-	-
2-lane Bridge,Abutment	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Abutment	Each	-	-	-	-	-	6	-	2	8	-	-
2-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Pier	Each	-	-	-	-	-	-	-	1	1	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	300
1-lane Spillway	m	-	-	-	-	-	845	-	-	18	-	-
1-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
2-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 1-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 2-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	l.s.	1	1	1	1	1	1	1	1	1	1	1
Road Construction Cost	M.p.	.62	1.80	2.76	2.98	.67	3.30	10.17	3.42	2.62	2.63	7.96
Bridge Construction Cost	M.p.	.00	.00	.00	.00	.00	14.61	.00	2.20	4.88	.00	5.45
Total Construction Cost	M.p.	.62	1.80	2.76	2.98	.67	17.91	10.17	5.63	7.50	2.63	13.40
Road Construction Cost/Impr't km	M.p.	.68	.47	.69	.69	.74	.50	1.82	2.85	.49	.73	.61
Total Construction Cost/Total km	M.p.	.56	.47	.48	.69	.48	2.71	1.82	1.02	1.32	.73	1.03

TABLE 5.1 - 4 (4)

Quantity and Construction Cost OCCIDENTAL MINDORO

	Unit	P11	P24-2	P51	B8-1	B10-6	B9-25	B9-6	B7-1	B10-3	B2-6	B9-7
Total Road Length	km	.9	4.5	15.0	7.8	2.2	5.5	2.7	4.3	1.2	5.5	5.9
Improvement Length	km	.9	4.5	15.0	7.8	2.2	5.5	2.7	3.1	1.2	5.5	5.9
Proposed Pavement Type		6.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV 6.0-PCC	4.0-GRV
Quantity												
100 Clearing & Grubbing	m2	-	45000	225000	-	-	-	-	-	-	-	-
Stripping	m3	-	4500	22500	-	-	-	-	-	-	-	-
102 Roadway & Drainage Excavation	m3	1161	1350	37500	5850	1914	4125	2025	2325	750	4279	4425
104 Borrow	m3	2969	6593	6225	4407	1067	7929	1526	3729	3983	17263	3334
200 Aggregate Subbase	m3	189	2070	6900	3588	644	2530	1242	1426	552	2862	2714
Preparation of Prev.Road(Grvl)	m2	4050	-	-	35880	9640	25300	12420	14250	4920	24380	27140
Preparation of Prev.Road(Asph)	m2	-	-	-	-	-	-	-	-	-	1200	-
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	-	-	-	-	-	-
202 Crushed Aggregate Base Course	m3	-	-	-	-	-	-	-	-	-	-	-
300 Crushed Aggr. Surface Course	m3	810	2700	9000	4680	1320	3300	1620	1860	720	3180	3540
301 Bituminous Prime Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
305 Bituminous Macadam Pavement	m2	-	-	-	-	-	-	-	-	-	-	-
310 Bitum.Concrete Surface Course	M.T.	-	-	-	-	-	-	-	-	-	-	-
304 Double Bitum.Surface Treatment	m2	-	-	-	-	-	-	-	-	-	-	-
311-1 PCC Pavement (t=23 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-2 PCC Pavement (t=20 cm)	m2	-	-	-	-	-	-	-	-	-	1200	-
311-3 PCC Pavement (t=18 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
500 RCPC (dia.910mm)	m	60	112	480	128	32	120	40	80	40	230	96
Headwall for RCPC (dia.910mm)	Set	4	14	60	16	4	15	5	10	5	27	12
504 Grouted Riprap	m3	558	-	-	-	-	1261	-	947	1097	4491	-
Side Ditch (Grouted Riprap)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge,Superstructure	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Superstructure	m	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge,Abutment	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Abutment	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Spillway	m	-	100	-	-	-	-	-	-	-	30	110
1-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
2-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 1-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 2-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	l.s.	1	1	1	1	1	1	1	1	1	1	1
Road Construction Cost	M.p.	1.28	2.90	10.69	3.91	1.00	4.27	1.34	2.51	1.78	8.27	2.96
Bridge Construction Cost	M.p.	.00	1.32	.00	.00	.00	.00	.00	.00	.00	.40	1.45
Total Construction Cost	M.p.	1.28	4.22	10.69	3.91	1.00	4.27	1.34	2.51	1.78	8.67	4.41
Road Construction Cost/Impr't km	M.p.	1.42	.64	.71	.50	.45	.78	.50	.81	1.49	1.50	.50
Total Construction Cost/Total km	M.p.	1.42	.94	.71	.50	.45	.78	.50	.58	1.49	1.58	.75

TABLE 5.1 - 4 (5)

Quantity and Construction Cost OCCIDENTAL MINDORO

	Unit	B7-7	B10-8	B9-8	B1-5	B10-7	B6-7	B8-5	B7-8	B1-6	B9-22	B5-5
Total Road Length	km	5.8	4.2	6.0	2.0	6.4	3.9	2.4	4.5	2.0	3.1	.8
Improvement Length	km	5.8	4.2	6.0	2.0	6.4	3.6	2.4	4.5	2.0	3.1	.8
Proposed Pavement Type		4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV
Quantity												
100 Clearing & Grubbing	m2	-	-	25000	-	-	-	-	-	10000	-	-
Stripping	m3	-	-	2500	-	-	-	-	-	1000	-	-
102 Roadway & Drainage Excavation	m3	210	3469	3375	3750	1231	2700	1800	3375	2175	2325	600
104 Borrow	m3	19580	13209	11646	405	26063	2034	1356	2543	1793	1752	427
200 Aggregate Subbase	m3	1912	1932	2760	920	2016	1656	1104	2070	920	1426	368
Preparation of Prev.Road(Grvl)	m2	23260	18540	16100	6200	23290	16560	11040	20700	2800	14260	3680
Preparation of Prev.Road(Asph)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	-	-	-	-	-	-
202 Crushed Aggregate Base Course	m3	-	-	-	-	-	-	-	-	-	-	-
300 Crushed Aggr. Surface Course	m3	3480	2520	3600	1140	3840	2160	1440	2700	1200	1860	480
301 Bituminous Prime Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
305 Bituminous Macadam Pavement	m2	-	-	-	-	-	-	-	-	-	-	-
310 Bitum.Concrete Surface Course	M.T.	-	-	-	-	-	-	-	-	-	-	-
304 Double Bitum.Surface Treatment	m2	-	-	-	-	-	-	-	-	-	-	-
311-1 PCC Pavement (t=23 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-2 PCC Pavement (t=20 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-3 PCC Pavement (t=18 cm)	m2	-	-	-	400	-	-	-	-	-	-	-
500 RCPC (dia.910mm)	m	152	176	184	32	104	56	40	72	40	48	16
Headwall for RCPC (dia.910mm)	Set	19	22	23	4	13	7	5	9	5	6	2
504 Grouted Riprap	m3	2619	3900	2131	-	-	-	-	-	-	-	-
Side Ditch (Grouted Riprap)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge,Superstructure	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Superstructure	m	10	-	-	-	-	60	-	-	10	-	-
2-lane Bridge,Abutment	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Abutment	Each	2	-	-	-	-	2	-	-	2	-	-
2-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge,Pier	Each	-	-	-	-	-	2	-	-	-	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Spillway	m	-	-	300	-	150	-	-	-	80	-	-
1-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
2-cell RCBC	m	-	-	-	-	-	9	-	-	-	9	-
Wingwall for 1-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 2-cell RCBC	Set	-	-	-	-	-	1	-	-	-	1	-
Miscellaneous	l.s.	1	1	1	1	1	1	1	1	1	1	1
Road Construction Cost	M.p.	6.32	6.34	5.69	1.12	5.42	1.80	1.20	2.25	1.17	1.55	.40
Bridge Construction Cost	M.p.	.86	.00	3.96	.00	1.98	3.58	.00	.00	1.91	.53	.00
Total Construction Cost	M.p.	7.18	6.34	9.65	1.12	7.40	5.38	1.20	2.25	3.09	2.07	.40
Road Construction Cost/Impr't km	M.p.	1.09	1.51	.95	.56	.85	.50	.50	.50	.59	.50	.51
Total Construction Cost/Total km	M.p.	1.24	1.51	1.61	.56	1.16	1.38	.50	.50	1.54	.67	.51

TABLE 5.1 - 4 (6)

Quantity and Construction Cost OCCIDENTAL MINDORO

	Unit	B2-4	B0-2	B0-8	B0-9	B1-2	B8-9	B6-2	B8-8
Total Road Length	km	4.0	7.0	5.0	2.7	4.6	3.7	3.9	5.8
Improvement Length	km	2.5	5.2	3.9	2.7	4.6	3.7	3.9	5.8
Proposed Pavement Type		4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV	4.0-PCC 4.0-GRV	4.0-GRV	4.0-GRV	4.0-GRV
Quantity									
100 Clearing & Grubbing	m2	-	-	-	-	40000	24000	24000	30000
Stripping	m3	-	-	-	-	4000	2400	2400	3000
102 Roadway & Drainage Excavation	m3	1875	5682	3488	238	1544	3275	3773	2700
104 Borrow	m3	1413	3990	2022	4262	8621	1866	1759	6277
200 Aggregate Subbase	m3	1150	2328	1794	698	2408	1702	1794	2668
Preparation of Prev.Road(Grvl)	m2	11500	18050	17790	9440	1840	7820	7570	12840
Preparation of Prev.Road(Asph)	m2	-	-	-	-	800	-	-	-
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	-	-	-
202 Crushed Aggregate Base Course	m3	-	-	-	-	-	-	-	-
300 Crushed Aggr. Surface Course	m3	1500	3120	2280	1620	2640	2220	2340	3480
301 Bituminous Prime Coat	M.T.	-	-	-	-	-	-	-	-
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-
305 Bituminous Macadam Pavement	m2	-	-	-	-	-	-	-	-
310 Bitum.Concrete Surface Course	M.T.	-	-	-	-	-	-	-	-
304 Double Bitum.Surface Treatment	m2	-	-	-	-	-	-	-	-
311-1 PCC Pavement (t=23 cm)	m2	-	-	-	-	-	-	-	-
311-2 PCC Pavement (t=20 cm)	m2	-	-	-	-	800	-	-	-
311-3 PCC Pavement (t=18 cm)	m2	-	-	400	-	-	-	-	-
500 RCPC (dia.910mm)	m	40	80	64	40	128	88	96	120
Headwall for RCPC (dia.910mm)	Set	5	10	8	5	16	11	12	15
504 Grouted Riprap	m3	-	-	-	-	780	-	-	-
Side Ditch (Grouted Riprap)	m	-	-	-	-	-	-	-	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-
2-lane Bridge,Superstructure	m	-	-	-	-	-	-	-	-
1-lane Bridge,Superstructure	m	-	-	35	-	-	-	-	-
2-lane Bridge,Abutment	Each	-	-	-	-	-	-	-	-
1-lane Bridge,Abutment	Each	-	-	6	-	-	-	-	-
2-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-
1-lane Bridge,Pier	Each	-	-	-	-	-	-	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	-
1-lane Spillway	m	100	-	-	-	80	-	-	-
1-cell RCBC	m	-	-	-	-	-	-	-	-
2-cell RCBC	m	-	26	9	-	-	-	-	9
Wingwall for 1-cell RCBC	Set	-	-	-	-	-	-	-	-
Wingwall for 2-cell RCBC	Set	-	3	1	-	-	-	-	1
Miscellaneous	l.s.	1	1	1	1	1	1	1	1
Road Construction Cost	M.p.	1.25	2.78	2.06	1.40	4.02	2.04	2.14	3.35
Bridge Construction Cost	M.p.	1.32	1.52	3.28	.00	1.06	.00	.00	.53
Total Construction Cost	M.p.	2.57	4.30	5.33	1.40	5.07	2.04	2.14	3.88
Road Construction Cost/Impr't km	M.p.	.50	.53	.53	.52	.87	.55	.55	.58
Total Construction Cost/Total km	M.p.	.64	.61	1.07	.52	1.10	.55	.55	.67

5.1.3 Summary of Preliminary Design

Results of preliminary design were summarized in Tables 5.1-5 and 5.1-6 for major and minor roads, respectively.

TABLE 5.1-5 SUMMARY OF PRELIMINARY DESIGN :
Province of Occidental Mindoro
- Major Roads -

	Type of Improvement			
	Rehabilitation/ Improvement - 1	Improvement-2/ Widening	New Construction	Total
Primary Major Roads				
1. No. of Links	-	1	1	2
2. Total Length (km)	-	34.2	26.0	60.2
3. Improvement Length (km)	-	26.1	26.0	52.1
4. Construction Cost (million P)	-	107.4	89.2	196.6
5. Const. Cost/Imp. Length (MP/km)	-	4.11	3.43	3.77
Secondary Major Roads				
1. No. of Links	5	1	2	8
2. Total Length (km)	52.3	2.2	29.6	84.1
3. Improvement Length (km)	15.4	2.2	29.6	47.2
4. Construction Cost (million P)	23.6	1.2	52.2	77.0
5. Const. Cost/Imp. Length (MP/km)	1.53	1.83	1.76	1.63
Major Roads Total				
1. No. of Links	5	2	3	10
2. Total Length (km)	52.3	36.4	55.6	144.3
3. Improvement Length (km)	15.4	28.3	55.6	99.3
4. Construction Cost (million P)	23.6	108.6	141.4	273.6
5. Const. Cost/Imp. Length (MP/km)	1.53	3.84	2.54	2.76

TABLE 5.1-6 SUMMARY OF PRELIMINARY DESIGN
Province of Occidental Mindoro
- Minor Roads -

	Type of Improvement		
	Rehabilitation/ Improvement-1&2/ Widening	New Construction	Total
Minor Roads (National/ Provincial/City)			
1. No. of Links	24	2	26
2. Total Length (km)	127.4	19.5	146.9
3. Improvement Length (km)	109.4	19.5	128.9
4. Construction Cost (million P)	142.9	14.9	157.8
5. Const. Cost/Imp. Length (MP/km)	1.31	0.76	1.22
Minor Roads (Barangay)			
1. No. of Links	23	4	27
2. Total Length (km)	94.9	18.0	112.9
3. Improvement Length (km)	89.0	18.0	107.0
4. Construction Cost (million P)	87.6	13.1	100.7
5. Const. Cost/Imp. Length (MP/km)	0.98	0.73	0.94
Minor Roads Total			
1. No. of Links	47	6	53
2. Total Length (km)	222.3	37.5	259.8
3. Improvement Length (km)	198.4	37.5	235.9
4. Construction Cost (million P)	230.5	28.0	258.5
5. Const. Cost/Imp. Length (MP/km)	1.16	0.75	1.10

5.2 ECONOMIC EVALUATION

5.2.1 Basic Assumptions

The commonly used cost-benefit analysis was applied under the following basic assumptions:

i) Analysis Period

1991 - Detailed design
1992 - Construction
1993 ┐
     │ -Project life (25 years)
2017 ┘

ii) Discount Rate: 15% pa

iii) Quantified Cost

Initial construction/improvement costs
Periodic maintenance costs

iv) Quantified Benefit

Traffic benefit
Development benefit (only for development projects)
Maintenance cost savings

The periodic maintenance costs, or rehabilitation costs, such as overlay, reconstruction and regravelling which will be needed after completion of the project to prolong the pavement life, were treated as project costs in this study, while the difference between routine maintenance costs and total maintenance costs in the "w/o" case was taken into account as a project benefit. In the case where the routine maintenance costs are higher than the "w/o" maintenance costs, the difference is considered as a negative benefit.

5.2.2 Economic Costs

1) Initial Construction/Improvement Costs

The construction costs discussed in Section 5.2.1 are the financial costs and do not include the costs for detailed design and construction supervision. In the cost-benefit analysis, the following economic cost was used:

Construction Cost	100%
-Tax	-15%
+Detailed Design Cost	4%
+Construction Supervision Cost	6%
Total Economic Cost	95%

In the cost-benefit stream, 4% for detailed design cost was assumed to be spent in 1991 and the remaining 91% in 1992.

2) Periodic Maintenance Costs

Periodic maintenance, or rehabilitation, will be necessary when the riding quality of a pavement decreases to a certain minimum level of acceptability. Table 5.2-1 shows the periodic maintenance assumed in this Study.

TABLE 5.2-1 PERIODIC MAINTENANCE COST ASSUMED IN THE ANALYSIS

Surface Type	Periodic Maintenance Work	Timing	Financial Cost 1) (million₱/Km)	Economic Cost
Gravel	10cm Regravelling	When thickness of gravel is reduced by 10cm, assuming 1.5cm loss annually from rainfall and 1.5cm loss every 100,000 vehicles (2-6 years)	4.0 m Gravel: ₱ 0.210 M 6.0 m Gravel: ₱ 0.320 M	85% of Cost
BMP	5.5cm BMP Overlay	When pavement serviceability decreases to 2.0, assuming 85,000 ESAL or 350,000 vehicle repetitions (4-10 years)	₱ 0.830 M	85% of Cost
AC	5 cm AC Overlay	When pavement serviceability decreases to 2.0, assuming 800,000 ESAL or 2,300,000 vehicle repetitions (8-20 years)	₱ 1.170 M	85% of Cost
PCC	5 cm AC Overlay	When pavement serviceability decreases to 2.0, assuming 2,000,000 ESAL or 5,700,000 vehicle repetitions (10-25 years)	₱ 1.200 M	85% of Cost

Note: 1) As of April 1990

5.2.3 Benefits

1) Traffic Benefits

a) Traffic Cost

Basic Traffic Costs

The basic traffic costs were provided by PMO-FS, as shown in Table 5.2-2.

TABLE 5.2-2 BASIC TRAFFIC COSTS EXCLUDING TAX (AS OF DECEMBER 1989)

	Running Cost (₱/km)	Fixed Cost (₱/hour)	Time Cost (₱/hour)
Car/Van	1.75	6.30	17.70
Jeepney	1.12	23.76	26.40
Bus	2.81	35.64	95.04
Truck	3.48	38.88	0
Motor-tricycle	0.36	8.76	4.98
Motorcycle	0.31	0.72	8.34

Actual Traffic Costs

The actual traffic costs were estimated according to the dl-system concerning running costs and the dt-system with regard to fixed and time costs. The dl-values and operating speed for different surface conditions are shown in Tables 5.2-3 and 5.2-4, respectively.

TABLE 5.2-3 DL-VALUES IN KM PER ACTUAL KM

Surface Type / Surface Condition	PCC/AC	BMP/DBST	Gravel	Earth
Good	0	0.14	0.29	-
Fair	0.17	0.38	0.60	-
Bad	0.43	0.65	0.87	1.20
Very Bad	0.89	1.04	1.20	1.56
Impassable	1.73	1.73	1.73	1.73

TABLE 5.2-4 OPERATING SPEED IN KM/HOUR

Surface Condition	Surface Type: PCC/AC OV	PCC/AC TR	PCC/AC MC	BMP/DBST OV	BMP/DBST TR	BMP/DBST MC	Gravel OV	Gravel TR	Gravel MC	Earth OV	Earth TR	Earth MC
Good	65	40	60	63	38	55	60	35	50	-	-	-
Fair	55	35	50	53	33	45	50	30	40	-	-	-
Bad	30	20	20	30	20	20	30	20	20	20	10	10
Very Bad	20	10	10	20	10	10	20	10	10	10	5	5
Impassable	10	5	5	10	5	5	10	5	5	10	5	5

Note: OV = Car/Jeepney/Bus/Truck
TR = Motor-tricycle
MC = Motorcycle

Traffic Costs of Other Transport Modes

In addition to the land-based motorized vehicles, the traffic costs of other modes were estimated as shown in Table 5.2-5.

TABLE 5.2-5 TRAFFIC COST OF OTHER MODES (COMMON TO ALL SURFACE TYPES AND CONDITIONS)

Mode	Traffic Cost in ₱/Km
Animal Drawn	4.0
Walking (head loading)	1.2
Banca Boat	2.25

b) Traffic Benefits in Traffic Projects

Traffic on the project roads wwas broken down into four categories: normal traffic, diverted traffic-1, diverted traffic-2 and generated traffic.

The traffic benefits were estimated as follows:

i) Normal Traffic : Difference in traffic costs between "w/o" and "with" cases. The change in traffic costs results not only from the improvement of surface type and condition but also from consequent change in modal distribution.

ii) Diverted Traffic-1 : Difference between traffic costs along the "w/o" route and those along the "with" route. Where diverted traffic passes through two or more project roads, the benefits were allocated to each road in proportion to length.

iii) Diverted Traffic-2 and Generated Traffic: Half of the difference in traffic costs between "w/o" and "with" cases. This is the commonly used approximation.

Traffic costs were calculated assuming the following surface conditions:

"W/O" Case : Present surface condition is maintained.
"With" Case: Gravel/BMP are maintained in a fair condition.
AC/PCC are maintained in a good condition

c) Traffic Benefits in Development Projects

No diverted traffic is expected in most development projects. The benefits from normal traffic generated traffic were estimated in the same way as used for the traffic projects paying attention to the following:

i) The travel distance considered in the benefit calculation is the distrance from the average gravity point of transport (gravity of population for passenger traffic and non-agricultural traffic and gravity of agricultural production for agricultural traffic) to the connecting point with a higher road.

ii) The benefit from generated agricultural traffic is not considered as a traffic benefit because it is included in the development benefit. Therefore, the generated traffic benefits are only from passenger traffic and non-agricultural traffic.

2) Development Benefits

Development benefits were assessed using the producer surplus approach, under the hypothesis that substantial road improvement which removes constraints on development will permit and encourage farmers to adopt modern agricultural techniques and inputs. The development benefit consists of the difference in the

net value of total production (farmgate value less production costs) between the "w/o" and "with" cases. Changes in the volume and value of agricultural production will be achieved by one or more of the following:

i) Increase in cultivated area
ii) Increase in yield
iii) Increase in intensity of land use through increasing the number of harvest or intercropping
iv) Changes in the type of crop

Using the data obtained from the socio-economic survey, development benefits were calculated from the following equation:

Benefit = PRODw(FGPw-CPw)-(FGPw-CPw/o)

where, PRODw = Production in metric tons, with
PRODw/o= Production in metric tons, w/o
FGPw = Farmgate price in pesos per metric ton, with
CPw = Production cost in pesos per metric ton, with
CPw/o = Production cost in pesos per metric ton, w/o

The increase in farmgate price resulting from reduction in traffic cost is not included in the development benefits, because it is considered a part of the traffic benefits.

Table 5.2-6 presents the summary of demographic and agricultural data.

TABLE 5.2 - 6 (1)

Summary of Demographic and Agricultural Data OCCIDENTAL MINDORO

Class of Road	Type of Impr't	Road Number	Road Length (km)	1990 Population Total	1990 Population /km	1990 Crop Area (ha) Total	Major Crop				1993 AADT w/o	1993 AADT with	IRR (%)
Minor (Nat'l/ Prov'l)	Rehab/ Imp-1	P24-1	4.7	2367	504	2310	1400(Palay)	800(Corn)	110(Banan)		0	18	23.7
		P41	17.6	9676	550	1770	1540(Palay)	150(Vege.)	80(Corn)		19	46	16.7
		P29	1.9	2092	1101	252	250(Palay)	2(Corn)			4	6	14.9
		N9	4.0	6924	1731	10	10(Coco.)				23	31	13.8
		P34	6.5	2210	340	290	290(Palay)				10	12	13.1
		P31	1.7	2175	1279	90	50(Corn)	40(Palay)			0	1	11.5
		P42	8.0	2993	374	1270	1270(Palay)				11	31	7.9
		P40	11.4	6003	527	590	390(Palay)	100(Corn)	100(Vege.)	0(Banan)	17	31	6.5
		P28	1.8	2377	1321	151	80(Coco.)	70(Palay)	1(Corn)		4	7	6.4
		P47	1.9	1329	699	560	360(Palay)	200(Root)			7	7	6.3
		P25	1.9	820	432	320	160(Palay)	130(Corn)	30(Vege.)		2	2	6.3
		N7-1	8.7	750	86	273	270(Palay)	2(Corn)	1(Root)		1	4	5.9
		P46	1.1	2755	2505	170	120(Palay)	50(Coco.)			7	13	4.9
		P55	3.8	1569	413	170	150(Palay)	20(Root)			4	7	4.2
		N8-2	5.8	5425	935	291	290(Palay)	1(Vege.)	1(Root)		23	24	4.1
		P44	4.3	2825	657	820	770(Palay)	50(Vege.)			3	14	3.8
		N3	1.4	2849	2035	130	50(Palay)	50(Coco.)	30(Corn)		9	14	2.7
		N7-3	6.6	775	117	251	101(Palay)	100(Corn)	50(Banan)		0	3	1.6
		P12	5.7	300	53	280	200(Coco.)	80(Palay)			0	2	.0
		N2	5.5	4004	728	250	80(Corn)	60(Coco.)	60(Root)	50(Palay)	13	13	.0
		P20	5.6	2839	507	250	150(Palay)	100(Coco.)			8	8	.0
	Imp-2/ Widen	P19	3.6	1390	386	800	680(Palay)	120(Corn)	0(Vege.)		13	13	10.4
		P1	13.0	927	71	1190	420(Palay)	420(Root)	350(Coco.)		0	8	3.6
		P11	.9	1440	1600	240	100(Palay)	90(Coco.)	50(Vege.)		3	7	3.3
	New Const.	P24-2	4.5	1340	298	1100	510(Palay)	510(Corn)	80(Banan)		0	6	13.4
		P61	15.0	100	7	5	3(Corn)	2(Vege.)			0	0	4.6
Minor (Baran-gay)	Rehab/ Imp-1	B8-1	7.8	3719	477	1450	1030(Palay)	420(Corn)			9	24	24.1
		B10-6	2.2	275	125	370	300(Palay)	40(Corn)	30(Root)		2	5	21.8
		B9-25	5.5	175	32	390	390(Palay)				3	7	15.5
		B9-6	2.7	145	54	360	260(Palay)	100(Root)			0	3	11.6
		B7-1	4.3	206	48	500	500(Palay)				3	9	10.4
		B10-3	1.2	25	21	380	350(Palay)	30(Corn)			0	2	10.3
		B2-6	5.5	2593	471	670	370(Palay)	200(Vege.)	100(Corn)		3	7	10.0
		B9-7	5.9	155	26	210	160(Palay)	50(Corn)			0	2	7.7
		B7-7	5.8	95	16	700	700(Palay)				5	12	6.0
		B10-8	4.2	135	32	310	270(Palay)	40(Root)			0	2	5.1
		B9-8	6.0	75	13	230	180(Palay)	50(Corn)			0	1	4.7
		B1-5	2.0	145	73	80	50(Palay)	30(Corn)			0	1	4.0
		B10-7	6.4	184	29	300	230(Palay)	50(Corn)	20(Banan)		2	4	3.7
		B6-7	3.9	693	178	290	150(Palay)	140(Root)			0	1	3.6
		B8-5	2.4	565	235	70	40(Palay)	30(Vege.)			0	2	3.5
		B7-8	4.5	87	19	400	250(Palay)	150(Corn)			0	0	3.5
		B1-6	2.0	35	18	120	90(Palay)	30(Corn)			0	1	3.3
		B9-22	3.1	96	31	350	250(Palay)	100(Root)			0	1	3.2
		B5-5	.8	45	56	50	50(Palay)				0	0	2.8
		B2-4	4.0	455	114	110	110(Palay)				0	0	2.5
		B0-2	7.0	550	79	293	260(Palay)	30(Root)	3(Vege.)		1	2	2.4
		B0-8	5.0	295	59	290	150(Coco.)	140(Palay)			0	2	.2
	Imp-2/ Widen	B0-9	2.7	150	56	790	480(Palay)	210(Corn)	100(Root)		2	5	19.5
	New	B1-2	4.6	250	54	161	160(Corn)	1(Palay)			0	1	3.2

TABLE 5.2 - 6 (2)

Summary of Demographic and Agricultural Data OCCIDENTAL MINDORO

Class of Road	Type of Impr't	Road Number	Road Length (km)	1990 Population Total	1990 Population /km	1990 Crop Area (ha) Total	1990 Crop Area (ha) Major Crop	1993 AADT w/o	1993 AADT with	IRR (%)
Minor (Baran-gay)	New Const.	B8-9	3.7	189	51	360	150(Root) 130(Banan) 80(Palay)	0	0	1.7
		B6-2	3.9	64	16	190	100(Root) 60(Coco.) 30(Palay)	0	0	.0
		B8-8	5.8	345	59	490	260(Coco.) 140(Banan) 90(Palay)	0	1	.0

3) Maintenance Cost Savings

The difference in maintenance costs between the "w/o" and "with" cases is considered one of the benefits. Maintenance costs in the "w/o" case were estimated based on the current EMK system, while maintenance costs in the "with" case were estimated as shown in b) below. It is noted that periodic maintenance cost in the "with" case is not included in the calculation of maintenance cost savings, because it is treated as a part of project costs.

In the case where the routine maintenance costs in the "with" case are higher than the maintenance costs in the "w/o" case (especially in the case of new construction, the maintenance cost in the "w/o" case in zero), the difference is considered as a negative benefit).

a) Maintenance Cost in "w/o" Case

According to the current EMK system, the annual maintenance cost per km was estimated as basic maintenance cost of ₱17,143.00/km times the EMK factor as shown in Table 5.2-7.

TABLE 5.2-7
EMK FACTOR FOR DIFFERENT SURFACING AND AADT

AADT / Surface Type	25	50	75	100	150	200	300	400
Earth	0.35	0.40	0.50					
Gravel	0.40	0.60	0.90	1.40	1.90	2.20	2.40	2.50	2.60

AADT / Surface Type	400	600	1000	1500	2000	3000	5000	10000
Bituminous	1.10	1.55	2.10	2.50	2.60			
Gravel	0.50	0.60	0.80	0.85	0.90	0.95	1.00	1.05	1.10

b) Routine Maintenance Costs in "with" Case

The costs deemed necessary to maintain the improved roads in a fair condition were estimated as shown in Table 5.2-8.

TABLE 5.2-8
ESTIMATED ROUTINE MAINTENANCE COSTS

Surface Type	Operation	Annual Cost (peso/km)
Gravel	Vegetation Control	1,150
	Ditch Cleaning Grading Pothole Repair	4.0 m Gravel: 2,650 + 40 AADT 6.0 m Gravel: 3,000 + 45 AADT
	Total	4.0 m Gravel: 3,800 + 45 AADT 6.0 m Gravel: 4,150 + 45 AADT
BMP	Vegetation Control	1,150
	Ditch Cleaning	1,100
	Shoulder Repair	2,150
	Patching	8,000 + 7.5 AADT
	Regravelling Shoulder	8,600
	Total	21,000 + 7.5 AADT
AC	Vegetation Control	1,150
	Ditch Cleaning	1,100
	Shoulder Repair	2,150
	Crack and Joint Sealing	9,300
	Regravelling Shoulder	8,600
	Total	20,400
PCC	Vegetation Control	1,150
	Ditch Cleaning	1,100
	Shoulder Repair	2,150
	Crack and Joint Sealing	5,600
	Regravelling Shoulder	8,600
	Total	18,600

5.2.4 Economic Evaluation

Results of economic evaluation are summarized in Table 5.2-9 and illustrated in Figure 5.2-1. Results of economic evaluation of each project road is presented in Table 5.2-10.

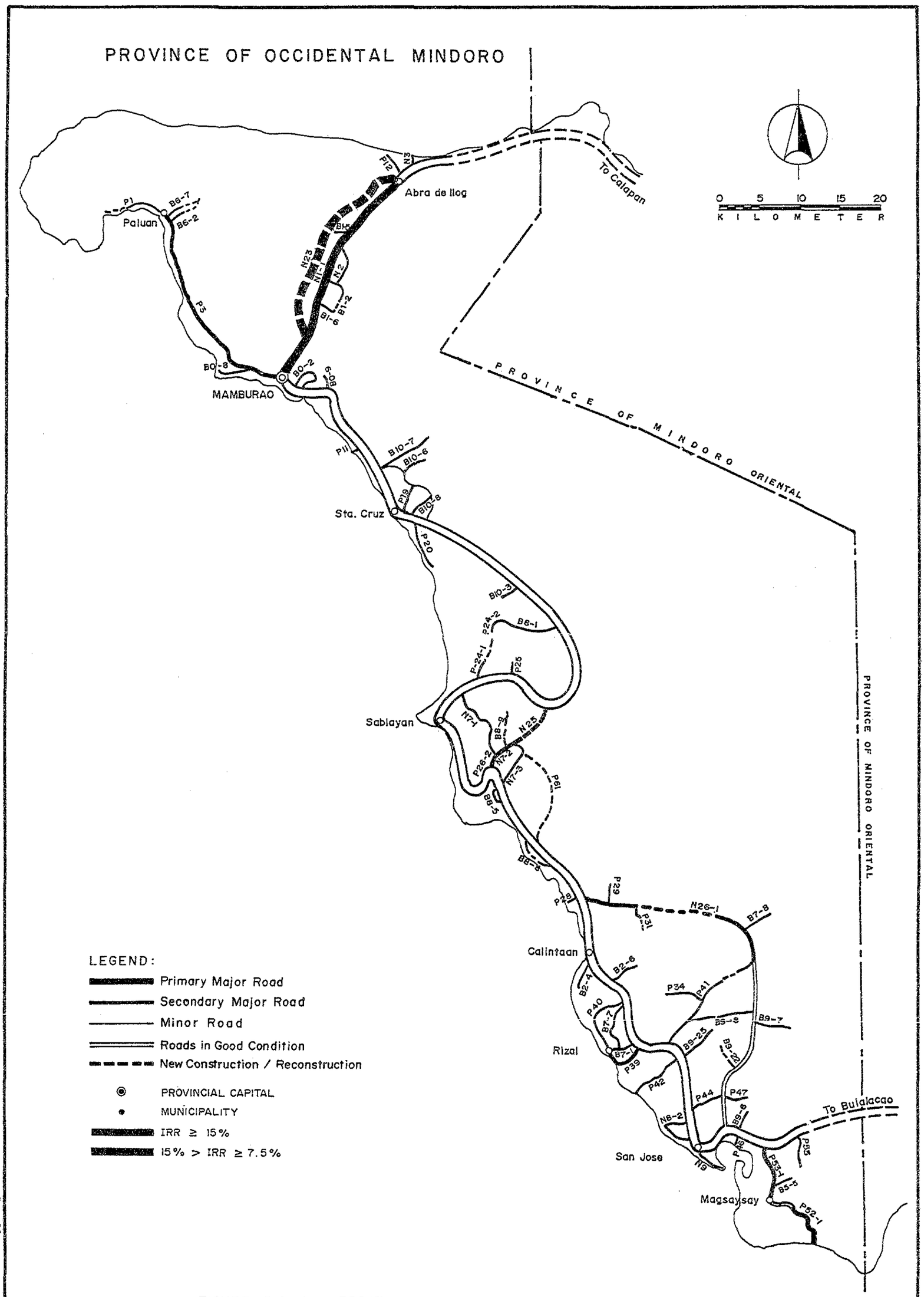

FIGURE 5.2 - 1 PROJECT ROADS and ECONOMIC EVALUATION RESULTS

TABLE 5.2 - 9 (1)

Road Length and Construction Cost OCCIDENTAL MINDORO

Class of Road	Range of IRR	Rehabilitation/Improvement-1						Improvement-2/Widening						New Construction					
		No.	Total Length	Improv Length	Road Cost	Bridge Cost	Total Cost	No.	Total Length	Improv Length	Road Cost	Bridge Cost	Total Cost	No.	Total Length	Improv Length	Road Cost	Bridge Cost	Total Cost
Primary Major	15<	-	-	-	-	-	-	-	-	-	-	-	-	1	26.0	26.0	79.2	9.9	89.2
	10-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.5-10	-	-	-	-	-	-	1	34.2	26.1	83.9	23.5	107.4	-	-	-	-	-	-
	<7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	1	34.2	26.1	83.9	23.5	107.4	1	26.0	26.0	79.2	9.9	89.2
Second'y Major	15<	2	8.1	8.1	5.1	-	5.1	1	2.2	2.2	1.2	-	1.2	1	6.0	6.0	10.2	3.1	13.3
	10-15	1	7.0	3.0	2.1	-	2.1	-	-	-	-	-	-	-	-	-	-	-	-
	7.5-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	<7.5	2	37.2	4.3	9.1	7.3	16.4	-	-	-	-	-	-	1	23.6	23.6	29.5	9.4	38.9
	Total	5	52.3	15.4	16.2	7.3	23.6	1	2.2	2.2	1.2	-	1.2	2	29.6	29.6	39.7	12.6	52.2
Minor (Nat'l/ Prov'l)	15<	2	22.3	22.3	25.6	9.8	35.5	-	-	-	-	-	-	-	-	-	-	-	-
	10-15	4	14.1	8.5	6.0	3.3	9.3	1	3.6	3.6	2.6	-	2.6	1	4.5	4.5	2.9	1.3	4.2
	7.5-10	1	8.0	8.0	16.4	-	16.4	-	-	-	-	-	-	-	-	-	-	-	-
	<7.5	14	65.5	53.1	40.3	24.2	64.5	2	13.9	13.9	9.2	5.4	14.7	1	15.0	15.0	10.7	-	10.7
	Total	21	109.9	91.9	88.3	37.3	125.6	3	17.5	17.5	11.9	5.4	17.3	2	19.5	19.5	13.6	1.3	14.9
Minor (Baran-gay)	15<	3	15.5	15.5	9.2	-	9.2	1	2.7	2.7	1.4	-	1.4	-	-	-	-	-	-
	10-15	3	8.2	7.0	5.6	-	5.6	-	-	-	-	-	-	-	-	-	-	-	-
	7.5-10	2	11.4	11.4	11.2	1.8	13.1	-	-	-	-	-	-	-	-	-	-	-	-
	<7.5	14	57.1	52.4	39.4	18.9	58.3	-	-	-	-	-	-	4	18.0	18.0	11.5	1.6	13.1
	Total	22	92.2	86.3	65.4	20.8	86.2	1	2.7	2.7	1.4	-	1.4	4	18.0	18.0	11.5	1.6	13.1
Total	15<	7	45.9	45.9	39.9	9.8	49.7	2	4.9	4.9	2.6	-	2.6	2	32.0	32.0	89.4	13.1	102.5
	10-15	8	29.3	18.5	13.7	3.3	17.0	1	3.6	3.6	2.6	-	2.6	1	4.5	4.5	2.9	1.3	4.2
	7.5-10	3	19.4	19.4	27.6	1.8	29.5	1	34.2	26.1	83.9	23.5	107.4	-	-	-	-	-	-
	<7.5	30	159.8	109.8	88.7	50.5	139.2	2	13.9	13.9	9.2	5.4	14.7	6	56.6	56.6	51.7	11.0	62.8
	Total	48	254.4	193.6	169.9	65.4	235.4	6	56.6	48.5	98.4	29.0	127.4	9	93.1	93.1	144.0	25.4	169.5

TABLE 5.2 - 9 (2)

Road Length and Construction Cost OCCIDENTAL MINDORO

Class of Road	Range of IRR	Total					
		No.	Total Length	Improv Length	Road Cost	Bridge Cost	Total Cost
Primary Major	15<	1	26.0	26.0	79.2	9.9	89.2
	10-15	-	-	-	-	-	-
	7.5-10	1	34.2	26.1	83.9	23.5	107.4
	<7.5	-	-	-	-	-	-
	Total	2	60.2	52.1	163.2	33.5	196.6
Second'y Major	15<	4	16.3	16.3	16.5	3.1	19.6
	10-15	1	7.0	3.0	2.1	-	2.1
	7.5-10	-	-	-	-	-	-
	<7.5	3	60.8	27.9	38.6	16.8	55.4
	Total	8	84.1	47.2	57.1	19.9	77.0
Minor (Nat'l/ Prov'l)	15<	2	22.3	22.3	25.6	9.8	35.5
	10-15	6	22.2	16.6	11.5	4.6	16.2
	7.5-10	1	8.0	8.0	16.4	-	16.4
	<7.5	17	94.4	82.0	60.2	29.7	89.9
	Total	26	146.9	128.9	113.8	44.1	157.9
Minor (Baran-gay)	15<	4	18.2	18.2	10.6	-	10.6
	10-15	3	8.2	7.0	5.6	-	5.6
	7.5-10	2	11.4	11.4	11.2	1.8	13.1
	<7.5	18	75.1	70.4	50.9	20.5	71.4
	Total	27	112.9	107.0	78.3	22.4	100.7
Total	15<	11	82.8	82.8	132.0	22.9	154.8
	10-15	10	37.4	26.6	19.2	4.6	23.9
	7.5-10	4	53.6	45.5	111.5	25.4	136.9
	<7.5	38	230.3	180.3	149.7	67.0	216.7
	Total	63	404.1	335.2	412.4	119.8	532.2

TABLE 5.2 - 10 (1)

Summary of Economic Analysis OCCIDENTAL MINDORO

Cost/Benefit:1991-2017 Discounted Total

Class of Road	Type of Impr't	Road Number	1993 AADT w/o	1993 AADT with	Length (km) Total	Length (km) Improvement	Economic Cost (Mp/km) Construct.	Economic Cost (Mp/km) Period Maint.	Economic Cost (Mp/km) Total	Benefit (Mp/km) Normal	Diverted	Generated	Develop't	Maint sav'g	Benefit (Mp/km) Total	Econom.Indicator NPV (Mp)	B/C	IRR (%)
Primary Major	Imp-2/ Widen	N1-1	167	243	34.2	25.8(6.0-BMP) .3(6.0-PCC)	3.42	.49	3.91	1.27	-	.94	-	.05	2.26	-43.1	.6	7.9
	New Const.	N23	167	243	26.0	26.0(6.0-BMP)	2.85	.49	3.34	3.58	-	2.66	-	-.14	6.11	71.8	1.8	26.2
Second'y Major	Rehab/ Imp-1	N7-2	18	122	2.7	2.4(6.0-GRV) .3(6.0-PCC)	.57	.32	.89	.09	3.81	.27	-	-.05	4.12	8.7	4.6	82.2
		P53-1	195	198	5.4	5.4(6.0-GRV)	.50	.37	.87	.97	-	-	-	.10	1.08	1.1	1.2	21.1
		P52-1	39	42	7.0	3.0(6.0-GRV)	.57	.19	.76	.64	-	.00	-	.03	.66	-.3	.9	12.6
		P39	101	130	6.1	4.3(6.0-GRV)	1.75	.37	2.12	.74	-	.20	-	.08	1.02	-4.8	.5	4.7
		P3	42	53	31.1	-	6.10	-	6.10	1.12	-	.31	-	-	1.43	-4.7	.2	1.6
	Imp-2/ Widen	P26-2	18	122	2.2	2.2(6.0-GRV)	.47	.36	.83	.10	4.86	.30	-	-.05	5.20	9.6	5.3	100.0
	New Const.	N25	0	102	6.0	6.0(6.0-GRV)	1.84	.32	2.16	-	2.52	1.02	-	-.08	3.46	7.8	1.6	23.7
		N26-1	0	2	23.6	23.6(6.0-GRV)	1.37	.17	1.55	-	.00	.76	-	-.01	.75	-18.7	.5	6.4

TABLE 5.2 - 10 (2)
Summary of Economic Analysis OCCIDENTAL MINDORO

Cost/Benefit:1991-2017 Discounted Total

Class of Road	Type of Impr't	Road Number	1993 AADT w/o	1993 AADT with	Length (km) Total	Length (km) Improvement	Economic Cost (Mp/km) Construct.	Economic Cost (Mp/km) Period Maint.	Economic Cost (Mp/km) Total	Benefit (Mp/km) Normal	Diverted	Generated	Develop't	Maint sav'g	Benefit (Mp/km) Total	Econom.Indicator NPV (Mp)	B/C	IRR (%)
Minor (Nat'l/ Prov'l)	Rehab/ Imp-1	P24-1	0	18	4.7	4.7(6.0-GRV)	3.30	.17	3.47	4.72	-	.17	.60	.00	5.50	9.5	1.6	23.7
		P41	19	46	17.6	17.6(6.0-GRV)	.79	.19	.98	.66	-	.05	.39	-.01	1.10	2.0	1.1	16.7
		P29	4	6	1.9	1.8(6.0-GRV)	.58	.17	.75	.10	-	.00	.63	.01	.74	.0	1.0	14.9
		N9	23	31	4.0	1.0(6.0-BMP)	1.35	.16	1.50	1.30	-	.11	-	-.03	1.39	-.1	.9	13.8
		P34	10	12	6.5	.1(4.0-PCC)	.48	.11	.59	.20	-	.00	.30	.01	.51	-.3	.9	13.1
						3.9(4.0-GRV)												
		P31	0	1	1.7	1.7(4.0-GRV)	2.02	.11	2.14	1.02	-	.51	.07	.01	1.60	-.9	.7	11.5
		P42	11	31	8.0	8.0(6.0-GRV)	1.70	.17	1.88	.60	-	.05	.39	.00	1.04	-6.7	.6	7.9
		P40	17	31	11.4	7.2(6.0-GRV)	.57	.18	.75	.20	-	.02	.18	.00	.41	-2.5	.5	6.5
		P28	4	7	1.8	1.8(4.0-GRV)	.42	.11	.54	.16	-	.01	.12	.01	.30	-.4	.6	6.4
		P47	7	7	1.9	.8(4.0-GRV)	2.65	.11	2.76	.23	-	.00	.96	.01	1.20	-1.2	.4	6.3
		P25	2	2	1.9	1.9(4.0-GRV)	.63	.11	.74	.07	-	.01	.25	.01	.34	-.8	.5	6.3
		N7-1	1	4	8.7	8.7(4.0-GRV)	.44	.11	.56	.08	-	.01	.17	.01	.27	-2.5	.5	5.9
		P46	7	13	1.1	.9(6.0-GRV)	.57	.17	.74	.21	-	.02	.18	.00	.42	-.3	.6	4.9
		P55	4	7	3.8	3.8(4.0-GRV)	.39	.11	.51	.10	-	.00	.12	.01	.24	-1.0	.5	4.2
		N8-2	23	24	5.8	4.0(6.0-GRV)	.57	.18	.75	.04	-	.00	.26	.01	.32	-1.7	.4	4.1
		P44	3	14	4.3	4.3(6.0-GRV)	.58	.17	.75	.15	-	.00	.27	.01	.42	-1.4	.6	3.8
		N3	9	14	1.4	.9(6.0-GRV)	.61	.17	.79	.24	-	.02	.09	.00	.36	-.4	.5	2.7
		N7-3	0	3	6.6	6.6(4.0-GRV)	2.26	.11	2.37	.22	-	.02	.31	.01	.56	-12.0	.2	1.6
		P12	0	2	5.7	5.4(4.0-GRV)	1.15	.11	1.27	.07	-	.01	.10	.01	.19	-5.8	.2	.0
		N2	13	13	5.5	1.2(4.0-GRV)	3.90	.11	4.01	.14	-	.00	.40	.01	.55	-4.2	.1	.0
		P20	8	8	5.6	5.6(6.0-GRV)	1.51	.17	1.68	.13	-	.02	.09	.01	.24	-8.1	.1	.0
	Imp-2/ Widen	P19	13	13	3.6	3.6(6.0-GRV)	.61	.17	.78	.13	-	.00	.41	.01	.55	-.8	.7	10.4
		P1	0	8	13.0	13.0(6.0-GRV)	.86	.17	1.03	.25	-	.02	.16	.01	.44	-7.7	.4	3.6
		P11	3	7	.9	.9(6.0-GRV)	1.18	.17	1.36	.31	-	.00	.24	.01	.56	-.7	.4	3.3
	New Const.	P24-2	0	6	4.5	4.5(4.0-GRV)	.78	.11	.89	.37	-	.01	.44	-.02	.79	-.5	.9	13.4
		P61	0	0	15.0	15.0(4.0-GRV)	.59	.11	.71	.01	-	.00	.25	-.02	.24	-7.0	.3	4.6

TABLE 5.2 - 10 (3)

Summary of Economic Analysis OCCIDENTAL MINDORO

Cost/Benefit:1991-2017 Discounted Total

Class of Road	Type of Impr't	Road Number	1993 AADT w/o	1993 AADT with	Length (km) Total	Length (km) Improvement	Economic Cost (Mp/km) Construct.	Economic Cost (Mp/km) Period Maint.	Economic Cost (Mp/km) Total	Benefit (Mp/km) Normal	Diverted	Generated	Develop't	Maint savg	Benefit (Mp/km) Total	Econom. Indicator NPV (Mp)	B/C	IRR (%)
Minor (Barangay)	Rehab/ Imp-1	B8-1	9	24	7.8	7.8(4.0-GRV)	.42	.11	.53	.58	-	.01	.23	.00	.82	2.3	1.5	24.1
		B10-6	2	5	2.2	2.2(4.0-GRV)	.38	.11	.49	.10	-	.00	.69	.01	.80	.7	1.6	21.8
		B9-25	3	7	5.5	5.5(4.0-GRV)	.65	.11	.76	.14	-	.00	.64	.01	.79	.2	1.0	15.5
		B9-6	0	3	2.7	2.7(4.0-GRV)	.41	.11	.53	.07	-	.00	.33	.01	.41	-.3	.8	11.6
		B7-1	3	9	4.3	3.1(4.0-GRV)	.67	.11	.79	.13	-	.00	.39	.01	.53	-.8	.7	10.4
		B10-3	0	2	1.2	1.2(4.0-GRV)	1.24	.11	1.35	.10	-	.00	.73	.01	.85	-.6	.6	10.3
		B2-6	3	7	5.5	5.3(4.0-GRV) .2(6.0-PCC)	1.31	.11	1.42	.20	-	.03	.65	.00	.88	-2.9	.6	10.0
		B9-7	0	2	5.9	5.9(4.0-GRV)	.62	.11	.74	.16	-	.01	.23	.01	.41	-1.9	.6	7.7
		B7-7	5	12	5.8	5.8(4.0-GRV)	1.03	.11	1.14	.21	-	.00	.29	.01	.51	-3.7	.4	6.0
		B10-8	0	2	4.2	4.2(4.0-GRV)	1.25	.11	1.37	.09	-	.00	.38	.01	.48	-3.8	.3	5.1
		B9-8	0	1	6.0	6.0(4.0-GRV)	1.34	.11	1.45	.25	-	.00	.29	.00	.54	-5.5	.4	4.7
		B1-5	0	1	2.0	2.0(4.0-GRV)	.47	.11	.58	.05	-	.00	.16	.01	.22	-.7	.4	4.0
		B10-7	2	4	6.4	6.4(4.0-GRV)	.96	.11	1.07	.13	-	.00	.22	.01	.36	-4.6	.3	3.7
		B6-7	0	1	3.9	3.6(4.0-GRV)	1.24	.11	1.36	.22	-	.02	.23	.01	.47	-3.2	.3	3.6
		B8-5	0	2	2.4	2.4(4.0-GRV)	.42	.11	.53	.06	-	.01	.14	.01	.22	-.7	.4	3.5
		B7-8	0	0	4.5	4.5(4.0-GRV)	.42	.11	.53	.03	-	.00	.16	.01	.20	-1.5	.4	3.5
		B1-6	0	1	2.0	2.0(4.0-GRV)	1.28	.11	1.40	.11	-	.00	.30	.00	.40	-2.0	.3	3.3
		B9-22	0	1	3.1	3.1(4.0-GRV)	.56	.11	.67	.04	-	.00	.22	.01	.27	-1.2	.4	3.2
		B5-5	0	0	.8	.8(4.0-GRV)	.42	.11	.53	.01	-	.00	.19	.01	.21	-.3	.4	2.8
		B2-4	0	0	4.0	2.5(4.0-GRV)	.85	.11	.97	.22	-	.01	.11	.01	.34	-1.6	.4	2.5
		B0-2	1	2	7.0	5.2(4.0-GRV)	.69	.11	.80	.00	-	.00	.22	.01	.24	-2.9	.3	2.4
		B0-8	0	2	5.0	3.9(4.0-GRV)	1.14	.11	1.25	.10	-	.01	.20	.01	.31	-3.7	.2	.2
	Imp-2/ Widen	B0-9	2	5	2.7	2.7(4.0-GRV)	.43	.11	.55	.11	-	.00	.62	.01	.74	.5	1.4	19.5
	New Const.	B1-2	0	1	4.6	.2(4.0-PCC) 4.4(4.0-GRV)	.92	.11	1.03	.06	-	.01	.24	-.02	.29	-3.4	.3	3.2
		B8-9	0	0	3.7	3.7(4.0-GRV)	.46	.11	.57	.03	-	.00	.17	-.01	.19	-1.4	.3	1.7
		B6-2	0	0	3.9	3.9(4.0-GRV)	.46	.11	.57	.02	-	.00	.13	-.01	.14	-1.7	.2	.0
		B8-8	0	1	5.8	5.8(4.0-GRV)	.56	.11	.67	.02	-	.00	.11	-.01	.12	-3.2	.2	.0